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TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

P. W DEPARTMENT

G.O. No. 543 W
B.P. No:

Press.
Mis.

Dated 9. 3. 1885

198

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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

General.
Establishment.

Read—the following letter from A. B. SAMPSON, Esq., Under Secretary to the Government of India, Public Works Department (General), to the Secretary to the Government of Madras, Public Works Department, dated Fort William, 11th February 1885, No. 229 G. :—

In reply to your letter No. 3133 W., dated 20th December 1884, I am directed to communicate the sanction of the Government of India to the temporary Engineer and upper subordinate establishment noted on the margin for Nos. I, II and III tank divisions for a period not exceeding one year, and to state that the salaries should be considered personal.

2	Tempy. Engrs. on Rs. 650 per month each.		
1	Do. Engr. on „ 550	do.	
3	Do. Engrs. on „ 450	do.	each.
3	Upper Subordinates „ 300	do.	do.

2. I am also to sanction the continued employment, for another year, of a Superintendent of Works with an additional allowance of Rs. 100 per month for the supervision of the divisions referred to above, and to request that a report of the progress made up to date may be submitted on an early date for the information of the Secretary of State for India.

3. The names of the persons appointed and the dates of their joining their appointment should be reported.

Order—dated 9th March 1885, No. 543 W., Public Works.

Communicated to the officers concerned.

2. The Chief Engineer for Irrigation will submit the report called for in paragraph 2 of the letter from the Government of India.

(True Extract.)

Major, R.E.,
Under Secy. to Govt., P.W.D.

To the Chief Engineer for Irrigation.
„ Examiner, Public Works Accounts.
„ Superintendent of Works, Tank Maintenance Scheme.

Exd. A. Grubert.
Spare Copies

GENERAL.
ESTABLISHMENT.

Govt. of {1885} Madras.

PUBLIC WORKS.

ated March, 9th.

Encl.

rd.

G.O., 9th March 1885, No. 543 W.

MARCH.

Temporary Engineer and Upper Subordinate Establishment

Letter from the Government of India sanctioning the — required for the Tank Maintenance Scheme, communicated to the officers concerned.

5A3
1

NOTE BY THE CHIEF ENGINEER FOR IRRIGATION.

The records of past years show that so long as we have managed the country the condition of the irrigation works, that is tanks and channels such as are now classified as irrigation works for which neither Capital nor Revenue Accounts are kept, has been considered unsatisfactory, and that it has on all sides been considered that larger sums than could be allotted from the revenue should be expended on their maintenance, and that considerable expenditure would be requisite to put them into an efficient state.

2. The subject seems to have been first brought to notice by Sir Arthur Cotton (then Captain A. Cotton) in a letter to the Board of Revenue, dated 13th December 1837, from which the following quotations are made:—

"The irrigation works in general are so far from being in good order that the revenue actually derived from them at present is by no means the full measure of their value.

"The average wet revenue of the Carnatic districts for five years up to Fasli 1244, omitting Tanjore, and adding 3 lakhs of rupees for Chingleput, amounted to Rs. 85 lakhs.

"The wet revenue of the Carnatic, including Tanjore, amounted to Rs. 118 lakhs."

If the irrigation works are put in good order Captain Cotton estimated that the revenue would rise from 85 to 120 lakhs, making total revenue including Tanjore 153 lakhs; he assumes the revenue to be 40 per cent. of the crop, and that the returns in revenue to Government roughly are 20 per cent. on outlay, from which he draws the following conclusions:—

(1.) The original cost of the irrigation works may be about 825 lakhs of rupees.
(2.) The annual value of the crop dependent on them, in good order, would be about 413 lakhs.
(3.) The annual revenue to Government would be about 165 lakhs.
(4.) Present actual revenue 118 lakhs.
(5.) Present total value of annual crop dependent on them, including rent free lands, about 320 lakhs.

Captain Cotton believes that nearly all the tanks in the country and nearly all the channels also, excepting those of Tanjore and the very large ones of other districts, water less lands than they once did, many only one-fourth, and very great numbers from one-half to three-fourths; and he instances several districts in which there has been a considerable falling off of revenue, while "In Tanjore there has been an increase of nearly 40 per cent. of gross produce in thirty years."

He gives the following account of the expenditure on irrigation works:—

Average expenditure of last six years in Tank Department	Rs.	5,30,000
Total revenue dependent on the works at present ...	,,	1,18,00,000
Expenditure about 5 per cent. on revenue:—		
Revenue which would be derived from works if in good order	,,	1,65,00,000
Expenditure as at present below 4 per cent. on this revenue:—		
Total value of gross produce at present	Rs.	3,20,00,000
Expenditure at present on total annual amount of property about 2 per cent.		
Supposed original cost of works	Rs.	8,25,00,000
Annual expenditure less than ¾ per cent.		

He says:—

"In England canals and such works, in which water is retained, require an annual outlay of 3 to 4 per cent., or from four to six times as much as here allowed.

"As the works are so very generally in want of extensive repairs, I am satisfied that a sum double the amount of the present expenditure would be most economically laid out for some years; indeed, I feel sure that if it is desirable to bring the same extent of land under effective irrigation as has been so at times within the last thirty years, it cannot be done with less than an annual expenditure of that sum, viz., 12 lakhs of rupees, at the very least for some years to come.

"I know that there are still numberless works, which if put into an efficient state would most amply repay the outlay. I would further urge an extended expenditure, not only on the ground of policy, but also of justice, the lands that are watered by Government works, are bought and sold in dependence upon the faith of Government that it will keep up a vigilant attention to those works; there are at this moment multitudes of estates that are of one-fourth or one-half the value that they once were, owing to the decayed state of the irrigation works.

"Even in the last twenty years, omitting Tanjore, the land revenue of the watered districts was on the average of five years terminating with—

"Fasli 1214	...	
" 1219	...	214 lakhs.
" 1222	...	216 "
" 1229	...	203 "
	...	215 "

Since when it has regularly declined in fifteen years to 189½ lakhs, being a falling off in that period of 26½ lakhs per annum, more than four times the whole cost of the Tank Department at present.

"It thus appears that in most of the districts there has been an actual, and in many a very considerable falling off, even during the short period of which we have any returns; and as the irrigation has undoubtedly been better attended to for the last ten years than it was twenty years ago, we cannot be mistaken in concluding that it had been declining previous to the period of the returns; and when to this is added the consideration, that almost all the districts when they came under our charge had been in such a state of confusion for some time that all the public works were in a dilapidated state (and the comparison is made with their revenue while in that state) the sad effects of the neglect of the irrigation must be most palpable; for it is certain that instead of the revenue having declined, had the tanks, &c., been put into a state of repair, it would have very greatly increased.

"The expenditure upon the irrigation has certainly not exceeded one-third of what upon the strictest principles of economy it ought to have been."

3. In 1851 a Commission was appointed by Government to inquire into and report upon the system of Public Works in the Presidency. The Commissioners submitted an exhaustive Report in December 1852, quoting largely from Captain A. Cotton's letter above referred to, and printing it in an appendix to their report. They value capital invested in construction of Government works of irrigation at 1,500 lakhs, and state that the annual outlay on works on average of past ten years has been 7 lakhs or less than half per cent. on original cost, or 4⅔ per cent. on gross yearly proceeds, annual revenue derived by Government.

They state that in the twelve following irrigation districts:—

Bellary,	Salem,
Cuddapah,	Trichinopoly,
Nellore,	Tanjore,
North Arcot,	Coimbatore,
South Arcot,	Madura, and
Chingleput,	Tinnevelly,

in Fasli 1259 the ayacut being assessment ... ... 2,682,260 acres, and ... 1,84,21,855 rupees.

Cultivation in that, a good year, was 1,787,909 acres, assessment Rs. 1,12,89,352, leaving waste no less than 894,351 acres.

"In most districts it appears probable that the whole extent of the ayacut was formerly under cultivation though not all at the same time.

"Making allowance for all disabling causes by a deduction of even as much as one-third of the whole extent entered as irrigated, waste in above districts would amount to 1,262,906 acres."

Further on they state—

"In short all the works in the country, with a few exceptions, are in a state that may be called 'below par,' that is they are below their state of full efficiency, and incapable of effecting their proper amount of irrigation. The tanks are in want of sluices, or such as they have are out of order, or they have no calingulahs, or such as there are are too small or too high, and so the stability of the tank is in danger, or the bank is low or weak, and the ryots are afraid to store a full tank, or their channels of supply have been become choked up and no longer bring a full supply of water, and as to the irrigating channels many of them are in the state described * * * from the want of regulating works at their head; or they have become filled up by deposit, or the river has thrown up a bank in front of them and they got no water; or they have too few outlets for irrigation and the ryots cut through the bank; or the outlets are too large and a vast quantity of water is wasted. Such is unfortunately the description which now applies to a very large proportion of all the works of irrigation throughout the country, with the partial exception of the favored districts of Tanjore and a part of Trichinopoly."

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The Committee drew up a list of the works undertaken by Government in the past fourteen years for the improvements of irrigation. Most of them are the larger channels in the districts which show a very considerable return on expenditure; the general results are —

There are thirty-nine works, original cost Rs. 3,22,278. Percentage of yearly net revenue given on first cost—

Thirteen works vary from 259⅜ per cent. to 77 9/16 per cent.
Twenty-one " " 47½ " to 7⅞ "
Two works are between 3 and 4 per cent.
Three works are unremunerative.

"It must never be forgotten that for every 100 rupees of revenue so sacrificed a further loss of fully 150 rupees is entailed on the ryots."

On the subject of proposed outlay they say—

"Revenue from land irrigated by Government works amounts to 135 lakhs yearly; add for Inam lands under works which Government are bound to maintain 15 lakhs; total 150 lakhs. The sum now expended annually on repairs is about 7 lakhs of rupees. This would probably be sufficient if the works were once brought into good order, but they are in general much out of repair, and a considerable expenditure is required to bring them to a proper point of efficiency so as to yield a maximum return. We would propose 15 lakhs yearly as the usual expenditure in maintaining existing works and bringing them into an efficient condition, including the furnishing them with proper sluices and calingulahs, improving their sources of supply and other minor and ordinary improvements; 15 lakhs of rupees steadily laid out every year on these objects, under able and judicious direction, would soon produce a marked effect. The proposed expenditure would be 10 per cent. on the present revenue from irrigation, but this rate would be gradually reduced as the effect of the improvement became apparent and as the whole number of works in efficient repair became larger year by year.

"The Native Princes who constructed the works of irrigation subjected every acre of land irrigated to a special cess for the purpose of keeping the works in repairs. After the assumption of the Government by the English, all the items making up the land revenue were consolidated into a single demand, for the most part a fixed sum in money per acre or cawny, the revenue in kind being commuted; these fees are therefore paid to Government on the express condition that the works shall be kept in good repair."

In addition to 15 lakhs to be expended yearly on maintenance and minor works, the Committee propose that 7½ lakhs at least should be annually devoted to the object of extending the benefits of irrigation.

"Thus the whole ordinary and usual sum proposed to be spent yearly on works of irrigation is 22½ lakhs.

"We have been brought to the opinion that the surplus revenue of this Presidency when fairly computed, *i.e.*, the surplus over its own expenditure or over the expenditure of the territories of which it receives the revenue, is much larger than appears under the present mode of making up the Imperial accounts.

"But whether the present surplus of revenue over expenditure be large or small, we would contend against the principle of making the accidental amount of that surplus, the measure of the expenditure on improvements morally certain to produce a large increase of revenue by the legitimate and really beneficial means of augmenting the comfort and the resources of the people."

The Committee recommend that the sum they have fixed for expenditure on irrigation works should be so expended without consideration of the current surplus revenue, that it should be, if necessary, raised by loan, it being the part of true wisdom to borrow money at 5 per cent. which will return directly 20 per cent.

4. In consequence of this report the Public Works Department was, in very much its present shape, organized and entrusted with the maintenance of all irrigation works, and under the new régime all help from the ryots, which under the name of Kudimaramut or customary labor had been enforced while the works were under the Revenue Department, ceased, and the cost of maintenance thrown upon the Government was necessarily enhanced. The new Department not having worked altogether satisfactorily a Committee was, after the lapse of some years, appointed to report on the subject. Their report was submitted in 1870, and in it they say:—

"Evidence shows that the works are not in that state of efficiency in which they require to be placed and that, treating the works as a whole, the expenditure of money on them has not been sufficient.

"Public Works Commissioners in 1851 state the average annual outlay on repairs of irrigation works was 7 lakhs, or 5 per cent. on the revenue then yielded by irrigated land. Adverting to the great increase which has since taken place in the cost of labor and materials, and having

in mind how much State expenditure on irrigation works was at that time supplemented by the co-operation of the ryots, we have no doubt that the average expenditure of late years represents an outturn of work, especially of minor works, far smaller than that executed in former years.

"A percentage of the revenue from irrigation should be devoted to the maintenance of the works, to be treated as a first charge on the revenue. We recommend that this charge be fixed at 8 per cent. on the revenue, and that the sum so obtained be devoted entirely to the maintenance of such of the irrigation works of the several districts as are not otherwise provided for, including under the head of maintenance such minor improvements, the construction of sluices, &c., as may be found requisite for the safety of the works, or for increasing their usefulness.

"Eight per cent. on the revenue, taking the revenue on irrigated lands at 170 lakhs, would give an annual grant of Rs. 13,60,000 for the maintenance of existing works. This sum is less than the grant, viz., 14 lakhs, which for the last two or three years has been annually entered in the budget under the head of Agricultural Repairs, but it is considerably more than has actually been spent on irrigation repairs."

5. Major (now Colonel) Mullins, in a dissent from Commissioner's report, says,

"I concur entirely with the report of the majority in considering that the irrigation works generally are not in that condition of efficiency in which they require to be placed, as also in the opinion that the grants of money for irrigation repairs, have, for a series of years, been altogether inadequate.

"I am of opinion that it will be necessary to allow, for several years to come, a considerably larger outlay (than 8 per cent. on the revenue)."

6. Sir W. Robinson, in a minute attached to the report, says,

"The conviction is thus forced on one that, however faithfully the proposed assignment may in future be apportioned amongst the works needing repair and maintenance, an assignment of 8 per cent., or even a much larger proportion of the gross wet revenue, if spent on the extravagant system now followed, must fail to meet the urgent demands of the country within any reasonable period."

Sir W. Robinson in referring to "the extravagant system" contemplated more being done by the people themselves.

He does not consider that there was any obligation on the State to maintain single-handed the old existing communal agricultural works, or that the consolidated wet revenue demand is a special charge conditional on the supply of State water.

He recommended that minor irrigation works should be classed as grant-in-aid works, that 6¼ per cent. (one anna in the rupee) should be assigned as a Local Fund in the district to meet grants-in-aid not exceeding half the estimated cost, for the repair and improvement of any work. The cultivators under the work paying the rest and finding the labor as occasion requires.

7. The Department was after this reorganized, but the result as regards minor irrigation works has not been very satisfactory, no more money being available for them. The next enquiry into the state of these works was made by the Famine Commissioners in 1878 who state as follows:—

"Petty Irrigation Works.—The account given of the condition of these is by no means satisfactory. In former days they were to a great extent maintained by a system of contributed or statutory labor, the Government being held liable only for any considerable work of improvement or restoration, and the ordinary petty yearly repairs being done by the population interested in the irrigation. In 1856-57 the duty of initiating tank repairs was transferred from the Revenue officials to the re-organized Public Works Department without, however, the power which has been enjoyed by the Collector, of enforcing statutory labor. Since that time the ryots have taken less and less part in the maintenance and repair of tanks and channels. On the other hand, the Public Works Department, though spending considerable sums annually in the repair of particular works have not been able to carry out all the necessary restorations; and there are many works which have fallen out of order for want of proper supervision and timely repair.

"There is a general consent that the measures now adopted for the maintenance of the tanks in efficiency are wholly inadequate. The expenditure has been more liberal of late years; but still the Irrigation Department reckon that, in order to make the more important tanks safe in years of ample rainfall, an annual grant three times as great as that hitherto appropriated for this purpose, and a period of 20 years would be necessary. Such a delay in effecting a necessary improvement would be very bad economy. The security of the annual revenue of £700,000, which is dependent on these works, is a matter which the Government cannot be justified in overlooking; and any loss which Government sustains corresponds to far more serious damage inflicted on the agricultural class. The Government ought then, in our opinion, to frame a scheme for putting the tanks into order with as little delay as financial considerations and the arrangements of the administration will permit, and carry it out in a systematic and continuous method till this serious cause of preventible loss has been removed."

8. In an appendix to the Famine Commissioner's Report is a report by the Irrigation Committee appointed under them, in which certain recommendations for the treatment of minor irrigation works are made, which have been approved by Government and are now being carried out. Generally speaking the works are being divided into two classes:—

(1.) Those which irrigate more than 200 acres, which are called "Imperial."
(2.) Those which irrigate less than 200 acres, which are called "Minor."

All works however coming under the second head which from their position affect Government works of any consequence are classed under the first head.

Imperial works are to remain under the charge of the Public Works Department and minor works are temporarily placed under the charge of the Revenue Department, it being intended that subsequently they should be sub-divided into three classes, some of them being entirely handed over to the ryots and others maintained by the ryots in return for a certain remission of revenue. A Kudimaramut Bill has also, in accordance with the recommendations of the Committee, been prepared and submitted to Government, and an Irrigation Law has been drafted. Steps are thus being taken towards better management of the tanks and channels, but from all districts come complaints that the funds allotted for minor irrigation works are insufficient and that the works are generally in bad order.

9. It would thus appear that the condition of the irrigation works in the Presidency is much the same as when Captain A. Cotton reported on them in 1837, but from Statement I appended it appears that the expenditure on the works was considerably increased after 1866-67, the average expenditure of the five years ending—

1851-52 being ... ... Rs. 7,79,402
or 7·54 per cent. on the revenue.
For the five years ending 1871-72 being ... ... „ 14,12,870
or 12·34 per cent. on the revenue.
For the five years ending 1876-77 being ... ... „ 11,53,426
or 10·54 per cent. on the revenue.

The average revenue for these periods being—

Rs. 1,03,42,713
„ 1,14,50,543
1,09,40,747

and the reports of late years show that latterly—

194 tanks * have been put in good order,
1,289 sluices * have been built,
1,139 weirs * have been constructed.

* From 1874-75 to 1881-82.

Statement II shows the grants that have been made for the past six years for Original Works and Repairs, and it will be seen that while the annual grant for repairs varies from a little over 6 lakhs to nearly 9 lakhs, from 2¼ to 3¼ lakhs were allotted annually for Original Works.

Statement III shows the expenditnre on Agricultural Works, under which head are classed River Embankments, River Conservancy, Drainage, &c., for a series of years, and proves that while the improvement of tanks and channels have received attention, a considerable proportion of the available funds has been expended on these essential works.

Before the famine, steps were taken under the direction of the Chief Engineer for Irrigation to group the tanks and channels in all districts, that is, to ascertain the circumstances of each individual work with reference to those lying above and below it in each drainage basin, and to note the requirements. The progress made in this work is as follows:—

	Area.	Revenue.
Works grouped	... 392,697	18,94,654
Works to be grouped ...	... 2,413,021	70,92,836
	2,805,718	89,87,490

This necessary work was interrupted by the famine, and the subsequent reduction of establishment in the Department prevented it being again taken up, and latterly the time that would have been occupied on this work has been taken up in classifying the

works as Imperial and Minor. When this classification has been finally completed, which it is anticipated it will be very shortly, it is proposed to take up the subject of the future maintenance of minor irrigation works specially, and to this end the evidence taken before the last Committee appointed by the Madras Government to consider the subject has been abstracted and the opinions of selected officers are being collected. Until this is done the expression of my individual opinion would be premature, and it need only be said that the subject must ere long be definitely disposed of.

10. Meanwhile, although full enquiry into the circumstances of each individual work is necessary to allow of money being economically expended, there are many works whose requirements have been ascertained, but not yet attended to, and many minor works on which to prevent risk of loss to Government and the cultivators, repairs of a nature not requiring scientific superintendence, are emergently required, and on these works a larger annual grant than is now made can be usefully expended.

11. The work to be done must be classed under two heads.—

(1.) Bringing each work up to the standard of efficiency and providing proper weirs and sluices.

(2.) Maintenance of works already brought up to the standard.

The first of these will bear no relation to the revenue, in many cases it will mean simply restoration, but in the case of most works it will be a work of improvement; the majority of the smaller tanks have never been provided with efficient weirs and in very many instances water has been drawn from the tanks by cuts through the banks or by rough sluices of hollow trees which are a continued source of danger to the works. In these cases the work to be done would be classified as "Extensions and improvements."

Under the second head "Maintenance," which must be understood to mean ordinary repairs which the ryots cannot perform, the expenditure should, it is thought, be a certain percentage of the revenue, and here we have the opinions of the Committees and individuals above noted for guidance. Starting with that of Sir A. Cotton we have the statement that works in which water is retained require an annual outlay of 3 to 4 per cent. on the revenue should be expended on maintenance and improvement. The Committee of 1852 state that 10 per cent. on the revenue should be expended on maintenance and improvement. The Committee of 1870 considered that 8 per cent. on the revenue should be expended on maintenance including minor improvements. Major (now Colonel) Mullins considered that a much larger outlay than 8 per cent. on the revenue would be required for many years and Sir W. Robinson proposed 6¼ per cent. (one anna in the rupee) on the revenue only as a grant-in-aid. If we suppose the total assessment, including second crop, to average 6 rupees per acre, 8 per cent. on the revenue would approximate to a charge of 8 annas per acre, and here perhaps may be a guide in settling the charge. The cost of maintenance on the principal systems of irrigation is as follows:—

Godávari Delta	4½ annas per acre.	Srivaikuntham Anicut	11 annas per acre.
Kistna "	8 " "	Pálár "	4½ " "
Pennér Anicut	5 " "	Chembrambakam Tank	8¾ " "

These works have the advantage of being concentrated, and under an efficient establishment, so that in the case of scattered works, many of which cannot be under the immediate eye of the permanent establishment, it does not appear unreasonable to allow a maintenance charge of 8 annas per acre, which on existing cultivation (say 2,500,000 acres) would amount to an annual grant of Rs. 12,50,000.

12. Returning now to the first head of proposed expenditure, "bringing each work up to the standard of efficiency," it is extremely difficult to estimate the cost of the work to be done, but taking the Report of Famine Commission, which quotes the opinion of the "Irrigation Department" as a guide, we find it is estimated that an expenditure of three times the annual grant hitherto appropriated will be necessary for twenty years. The annual expenditure (average of five years before the famine) was in round numbers Rs. 11,50,000, so that the proposed annual grant amounted to Rs. 34,50,000; this sum was of course to include the cost of maintenance, so that if we deduct 8 annas per acre for maintenance, the balance, Rs. 22,00,000, represents the sum which should be annually available for expenditure on "Restoration" or "Extensions and Improvements." In twenty years this would amount to 440 lakhs, or adding one-fourth for Establishment and Tools and Plant to 550 lakhs. In the Note by the Chief Engineer for Irrigation, printed with G.O., No. 685 I., 11th October 1881, copy

of which was forwarded to the Government of India, it is stated that 65 lakhs will be required to furnish tanks and channels with requisite masonry works and for minor miscellaneous improvements, but it may be noticed that this does not include the work that would be necessary to bring the tanks to a proper standard of efficiency.

13. As to the return to be expected from this expenditure, it is necessary to refer to a statement printed with letter No. 2696 W., dated 16th October 1882, from the Madras Government to the Government of India. Here it is shown that under the class of works now being treated of—

The ayacut was	Acres	5,150,000
The assessment was	Rs.	2,48,20,000

but that in consequence of the bad condition of the works the aggregate losses each year, in the opinion of the Revenue officers of Government, amount to not less than 40 lakhs. The ayacut is supposed to be the irrigable area under the work, but there are many cases where the ayacut includes land which in its present state cannot be irrigated and possibly never may be irrigated. It is true that if each work were brought up to its original irrigating capacity, though some of the ayacut might remain uncultivated, other waste lands not included in the ayacut might be irrigated, and it may be reasonable to set off the one against the other. Here then is the return to be expected from the outlay as given above, it amounts to 7·2 per cent.

14. The question now arises, how the money required can be expended, and it is necessary to call attention to the fact that to avoid loss by wasteful expenditure a considerable sum must be spent on "preliminary expenses." The grouping must be completed. As each group is worked out, and the circumstances of every individual tank in it ascertained, work can then be taken up without waiting for the grouping in each district or division to be completed, but the first thing to be done is to put on an establishment to deal with the grouping. The permanent establishment is not sufficiently strong to deal with it, and also to carry out works on any extended scale. The subject of the future management of minor irrigation works must be connected with the work of grouping, because the determination of what tanks should be abandoned, and what tanks can be handed over to the ryots without risk to other interests, depends on the investigation of the circumstances of each work.

The proposal that has been made to constitute tank divisions seems on the whole to be the best way of dealing with the subject, and it has this advantage that the working may be extended by the constitution of more divisions. It is in the first instance essential that work should be started on a proper footing, and though the tank divisions would work under the Superintending Engineers, it does not seem advisable, owing to the different number and condition of the works in each civil district, simply to give each Superintending Engineer a new division and let him commence work in his own way. An officer of some experience should be appointed to start the work, as at first the settlement of the question of the future management of the smaller tanks would claim considerable attention, but once the work was started on a proper footing and a decision come to as to the management of the smaller works, he might be withdrawn and the divisions left to the Superintending Engineer. It may also be desirable to appoint an Executive Engineer as Assistant to the Chief Engineer for Irrigation for a time. These would be special appointments, and would, with establishment, cost about Rs. 24,000 a year.

The cost of one tank division would be Rs. 32,000, and as considering the works are much scattered a large sum cannot be expended by each division in carrying out work, it is probable that 1½ lakhs per annum would be the expenditure including establishment and tools and plant of each division. If the work is begun next year, one division might be started, and 1½ lakhs would be required, the following year two divisions, and so on, as men were available, till at least one division would be working in each circle, and the expenditure would then be 9¼ lakhs or, as the special officers might by that time be withdrawn, to 9 lakhs. An annual expenditure of 10 lakhs would make the work last fifty-five years, and although tank divisions might be increased to almost any extent yet there seems no hope of bringing the works up to the proper standard of efficiency in a short time, and when we find twenty years spoken of as an unreasonable time to be occupied on it, it can only be supposed that the magnitude of the work has not been fully considered. If work is

taken up as proposed, the following is a rough forecast of the expenditure necessary in the next five years :—

	Improvements to Irrigation Works. LAKHS OF RS.
1883-84	1·5
1884-85	3
1885-86	4·5
1886-87	7
1887-88	10

This expenditure is to be incurred solely on the work to be undertaken by the tank divisions, until they are working properly. Works of maintenance and improvement must be carried out, as they are at present, imperfectly, by the permanent establishment. In the fourth year probably all works of improvement will be taken up by the tank divisions, and then the budget should provide, under Ordinary Irrigation and Navigation Works, 7 lakhs for Improvements to Irrigation Works ; Maintenance at 8 annas per acre, (say) 12½ lakhs, and Agricultural Works 4 lakhs ; total 23½ lakhs—to be increased the following year to 28½ lakhs.

27th November 1882. (Signed) J. O. HASTED, Colonel, R.E.,
Ag. Chief Engineer for Irrigation.

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I.

STATEMENT showing the Total Area irrigated under, the Revenue derived from, and Outlay incurred on, Irrigation and Navigation Works for which neither Capital nor Revenue Accounts are kept in all the Districts of the Madras Presidency for 35 years from 1847-48 to 1881-82.

Years.	Area irrigated.		Average for five years.			Remarks.
	Government.	Zemindari and Inam.	Revenue.	Outlay.	Percentage of Outlay on Revenue.	
	Rs.	Rs.	Rs.	Rs.	Rs.	
1847-48	14,70,536	...	1,05,34,17	10,30,646	...	
1848-49	15,22,315	...	1,00,94,65	7,35,465	...	
1849-50	14,80,398	...	95,88,70	6,14,143	...	
1850-51	16,52,009	...	1,02,42,73	6,03,060	5·89	
1851-52	16,58,714	...	1,13,03,66	9,13,796	8,16	
1852-53	17,14,197	...	1,30,87,92	...	...	
1853-54	16,94,979	...	1,19,19,09	...	...	
1854-55	16,16,017	...	1,17,26,68	...	...	
1855-56	16,07,113	...	1,27,37,37	11,05,337	8·68	
1856-57	16,77,076	...	1,26,59,08	11,99,244	9·47	
1857-58	16,60,510	...	1,26,52,33	9,34,017	7·38	
1858-59	17,35,405	...	1,43,80,24	13,80,060	9·59	
1859-60	17,75,760	...	1,17,44,07	11,40,355	9·70	
1860-61	17,55,658	...	1,11,88,29	8,00,887	7·15	
1861-62	18,32,719	...	1,17,39,28	6,74,706	5·74	
1862-63	19,58,349	...	1,21,97,13	7,70,795	6·31	
1863-64	19,35,007	...	1,17,57,82	6,76,304	5·75	
1864-65	18,88,601	...	1,14,4,006	8,62,184	7·53	
1865-66	20,19,648	...	1,17,3,503	6,61,042	5·63	
1866-67	21,02,641	...	1,20,2,978	8,00,886	6·66	
1867-68	18,88,179	...	1,10,3,761	* 17,18,916	* 15·57	
1868-69	19,56,063	...	1,14,71,294	16,72,795	14·58	
1869-70	19,63,278	...	1,14,3,203	13,15,604	11·50	
1870-71	20,42,968	...	1,19,45,510	18,15,194	15·19	
1871-72	22,99,555	4,39,985	1,1,83,150	11,41,843	9·64	
1872-73	24,46,645	3,33,400	1,1,27,801	11,72,302	10·29	
1873-74	25,03,862	2,49,363	1,1,36,160	12,30,853	10·81	
1874-75	21,57,302	2,26,782	1,3,80,398	11,51,985	10·01	
1875-76	22,94,096	7,04,314	1,1067,875	10,71,212	9·67	
1876-77	18,93,633	7,19,619	7,01,503	11,40,777	16·26	
1877-78	24,01,710	7,19,836	1,1,89,730	11,67,772	9·81	
1878-79	25,17,670	7,78,363	1,1,92,215	12,61,896	10·56	
1879-80	25,13,870	7,37,866	1,9,01,671	7,30,815	6·13	
1880-81	25,11,395	8,37,579	1,2,56,092	4,11,009	3·27	

* Includes famine expenditure in 1866-67 and 1867-68.

Public Works Establishment was reduced.
Value of work done from Famine funds on the Pálkár anicut channels erroneously debited to this head in 1878-79 was written back during the year.

II.

STATEMENT of Grants for Irrigation and Navigation Works for which neither Capital nor Revenue Accounts are kept, from 1876-77 to 1881-82.

Districts.	1881-82.		1880-81.		1879-80.		1878-79.		1877-78.		1876-77.	
	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Ganjam	5,000	30,000	5,000	16,620	1,620	31,080	4,566	15,810	4,331	17,000	3,000	29,900
Vizagapatam			2,500	5,000	2,500	17,100	2,000	11,000	1,500	22,500	2,900	19,000
Godávari	4,809	8,000	5,160	7,500	7,000	22,000	7,500	17,840	17,111	17,000	11,500	15,200
Kistna	500	4,100	500	8,000	6,000	10,000	7,002	8,920	10,460	8,000	3,500	5,200
Nellore	8,000	40,500	10,000	50,000	6,000	60,000	7,000	50,470	7,000	60,000	19,850	56,300
Bellary	10,000				7,002	10,000	7,000	60,560	7,000	50,000	8,000	60,000
Cuddapah	6,000	56,000	10,743	22,500	15,000	45,000	11,000	45,090	9,500	50,000	12,000	40,000
Kurnool			5,000	20,000	22,121	25,000	10,000	44,000	18,120	50,000	28,000	52,000
Chingleput	27,297	49,000	17,847	75,000	17,500	78,210	16,500	68,216	48,840	89,000	52,942	87,900
North Arcot	71,000	97,000	15,000	65,000	14,200	80,000	14,500	76,398	15,000	97,000	20,000	88,500
South do.	42,000	99,000	6,000	24,000	10,000	1,02,000	12,000	90,110	17,000	92,510	42,000	1,04,000
Salem	40,000	12,000	6,000	..	21,000	85,000	16,905	67,390	20,550	66,000	20,000	53,000
Coimbatore	10,278	98,000	3,528	25,000	1,000	16,200	7,500	46,100	5,500	56,460	6,000	70,500
Tanjore	4,000	14,500	3,722	45,000	2,000	10,000	2,000	9,210	3,500	10,500	3,000	..
Trichinopoly	6,000	30,500	4000	30,000	5,000	44,000	7,500	39,560	10,200	40,400	8,000	45,000
Madura	2,000	16,000	..	..	6,200	50,000	11,000	55,450	5,400	49,000	4,000	49,000
Tinnevelly	12,200	60,000	4000	70,000	23,000	1,50,000	24,715	1,48,650	22,554	57,500	36,100	61,000
Reserve ..	36,500	1,31,000	21,000	95,000	28,100	..	35,000	..	34,274	..	41,500	..
Total ..	2,26,276	5,25,000	2,2,300	6,17,000	1,01,287	5,20,710	2,04,816	8,95,050	2,86,145	8,04,410	3,21,302	8,12,200

III.

STATEMENT showing Outlay on Agricultural Works incurred from 1863-64 to 1881-82.

Districts.	1863-64.		1864-865.		1865-66.		1866-67.		1868-69.		1875-76.		1876-77.		1377-78.		1878-79.		1879-80.		1880-81.		1881-82.	
	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.	Original Works.	Repairs.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Ganjam ..	1,235	..	..	..	..	..	..	..	..	..	1,319	12,617	54	19,692	782	16,548	53	3,483	104	2,560	..	676	..	..
Vizagapatam	..	..	..	..	..	..	..	..	..	..	..	1,914	15	837	3	880	..	628	1	2,208	..	..	..	180
Godávari ..	..	..	..	..	..	..	..	..	..	..	42,734	40,993	29,602	46,019	15,952	6,551	..	21,935	..	22,575	32,486	21,118	73,881	24,694
Kistna ..	..	..	1,571	..	3,177	..	415	..	..	..	..	14,981	..	6,744	8,433	3,405	1,978	2,746	9,128	443	11,121	7,209	10,193	5,684
Nellore ..	..	..	..	..	..	..	..	..	..	..	4,498	4,999	45,999	3,005	15,481	100	4,373	2,046	10,449	184	5,357	131	1,483	804
Cuddapah ..	..	..	..	..	..	..	..	..	..	..	..	6,849	1,489	914	801	609	5,236	797	1,466	744	470	485	..	431
Bellary ..	..	..	..	..	..	..	..	..	..	..	28	..	89	..	170	200	18	..	..	..	..	..	..	..
Kurnool ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Chingleput ..	..	..	..	..	..	..	8,446	..	274	..	..	4,736	115	8,070	1,889	1,524	12	3,132	3,556	276	3,990	1,095	914	967
North Arcot.	..	..	..	..	..	..	..	..	..	..	..	2,925	142	1,456	..	127	93	..	196	..	..	..	25	..
South do.	..	..	2,310	..	..	..	3,500	..	..	..	255	10,491	112	1,927	..	11,207	110	4,905	..	14,494	249	13,303	..	12,099
Salem ..	..	..	..	..	..	..	..	..	..	..	42	3,864	..	3,271	..	..	639	630	..	1,262	..	1,448	176	436
Coimbatore.	..	..	..	..	..	..	..	..	..	..	2,350	5,861	106	4,167	..	402	102	2,856	2,333	7,272	1,858	6,150	501	3,306
Tanjore ..	..	..	..	..	1,900	..	3,284	..	..	..	..	1,14,216	1,312	61,413	759	60,657	..	51,483	969	52,562	1,002	68,355	1,335	68,844
Trichinopoly	..	..	..	..	..	..	..	..	..	..	..	80,561	2,515	56,561	6,657	88,330	15	36,014	628	15,396	2,015	19,408	795	30,537
Madura ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	366	..	..	..	511	..	..	..	..
Tinnevelly ..	..	..	..	..	..	..	..	..	..	..	..	4,269	..	3,703	..	471	..	29,153	7,066	5,025	5,503	5,135	17,228	3,000
Total ..	1,235	..	3,885	..	5,077	..	15,645	..	274	..	52,225	2,59,266	81,550	2,17,773	50,927	2,11,377	12,629	1,59,895	36,190	1,25,512	63,950	1,50,501	1,06,031	1,55,982

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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

No. 60.

READ—the following letter from Major G. F. L. MARSHALL, R.E., Under Secretary to the Government of India, Public Works Department (Civil Works—Irrigation), to the Secretary to the Government of Madras, Public Works Department, dated Fort William, 26th January 1883, No. 40 I.:—

In acknowledging the receipt of your letter, No. 3273 W., dated the 11th December 1882, on the subject of minor irrigation works in the Madras Presidency, I am directed, in reply, to state that the financial programme detailed in the 3rd paragraph of your letter is approved by the Government of India, and that grants under 33. Irrigation and Navigation, for the Madras Presidency, will be provided for the years 1883-84 to 1886-87 inclusive to the following extent:—

Rs.	19,78,300	1883-84
"	21,28,300	1884-85
"	22,78,300	1885-86
"	25,28,300	1886-87

2. It must be understood that these grants are intended to be final up to the year 1886-87 and to include all expenditure under both works and establishment.

3. I am to point out that, in order to ensure the fullest possible benefit being derived from this expenditure, it is essential that the Statute Labor question, the question of the extent to which the Public Works Department Agency should be superseded by that of the Collectors, also the question of the extent to which tanks should be repaired by the State, should one and all receive careful and full consideration; and I am to say that, in view to an early settlement of them, the Inspector-General of Irrigation will be deputed to Madras and may be expected to arrive there about the 25th instant, in order to discuss with the local officers these and the further subjects connected with irrigation which are still undisposed of.

No. 61.

ORDER—dated 12th February 1883, No. 143 I., Public Works.

Communicated to the officers concerned, with copy of note, dated 27th November 1882, by the Chief Engineer for Irrigation.

(True Extract.)

(Signed) J. O. HASTED, Colonel, R.E.,
Ag. Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

To Superintending Engineers.
To the Chief Engineer for Irrigation.
" Examiner, Public Works Accounts.
" Revenue Department.
" Board of Revenue.

Exd. A. Aubert.
Spare Copies

IRRIGATION.
ACCOUNT.

Govt. of {1883} Madras.

PUBLIC WORKS.

Dated February, 12th.

Recd.

Encl.

G.O., 12th Feb. 1883, No. 143 I.

FEBRUARY.

Minor Irrigation Works

Letter from the Government of India accepting the proposals of the Madras Government for dealing with —, communicated to the officers concerned.

5/3/8

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

General.
Establishment.

READ—the following letter from G. H. W. WALKER, Esq., Officiating Under Secretary to the Government of India, Public Works Department (General), to the Secretary to the Government of Madras, Public Works Department, dated Simla, 21st May 1883, No. 741 G.:—

In reply to your letters, Nos. 1134 W. and 1212 W., of 16th and 23rd April 1883, I am directed to communicate sanction to the temporary establishment marginally noted, required for dealing systematically with the tank system for the period of one year, and to state that should it become necessary to retain the establishment in question for a longer period, application should be made for renewal of sanction three months before the expiry of the present sanction.

		Rs.
2 Executive Engineers	...	650 each.
1 Assistant Engineer	...	450
1 Sub-Engineer	...	300

2. As regards the appointment of a Superintending Engineer for this work, I am to remind you that a Superintendent of Works, and not a Superintending Engineer, has already been sanctioned by the Government of India in Public Works Department, No. 459 G., of 19th March 1883, and you were informed in Public Works Department letter, No. 502 G., of 4th April 1883, that the local Government was at liberty to employ one of its Superintending Engineers on this duty if it was considered necessary, filling up his place by a Superintendent of Works; no further orders are therefore required on this point.

3. The rest of the temporary establishment to which sanction is asked can be sanctioned by the Madras Government under Public Works Code, I, 88.

4. As regards appointment of officers to fill these posts, I am to refer you to paragraph 2 of Public Works Department letter, No. 742 G., of 21st May 1883, and to add that the present sanction must not be taken as affecting the question of the strength of the permanent establishment which is being separately considered.

ORDER—dated 16th June 1883, No. 1700 W., Public Works.

Communicated to officers concerned.

2. The Superintending Engineer will at the proper time report on the subject of paragraph 1 of the foregoing letter.

3. The question of the provision of the necessary Engineer Establishment for the project will be dealt with separately.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
" Superintending Engineer, Tank Maintenance Scheme.
" Examiner, Public Works Accounts.

Exd. C. Howarth.
Spare Copies

GENERAL.
ESTABLISHMENT.

Govt. of {1883} Madras.

PUBLIC WORKS.

Dated June, 16*th*.

Read. *Encl.*

G.O., 16th June 1883, No. 1700 W.

JUNE.

Tank Systems

Temporary establishment of one Assistant and two Executive Engineers and a Sub-Engineer for dealing systematically with the —. The sanction of the Government of India to the entertainment of a —, communicated, with remarks, to officers concerned.

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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Establishment.

READ—the following papers:—

From Lieutenant-Colonel P. MONTGOMERIE, R.E., Superintending Engineer, Tank Maintenance Scheme, to the Chief Engineer for Irrigation, dated Chepauk, 17th November 1883, No. 518 T.

With reference to paragraph 2 of G.O., No. 1700 W., dated 16th June 1883, I have the honor to request that sanction may be obtained for the retention of the following temporary engineer establishment, viz.:—

	Rs.
2 Executive Engineers	650 each.
1 Assistant Engineer	450
1 Sub-Engineer	300

and that sanction may also be obtained for the entertainment of the following engineer establishment required for No. 2 Tank division:—

	Rs.
1 Executive Engineer	650
1 Assistant Engineer	450
1 Sub-Engineer	300

No. 144 I.

Submitted to Government with a recommendation that the sanction of the Government of India to the temporary establishment required for the Tank divisions next official year may be obtained.

2. As the establishment for the division at present employed is still incomplete, and much remains to be done to place the work on a proper footing, it is suggested that Colonel Montgomerie should continue in charge of the divisions for another year, and that the Government of India should be requested to renew the sanction conveyed in their letter, No. 459 G., dated 19th March 1883, to the appointment of a Superintendent of Works, with the understanding that this appointment will be in lieu of that of one of the two Executive Engineers sanctioned in Government of India letter, No. 741 G., dated 21st May 1883.

CHEPAUK, 4th December 1883.

(Signed) J. O. HASTED, Colonel, R.E.,
Ag. Chief Engineer for Irrigation.

To the Acting Joint Secretary to Government,
Public Works Department, Irrigation Branch.

ORDER—dated 7th January 1884, No. 11 I., Public Works.

The Government of India will be requested to sanction the establishment required for the Tank Maintenance Scheme for the next official year, and to permit the re-appointment of a Superintendent of Works in place of one of the Executive Engineers previously sanctioned.

2. The Superintending Engineer will apply for the sanction of Government to the temporary subordinate and office establishments required for next year.

3. Ordered that the following letter be sent to the Government of India :—

(Here enter No. 12 I., dated 7th January 1884.)

(True Extract.)

(Signed) J. O. HASTED, Colonel, R.E.,
Ag. Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

To the Superintending Engineer, Tank Maintenance Scheme.
" Chief Engineer for Irrigation.
" Examiner, Public Works Accounts.

Exd. E. Fernandez.
Spare Copies

543/10

IRRIGATION.
ESTABLISHMENT.

Govt. of {1884} Madras.

PUBLIC WORKS.

Dated January, 7th.

Recd. *Encl.*

G.O., 7th Jan. 1884, No. 11 I.

JANUARY.

Establishment

The Government of India to be requested to sanction the — for the Tank Maintenance Scheme for the next official year.

5/3
11

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Establishment.

LETTER—from

COLONEL J. O. HASTED, R.E.,

Acting Joint Secretary to the Government of Madras,

Public Works Department,

Irrigation Branch,

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,

PUBLIC WORKS DEPARTMENT,

(IRRIGATION.)

SIR,

In forwarding, herewith, a copy of Proceedings of Madras Government, No. 11 I., dated 7th January 1884, I am directed to request that sanction for the temporary establishment required for the Tank Maintenance Scheme may be renewed for another year. The present sanction is for a Superintendent of Works, two Executive Engineers, one Assistant Engineer and one Sub-Engineer, and I am to say that, as the work has not yet fairly been started, the re-appointment of the Superintendent of Works is considered essential, but that it is proposed he should take the place of one of the Executive Engineers, thus reducing the establishment already sanctioned by an Executive Engineer.

2. I am also to request that a fresh sanction may be accorded to the temporary establishment, noted in the margin, required for the No. 2 Tank division, which will be formed from the 1st March next in accordance with the scheme approved in your letter, No. 40 I., dated 26th January 1883.

	RS.
1 Executive Engineer	650
1 Assistant Engineer	450
1 Sub-Engineer	300

I have the honor to be,

Sir,

Your most obedient servant,

(Signed) J. O. HASTED, Colonel, R.E.,
Ag. Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

FORT ST. GEORGE,
7th January 1884.

Exd. E. Fernandez.
Spare Copies

IRRIGATION.
ESTABLISHMENT.

Govt. of [1884] Madras

PUBLIC WORKS.

Dated January, 7th.

Recd. *Encl*

7th Jan. 1884, No. 12 I.

JANUARY.

Establishment

Requesting to renew for another year the sanction for the — required for the Tank Maintenance Scheme.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

General.
Establishment.

READ—the following letter from G. H. W. WALKER, Esq., Officiating Under Secretary to the Government of India, Public Works Department (General), to the Secretary to the Government of Madras, Public Works Department, dated Fort William, 11th February 1884, No. 195 G. :—

I am directed to acknowledge the receipt of your No. 12 I., dated 7th January 1884, applying for renewal of sanction to the establishment noted in the margin for the Tank Maintenance Scheme, and asking for further sanction to three temporary engineers on the same rate of pay for a second division.

	RS.
Local allowance for Superintendent of Works	100
1 Temporary Engineer	650
1 Do.	450
1 Sub-Engineer	300

2. I am to remind you that it was stated in paragraph 5 of your No. 3273 W., dated 11th December 1882, that the additional Superintending Engineer, who was ultimately provided for the scheme by means of the local allowance of 100 rupees given to an Executive Engineer acting as Superintendent of Works, would be required probably for one year only. Accordingly the allowance was sanctioned by the Government of India, and confirmed by the Secretary of State, for one year. Before extending this sanction it is necessary that valid reasons for the extension should be given, and I am to request that a statement may be furnished showing the work already done and remaining to be done by Colonel Montgomerie, the officer who is in charge of the scheme.

3. In regard to the establishment for the first and second Tanks divisions, I am to say that the Government of India will willingly accord sanction to the entertainment of temporary engineers, within the limit mentioned by you, on the Madras Government submitting the names of competent men; but I am to point out that hitherto no such appointments, requiring the sanction of the Government of India, have been proposed for the Tanks, unless Mr. Wallnut, whose appointment was sanctioned for the Barur tank, is considered to belong to the Tanks division, and it is observed from the last distribution return that the division has been manned by members of the permanent establishment and temporary men for whose appointment the sanction of the Madras Government sufficed. Under these circumstances, the submission of the names of suitable engineers will be awaited, who may be utilised, after sanction, either in the Tanks division itself, or to set permanent officers free for employment in that division.

4. Finally, I am to state that the Government of India desires to impress upon the Government of Madras its preference to the actual improvement of the tanks of even one district, to the mere preparation of schemes in a large number of districts; and I am to request that this may be borne in mind both with regard to the extension of the appointment of Superintendent of Works and the plan of operations for the Tank scheme.

Order—dated 21st February 1884, No. 472 W., Public Works.

Communicated to the Chief Engineer for Irrigation for report on the subject of paragraph 2 of the letter from the Government of India, and for information and guidance as regards paragraph 4.

2. The Government of India will be addressed, with reference to paragraph 3, on receipt of the report now called for.

(True Extract.)

(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
" Superintending Engineer, Tank Maintenance Scheme.

Exd. E. Fernandez.
Spare Copies

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13

GENERAL.
ESTABLISHMENT.

Govt. of {1884} Madras.

PUBLIC WORKS.

Dated February, 21st.

Recd. *Encl.*

G.O., 21st Feb. 1884, No. 472 W.

FEBRUARY.

Establishment for the Tank Maintenance Scheme

Remarks of the Government of India on application for renewal of sanction to the —, and asking for three temporary engineers for a second division, communicated to the Chief Engineer for Irrigation for report.

573/14

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

General.
Establishment.

Read—the following paper :—

No. 65 I.

Note by the Acting Chief Engineer for Irrigation.

The Tank divisions were started with the object of grouping all the scattered works of irrigation throughout the Presidency, investigating the circumstances of each individual work, estimating for the work required to bring each up to the standard of efficiency, and for providing it with proper means of discharging surplus water and with efficient irrigation sluices, and of carrying out the work estimated for. The scheme, as sanctioned by the Government of India, provided for one division being employed the first year, and an additional one every subsequent year until six divisions were working, one in each circle.

2. The work was started in this official year under Lieutenant-Colonel Montgomerie, one division being appointed to work in the Madura district where it was believed the irrigation works were in greater need of improvement than elsewhere. There was of course a great deal of preliminary work to be done. The system on which the work was to be taken up, the forms to be adopted, the maps, plans, and sections to be prepared, were all discussed fully with Colonel Montgomerie, and some delay naturally occurred in getting work started in the country.

3. The work hitherto done will best be understood from the accompanying map, which is one of the Revenue Survey maps on which the divisions of the primary maps have been laid down. It was intended to make the greatest possible use of the Revenue Survey maps, and even in places where these maps have not yet been published, the Revenue Survey Department have obligingly placed at our disposal such maps as have been prepared. On these maps the main drainage basins are first laid down, and then divided into minor basins as appears most convenient. The outdoor parties then verify the basins and take up each work, obtaining from the Revenue Department full revenue details, working out the hydraulic details, and ascertaining the requirements of each ; finally preparing sections of each tank bank and channel, and plans of existing masonry works, and estimating for the work necessary to put each tank and channel into good order. These estimates are then sanctioned and sent out for execution under the Tank division ; it may be a question how the works can best be carried out, but the principle has been adopted that each divisional office shall work independently ; a portion of the established Public Works division is thus handed over to the Tank division which will, on completion of the works, give back the charge again. Complete estimates for one minor basin only have yet been prepared, and estimates to the amount of about Rs. 30,000, sanctioned ; and Colonel Montgomerie has submitted a full report with the plans and estimates of this basin, explaining the method in which the work has been started, and discussing the means by which the work may be most economically carried out, which will shortly be laid before Government.

4. Madura having been selected as the district in which the first Tank division should work, it was decided to locate the second division in the Madras district, where the tanks are very numerous, and the circumstances of the irrigation are somewhat different from those in Madura. The map shows clearly what work has been done,

although only one division has yet been sanctioned; the maps have been got in readiness for the second division, and some of the surveyors whose work was completed in Madura are now engaged under an officer in grouping and investigating in Madras, in fact starting the work, so that when the additional establishment is sanctioned, there may be no delay in preparatory work.

5. The two divisions will, during the year, work out the shaded portions of the maps, and it is hoped complete the execution of works over a great portion of the area; and grouping and investigation will be pushed on northward from Madura and southward from Madras.

6. The present idea is for the third division, which will be appointed in the commencement of 1885-86, to start work in Kurnool and work through the Ceded Districts, and the maps of this portion will be prepared before the end of the year, and if possible an officer with some surveyors detached to commence operations, so that the work may be taken up without any delay.

7. The officers engaged being new to the work, and it being very desirable that all should work on the same system, it is considered necessary that the services of the Superintending Engineer should be retained for another year. Whatever is decided should be done eventually, the work should be in full swing before any change is made.

(Signed) J. O. HASTED, Colonel, R.E.,
Acting Chief Engineer for Irrigation.

Chepâk,
22nd March 1884.

To the Acting Joint Secretary to Government,
Public Works Department, Irrigation Branch.

Endorsement on the above.

Forwarded to the Secretary to Government, Public Works Department, with reference to G.O., No. 472 W., dated 21st February 1884.

(Signed) J. O. HASTED, Colonel, R.E.,
Ag. Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

Order—dated 31st March 1884, No. 861 W., Public Works.

Ordered that the report submitted by the Chief Engineer for Irrigation be forwarded to the Government of India, and that sanction be requested to the renewal, for a further period of one year, of the sanction to a local allowance of Rs. 100 to an Executive Engineer acting as Superintendent of Works, who takes the place of the Superintending Engineer employed on the Tank Maintenance Scheme.

(Here enter No. 862 W., dated 31st March 1884.)

(True Extract.)

(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
" Superintending Engineer, Tank Maintenance Scheme.
" Revenue Department.

Exd. A. Aubert.
Spare Copies

5743/15

GENERAL.
ESTABLISHMENT.

Govt. of Madras. 1884

PUBLIC WORKS.

Dated March, 31*st.*

Recd. *Encl.*

G.O., 31st March 1884, No. 861 W.

MARCH.

Tank Maintenance Scheme

Regarding the necessity for the continuance of Colonel Montgomerie's services in connection with the —, and for the renewal of the sanction of a local allowance to the Executive Engineer holding charge of a circle in his place.

5713/16

31st March 1884, No. 862 W., Public Works.

PUBLIC WORKS DEPARTMENT.

General.
Establishment.

Letter—from

Colonel J. SHAW-STEWART, R.E.,

Secretary to the Government of Madras,

Public Works Department,

To

The SECRETARY to the GOVERNMENT of INDIA,

Public Works Department,

Sir,

I am directed to acknowledge the receipt of your letter, No. 195 G., dated 11th February 1884, and, with reference to paragraph 2, to forward, for the information of the Government of India, the accompanying report by the Chief Engineer for Irrigation, showing the work already done and remaining to be done by Colonel Montgomerie in connection with the Tank Maintenance Scheme on which he is employed.

2. His Excellency the Governor in Council trusts that, on consideration of Colonel Hasted's report, the Government of India will see the necessity for the continuance, for another year at least, of Colonel Montgomerie's services on his special work, and will accordingly support the proposal of the Madras Government to extend the existing sanction of a local allowance of Rs. 100 per mensem to the Executive Engineer who replaces Colonel Montgomerie in the charge of a Superintending Engineer's circle.

3. I am to add that the Government of India will be separately addressed in regard to the entertainment of temporary Engineers for the Tank divisions.

I have the honor to be,

Sir,

Your most obedient servant,

(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

Fort St. George,
31st March 1884.

Exd. A. Aubert.
Spare Copies

GENERAL.
ESTABLISHMENT.

Govt. of | 1884 | Madras

PUBLIC WORKS.

Dated March, 31st.

Read. *Enc*

G.O., 31st March 1884, No. 862 W

MARCH.

Tank Maintenance Scheme

Regarding the necessity for the continuance of Colonel Montgomerie's services in connection with the — and for the renewal of the sanction of a local allowance to the Executive Engineer holding charge of a circle in his place.

543
17

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

General.
Establishment.

READ—the following papers :—

From A B. SAMPSON, Esq., Under Secretary to the Government of India, Public Works Department (General), to the Secretary to the Government of Madras, Public Works Department, dated Simla, 30th April 1884, No. 512 G.

Referring to your letter, No. 862 W., dated 31st March 1884, regarding what has already been done and remains to be done by Colonel Montgomerie in connection with the Tank Maintenance Scheme on which he is employed, I am directed to observe that in the 3rd paragraph of Colonel Hasted's note, dated 22nd March 1884, submitted therewith, it is stated that "on these maps the main drainage basins are first laid down and then divided into minor basins as appears most convenient. The out-door parties then verify the basins and take up each work, obtaining from the Revenue Department full revenue details, working out the hydraulic details and ascertaining the requirements of each." With reference to this description of the work done I am to inquire whether it applies to the whole of the Madura district.

2. I am also to request that it may be stated what has been the actual strength of the establishment employed directly under the orders of Colonel Montgomerie.

OFFICIAL MEMORANDUM.

With reference to endorsement, No. 108 E., dated 8th instant, on letter from the Government of India, the undersigned has the honor to report that the Vigai river basin, in the Madura district, has been sub-divided, and the Upper Vigai basin has been grouped, all details worked out, and the actual work of restoration put in hand ; the rest of the Madura district has not yet been taken up.

2. Enclosed is a statement furnished by the Examiner, Public Works Accounts, showing the strength of the establishment employed under Colonel Montgomerie during last official year.

OOTACAMUND,
17th May 1884.

(Signed) J. O. HASTED, Colonel, R.E.,
Chief Engineer for Irrigation.

To the Secretary to Government, Public Works Department.

Office Note from the Examiner, Public Works Accounts, dated 14th May 1884, No. 105.

Herewith the required statement showing the actual strength of the establishment employed directly under the orders of the Superintending Engineer, Tank Maintenance Scheme, during the past year 1883-84.

Statement showing the actual strength of the Establishment employed directly under the orders of the Superintending Engineer during the year 1883-84.

Months.	Engineer Establishment.			Upper Subordinate Establishment.				Petty.	Office Establishment. Clerks.											Office Establishment. Draftsmen.							Cost.			
	Superintending Engineer.	Executive Engineer.	Assistant Engineer.	Sub-Engineer.	Supervisors.	Overseers.	Surveyors.	Lascars.	II Class, 1st Grade, 160—200.	II Class, 2nd Grade, 120—160.	II Class, 3rd Grade, 100—120.	III Class, 2nd Grade, 60—80.	III Class, 3rd Grade, 50—60.	IV Class, 1st Grade, 40—50.	IV Class, 2nd Grade, 30—40.	IV Class, 3rd Grade, 20—30.	V Class, 1st Grade, 15—20.	V Class, 2nd Grade, 10—15.		1st Class, 50—70.	2nd Class, 35—50.	3rd Class, 20—30.	Special, 80—100.	Messengers.	Muchies.	Accountants, 5th Grade.	Salary.	Travelling allowance.	Contingencies.	Total cost.
Superintending Engineer, Tank Maintenance Scheme.																											RS.	RS.	RS.	RS.
March 1883	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
April "	1	..	..	..	1	2	..	..	1	..	..	..	..	..	1	2	..	..	..	1	2	1	..	2	1	..	1,797	..	..	1,797
May "	1	..	1	..	1	1	..	3	1	..	..	..	..	..	1	2	..	..	..	1	2	1	..	3	1	..	2,427	..	105	2,532
June "	1	..	1	..	1	1	..	2	1	..	..	..	1	..	1	2	..	..	..	1	2	1	..	3	1	..	2,268	..	43	2,311
July "	1	..	..	..	..	..	..	3	1	..	..	..	1	..	1	1	..	..	..	1	2	1	..	3	1	..	2,228	229	22	2,479
August "	1	..	..	..	..	..	1	3	1	..	..	..	1	..	1	1	..	..	..	1	2	..	1	3	1	..	2,120	204	63	2,387
September "	1	..	..	..	..	..	1	3	1	..	..	..	1	..	1	1	..	..	..	1	2	..	1	3	1	..	2,206	..	103	2,309
October "	1	..	..	..	..	..	1	2	1	..	..	..	1	..	1	1	..	..	..	1	2	..	1	3	1	..	2,232	124	66	2,422
November "	1	..	..	..	..	..	1	3	1	..	..	..	1	..	1	1	..	..	..	1	2	..	1	3	1	..	2,203	153	541	2,897
December "	1	..	..	..	..	..	1	3	1	..	..	..	1	..	1	1	..	..	..	1	2	..	1	3	1	..	2,180	142	21	2,352
January 1884	1	..	..	..	..	..	1	2	1	..	..	..	1	..	1	1	..	..	..	1	2	..	1	3	1	..	2,167	..	38	2,205
February "	1	..	1	..	1	1	..	3	1	..	..	..	1	..	1	1	..	..	..	1	1	..	1	3	1	..	2,891	256	171	3,318
No. 1 Tank Division.																														
March 1883	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
April "	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
May "	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
June "	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
July "	..	..	1	..	1	1	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	3	..	..	475	..	14	489
August "	..	..	1	..	1	2	..	..	..	..	..	1	..	..	1	2	..	..	..	1	..	..	..	3	..	..	649	..	2	651
September "	..	..	2	1	1	3	..	..	..	..	..	1	..	..	1	2	..	..	..	1	..	..	..	3	..	..	988	879	7	1,874
October "	..	..	2	1	2	3	..	3	..	..	..	1	..	..	1	4	..	..	..	1	..	1	..	2	..	1	1,708	475	29	2,212
November "	..	..	2	1	2	3	..	3	..	..	..	1	..	..	1	4	..	..	..	1	..	1	..	5	..	1	1,812	498	75	2,385
December "	..	1	2	1	2	3	..	3	..	..	..	1	..	..	1	5	..	..	..	1	..	1	..	3	..	1	2,261	624	99	2,984
January 1884	..	1	2	1	2	3	..	3	..	..	..	1	..	..	1	5	..	..	..	1	..	1	..	4	..	1	2,734	341	585	3,660
February "	..	1	1	1	2	3	..	3	..	..	..	1	..	1	1	4	..	..	..	1	..	1	..	4	..	1	1,623	431	297	2,351
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	36,978	4,356	2,281	43,615

Madras,
14th May 1884.

(Signed) D C GORDON,
Examiner, Public Works Accounts.

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Order—dated 23rd May 1884, No. 1305 W., Public Works.

Ordered that the information supplied by the Chief Engineer for Irrigation be forwarded to the Government of India.

(Here enter No. 1306 W., dated 23rd May 1884.)

(True Extract.)

(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Superintendent of Works, Tank Maintenance Scheme.
,, Chief Engineer for Irrigation.

Endorsement—dated 23rd May 1884, No. 1306 W., Public Works.

Copy of the above forwarded to the Government of India with reference to their letter, No. 512 G., dated 30th April 1884.

(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

Exd. E. Fernandez.
Spare Copie.

GENERAL.
ESTABLISHMENT.

Govt. of 1884 Madras.

PUBLIC WORKS.

Dated May, 23rd.

Recd. *Encl.*

G.O., 23rd May 1884, No. 1306 W.

MAY.

Tank Maintenance Schem

Furnishing information with refere
work done in the Madura district in c
tion with the — and as to the actual st
of the establishment employed directly
orders of the Superintending Engin
charge of the scheme.

5283/19

SCHEME

FOR THE

REPAIR AND CONSERVANCY OF THE MINOR IRRIGATION WORKS

IN THE

MADRAS PRESIDENCY.

By Lieut.-Colonel P. MONTGOMERIE, R.E.

543/20

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SCHEME

FOR THE

REPAIR AND CONSERVANCY OF THE MINOR IRRIGATION WORKS IN THE MADRAS PRESIDENCY.

By Lieut.-Colonel P. MONTGOMERIE, R.E.

PREFATORY REMARKS.

Natural divisions of the subject.

1. In dealing with the question of the management of Minor Irrigation works, it will be most convenient to consider it under the two heads into which the subject naturally divides itself, viz.:—

I. Their professional treatment.
II. Their conservancy.

The former of these can only be performed by duly qualified Engineers, and the latter cannot be accomplished without the intervention of the department to which the collection of the revenue and the granting of remissions is entrusted; and both operations, although separate and distinct, cannot be intelligently conducted except under one head, whether it be a collective body or one individual.

I. Professional treatment.
II. Conservancy.

PART I.

The Professional Treatment of Minor Irrigation Works.

The Revenue and Capitalized Value of Minor Irrigation Works.

Analysis of the land revenue accounts of Madras, 1882-83.

2. The following figures, which have been extracted from the general administration report of the Madras Presidency for 1882-83 and from the irrigation revenue accounts compiled in the Office of the Director of Revenue Settlement and Agriculture, indicate the relative importance of the minor systems of irrigation, usually termed "Minor irrigation works," and the other sources of land revenue in the presidency.

Total Cultivation.

Statement, page vii of the General Administration Report for 1882-83.

Statement, printed in Proceedings of the Madras Government, No. 782 I., dated 25th September 1883.

During the year the area of Government and inam lands which were cultivated in the presidency amounted to 21,474,685 acres; of this area, 4,727,657 acres were irrigated. The area of zamindari lands which were cultivated during the year was 1,419,990 acres, of which 215,111 acres were irrigated; and the total area under cultivation was 22,894,675 acres, of which 4,942,768 acres were irrigated; and, excluding Nilgiris, South Canara and Malabar districts, where there are no artificial works of irrigation, the total area dependent upon irrigation works was 4,313,846 acres.

The total land revenue, assessed on Government and inam lands throughout the presidency, was Rs. 5,46,45,017, and the peishcush, or permanently settled revenue, was Rs. 51,31,879, making a total of Rs. 5,97,76,896; of this, Rs. 2,00,85,218 was the portion dependent upon irrigation in all the districts except Nilgiris, South Canara and Malabar.

Total Revenue.

Statement, page viii, General Administration Report, 1882-83.

Mr. Wilson's figures.

Page 16, Departmental Chapter of do.

From these figures it will be seen that while the irrigated area is a little more than one-fifth of the entire area cultivated, the revenue dependent upon irrigation works alone is a little more than one-third of the total land revenue of the presidency.

3. This revenue dependent on irrigation works includes the following :—

Revenue from works for which Capital and Revenue Accounts are kept.

Productive Public Works.

	Area Irrigated.	Revenue.	Total.	
	ACRES.	Rs.	Rs.	
Godávari delta ...	564,213	22,45,014	...	P.M.G., No. 715 I., of 4th Sept. 1883.
Kistna do. ...	261,158	11,83,645	...	" " 762 I., of 14th " "
Pennér anicut ...	63,653	2,99,452	...	" " 725 I., of 5th " "
Karnool canal ...	14,903	59,255	...	" " 1031 I., of 13th Dec. "
Cauvery delta ...	892,871	41,01,753	...	" " 715 I., of 4th Sept. "
Srivaikuntham anicut...	19,546	1,96,813	...	" " 725 I., of 5th " "
Total ...	1,756,344	...	80,85,931	

Irrigation and Navigation Works for which Capital and Revenue Accounts are kept.

	Area Irrigated.	Revenue.	Total.	
	ACRES.	Rs.	Rs.	
Chembrambakam tank ...	12,763	65,901	...	P.M.G., No. 725, of 5th Sept. 1883.
Pálár anicut	66,212	2,86,336	...	
Pelandorai anicut ...	3,386	14,434	...	
Madras water-supply and irrigation extension project	7,435	29,793	...	P.M.G., No. 762 I., of 14th Sept. 1883.
	89,796	...	3,96,463	
Total ...	1,846,140	...	84,82,401	

Deducting the above amounts from the total revenue dependent on irrigation works, the difference, or Rs. 1,16,02,807, is the revenue dependent on the minor irrigation works. This amount is nearly one-fifth of the entire land revenue of the presidency, and is 36 per cent. greater than the revenue derived from the whole of the important systems for which capital and revenue accounts are kept.

Revenue dependent on the Minor Irrigation Works.

4. This revenue, dependent on the minor irrigation works, is divided between "land" and "water" as follows :—

Capitalized value of the Minor Irrigation Works.

Director of Revenue Settlement's remarks.

	Rs.
Land assessment	31,96,581
Water or irrigation revenue ...	84,06,226
Total ...	1,16,02,807

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The total expenditure incurred during the year on Irrigation and Navigation works for which neither Capital nor Revenue Accounts are kept was Rs. 12,27,897. The collection charges in the Civil Department at 7·2 per cent. on this irrigation revenue amounts to Rs. 6,05,250, so that the net irrigation revenue for the past year from these minor irrigation works amounted to Rs. 65,73,079, and the capitalized value of these works at 25 years' purchase of the net revenue would amount to Rs. 16,43,26,975 or about 16½ millions sterling.

Page 146 of Departmental Chapter of General Administration Report, 1882-83.

5. Regarding this valuable property, which yields nearly three-fifths of the whole of the revenue from the irrigation works of Madras, and which has been in the possession of the British for nearly a century, there is at this present moment hardly any detailed information, either revenue or professional, recorded in a systematic manner and which is absolutely necessary for its intelligent administration.

Want of detailed information, revenue and professional.

Without detailed data, extending over a series of years, it is not possible to judge of the accuracy or otherwise of the crude opinions which are occasionally hazarded regarding the deterioration of the works and the annual loss of revenue which might be avoided if the works themselves were maintained at some undefined standard of efficiency.

6. That the majority of the minor irrigation works of Madras must have deteriorated may be assumed from the fact that while, as a rule, the expenditure incurred by Government has, under the existing regime, been necessarily confined to the more important tanks and to those works, which, owing to their neglected state, have more easily been damaged by heavy floods, the majority of the works which have not yet arrived at this stage of dilapidation have hardly been touched, either by the Government or by the cultivators for years; but the extent to which this deterioration has advanced cannot be ascertained without technical data, which must be collected by the professional department.

Technical data to be collected by the Public Works Department.

7. On the other hand the avoidable loss of revenue through the neglected state of the works cannot be arrived at by a comparison of the ayacut areas with the actual areas irrigated, for the former merely represent the maximum areas, which in the most favorable years of rainfall it is supposed might be brought under irrigation and in many cases include lands which never can or will be irrigated. To determine the actual capabilities for irrigation of each source of supply, revenue details extending over a series of years, with explanations of the causes of remissions, are necessary; and no attempt has yet been made by the revenue authorities to furnish this important data.

Revenue details to be furnished by the Revenue Department.

8. The want of the detailed information and data being the cause of the misapprehension which exists in regard to the Minor Irrigation works of the Madras Presidency, it is considered that with a clearer view of the actual conditions, capabilities and circumstances of the works, the administrative reforms necessary for their proper management will suggest themselves. With this view the Upper Vaigai river basin in the Madura district has been selected as a suitable tract of country for complete investigation in order to illustrate the subject, because—

Upper Vaigai basin selected to illustrate the condition of Minor Irrigation works generally.

1st. The Madura district is reputed to be the most neglected district in the Presidency in regard to the conservancy of its irrigation works.

2nd. The water-supply of the Upper Vaigai basin being more certain and abundant than the local supplies available in most of the other districts, the capabilities for improvement are more likely to exist in this tract of country than elsewhere, and the fluctuations of revenue owing to the uncertainty of local rainfall is reduced to a minimum.

The actual circumstances of irrigation works of course vary for each locality, but it is thought that an examination of the circumstances of the works in the Upper Vaigai basin, which are all old native works, will set at rest the vexed question regarding the

efficiency of native irrigation works generally to perform the duties for which they were originally designed.

The Professional Investigation of Minor Irrigation Works.

9. Before referring to these special investigations, it will be convenient here to explain the method which has been adopted, and the principles which must guide the professional investigations of the minor irrigation works generally, and which have to be carried out for the whole of the Madras Presidency, before it can be possible to place their administration on a proper footing.

Method and general principle to be explained.

The attempts which have hitherto been made to divide these works into separate and distinct units (estimated at some 50,000 works) and to place them in different categories according to the areas of irrigation under each, with a view to conserving them under separate arrangements, must naturally lead to failure; for not only is it wrong in principle and contrary to the very elements of the art of irrigation, which require all irrigation works dependent on the same source of supply to be treated as a whole, but, as has been pointed out by experienced revenue officials, it would be manifestly unjust to the cultivators who hold lands under all classes of works on equal terms.

Classification of Minor Irrigation works with reference only to areas irrigated unsuitable.

10. The professional investigations must therefore be carried out solely with reference to the water-supply available, and in a comprehensive and systematic manner for all works dependent on the same source. With this object the catchment basins of each main river in the Madras Presidency in which the irrigation works are situated have been carefully indicated on the Ordnance Survey sheets (scale 4 miles to the inch) so as to form a Primary Index to the Irrigation. A list of these main river basins are given in Appendix A. These main river basins will be further sub-divided into convenient minor basins, the drainage of each being separate and distinct. The detailed investigations of each minor basin can then be taken up as a whole and all the irrigation works contained in them arranged into groups, sub-groups and isolated works in accordance with the irrigation professional circulars.

Systematic investigation with reference to sources of supply necessary.

Appendix (A).

Detailed investigations to include.

11. The detailed investigations of each minor basin will include:—

1*st*. The preparation of a group irrigation map (scale, 1 inch to a mile) which will comprise the whole of the minor basin showing the numbering of the works in each group and the catchment areas of each individual work.

Group map; scale, 1 inch to a mile.

2*nd*. The preparation of detailed irrigation maps (scale, 4 inches to a mile) showing the position, etc., of all works in a sub-group or series of sub-groups as may be most convenient. As a rule these maps may be prepared by reducing the village maps when sufficiently intelligible, and on the clear margins of these maps will be entered detailed sketches drawn to scale of each important masonry work, with longitudinal sections of the bunds of all of the tanks, showing the standard levels to be maintained for—

Detailed maps, 4 inches to a mile.

(*a*) Level of the top of the bund.
(*b*) Maximum water level.
(*c*) Full supply level.

3*rd*. A statement of financial details of each of the irrigation works in the minor basins arranged according to the grouping decided upon. This statement will show the average revenue and remissions for five years, with explanations of the causes of remissions, the anticipated increase of revenue, and the estimated cost of bringing up each irrigation work to the standard of efficiency.

Statement of financial details.

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4*th*. A group abstract of hydraulic details of each work in the minor basin, prepared according to the grouping decided upon.

Abstract of hydraulic details.

5*th*. A descriptive memoir of each irrigation work in the minor basin showing the hydraulic details separately for each work.

Descriptive memoirs.

6*th*. A separate estimate for each sub-group or isolated work showing the work necessary to bring them up to the standard of efficiency.

Estimate by sub-groups.

12. It is proposed that all the maps should be lithographed and the descriptive memoirs printed and bound up by main river basins for future reference and guidance. The cost of their publication, it will be seen from the estimate given in Appendix (C), will amount to only 3·27 per cent. of the revenue or ·16 per cent. of the capitalized value of the works.

Proposed publication of descriptive memoirs with maps.

Appendix (C).

Special Investigation of the Periyakulam Minor Basin.

13. To facilitate the investigations of the Upper Vaigai river basin, which comprises all lands draining into the Vaigai river above the Perria-Ani situated about 24 miles above the Town of Madura: this tract of country has been sub-divided into the following five minor basins, the drainage of each of which is separate and distinct.

Minor Basins of the Upper Vaigai river basin.

Name of Minor Basins.	Limit and Extent.	Area in square miles.
Andiputy Basin.	Al lands draining into the Vaigai river on the right bank between its junction with the Surulyaur river and Perria Ani.	
Tulla Vaigai Basin.	All lands draining into the Vaigai or irrigated from it above its junction with the Surulyaur river and including the Tadicherie river irrigation.	
Surulyaur Basin.	All lands draining into the Surulyaur river above its junction with the Vaigai river.	
Periyakulam Basin.	All lands draining into the Vaigai river, on the left bank between its junction with the Surulyaur river and the Batlagoondu basin.	
Batlagoondu Basin.	All lands draining into the Vaigai river on its left bank between the Periyakulam basin and the Perria Ani.	

14. As the circumstances of the irrigation works in each of these minor basins is almost precisely similar, the Periyakulam minor basin has been selected as a specimen of the whole. A list of the plans and documents connected with the investigations of the minor basin which are submitted with this report are given in Appendix (B).

Periyakulum Minor Basin selected as a specimen.

Appendix (B).

15. In deciding the standard of efficiency for each of the irrigation works in the Periyakulam Minor basin, the general principles enunciated in Proceedings of the Madras Government, No. 284 I., dated 5th May 1880, have been adhered to, and these are, as regards the smaller tanks, to utilize the existing surplus arrangements, whether permanent or temporary, for the discharge of flood waters, and to secure the

Standard of efficiency of tanks.

Waste weirs.
Calingulahs.
Taubagies.
Open vents.

Surplus sluices.
Bye-washes.
Mamul breaches.

safety of the works by fixing an efficient level for the top of the bunds above the maximum water level.

16. The old-fashioned plan of fixing the levels of the top of the bund above maximum water level in accordance with the breadth of the water-spread opposite and sloping it down to the bye-washes and sections of the bunds shown on the detailed irrigation maps. The following are the standard heights of bund for each class of tank which has been decided upon, the top width in each case being the same as the height above maximum water-level.

Level of top of bund to depend on the water-spread in front.

mamul breaches at the flanks of the bund have been followed—*vide*

Standard heights of opened tank bunds.

Class of Work.	Breadth of Water-spread from Bund.	Top of Bund above Maximum Water Level.
1st-class	From 1,500 to 900 feet ...	... 6' to 4½'
2nd do.	Do. 900 to 300 „ ...	... 4½' to 3'
3rd do.	Under 300 feet ...	... 3'
Special	Over 1,500 „ ...	... 6' and more.

17. As regards the standard of efficiency for the river channels, the existing anicuts and other masonry works are to be placed in thorough order, but no attempt has been made to provide head-sluices and other permanent masonry works unless the want of them has been the cause of repeated damage and loss of revenue. As a rule, the cultivators prefer open heads to their channels (when of moderate dimensions), as it enables them to secure the maximum benefit from ordinary floods and they have been accustomed to successfully manipulate the flow in their own fashion from time immemorial.

Standard of efficiency of channels.

18. Of course in the larger river channels, such as the Kalingarayen and Thadapully channels in the Coimbatore district, the Cauvery channels in the Trichinopoly district, and the other works which have been selected, as of sufficient importance to require a continuous record of expenditure, permanent masonry works are probably necessary, and if so, must be provided by Government; but in moderate sized channels, such as most of those in the Vaigai basin, they are not absolutely necessary and need not be provided unless especially desired by the cultivators themselves, in which case there would be no hardship whatever in requiring the cultivators to provide half the cost of the improvements either in money or labor, for the cultivators would secure much greater benefit from them than the Government, and it seems advisable that this principle be accepted and acted upon as a rule by Government.

General principles for constructing masonry works for channels.

19. In drawing up the scheme for the improvement of the Periyakulam minor basin the revenue details contained in the financial statement have been obtained direct from the Curnams of the villages, and these figures were subsequently verified by the Collector of the District—*vide* his letter, No. 4002, dated 1st November 1883, and which is given as Appendix (D) to this report. The ultimate extent of irrigation proposed under each work after it has been brought up to the standard of efficiency has been arrived at after consulting the cultivators themselves and may be accepted as sufficient, seeing that the cultivators are the most interested parties.

Preparation of financial statement, Periyakulam minor basin.

Appendix (D).

Proposed ultimate irrigation ascertained from cultivators.

Result of the Special Investigations of the Periyakulam Minor Basin.

20. From an examination of the statement of financial details which accompanies the special investigations of the Periyakulam minor basin, it will be observed that there are only seven tanks for which remissions of importance have been made;

Remissions under tanks.

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these are works Nos. 10, 12, 51, 52, 59, 61 and 62. Of these, Nos. 10 and 12 are not to be restored for the reasons given in the Collector's letter; appendix (D) and the others, it is hoped, will be brought up to an efficient state when the improvements proposed have been carried out.

21. The following analysis of the statement of financial details will give a general idea of the present condition of the irrigation works in the minor basin:—

Analysis of financial statement.

Revenue Details.

		Rs.	Rs.
Actual collections.	Assessment	40,176	
	Less remissions	1,426	
			38,750
Total ayacut assessments			43,861
		Difference ...	5,111

From this it would appear that if the full ayacut assessments were collected, the revenue would be increased by nearly 14 per cent; but as

	Acres.
The average existing irrigation	7,756
And ultimate anticipated irrigation	7,951
The anticipated increase ...	195

	Rs.
The anticipated increase of revenue from this at 4 Rs. per acre would be	780
Average remissions being	1,420

The total anticipated increase of revenue from which it will be seen that the probable increase of revenue will not be 6 per cent. of the existing gross revenue.

Proposed Expenditure.

The outlay proposed to secure the standard of efficiency amounts to Rs. 36,000. This is a little less than one year's gross revenue and is 115 per cent. of the anticipated net revenue due to irrigation, and the expected increase of revenue, viz., Rs. 2,200, would yield 6 per cent. on the proposed outlay.

22. Although it is evident from the detailed maps and sections that most of the tanks in the minor basin are considerably below par in the matter of their earthworks, a reference to the financial statement would indicate that so far as the loss of revenue to Government (through remissions attributable to the condition of the works) is concerned, the irrigation works themselves, in spite of the deterioration of the earthworks, are of sufficiently good design to fulfil the purposes for which they were originally constructed and to secure a handsome revenue to the State.

Tank bunds below par.

Sufficiency of general design.

23. No doubt the remarkable immunity from destructive breaches which the tanks in this minor basin would seem to enjoy is attributable in a considerable measure to the watchfulness of the cultivators in regulating the water stored. The chief incentive to this watchfulness on the part of the cultivators is no doubt the valuable and perennial nature of the water-supply which enables second-crop cultivation to be extensively carried out. But probably the fact that the bunds of the tanks are at present so little above the full supply level also acts very materially on the self-interest of the cultivators and prevents them from storing too great a supply in their tanks.

Regulation of water by the cultivators.

24. As regards the anicuts and river channels in this minor basin, some of the anicuts require considerable repairs to be carried out not only to prevent the destruction of the works but to secure the cultivation under the channels. These repairs have been estimated for and are shown in the statement of financial details. The channels themselves are generally in fair working order, and the clearances are principally effected by the cultivators.

Condition of anicuts and river channels.

25. The results of the professional investigation of the Minor Irrigation works in the Periyakulam minor basin may be summed up as follows:—

Summary of results.

1*st*. The work required to secure the standard of efficiency consists principally in the earthwork of the tank bunds, which are considerably below par, and in general repairs to the anicuts and other masonry works.

2*nd*. The estimated cost of the work required amounts to about one year's gross revenue.

3*rd*. The expected increase of revenue that will be secured is 6 per cent. on the proposed outlay.

4*th*. The anticipated increase of revenue is a little less than 6 per cent. of the present gross revenue and is not the difference between the ayacuts and the existing average cultivation, which would be 14 per cent.

5*th*. That the design of the works is sufficient for the purposes for which they were originally constructed; and even in their present deteriorated condition they are capable of securing a handsome revenue to the State.

6*th*. That the regulation of the water in the minor irrigation works may be safely left in the hands of the cultivators whose self-interests are concerned; and

7*th*. That the safety of the irrigation tanks generally will best be secured by raising the bunds in their centres to a sufficient height above maximum water level and generally sloping them down to the flanks where the surplus arrangements are usually situated, and by permanently deciding the position, level and extent of each surplus work whether permanent or temporary.

The Extension and Improvement of Minor Irrigation Works.

26. That there is considerable diversity of opinion regarding the practicability of permanently increasing the revenue under the majority of the minor irrigation works by the two most eminent hydraulic Engineers that have been connected with Madras Irrigation and which are as follows:—

Diversity of opinions.

Sir A. Cotton, R.E.; the late Colonel Anderson, R.E.

Sir A. Cotton.

"But I must here observe that the Irrigation works in general are so far from being in good order that the revenue actually derived from them at present is by no means the full measure of their value ..... I think that in any tank district the revenue is now much below what it would be if the works were in good order, so far from what I can judge from what I have seen of the multitude of tanks and channels that now only produce ⅔, ½ or even ¼ of the ayacut revenue."

The late Colonel Anderson.

"In every part of the Madras Presidency there are a number of rain-fed tanks, the revenue derived from which may be liable to undergo extraordinary fluctuations, owing to the uncertainty and insufficiency of the supply; the cultivation then becomes a lottery."

(Madras Civil Engineering Paper, No. VI., Notes on Canals and Rivers—Report to Board of Revenue, dated 13th December 1837, by Captain A. Cotton.)

Sir A. Cotton however qualifies his opinion in the following terms:—

"I believe that if a question was asked respecting the grounds on which the present annual expenditure has been fixed, there is no person whatever who could assign any reason for it, whether derived from the annual accounts of property dependent upon the works, or from the

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experience of past years showing how far the sums expended had been sufficient to prevent the revenue from falling off. No annual statement showing the increase or decrease of nunjay revenue with reports showing how far the increase or diminution was owing to the state of the irrigation works, how far to the failure of rains, how far to the state of assessments, are ever prepared; so that this most important subject is never brought into a clear point of view."

27. It is now several years since Sir A. Cotton expressed the above opinions, and it would be prudent, before deciding upon any comprehensive scheme for the general improvement and extension of minor irrigation works with the idea of permanently increasing the revenue under them, to examine the actual results of the schemes which have been carried out within late years.

The results of schemes executed.

From the Madras Irrigation Administration report for 1882-83 it will be seen that the improvements to the Chembrambaukam tank have resulted in a return of 1·12 per cent. on the capital charges.

Chembrambaukam tank.

The Pálár Anicut System has yielded only 27 per cent., and the financial results of the Pelandorai Anicut have been a loss of Rs. 56,191 including interest charges.

Pálár Anicut System.

Pelandorai Anicut.

From the statement given in Appendix (E) to this report it will be seen that the expenditure on the Mysore Tank Scheme up to 1879 amounted to Rs. 9,38,282, exclusive of survey establishments and tools and plant, and has yielded an increase of revenue giving a return of 2·4 per cent. on the outlay, only during the most favorable season.

Appendix (E) Mysore Tank Scheme.

28. It must also be borne in mind that the Minor Irrigation works of the Madras Presidency (which are nearly all old native works) are the results of long and often dear-bought practical experience, and that in most districts nearly every available site for the minor storage and distribution of the existing local supply has been utilized to the extent which practical experience has shown to be advisable. And with the knowledge of the actual results of the attempts which have been made within late years to enlarge or extend these minor works, it is evident that a scheme for the general extension and enlargement of them throughout the Presidency will not be a financial success.

Minor Irrigation Works of Madras, the result of long experience.

29. The results of the special investigations of the Periyakulam Minor Basin would seem to indicate that all that is necessary or advisable is to bring the minor irrigation works up to the standard of efficiency laid down in the Proceedings of the Madras Government, No. 284 I., dated 5th May 1880, and this would cost for works similarly situated to those in Upper Vaigai basin about one year's average revenue or considerably less than the approximate estimate given by the Acting Chief Engineer for Irrigation in the 12th paragraph of his memorandum, dated the 12th November 1882. This is a point however which cannot be definitely settled without detailed examinations of some other localities; and it is not improbable that the estimate given by the Acting Chief Engineer for Irrigation may not be too much for those localities where the irrigation is chiefly under tanks of considerable size and importance.

One year's revenue sufficient for Periyakulam Minor Basin.

30. All proposals for the extension and improvement of irrigation should, it is thought, be considered separately and independently of the general scheme for the maintenance and conservancy of the existing minor irrigation works, and should be confined principally to the regulation and improvement of the supply from the more important local streams such as the Barúr, Marandahully and Kistnagherry reservoir schemes in the Salem district, and the Sangam Project in the Nellore district, or to the utilization of the supply from the permanent sources such as the Periar Project in Madura, and the Bhavání Project in the Coimbatore district.

Proposals for extensions and improvements to be independent of tank maintenance scheme.

PART II.

The Conservancy of Minor Irrigation Works.

General Remarks on the Existing Arrangements.

31. The circumstances of the numerous minor irrigation works of the Madras Presidency are such that any scheme for their efficient conservancy must be considered in connection with the execution of the work required to bring them up to a fair standard of efficiency.

Conservancy and execution of general repairs to be considered together.

The admission made by the Acting Chief Engineer for Irrigation in his note of the 27th November 1882 that it must take 55 years to bring the works up to the proper standard of efficiency is tantamount to admitting that the work never can or will be done by the present Public Works Department, even with the assistance of five extra tank divisions. If this were really the case, it would be better for the interests of the country, as well as for the reputation of the Public Works Department, for that department to retire from the tank districts and abdicate in favor of an efficient conservancy department forming part and parcel of the Revenue administration. But the difficulties (so far as the Public Works Department are concerned) which have prevented it from efficiently carrying out the duties of conservancy are more imaginary than real, and may almost entirely be attributed to the supposed impossibility of separating the duties of its establishment between "Irrigation" and "General Work" and the further division of labor of the Irrigation Branch between conservancy and construction.

Separation of duties in the Public Works Department necessary for efficient conservancy.

This part of the subject, when once divested of the technicalities and departmental prejudices which have too long been allowed to surround it, becomes a matter almost entirely of administrative reform. The reform must however be carried out simultaneously in the Revenue and Public Works Departments.

32. It is well known to every one who has any experience of the rural districts of Madras in which these minor irrigation works are situated that any scheme for their maintenance and repair which does not invoke the influence of the Collectors and their subordinates, or ignores the labor of the cultivator as a prime factor of the scheme, will be practically useless.

Labor of the cultivator a prime factor in conservancy.

This is what the late Colonel Anderson said on the subject in 1862:—

"291. In the Madras Presidency, on the other hand, all works however small, and all repairs of irrigation works estimated to cost over 25 rupees are carried out under the supervision of the officers of the Department of Public Works. How this system came originally into operation, I would not attempt to explain. It will be allowed, I imagine, by all parties that it has great drawbacks. The question is not whether the work can be done best by the Revenue authorities or by the Department of Public Works, but whether it could not be done by the ryots themselves. There is no doubt that it is not any difficulty of construction that would stand in their way; but the difficulty of doing anything contrary to 'Mamul.' But when so much is said and written about educating and improving the natives, one would think that any effort of the kind would not be of much good, if they did not teach the natives first of all to help themselves. If there is one thing more than another in which they have an interest, it is the maintenance of their irrigation works, without which their land is useless.

The late Colonel Anderson's opinion.

"292. If the thousands of petty tanks and channels in the presidency were repaired by the ryots, both they and the Government would be gainers. The latter could well afford to reduce the revenue by the average cost of the annual repairs, less the charge for superintendence; while the ryots could of course execute the work cheaper than could be done by the department, to say nothing of the benefit they would derive by learning to exert themselves."

And Colonel Mullins, R.E., who has held the post of Chief Engineer for Irrigation during nearly three whole lustra and who has probably more experience of the minor irrigation works of Madras than any other member of the department, has admitted the necessity for assigning to the villagers themselves the work required for the maintenance of their minor works, for the following reasons:—

Admission by Colonel Mullins, R.E.

Chief Engineer's (for Irrigation) Memo., No. 111 of May 1880.
Proceedings of the Madras Government, Revenue Department, No. 547, dated 31st March 1881.

1*st*. The Public Works Department in the days of greatest expansion could not deal with a tithe of the minor irrigation works.
2*nd*. There never has been a State machinery which has done or could do the work needed to secure the efficiency of those works; and
3*rd*. No Government department can deal with them except in the way of general control.

33. From the estimates for the work required to secure the standard of efficiency of the irrigation works in the Periyakulam minor basin, it will be seen that earthwork and rough stone work form the bulk of it. This is precisely the description of work which the interested cultivators can perform more satisfactorily than any one else, and which they must be induced to take up of their own free will if possible. This desirable end will, it is considered, be accomplished as soon as the Kudimaramut Bill has been passed into law; for with the Kudimaramut Bill in one hand and the general repair estimates in the other there can be very little doubt which alternative the ryot will select.

Unskilled labor forms the bulk of the work required.

Moral effect of the Kudimaramut Bill in securing the labor of the cultivators for general repairs.

34. The Collector's Department is the only one which can possibly enforce the Kudimaramut Act, but it is Utopian to believe that without the assistance and advice of a duly trained Conservancy Department, the Collector can give effect to the Act or be certain that the general repairs are satisfactorily carried out. The proposals which have lately been made to give the Collector a small percentage of the grants made to him is not sufficient for the purpose, and must ultimately end in a waste both of time and money.

Collector's Department incapable for enforcing Kudimaramut or carrying out general repairs without a Conservancy Establishment.

35. The Public Works Department, if allowed free access to the revenue records as has been courteously permitted by the Collector of Madura, are perfectly capable of attending to the professional treatment of all minor irrigation works including the construction of all masonry works that may be required; and it is now only necessary to consider the administrative reforms which must be carried out both in the Public Works and Revenue Departments in order to secure the efficient maintenance and conservancy of the works.

Public Works Department can carry out professional investigation and construction work.

Administrative Reforms.

36. The essential reform which has to be made in the Public Works Department (at least in the Irrigation Branch) is the entire separation of the duties of conservancy from that of professional investigation and construction in all ranks below that of Executive Engineer. This principle is invariably followed on all railways and in every properly administered public work or private property; and it is believed that the necessary changes could be effected without in any way dislocating the department or by making any material changes in the manner and constitution of the existing Superintending Engineers' charges or by increasing the numbers of the executive divisions now allowed to the presidency. The proposed separation would of course not be carried out in those districts in which the large delta schemes are at present under construction. For it will be time enough after these projects have been fully completed to arrange for their conservancy.

Separation of conservancy from investigation, an essential reform in the Public Works Department.

Godávari, Kistna, Nellore and Tanjore.

37. There should be conservancy establishments for each collectorate, which must be distributed according to the sources of water-supply by minor basins; and the local heads of these conservancy establishments will have to be entrusted with magisterial powers to give effect to the important Acts which are about to be enacted by the legislature, viz:—

Separate Conservancy Establishments for each Collectorate.

Conservancy Engineers to have magisterial powers and assist Collectors in giving effect to the law.

The Kudimaramut Act,
The Rivers Conservancy Act, and
The Irrigation Act.

This would virtually place the Conservancy Engineer in the position of Assistant to the Collector, although for the purposes of discipline and account he would be under an Executive Engineer.

38. To form a nucleus for the Conservancy Establishments it will be necessary to re-arrange and amalgamate the following existing divisions into "General" and "Irrigation," respectively, the "Irrigation" divisions being arranged according to river basins, and the "General" divisions according to districts.

Eight existing divisions to be made Irrigation to form the nucleus of the Conservancy Establishments.

Districts and existing Divisions.	Amalgamated Divisions.		River basins to be comprised in Irrigation Divisions.
	General.	Irrigation.	
Ganjam	1	1	All basins north of the Godávari.
Vizagapatam			
Bellary	1	2	To be settled hereafter.
Cuddapah			
Kurnool			
Coimbatore	1	1	Cauvery above the Amarávati and Poonjar above hills.
Salem			Pálár and Madras drainage basins.
North Arcot	1	2	Cheyar and drainages south to Coleroon.
Chingleput			
South Arcot			
Trichinopoly	1	2	Amarávati and Cauvery.
Madura			Pallaur, Vagai and all south.
Tinnevelly			
	5	8	

39. The eight proposed Irrigation divisions would permanently take the place of the Tank divisions, and it is believed that when the Tank divisions have completed the professional investigations the Irrigation divisions, with the assistance of the conservancy establishments will be in a position to carry out all the work estimated for, as well as the periodical repairs which in future should be carried out more regularly and systematically than is done at present. The portion of the establishment of the Irrigation divisions not employed on conservancy would be utilised in preparing the estimates for the periodical repairs, and in executing the more important masonry works.

The eight Irrigation divisions to take the place of the Tank divisions.

40. In regard to the five General divisions proposed, it is considered that, with the improved means of communication afforded by railways, &c., and if the limit of repairs to be carried out by the department is extended from Rs. 1,000 to Rs. 2,000, as is the case in the Bombay presidency (or, for the matter of that, entirely abolished) and fewer new works were put in hand at one time, the establishment of the five General divisions would probably be in a position to perform the particular work required of them in a more satisfactory manner than can be done under the present system.

The five General divisions will be more efficient than the existing divisions.

41. The only changes in the Superintending Engineers' charges which the above proposals would entail would be to place the whole of the Amarávati river basin under the Superintending Engineer, VI Circle, and the North Arcot district, comprising the Upper Pálár basin, under the Superintending Engineer, III Circle. The necessity for these changes are self-evident when we take into consideration the sources of supply.

Slight alterations in Superintending Engineers' Circles.

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42. The reforms which should be carried out by the Revenue Department are—

To make the boundaries of the taluks conterminous as far as possible with the minor basins. It will be seen from the primary index to irrigation on which the taluks of the Madura district have been projected that it was evidently the intention when these taluks were formed that their boundaries should be the water-sheds of the basins forming the water-supply of the minor irrigation works, and it is considered that, with the more accurate maps that are now available, there will be no difficulty in re-arranging the taluks so as to agree with the proposed conservancy changes.

Revenue taluk boundaries to be re-arranged.

Taluks to be conterminous with minor basins and conservancy charges.

43. Arrangements must also be made to keep the Irrigation Engineers punctually informed of the state of the irrigation in their divisions by annual returns furnished to them by the Collectors, showing the remissions which have been granted and the precise cause of these remissions. This can easily be done by filling in the forms in which the financial details of the minor basins are now being collected by the Tank divisions.

Revenue returns to be punctually furnished to Irrigation Engineers.

44. An Irrigation Conservancy Code, defining the duties of all connected with the irrigation, must be drawn up.

Irrigation Conservancy Code to be drawn up.

45. And to prevent friction and ensure the Code being duly enforced, it will be necessary for the Irrigation Chief Engineer to be an *ex officio* Member of the Board of Revenue, and for an Engineer to be permanently attached to the Board as Irrigation Secretary. This officer need not be above the rank of Executive Engineer but until the scheme is in working order he ought to be a Superintending Engineer of the first class.

Chief Engineer for Irrigation to be an *ex officio* Member of the Revenue Board.

An Engineer to be Irrigation Secretary to Revenue Board.

46. The administrative reforms necessary to secure the maintenance and conservancy of the minor irrigation works are summed up briefly as follows :—

Brief summary of the administrative reforms required.

1*st*. The more intimate association of the Revenue and Public Works officials connected with the conservancy of the minor irrigation works, without which the interests both of the Government and the ryots must suffer.

2*nd*. The entire separation in the Irrigation Branch of the Public Works Department of the duties of conservancy from that of professional investigation and construction for all ranks below that of Executive Engineer, except in those districts in which the deltaic schemes are still under construction.

3*rd*. One or more conservancy sub-divisions, according to the size and importance of the district, to be attached to each Collectorate to supervise the execution of general repairs and to assist the Collector in enforcing—

(*a*) The Kudimaramut Act,
(*b*) The Rivers Conservancy Act, and
(*c*) The Madras Irrigation Act;

but which will be under an Executive Engineer for purposes of discipline and account.

4*th*. To enable the separation between conservancy and construction to be effected, and in order to create a nucleus for the formation of a duly qualified conservancy establishment, the existing divisions of the thirteen Tank districts to be re-arranged and amalgamated into eight Irrigation and five General divisions, respectively, the Irrigation divisions being arranged according to river basins and the General divisions according to districts.

5*th*. An intermediary grade between the Engineers and Upper Subordinates to be introduced into the Public Works Department, to have the title of Irrigation Conservator, and to which the subordinate officials of the Revenue Department will be eligible on their passing a qualifying examination.

6*th*. The local Irrigation Conservators (who will be sub-divisional officers of the Irrigation Executive Engineers) to be entrusted with magisterial powers for the purposes of carrying out the conditions of the law. They will thus become virtually the Assistants to the Collectors and will be intimately associated with him in the Irrigation Administration of the district.

7*th*. A conservancy charge will comprise one or more river basins or groups of taluks, whichever is most convenient, with an overseer to each taluk or group of minor basins, and a tank inspector to each minor basin or part of a minor basin.

8*th*. To prevent the General divisions from being hampered by petty details, the limits of the repair estimates to be carried out by them to be extended from Rs. 1,000 to Rs. 2,000, as is the case in the Bombay presidency; and fewer new works to be put in hand at one time. This with the improved means of communication afforded by railways, &c., will secure the efficiency of these divisions.

9*th*. The boundaries of revenue taluks to be made conterminous with those of the conservancy charges which have to be arranged according to the sources of water-supply by minor basins. The original taluk boundaries were manifestly intended to have been taken along the water-sheds when practicable; and there will probably be little difficulty in carrying out this essential reform with the assistance of the more accurate maps which are now available.

10*th*. Complete revenue return for each minor basin showing the remissions with explanations of the precise causes of these remissions to be furnished punctually by the Collector to the Irrigation Engineers.

11*th*. An Irrigation Conservancy Code defining the duties of all connected with the irrigation to be drawn up.

12*th*. And to prevent friction and ensure the Code being duly enforced the Chief Engineer for Irrigation must be made an *ex officio* Member of the Board of Revenue, and an Engineer must be permanently attached to the Board as Irrigation Secretary.

Suggested reforms will secure efficiency of conservancy establishments and reduce friction between Revenue and Public Works Department subordinates.

47. These reforms are suggested with the view of—

1*st*. Securing the necessary discipline and professional training of the conservancy establishments which cannot be done outside of the Public Works Department; and

2*nd*. Reducing to a minimum the friction which cannot altogether be avoided between the subordinate officials of the Revenue and Conservancy establishments by making the latter more intimately associated with the Revenue Administration of the districts.

And it is believed that if these reforms are fairly and honestly carried out, the maintenance and conservancy of the numerous minor irrigation works of the Madras presidency will be placed on a more efficient footing than has hitherto been possible.

Poposed scheme the logical conclusion of employment of Tank divisions.

48. The scheme now submitted is merely the carrying out to its logical conclusions the "Tank Maintenance Scheme" sketched by the Acting Chief Engineer. The strength of the present Tank divisions are very much below those that were employed in the Mysore scheme, especially in the number of Assistant Engineers, as will be seen from the printed report of the Mysore

Government, No. 102 A.G., dated 9th August 1875, and unless the Madras Tank divisions are considerably strengthened they cannot possibly cope with work entailed by execution as well as investigation. Even if their duties are confined to the professional investigation alone, it will take these five divisions about fifteen years to complete the investigation of the presidency. But if they are strengthened by the eight Irrigation divisions in the manner now suggested, there is every reason to believe that the management of the minor irrigation works of Madras may be placed on a proper footing in about six or seven years after the changes have been duly effected. For not only would the necessary professional investigations be materially accelerated, but the execution of the work required to secure the standard of efficiency will be carried out by the conservancy establishments without let or hindrance in the only manner which experience has shown to be practicable, viz., through the intervention of the cultivators interested in the irrigation works. And the only limit to the time required to bring the works up to a fair standard of efficiency will be the provision of the necessary funds.

CHEPÂK,
5th March 1884.

(Signed) P. MONTGOMERIE, Lieut.-Col., R.E.,
Superintending Engineer, Tank Maintenance Scheme.

APPENDIX A.

List of River Basins forming the Primary Index to the Irrigation of the Madras Presidency. The Approximate Areas of the Basins are taken from the Ordnance Survey Sheets.

Name of River Basin.	Limits of Drainage.	Areas in Square Miles.	Districts.
Upper Támbraparni basin.	All lands draining into the Támbraparni river above the Srivaikuntham anicut.	1,955	Tinnevelly.
Lower Támbraparni basin.	All lands draining into the Támbraparni river and its delta below the Srivaikuntham anicut.	475	Do.
Vaippar basin ...	All lands draining into the Vaippar river above Putur, 5 miles from the sea.	1,935	Madura and Tinnevelly.
Minor drainages into Gulf of Manar.	All lands draining into the sea south of the Támbraparni basins.	800	Tinnevelly and Madura.
	Between Támbraparni and Vaippar basins.	340	
	And between the Goondaur and Vaippar basins.	235	
Upper Goondaur basin.	All lands draining into the Goondaur river on left bank above main bifurcation at Kamuti on right bank above Ellapur channel head.	915	Madura.
Lower Goondaur basin.	All lands between the northern branch of the Goondaur and the Vaippar river on the south.	490	Do.
Upper Vaigai basin ...	All lands draining into Vaigai river above the Periya Ani Natchikulam.	1,405	Do.
Mid Vaigai basin ...	All lands draining into left bank of Vaigai between the Periya Ani and Mana Madura and all lands draining into or from its right bank below the Periya Ani and bordered on the east by the Vaigavati.	1,135	Do.
Lower Vaigai basin ...	All lands east of the Vaigavati and between the Cotta Currayaur and the north branch of the Goondaur.	915	Do.
Panlaur basin ...	All lands above the junction of the Panlaur and the Tiruminimmoot.	655	Do.
Pudukóta Vellar basin.	All drainage above main bifurcation of the Vellar near Aruntangi.	565	Trichinopoly, Pudukóta, Tanjore.
Iounney-aur basin ...	All drainages of the Iounney-aur down to sea.	625	Do.
Minor drainages into Bay of Bengal, south of Iounney-aur basin.	All drainages between Iounney-aur and Vaigai basins except those already specified.	1,950	Madura and Tanjore.
The delta of the Cauvery river.	All lands commanded by the waters of the Cauvery and Coleroon rivers below the Grand anicut regulators:—Bounded on the south by a portion of the Vennaur river, the Aganda Cauvery channel, the Kunnaun-aur and Paminiar river ending at mouth of Korayar river, and bounded on the north by the Coleroon river.	2,370	Trichinopoly and Tanjore.

List of River Basins forming the Primary Index to the Irrigation of the Madras Presidency—*cont.*

Name of River Basin.	Limits of Drainage.	Areas in Square Miles.	Districts.
Minor drainages into Cauvery and its delta on the south.	Between the towns of Trichinopoly and Tanjore.	320	Trichinopoly and Tanjore.
Minor drainages east of Tanjore.	Between Iounney-aur basin and delta.	360	.....
Minor drainages into the Coleroon river on the north.	Between the Upper and Lower Coleroon anicut.	1,035	Trichinopoly.
Minor drainages between Coleroon and Vellaur rivers.	Below Lower Coleroon anicut and below Ghatiatope anicut.	425	.....
Drainages into the Wyacondan channel.	Between the head of the Wyacondan channel and the town of Trichinopoly.	645	Patukota, Madura and Trichinopoly.
Amarávati basin ...	All lands draining into the Amarávati river above South Indian Railway.	3,550	Madura and Coimbatore.
Noyel basin	All lands draining into the Noyel river above the Madras Railway, South-West Line.	1,355	Coimbatore.
Bhaváni basin ...	All lands draining into Bhaváni river above the Kalingaroyen anicut.	2,480	Malabar, Nilgiris and Coimbatore.
Umbathnahully basin.	All lands draining into the Umbathnahully river.	650	Coimbatore.
Tadakarrai basin ...	All lands draining into the Tadakarrai river.	350	Do.
Honbully basin ...	All lands draining into the Honhully river.	730	Mysore and Coimbatore.
Cubbany basin ...	.....	2,725	Malabar.
Lotchman Teert basin.	.....	765	Mysore.
Talla Cauvery basin ...	.....	1,245	Do.
Hennawutty basin ...	.....	2,135	Do.
Shimsha basin ...	.....	3,330	Do.
Arkavutty basin ...	.....	1,605	Do.
Chinna-aur river or Sunada Ruvnara Nuddy basin.	All lands draining into the Chinnaaur river.	576	Salem.
Toppur Mullah basin.	All lands draining into the Toppúr river.	415	Do.
Omalur Mullay basin.	All lands draining into the Omalúr river.	470	Do.
Thirumanimathar basin.	All lands draining into the Thirumanimathur river.	835	Do.
Minor drainages into the Cauvery right bank.	All minor drainages into the Cauvery right bank above the Wyacondan head-sluice.	1,865	Coimbatore.
Minor drainages in the Cauvery left bank.	All minor drainages into the Cauvery left bank above the Upper Coleroon anicut.	2,600	Salem and Trichinopoly.
Upper Cauvery basin.	Total area drained by the Cauvery river above the Upper Coleroon anicut on left bank and above the Wyacondan head-sluice on the right bank.	27,705	Malabar, Wynaad, Nilgiris, &c.
Vellar basin	All lands draining into the Vellaur river above the Ghatiatope anicut.	2,823	Trichinopoly, Salem and South Arcot.
Ponniar basin ...	All lands draining into the Ponniar river above the Tirukoilúr anicut.	5,137	Mysore, Salem and South Arcot.

List of River Basins forming the Primary Index to the Irrigation of the Madras Presidency—*cont.*

Name of River Basin.	Limits of Drainage.	Areas in Square Miles.	Districts.
Minor drainages between Vellar and Cheyár basins.	All lands draining into the sea between Vellar and Cheyár basins.	3,102	South Arcot.
Upper Pálár basin ...	All lands draining into the Pálár river above the Pálár anicut near Arcot excepting lands commanded by Eastern Poinay anicut channels.	4,314	Mysore, Salem and North Arcot.
Cheyár basin ...	All lands draining into the Cheyár river and into Pálár right bank below Pálár anicut.	2,298	North Arcot and Chingleput.
Madras drainage basin.	All lands between the Kortalayár and Pálár rivers below the Poinay anicut and all lands draining into the Kortalayár above the Thamarapauk anicut.	2,704	North Arcot, Chingleput and Madras.
Minor drainages into the Pulicat lake.	All lands draining into the Pulicat lake between the Kortalayár and the Swarnamukhi river.	1,873	Chingleput and Nellore.
Swarnamukhi basin ...	All lands draining into the Swarnamukhi.	1,282	Nellore.
Kundleroo or Venkatagiri river basin.	All lands draining into the Kundleroo river above Kolikoodroo, 14 miles from the sea.	1,076	Do.
Pápaghni	All lands draining into the Pápaghni river above its junction with the Pennér river.	3,151	Cuddapah.
Chitrávati basin ...	All lands draining into the Chitrávati above its junction with the Pennér river.	2,488	Cuddapah and Anantapur.
Upper Pennér basin...	All lands draining into the Pennér above its junction with the Chitravati.	5,131	Mysore, Bellary and Anantapur.
Kundu basin ...	All lands draining into the Kundu river above its junction with the Pennér river.	3,362	Kurnool and Cuddapah.
Sagiler basin ...	All lands draining into the Sagiler above its junction with the Pennér river.	1,234	Cuddapah.
Minor drainages into right bank, Pennér.	All minor drainages into the right bank, Pennér, above the Sangam anicut.	1,006	Bellary, Cuddapah and Nellore.
Minor drainages into left bank, Pennér.	All minor drainages into the left bank of Pennér above the Sangam anicut.	301	Cuddapah and Nellore.
The Penuér basin ...	All lands draining into the Pennér above the Sangam anicut.	1,257	Nellore, &c.
Lower Pennér basin ...	The delta of the Pennér river between the Kandukúr and Zoovaldma rivers and all lands draining into it below the Sangam anicut.	966	Nellore.
Muniyar basin ...	All lands draining into the Muniyar river.	1,395	Do.
Mushi basin ...	All lands draining into the Pálár and Mushi rivers.	1,787	Do.

List of River Basins forming the Primary Index to the Irrigation of the Madras Presidency—*cont.*

Name of River Basin.	Limits of Drainage.	Areas in Square Miles.	Districts.
Gundlakamma basin...	All lands draining into the Gundlakamma river.	3,225	Kurnool, Kistna and Nellore.
Minor drainages into the sea, Nellore district.	All minor drainages between the Gundlakamma and the Swarnamukhi rivers.	794	Nellore.
Hindri basin ...	All lands draining into the Hindri above its junction with Tungabhadra.	1,380	Kurnool.
Vedavati basin ...	All lands draining into the Vedavati above its junction with the Tungabhadra.	8,804	Mysore and Bellary.
Chinna Haggari basin.	All lands draining into the Chinna Haggari above its junction with the Tungabhadra.	1,241	Do. do.
Tungabhadra basin ...	All lands draining into the Tungabhadra above the Sunkasala anicut.	16,036	Bellary and Kurnool.
Kistna basin ...	All lands draining into the Kistna above the Bezváda anicut.	97,050 —*vide* G.O., No. 723 I., of 24th February 1881.	Madras presidency, Bombay presidency, &c.
Godávari basin ...	All lands draining into the Kistna above the Dowlaishweram anicut.	115,570 —*vide* G.O., No. 28 I., of 11th January 1881.	Madras presidency, Central Provinces, &c.
Delta of the Godávari and Kistna rivers.	All lands under the Godávari and Kistna anicuts east of the Sámalkót, Ellore and Commamur canals.	4,850	Godávari and Kistna.
Minor drainages into the delta south of the Kistna river.	.....	...	Kistna.
Minor drainages into the delta between the Godávari and Kistna rivers.	.....	...	Godávari.
Minor drainages into the delta north of the Godávari river.	.....	...	Do.
Minor drainages into the sea north of the Godávari delta.	All minor drainages into the sea between the Verala and the Godávari delta.	...	Do.
Basin of the Varagha and Surada rivers.	.....	1,246	...
Nangolia basin ...	.....	3,314	Jeypore Zemindary and Vizagapatam.
Vamsadhava basin ...	.....	3,947	Ganjam.
Minor drainages into the sea between the Súráda and Nangolia rivers.	.....	1,991	...
Mahanuddy basin ...	All drainage above its mouth at Ganjam.	2,993	Ganjam.
Minor drainages into the sea between the Mahanuddy and Vamsadhava rivers.	.....	1,505	Do.
Minor drainages into the Chilka lake.	.....	...	Do.

(Signed) P. MONTGOMERIE, Lieut.-Col., R.E.,
Superintending Engineer, Tank Maintenance Scheme.

5th March 1884.

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APPENDIX B.

List of Plans and Documents connected with the Professional Investigation of the Periyakulam Minor Basin.

Number.	Plate No.	Description.	Remarks.
		Plans.	
1	...	Map of Primary Index to Irrigation showing the sources of supply available by River Basins in Madura and part of Coimbatore districts.	Not to be lithographed.
2	I	Group Irrigation Map of the Periyakulam Minor Basin, showing the catchment areas affecting groups, sub-groups and individual works.	To be lithographed.
3	II	Detail Irrigation Map of the Tamaraikulam sub-group of the Varagha Naddi group.	
4	III	Detail Irrigation Map of the Kollar Alagaparai Anicut Channel, Kumbukarai Channel and Kukalar Anicut Channel sub-groups of the Varagha Naddi group.	
5	IV	Detail Irrigation Map of the Nandinpuram, Melmangalam, Kilmangalam and Gullapuram Anicut Channel sub-groups of the Varagha Naddi group.	
6	V	Details of Masonry Works to accompany the Plate No. IV.	
7	VI	Detail Irrigation Map of the Seekodai and Varattar sub-groups of the Varattar group.	
		Documents.	
8	...	Statement showing the Hydraulic Details of Irrigation Works of the Varagha Naddi and Varattar groups of the Periyakulam Minor Basin.	
9	...	Statement showing the Financial Details of Irrigation Works of the Varagha Naddi and Varattar groups of the Periyakulam Minor Basin.	
10	...	Descriptive Memoirs of the Minor Irrigation Works in the Periyakulam Minor Basin.	To be published.

(Signed) P. MONTGOMERIE, Lieut.-Col., R.E.,
Superintending Engineer, Tank Maintenance Scheme.

5th March 1884.

APPENDIX C.

Estimate of the probable Cost of publishing 50 Copies of Descriptive Memoirs of the Irrigation Works with Maps for the Periyakulam Minor Basin.

	Rs.
Average Annual Assessment	40,000
Net Irrigation Revenue	32,000
Capitalised Value of Works at 25 years' purchase of Net Revenue ...	8,00,000

Number.	Measurement in inches. Length.	Breadth.	Depth.	Contents.	Particulars.	Rate.	Per.	Amount.	Total.
					Plate I.	Rs. A. P.		Rs. A. P.	Rs. A. P.
1	30"	22"	..	6·60	Squares of drawing with details, &c., complete.	10 0 0	100 sqr. inches.	66 0 0	
				50	Sheets of drawing paper 30" × 22"	1 0 0	Sheet.	50 0 0	
..	..	..	..		Printing charges, &c., complete	..	..	14 0 0	130 0 0
					Plate II.				
				10·60	Squares of drawing with details, &c. ..	10 0 0	Square.	106 0 0	
1	40"	26½"	..	50	Sheets of drawing paper 40" × 26½" ..	1 8 0	Sheet.	75 0 0	
..	..	..	..		Printing charges, &c., complete	..	..	19 0 0	200 0 0
					Plate III.				
				12·10	Squares of drawing with details	10 0 0	Square.	121 0 0	
1	55"	22"	..	50	Sheets of drawing paper	1 8 0	Sheet.	75 0 0	
..	..	..	..		Printing charges, &c., complete	..	..	19 0 0	215 0 0
					Plate IV.				
				9·35	Squares of drawing with details	10 0 0	Square.	93 8 0	
1	42½"	22"	..	50	Sheets of drawing paper	1 8 0	Sheet.	75 0 0	
..	..	..	..		Printing charges, &c.	..	..	16 8 0	185 0 0
					Plate V.				
				7·70	Squares of drawing with details	10 0 0	Square.	77 0 0	
1	35"	22"	..	50	Sheets of drawing paper	1 0 0	Sheet.	50 0 0	
..	..	..	..		Printing charges, &c.	..	..	13 0 0	140 0 0
					Plate VI.				
					Same as plate No. I	..	..	..	130 0 0
1	30"	22"	..	6·60	Total for 6 Plates ..	..	..	..	1000 0 0
					Printing Memoirs.				
					For printing 95 pages pica with outer margins, foolscap size.	2 0 0	Page	190 0 0	
..	..	..	..	..	For printing 22 pages full tabular in brevier.	5 0 0	Do.	110 0 0	
..	..	..	..	..	Printing one title page	..	..	1 8 0	
..	..	..	..	..	Do. two pages of contents	2 0 0	Do.	4 0 0	
..	..	..	..	..	Contingencies	..	..	4 3 0	310 0 0
..	..	..	..	..	Total Estimate ..	..	..	..	1310 0 0

N.B.—The cost of publishing the professional investigations of Minor Irrigation Works may therefore be taken at 3·27 per cent. of the Revenue or ·16 per cent. of the capitalised value of the works.

(Signed) P. MONTGOMERIE, Lieut.-Col., R.E.,
Superintending Engineer, Tank Maintenance Scheme.

5th March 1884.

From C. S. CROLE, Esq., Acting Collector of Madura, to the Superintending Engineer, Tank Division, dated Madura, 1st November 1883, No. 4002.

In returning the sketch map and the statement of the irrigable lands in the Varahanadi group of the Periyakulam minor basin that accompanied your letter, No. 365 A., dated 22nd September 1883, I have the honor to state that the figures entered in your statement tally with the total figures in the taluk accounts though in the former the total ayacut under one work, as per Revenue accounts, has been divided and entered under different channels.

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43-R1C-1229. 23

2. The marginally noted works mentioned in your statement have been repaired by the ryots at their own cost, and nanjatirva is paid for the lands under them.

3. Your statement shows that No. 10 Sahpurankulam in the Vadugarai village has an ayacut of 27·05 acres, assessed at Rs. 107-7-7; but this work having become silted up long ago, the lands under it have been included in the punja ayacut of the village.

4. As regards the sum spent by Government both on new works and repairs attached to the group under reference, I herewith forward a statement showing the outlay on works repaired by the Revenue Department. As to the other works mentioned in your statement, I am unable to furnish the required information and request that the Public Works Department may be addressed on the subject.

APPENDIX D.

STATEMENT showing the amount expended on Maramut of certain Irrigation Works in the Periyakulam Taluk (Periyakulam Minor Basin).

Village.	Number of the Irrigation Work.	Name of the Irrigation Work.	New Work or Repair.	Date of execution of the Work.	Amount expended on Maramut.	Remarks.
1	2	3	4	5	6	7
					Rs. A. P.	
Kaikilangudam ..	34	Chinnapolangudam ..	Repair ..	1877-78 ..	330 15 6	This maramut was conducted by the Revenue Department as famine relief work.
Do. ..	43	Kaikilangudam ..	Do. ..	1877-78 ..	514 3 3	
Do. ..	49	Vêmpadipakangudam.	Do. ..	1877-78 ..	403 0 1	
		Total ..			1,248 1 4	
Thenkarai ..	3	Periyakulam ..	Repair ..	1880-81 ..	257 5 0	This maramut was conducted during the years 1880-81, 1881-82, by the Revenue Department.
Kaikilangudam ..	43	Kaikilangudam channel.	New work.	1851-82 ..	616 3 7	
Do. ..	42	Kaikilangudam channel.	..	1881-83 ..	46 2 1	
				Total ..	918 13 8	
Kallupuram ..	62	Sirukulam ..	Repair ..	1883-84 ..	670 13 0	The estimate has been sanctioned for maramut of these two tanks and the work is now going on.
Kilanagulam ..	82	Pudukulam ..	Do. ..	1883-84 ..	342 10 5	
				Total ..	1,112 7 5	
				Grand Total	3,289 9 6	

MADURA,
2nd November 1883.

(Signed) E. G. RICKETTS,
for Acting Collector.

(Signed) P. MONTGOMERIE, Lieut.-Col., R.E.,
Superintending Engineer, Tank Maintenance Scheme.

From Captain H. M. KENSINGTON, R.E., Secretary to the Government of Mysore, Public Works Department, to the Superintending Engineer, Tank Maintenance Scheme, dated Bangalore, 18th February 1884, No. 561.

I have the honor to return the abstract statements received with your letter, No. 108, dated 24th January 1884, filled in so as to show the actual expenditure incurred up to 31st March 1879 in the serial restoration of tanks in the Bangalore and Kolar divisions. Column 8 has not been filled in, as the revenue of the tanks which depends upon the seasons fluctuates every year, and it is therefore not possible to state the actual increase in revenue secured. Of the four years for which revenue is shown in the abstracts, the first three, viz., 1875-76 to 1877-78, were famine years, and 1878-79 the only favorable year; and it would not, therefore, be fair to compare the average revenue for five years of these years with the figures in column 2, which represent the average revenue for five years before tanks were dealt with, when the seasons were probably favorable.

2. It will be seen that the total expenditure shown in the abstract for the Kolar division, viz., Rs. 5,69,667, differs from that shown in abstract previously supplied to you, viz., Rs. 4,28,458. This discrepancy is due to the latter abstract including only the sub-series which were completely dealt with, whereas the former abstract includes also the independent tanks that were selected for repair to afford relief to the distressed population.

APPENDIX E.

KOLAR DISTRICT.

Statement showing Revenue originally promised on account of Tanks in the Kolar district and that actually realised after completion compared with the actual expenditure incurred up to 31st March 1879.

Description.	Revenue (as given in the Financial Statement).		Revenue actually realised as per Tank Register during				Increase of Revenue secured.	Actual Expenditure up to 31st March 1879 exclusive of Survey Establishment and Tools and Plant	Increase of Revenue per cent. of Expenditure.	Remarks.
	Realised before the tanks were dealt with.	Anticipated subsequent to restoration.	1875-76.	1876-77.	1877-78.	1878-79.				
1	2	3	4	5	6	7	8	9	10	11
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
Ramsagar No. I Sub Series	1,265	2,540	1,026	1,145	1,245	1,360	..	18,886	..	
,, II ,, ...	2,579	5,569	2,277	1,995	2,169	3,025	..	31,306	..	
,, III ,, ...	1,151	2,435	722	776	879	885	..	15,557	..	
,, IV ,, ...	1,393	1,798	259	326	318	838	..	14,641	..	
,, V ,, ...	1,850	4,551	580	845	939	2,020	..	27,321	..	
,, VI ,, ...	2,584	6,758	2,751	2,764	2,902	5,635	..	28,022	..	
,, VII ,, ...	7,832	11,707	7,878	5,442	8,836	13,381	..	1,03,258	..	
,, VIII ,, ...	5,952	7,686	4,857	3,567	5,107	11,435	..	46,460	..	
,, IX ,, ...	1,056	2,103	807	330	669	1,865	..	16,353	..	
,, X ,, ...	704	1,021	458	439	426	651	..	2,235	..	
,, XII ,, ...	510	2,120	510	498	120	800	..	8,393	..	
,, XIII ,, ...	856	1,517	264	209	551	1,475	..	714	..	
,, XV ,, ...	1,757	7,015	3,666	624	1,598	381	..	45,849	..	
,, XVII ,, ...	1,803	1,415	844	892	728	826	..	4,782	..	
,, XVIII ,, ...	88	200	63	62	67	140	..	2,073	..	
,, XXI ,, ...	117	424	78	104	124	151	..	9,962	..	
,, XXII ,, ...	955	2,570	852	727	554	548	..	10,167	..	
,, XXIII ,, ...	2,148	3,551	1,551	1,484	1,522	2,053	..	27,160	..	
,, XXIV ,, ...	3,135	6,716	1,926	2,368	2,461	3,622	..	26,984	..	
,, XXV ,, ...	2,174	6,010	1,960	1,792	2,009	3,368	..	30,611	..	
Pálár minor series No. I Sarvareddy valley ..	262	630	328	464	541	446	..	4,916	..	
Do. outlying chains No. II Sundrapully valley.	1,210	1,695	1,681	1,255	947	1,689	..	12,606	..	
Do. Maderi valley No. III	816	1,799	658	..	1,004	1,869	..	7,228	..	
Kolar Holali tank	1,000	..	..	..	610	592	..	26,015	..	
Betamungala Dodkeri	2,837	3,050	2,953	2,953	2,918	2,510	..	14,963	..	
Ramsagar tank	2,926	5,765	2,513	1,671	2,527	4,056	..	26,912	..	
Sidlaghat Arsekeri tank	192	523	222	237	433	474	..	6,292	..	
Grand Total ..	49,146	91,178	41,670	32,979	38,184	66,095	16,949	5,69,667	2·97	
		— 49,146								
Net anticipated increase of Revenue ..		42,032								

	1878-79	
	Increase Revenue.	Expenditure.
	Rs.	Rs.
Bangalore district.	6,751	3,68,615
Kolar district ..	16,949	5,69,667
Total ..	23,700	9,38,282

Total Increase of Revenue per cent. of Expenditure 2·41 per cent. in 1878-79.

Accompaniment to letter, No. 561, dated 13th February 1884, from the Secretary to the Government of Mysore, Public Works Department.

(True Copy.)

(Signed) P. MONTGOMERIE, Lieut.-Col., R.E.,
Superintending Engineer, Tank Maintenance Scheme.

APPENDIX E.

BANGALORE DISTRICT.

Statement showing Revenue promised and that realised annually from Tanks since their completion compared with the actual expenditure incurred up to 31st March 1879.

Description.	Revenue shewn in the Financial Statement.		Revenue realised as per Taluk Account.	Anticipated.	Actual Revenue of Form No. III, as per Tank Registers kept in this office since the reformation of Tanks.		Actual Expenditure up to 31st March 1879 exclusive of Survey Establishment and Tools and Plant.	Increase of Revenue per cent. of Expenditure.	Increase of Revenue secured.	Remarks.	
					1875-76.	1876-77.	1877-78.	1878-79.			
1			2	3	4	5	6	7	8		9
			Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.		Rs.
I.—Hesseraghatta Series—											
Arakunthegey Sub-Series			2,751	2,195	2,920	824	1,669	7,553	7,553		
Jumbinkey	do.		2,168	3,235	1,702	1,068	1,489	5,568	5,568		
Nagenkere	do.		6,344†	7,486	2,437	1,471	3,612	6,812	6,812		
Kolahern	do.		3,429	6,508	2,465	1,189	1,434	3,161	3,161		
Kaode	do.		1,629†	3,893	1,197	342	865	5,004	5,004		
Hesseraghatte	do.		15,640	16,321	6,197	3,184	5,294	10,261	10,261		
II.—Kadgudy Series			8,544	15,607	9,417	6,249	9,345	10,383	10,383		
III.—Mo[illegible] series of cottying chains on the left bank of Arkavati below Harrenghatti series			891	3,182	1,303	458	711	927	927		
IV.—Hoskote series			4,989	7,643	1,676	2,050	2,953	2,344	2,344		
Grand Total			43,642	72,034	37,161	16,835	26,672	62,283	62,283		
				45,342							
Net anticipated increase of Revenue				27,392							

Increase Revenue. Rs. 6,751 — Expenditure. Rs. 3,63,615

Bangalore district 6,751 — 3,63,615
Kolar district 16,949 — 5,69,667
Total .. 23,700 — 9,33,282

Total increase of Revenue per cent. of Expenditure, 2·41 per cent. in 1878-79.

Accompaniment to letter, No. 640, dated 13th February 1884, from the Secretary to the Government of Mysore, Public Works Department.

(Signed) P. MONTGOMERIE, Lieut.-Col., R.E.,
Superintending Engineer, Tank Maintenance Scheme.

(True Copy)

5483/34

12TH JULY 1884, No. 647 I., PUBLIC WORKS.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following papers:—

G.O., dated 21st January 1884, No. 288, Revenue.

From Lieutenant-Colonel P. MONTGOMERIE, R.E., Superintending Engineer, Tank Maintenance Scheme, to the Chief Engineer for Irrigation, dated Chepâk, 5th March 1884, No. 409 T.

I have the honor to submit, for the orders of Government, the investigations of the Periyakulam Minor Basin, which has been selected to illustrate the condition and circumstances of the minor irrigation works of the Madras Presidency, together with a scheme for the more efficient repair and conservancy of minor irrigation works, generally based on the results of these investigations.

1 *Résumé.*
1 Scheme for the repair and conservancy of minor irrigation works.
1 Descriptive memoir of minor irrigation works.
1 Portfolio containing plans, &c.

2. The scheme now submitted is practically the carrying out to their logical conclusions the proposals for tank divisions sketched in your memorandum of the 27th November 1882, by making them permanent and efficient institutions, incorporated with the regular Public Works department, as was the case in the Mysore tank scheme, from which, I presume, your suggestions were originally taken. This will necessitate the amalgamating and re-arranging the thirteen existing divisions of the tank districts into "Irrigation" and "General," respectively, and the entire separation, in the new "Irrigation divisions," of the duties of the investigation and projection, from that of pure conservancy and the execution of repairs.

3. Some such scheme as that now proposed will be necessary in order to give effect to the important enactments connected with the conservancy of irrigation works, which are at present under the consideration of the legislature, and the fact that the minor irrigation works of the Presidency, under the present *regime*, cannot possibly be brought up to a proper standard of efficiency, even with the aid of five extra tank divisions, under 55 years, as admitted by you, clearly shows that the whole question is essentially one of conservancy, necessitating administrative reforms both in the departments of Revenue and Public Works.

The Kudimaramat Act.
The Rivers Conservancy Act.
The Madras Irrigation Act.

4. The authorised strength of the present Madras tank divisions is insufficient to enable them to cope with the execution of the repairs as well as the carrying out of the professional investigations; and to enable them to do this in anything like a satisfactory manner they must be increased to at least the strength allowed for the Mysore tank divisions, which, you will observe from the printed report marginally noted, gives three Assistant Engineers, instead of only one allowed in Madras, and also 18 surveyors, besides the regular subordinate grades for each tank division. But before recommending Government to authorise such an increase to the

Mysore Government letter, No. 402 A.G., dated 9th August 1875, to Government of India.

strength of the temporary divisions, which after all would not affect the general question of the conservancy of the works, I would most respectfully suggest the advisability of incorporating the temporary divisions with the permanent establishment in the manner proposed in the accompanying scheme. By this arrangement there would be some prospect that the estimates for the repairs required to bring the works up to the standard of efficiency would be carried out in a definite period. And the extra temporary establishment would then be free to complete the investigations, which are essentially necessary, before any satisfactory progress can be made in the conservancy of the works.

5. It will be admitted by every one who has had practical experience of the rural districts of Madras in which the minor irrigation works are situated that, from the very nature and circumstances of the case, no Department of Public Works, however constituted, can *alone* deal with the conservancy of the works, and that any scheme of conservancy, which does not invoke the influence of the Collector, or ignores the labor of the cultivator as a prime factor in the scheme, must be practically useless. In order to secure the co-operation of the Revenue authorities I have suggested the utilisation of a portion of the subordinate establishment of the permanent Tank or rather irrigation divisions as a separate conservancy branch to assist the Collectors in carrying out the repairs and in giving effect to the law; and I see no reason why this essential reform could not be carried out without hampering the action of the Public Works Department: for it would in no way alter its existing strength and organisation, and would principally consist in defining the duties of its subordinate members, instead of permitting them to be employed on any and every description of work indiscriminately as at present. The extra cost entailed by the tank inspectors would be more than covered by the increase of revenue anticipated, which it is estimated will be about 6 per cent.

6. Should it be found impracticable to form a separate conservancy branch of the Irrigation Department to co-operate with the Collectors in the execution of the repairs and the conservancy of the works, I have no hesitation in saying that it would be to the interests of the country generally as well as for the reputation of the Public Works Department for that department to retire from the tank districts so far as the conservancy of the minor irrigation works is concerned and to place the subordinate establishment thus set free at the disposal of the Collectors for the formation of a conservancy department, the Engineers being required to attend only to the purely professional part of the work and the supervision of the operations of the Collectors.

7. From appendix (C) it will be seen that the cost of publishing the results of the professional investigations will amount to only 3·27 per cent. of the revenue or to ·16 per cent. of the capitalised value of the works. By whatever agency the execution of repairs and conservancy is to be carried out in future, investigations into the condition and circumstances of the works are essential, and it is very necessary that the data collected should be permanently recorded for future reference and guidance.

8. In the accompanying statement is a *résumé* of the more important points brought out by the present inquiry, with an outline of the administrative reforms proposed. These proposals are very similar to those which I had the honor to submit to the Famine Commission, at their request, in February 1879, and the further inquiry into the subject has only confirmed my opinion as to their necessity.

ENCLOSURE.

RESUME of an inquiry into the actual condition and circumstances of the minor irrigation works of the Madras Presidency, with proposals for their more efficient repair and management, by Lieutenant-Colonel P. Montgomerie, R.E.

Part I. Professional Treatment of Minor Irrigation Works. The gross revenue from the minor systems of irrigation, usually known as the minor irrigation works of the Madras Presidency, during the year 1882-83, amounted to Rs. 116,92,807, and, deducting the land assessment,

the actual working expenses during the year in the Public Works Department, and the collection charges in the Civil department, at 7·2 per cent. on the irrigation revenue; the net irrigation revenue from these works amounted to Rs. 65,73,079, and the capitalised value of this net revenue at 25 years' purchase would amount to Rs. 16,43,26,975, or to about 16¼ millions sterling which may be assumed as the value to the State of the minor irrigation works.

2. This revenue from the minor irrigation works is 36 per cent. greater than the revenue from the whole of the large deltaic systems and other important works for which Capital and Revenue accounts are kept, and is three-fifths of the entire revenue derived from irrigation works in the presidency.

3. Owing to the dual management of the minor irrigation works in force in Madras the systematic and comprehensive record of irrigation data, both revenue and technical, which is essential for intelligent administration, has been impossible; and, as a consequence, there is very considerable misapprehension as to the actual condition and circumstances of the works. Sir A. Cotton considered they ought to produce from 50 to 75 per cent. more revenue, and some even now hope that they might yield 16 per cent. more if they were placed in a thorough state of repair.

Letter to Revenue Board, dated 13th December 1837, paragraph ( )

4. It has been considered that the complete investigation of a specific tract of country embracing all the irrigation works depending on the same source of supply would illustrate the condition and circumstances of the minor irrigation works generally, and with this view the Upper Vaigai river basin in the Madura district has been selected; because—

1*st*. The Madura district is reputed to be the most neglected district in the presidency in regard to the conservancy of its irrigation works; and

2*nd*. The water-supply of the Upper Vaigai river basin being more constant and abundant than the local supplies available in most of the other districts, the capabilities for improvement are more likely to exist in this tract of country than elsewhere; and the fluctuations of revenue owing to the uncertainty of local rainfall is reduced to a minimum.

5. Complete investigations of the Periyakulam minor basin, which is a sub-division of the Upper Vaigai river basin, and affords a fair sample of the irrigation works, are now submitted, and the following are the main points brought to light by the inquiry—

(*a*) That the standard of efficiency laid down in Proceedings, Madras Government, No. 284 I., dated 5th May 1880, is sufficient to ensure the general safety of the works, and that, although the irrigation works in the Periyakulam minor basin (especially in the matter of earthworks) are considerably below this standard, their general design is sufficiently good to enable them to fulfil the purposes for which they were originally constructed, judging from the remissions of revenue which have been made.

(*b*) That the work required to secure this standard of efficiency consists principally of earthwork and general repairs to the anicuts and other masonry works.

(*c*) That the estimated cost of the work required amounts to about one year's gross revenue.

(*d*) That the expected increase of revenue that will be secured is 6 per cent. on the proposed outlay.

(*e*) That the anticipated increase of revenue is a little less than 6 per cent. of the present gross revenue, and is not the difference between the ayacuts and the existing average cultivation which would be 14 per cent.

The inquiry into the condition of the irrigation works of this minor basin would further indicate—

(*f*) That all irrigation works dependent on the same source of supply must be treated as a whole; and that the number of isolated works having an independent source of supply are so small, at least in the southern districts, that there would be nothing gained by omitting them from the general investigations;

(*g*) That all the irrigation works in a minor basin must be under one and the same conservancy establishment; and that to place these works in different categories according to the areas of irrigation under each with a view to conserving them under different rules would be unjust to the cultivators and quite unnecessary if the works were under the charge of a distinct conservancy establishment co-operating with the Revenue authorities;

(*h*) That the regulation of the water in the minor irrigation tanks may be safely left in the hands of the cultivators whose self-interests are concerned; and that the safety of the tanks will best be secured by raising the bunds in their centres to a safe height above F.L.W.L. and gradually sloping them down to the flanks where the surplus arrangements are usually situated; and by permanently deciding the position, level and extent of each surplus work whether permanent or temporary; and

(*i*) With regard to the minor river channels such as most of these to be found in the Upper Vaigai basin, which have been successfully regulated by the cultivators from time

immemorial, the provision of head-sluices and other costly masonry works are unnecessary unless the want of them has been the cause of repeated damage and loss of revenue. And further, should the cultivators, who would generally derive the principal advantages from such accessories to their irrigation, be desirous for their construction, there would be no hardship in requiring them to provide half the costs either in money or in labor.

6. With reference to the general question of materially extending and improving existing minor irrigation works with the idea of permanently increasing the revenue, the results of those schemes which have been carried out within late years seem to indicate that any attempt to improve the works so as to increase the irrigating capacity beyond that which past experience has shown to be practicable is not likely to be a financial success.

The improvements to the Chembrambakam tank have resulted in a return of 1·12 per cent. on the capital charges.

The Pálár anicut system has yielded only ·27 per cent.

The financial results of the Pelandorai anicut have been a loss of Rs. 56,191 including interest charges.

And the Mysore tank scheme has yielded an increase of revenue giving a return of 2·4 per cent. on the outlay only during the most favorable season—*vide* Appendix (E).

7. All proposals for the extension and improvement of irrigation, it is therefore thought, should be considered separately and independently of the general scheme for the repair and conservancy of the existing minor irrigation works; and they should be confined principally to the regulation and improvement of the supply from the more important local streams, such as the Barúr, Marandahalli and Kistnagiri reservoir projects in the Salem district, and the Sangam project in the Nellore district. Or to the utilisation of the supply from the permanent sources such as the Periyar project in the Madura district and the Bhavání project in the Coimbatore district.

8. *Part II. The Conservancy of Minor Irrigation Works.*—The nature and circumstances of the minor irrigation works in the Madras Presidency are such that the execution of the work required to bring them up to the standard of efficiency must be considered in connection with the conservancy of the works; and this duty cannot be economically carried out by the same establishment which is employed on the professional investigations.

The former must be conducted by a permanent conservancy establishment co-operating with the revenue officials; and the latter will be performed by an establishment which for the most part need only be temporary.

9. It has been admitted by every one who has had experience of the rural districts of Madras in which the minor irrigation works are situated that any scheme for the repair and conservancy of the works which does not invoke the influence of the Collector and his subordinates, or ignores the labour of the cultivator as a prime factor in the scheme, must be practically useless. The bulk of the work required consists of earthwork and rough stone work such as the ryot is perfectly acquainted with. The question, therefore, of the conservancy of the minor irrigation works, when once divested of the technicalities and departmental prejudices which have too long been allowed to surround it, becomes a matter principally of administrative reform. The reform must, however, be carried out simultaneously in the departments of Revenue and Public Works.

10. The administrative reforms necessary to secure the repair and conservancy of the minor irrigation works are summed up briefly as follows:—

1*st*. The more intimate association of the Revenue and Public Works officials connected with the conservancy of the minor irrigation works without which the interests both of the Government and the ryot must suffer.

2*nd*. The entire separation in the irrigation branch of the Public Works Department of the duties of conservancy from that of professional investigation and construction, for all ranks below that of Executive Engineer, except in those districts in which the large deltaic schemes are still under construction.

3*rd*. One or more conservancy subdivisions according to the size and importance of the districts to be attached to each Collectorate; to supervise the execution of general repairs and to assist the Collector in enforcing
(*a*) The Kudimaramat Act;
(*b*) The Rivers Conservancy Act; and
(*c*) The Madras Irrigation Act,
but which will be under an Executive Engineer for purposes of discipline and account.

4*th*. To enable the separation between conservancy and construction to be effected, and in order to create a nucleus for the formation of a duly qualified conservancy establishment, the existing divisions of the thirteen tank districts to be re-arranged and amalgamated as follows into eight irrigation and five general divisions respectively. The irrigation divisions to be arranged according to river basins and the general divisions according to districts:—

Existing divisions and districts to be comprised in general divisions.	Amalgamated Divisions. General.	Amalgamated Divisions. Irrigation.	River basins to be comprised in irrigation divisions.
Ga...	1	1	All basins north of the Godávari.
V...patam			
...ry	1	2	To be settled hereafter.
Cuddapah			
Kurnool	1	1	Cauvery above the Amarávati and Pconiar above hills.
Coimbatore			
Salem	1	2	Pálár and Madras drainage basin. Cheyar and drainages south to Coleroon.
North Arcot			
Chingleput			
South Arcot	1	2	Amarávati and Cauvery. Pallaur Vaigai and all south.
Trichinopoly			
Madura			
Tinnevelly			
	5	8	

5*th*. An intermediary grade between that of Engineer and upper subordinate to be introduced into the Public Works Department, to have the title of "Irrigation Conservator" and to which the subordinate officials of the Revenue Department will be eligible on their passing a qualifying examination;

6*th*. The local "Irrigation Conservators" (who will be sub-divisional officers of the Irrigation Executive Engineer) to be entrusted with magisterial powers for the purpose of carrying out the condition of the law. They will thus become virtually the assistants of the Collector and will be intimately associated with him in the irrigation administration of the district;

7*th*. A conservancy charge or sub-division will comprise one or more river basins or groups of taluks, whichever is most convenient, with an overseer to each taluk or group of minor basins and a tank inspector to each minor basin or part of a minor basin;

8*th*. To prevent the general divisions from being hampered by petty details, the limits of the repair estimates to be carried out by them to be extended from Rs. 1,000 to Rs. 3,000 as is the case in the Bombay Presidency, and fewer new works to be put in hand at one time. This, with the improved means of communication afforded by railways, &c., will, it is believed, secure the efficiency of these divisions;

9*th*. The boundaries of revenue taluks to be made conterminus, as far as practicable, with those of the conservancy charges which have to be arranged according to the sources of water-supply by minor basins. The original taluk boundaries were manifestly intended to have been taken along the water-sheds where practicable; and there will probably be little difficulty in carrying out this essential reform with the assistance of the more accurate maps which are now available;

10*th*. Complete Revenue returns for each minor basin showing the remissions with explanations of the precise causes of these remissions to be furnished punctually by the Collectors to the Irrigation Engineers;

11*th*. An Irrigation Conservancy Code defining the duties of all connected with the Irrigation to be drawn up; and

12*th*. To prevent friction and ensure the code being duly enforced, the Chief Engineer for Irrigation must be made an *ex officio* Member of the Board of Revenue, and an Engineer must be permanently attached to the Board as Irrigation Secretary.

(Signed) P. MONTGOMERIE, Lieut.-Col., R.E.,
Suptg. Engr., Tank Maintenance Scheme.

5th March 1884.

No. 122 I.

Note by the Chief Engineer for Irrigation.

Colonel Montgomerie has, with the above letter, submitted the result of the complete investigation of the circumstances of the irrigation works in one minor basin, that is, a separate portion of one of the main river basins, in Madura, worked at by the Tank division.

2. In November 1882, when the Honorable Major Baring visited Madras, a scheme was brought forward for dealing systematically with the irrigation tanks and channels in the Presidency, other than those for which Capital and Revenue Accounts are kept, with a view to bringing each work into an efficient state, and subsequently the Government of India sanctioned the temporary appointment of a Superintendent of Works, and one (so called) tank division to commence the work.

3. It was decided to take up first the Madura district where irrigation works of this class were much in need of repair and there was a fair water-supply. In the first instance a map was prepared to show all the main river basins in the Presidency and then the upper Vaigai basin being the one selected for operations, a group Irrigation map, scale 1 inch = 1 mile, was prepared showing the minor basins with groups and sub-groups into which the main basin was naturally divided, each work in the minor basin being numbered and the catchment areas of each being worked out. Next a detailed irrigation map for all groups in the minor basin, scale 4 inches = 1 mile, was prepared, showing the position of each work in the group with longitudinal sections of all tank banks and detailed sketches of all masonry works, showing work to be done to put each tank and channel into repair. Statements of Financial and Hydraulic details of each work were prepared, with a descriptive memoir of each, and the estimates for repair of each were worked out in detail.

4. It is not necessary here to detail further the arrangements made for the investigation of these irrigation works which have been explained by Colonel Montgomerie. Every advantage has been taken of the experience gained in carrying out work of a similar nature in Mysore, and all details have been fully discussed with Colonel Montgomerie, and it is believed that nothing better suited to the circumstances of this Presidency can be suggested. The works are correctly grouped, their positions ascertained, their present circumstances and requirements laid down on paper and the latter estimated for. All Financial and Hydraulic particulars are permanently recorded, and a memoir of each work is prepared giving information as to standard levels, flood discharge, storage and irrigation details, &c., &c.

5. It has been proposed by Colonel Montgomerie that the maps should be lithographed and the descriptive memoirs printed and bound up by main river basins. He appends an estimate of the cost of so doing for one minor basin, the net irrigation revenue derived from which amounts to Rs. 32,000, amounting to Rs. 1,310 or 3·27 per cent. of the revenue. The estimate is of course approximate, but it is a guide to the expenditure necessary to maintain a complete record of each work, and it is recommended, in order that a permanent record may be maintained, that Colonel Montgomerie's proposal may be sanctioned.

6. The results of the investigation of this minor basin are briefly as follows :—

The works, both earth and masonry, are generally in much need of repairs, and require an expenditure of about one year's gross revenue to put them into good order.

The expected increase of revenue is 6 per cent. on estimated cost of repairs.

The full ayacut cannot be cultivated by the works as designed; if it could be, the increase of revenue would be 14 per cent. on cost of repairs.

7. It would not be fair to judge of the probable increase of revenue in the whole Presidency, from the result of the investigations on so limited an area; it has generally been supposed that were the works in an efficient state the whole ayacut area would be cultivated, and the loss of revenue consequent on the neglect to put the works into good order was therefore assumed to be the difference between the actual collections and those that would be made if the whole ayacut were cultivated. In a former note on the subject it was stated that in many cases the whole ayacut area could not be cultivated under any circumstances, but there was no certainty about it. The increase now estimated has been arrived at after consulting the cultivators who must be the best judges of what they can undertake, and possibly may be too low, but it is not safe to calculate on more, and if the result is disappointing, it is yet satisfactory to find that the return on proposed outlay is remunerative.

8. Colonel Montgomerie has compared these results with those actually attained in other places, and has selected the following works for comparison :—

1. The Chembrambaukam tank.
2. The Pálár anicut system.
3. The Pelandorai anicut.

This comparison is altogether valueless for the following reasons :—

The Chembrambaukam tank was the subject of a great mistake.

The Pálár anicut is built across a river which is very uncertain and in some years carries no flood-water whatever.

The Pelandorai anicut is an incomplete work.

A more legitimate comparison is made further on with the Mysore tank scheme, where it is shown that the expenditure up to 1879 had, in the most favorable season, yielded a return of only 2·4 per cent.; but here again the results of the year after the famine have been compared, which is hardly fair. The comparison can only justly be made between the actuals of some years after completion of works. It may, however, be said that there can be no question of the advisability of spending money on repairs which will return 6 per cent., and further that if a direct return of only 2 per cent. could be secured it would be good policy to spend a year's revenue.

9. In paragraph 13 of his "scheme" Colonel Montgomerie refers to proposals for extensions and improvements which, he says, should be considered separately from the "Tank Maintenance Scheme." This term is hardly applicable here; the work the Tank divisions are engaged on is the restoration of the irrigation works, it is not intended to comprise any extensions, and the improvements it should provide for are the provision of efficient escapes and sluices where there are none, or only inefficient ones. It would manifestly be impossible to combine extensions with restoration without delaying the work almost indefinitely.

10. The work before us is to put every tank and channel into a state of efficiency. These works are for the most part well designed and suited for their intended duty. They were constructed very many years ago under Native Government, and in course of time have of necessity greatly deteriorated. Under British Government a considerable amount of money has been expended in repairing and restoring the works, and till of late this was done by taking up such works as were reported by the Revenue authorities to be most in need of repair and dealing with them individually. Of late years an attempt has been made to group the works and deal systematically with each group, but with the available establishment it has been impossible to deal with more than a small proportion of the works. As civilisation has advanced, the wants of the ryots have been brought more prominently forward, and the louder demand for more to be done by Government has led to the supposition that the irrigation works formerly were well maintained and latterly have been almost entirely neglected. There cannot be a more mistaken notion; an intimate acquaintance with the irrigation districts of the presidency for twenty-eight years justifies the assertion that more has been done during late years than has been done at any period during British rule, and probably at any time since the construction of the works. As much has been done as could be done, and the work now undertaken is not, as it would appear to be assumed, to make good the shortcomings of this or that department which has been struggling shorthanded with the monster, but to repair the deterioration from a long course of years and to bring every work to the standard of its original or best irrigating capacity.

11. In the note originally submitted on this subject, it was suggested that six Tank divisions should eventually be formed, and it was intended that these divisions should not only group the works and estimate for their requirements, but also carry out the works estimated for. Colonel Montgomerie has stated that any scheme for the conservancy of the irrigation works must be considered in connection with the execution of the work required to bring them up to a fair standard of efficiency, and has, in considerable detail, worked out such a scheme involving radical changes in the constitution of the Public Works Department. It seems unnecessary here to discuss the details of this scheme, or to say more than that it is not generally approved; but a careful consideration of all that has been written on the subject has led to the conclusion that it may be well to abandon the original intention and to restrict the Tank division to grouping and preparation of estimates, leaving the work to be carried out by the ordinary divisions within which they lie. It may be that by throwing this work on the

ordinary divisions other irrigation repairs, which the divisions are estimating for and carrying out, will be retained; but these very works will in time come under the operation of the Tank division, and it is more satisfactory for the works of a district to be attended to systematically. The Tank divisions would thus progress much more rapidly than was originally contemplated, and should they get on so far ahead that the ordinary divisions could not grapple with the works laid out for them, they might temporarily be reduced and the ordinary divisions strengthened proportionately.

12. The subject of the conservancy of the works after they have been brought up to the standard of efficiency is now forced on our consideration. The works in one minor basin will shortly be put in repair, and if conservancy is not attended to they will immediately begin to deteriorate. This has been brought forward by Mr. Crole, who, in his letter, No. 507, dated 22nd October 1883, printed with G.O., Revenue Department, No. 288, dated 21st January 1884, sketches out a scheme which generally agrees with that which Colonel Montgomerie has submitted; this will be noticed further on. The first point is to arrive at a definition of conservancy.

13. There are, it appears, two classes of repairs which the works will always require. Supposing that a tank has had its bank brought to proper section throughout, its revetment packed to slope and raised to sufficient height, the bank slopes dressed, turfed, planted with grass, or gravelled, its waste weir made of sufficient length and its sluices put into working order, deterioration begins by rain-water gullying the slope, waves during strong wind damaging the revetment, cattle pulling out the grass, trees taking root in the masonry, &c. To check this, in the first instance, only "petty repair" is necessary. As the rain passes over, the gullies should be filled; as the wind subsides, the loose stones in the revetment should be repacked; the grass pulled out by the cattle should be replaced, and the trees and shrubs establishing themselves on the masonry works should be pulled out by the roots; this is "petty repair." It may be said that once a work has been put into repair, the execution of these "petty repairs" will be all that is needed to maintain it, and this is the view taken by the Irrigation Committee whose report will be found in appendix V to the Famine Committee Report, but it is considered that more will be required; that after the lapse of some years, in spite of petty repairs having been regularly carried out, the works will generally have deteriorated, the tank bank will have become washed down by almost imperceptible degrees, the revetment will have to some extent subsided, the brick or stone of the masonry works will have decayed, and something more than petty repair will be required to bring the work up to the standard of efficiency once more. This may be called "ordinary repair" which would be required probably once in 10 to 15 years. Petty repair, which is conservancy, should, it is thought, be carried out by the cultivator, ordinary repairs by the State.

14. Petty repair is, in fact, the work which, it has always been maintained, should be done by kudimaramut; and it was hoped that the Kudimaramut Bill would have given power to enforce its execution. There are, say, 50,000 irrigation works scattered throughout the presidency, and during the monsoon, or in times of heavy rain, the tank and channel banks must suffer; a gully is formed and rapidly becomes a wide and deep gap in the bank, the water gets behind the revetment and down come several stones, a sudden flood throws a deposit in front of a sluice or across the head of a channel, and this happens in a day or in a few hours. However strong the department entrusted with the maintenance of these works may be, it is evidently quite impossible for its officers to attend immediately to even a tithe of the cases where a few hours' work, possibly not so much, is needed to avert disaster. At this very time, too, it must be remembered, heavy rains are driving the laborer out of the fields, and the laborers are actually in their houses but a few hundred yards, it may be, from the spot where a few annas' worth of labor is sorely needed. It is no more possible for the State to undertake to fill gullies, replace stones in revetments, &c., than it is for a large landowner in England to stop gaps in fences, repair gates, &c. Petty repairs must be, and always have been, the duty of the tenant. Here as a tank or channel supplies the lands of many ryots, it is of course difficult to apportion the labor, but it is hoped that the old village system is not yet quite a thing of the past, and that this might be settled by a panchayet of the principal ryots.

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15. It is understood, however, that the Kudimaramut Bill will shortly be withdrawn, and that no means are to be adopted of enforcing the execution of petty repairs. The help of the cultivators in the conservancy of the works must be sought for in some other way. There is already a good deal done in some places by them, and in some districts a voluntary cess has been collected for the execution of trifling repairs. If this system could be extended, if the cultivators could be induced to contribute a small percentage on their assessment and this money was expended on the village works by village labor, under the direction of the principal ryots, conservancy might be attended to. It is the best way of making a cess take the place of kudimaramut, and as regards the objections usually raised to an additional cess, the remark made by the Honorable Mr. Sullivan, in suggesting a substitute for the Kudimaramut Bill, may be quoted. He says: "It merely represents the value of the labor which would otherwise have to be contributed gratis, and as it does not go to swell the land revenue, but is expended on the objects for which and in the locality where it is raised, the people do not regard it as an addition to the regular fiscal burden."

16. The remarks made by Colonel Montgomerie in paragraph 32 of his scheme are very much to the point. The labor of the cultivator must be a prime factor in conservancy and it must be invoked by the Collector. When once the minor irrigation works in a district or taluk have been put in good order, no professional agency is required to supervise conservancy. The cultivators are quite capable of doing all that is needed, and the tahsildar or other subordinate of the Collector is able to see whether it has been done. This was contemplated in G.O., No. 284 I., dated 5th May 1880, which contains the orders under which the irrigation works have been classed as Imperial and Minor, and the principle on which it was then intended that minor works should be maintained and repaired was that the villagers should in all cases do the work and should receive remissions or grants-in-aid as payment for work done. It was never contemplated that the work should be measured up and paid for by the yard. The money was to be given as a grant-in-aid to the villagers; no expensive establishment was to be kept up, but inspectors were to be appointed under the Collectors who would report whether the works were receiving due attention. This scheme, however, has never been fairly tried. Lists of the works were prepared, and it was settled between the Collector and the Superintending Engineer what works were to be classed as Imperial; these lists were sent to this office, examined, and, with some alterations, approved. Money was placed at the Collectors' disposal, and forthwith, with one accord, the Collectors applied for establishments to estimate, lay out, measure up and pay for the work done. No attempt seems to have been made to carry out repairs by means of the villagers, giving them remissions or grants-in-aid as required.

17. There is much that is good in the schemes sketched by Colonel Montgomerie and Mr. Crole, but it is thought that they will fail in attempting to carry out all conservancy and repairs by paid labor working under an establishment. No establishment can undertake petty repairs at the right moment; it cannot attend to hundreds of works at the same time, cannot put in the "stitch in time" which will save so many subsequent stitches; only the villagers can do that.

18. As regards the division of irrigation works between Imperial and Minor, it must be remembered that that already made under the instructions conveyed in G.O., No. 284 I., dated 5th May 1880, is not considered to be final. The proper and final division must be those works which require professional superintendence should be classed as Imperial and be attended to by Public Works Department; all others should be Minor, and these might be sub-divided into those which can be entirely handed over to the villagers and those which can be maintained by the villagers acting under the Revenue Department. If the investigations now in progress under the Tank divisions were completed, it would be a simple matter to classify the works in this way; but until they are completed, it does not seem practicable to do more than classify by acreage; this division approximately shows the works that require professional superintendence, and those works which do not are handed over to the Revenue Department, and until they can be restored must be kept as efficient as possible by ordinary repairs, such as can be executed under the direction of a maistry. It would manifestly be a waste of money to pay an Engineer officer to assist the Collector in looking after such work,

and if it be said that a highly paid officer is necessary to prevent waste of money, the reply is, give the money as Government formerly directed as a grant-in-aid to the villagers, interest them in the work, and it will be rarely that a complaint is made of not enough to show for the expenditure.

19. The treatment of minor irrigation works is a subject regarding which there has been a vast amount of discussion, and a very great diversity of opinion. The Government have laid down certain lines on which to work, and there seems to be no good and sufficient reasons for a radical change in the constitution of the Public Works Department because these lines (which have not been adhered to) have not at present led to the happiest results. We start with the works generally out of repair, and we knock on the head the old custom of the ryots attending to petty repairs, and expect to find a royal road out of our difficulties. The expectation will never be realised, and time is only wasted in trying change after change. The general principles on which we ought, it is thought, to work, and which are in effect very nearly those we are working on, are—

1. Conservancy and ordinary repair is the work of the villagers under the Revenue Department aided by remissions or grants-in-aid.
2. Imperial works are those which need professional treatment. All other works are Minor and may be taken charge of by the Revenue Department, a considerable proportion being handed over entirely to the villagers, as has already been done in the Cuddapah sub-division.

20. The rules to be laid down consequently are as follows:—

1. The Tank divisions will be employed in grouping and estimating for restoration of irrigation works.
2. The Public Works ordinary divisions will carry out the work to be done.
3. The present classification of the works will be revised on the completion of each minor basin, and the Government will be asked to finally settle which are Imperial and Minor, and which of the latter class can be handed over to the villagers.
4. In the ungrouped basins the present classifications to be adhered to, or modified by agreement between Revenue and Public Works Departments and approved by Government.
5. The conservancy and repair of Imperial works to rest with the Public Works Department, and that of Minor works with the Revenue Department.
6. No new work of any kind to be undertaken by the Revenue Department.

21. It has been said that the system of working by means of remissions and grants-in-aid will never answer; all that is asked is that a fair trial should be given to it, and if kudimaramut is now to be regarded as a thing of the past, there are stronger reasons for trying it, than there were in 1880. If the Revenue Department cannot work in this way, the alternative is, to use an old term, a Maramut establishment under the Collector, hand over all the smaller works, as far as possible, to the villagers, and leave restoration entirely to the Public Works Department, who should have nothing to do with any work which does not require professional treatment. The Local Self-Government Committee recommended that the repair of minor irrigation works should be transferred to the taluk boards; it was thought that as only a limited number of works could be repaired yearly with the available funds, the taluk boards would be in a position to decide where the money could be expended to the best advantage, and that if they undertook the repairs themselves it would strengthen their establishments and enable them to employ competent men for the supervision of both tank and road works. It may be too soon to take any further step in the matter, but the proposal is worthy of consideration, and when the boards have become settled institutions, a transfer of works might be experimentally made.

22. One other point requires notice. It may be said that the transfer of minor works to the Collector is throwing work on an officer already overworked, but Mr. Crole has stated that if the Collector were given a conservancy establishment, economy, efficiency, increased revenue and substantial improvement on the national wealth of the district must ensue; and he proposes a very extensive establishment to work under

him, the Superintending Engineer having professional supervision. If all works requiring professional treatment are retained in charge of the professional department, this supervision will not be necessary, and the subordinate establishments, which would suffice to superintend the simple repairs left to the Collector, might work under the tahsildars.

(Signed) J. O. HASTED, Colonel, R.E.,
Chief Engineer for Irrigation.

10th April 1884.

ORDER—dated 12th July 1884, No. 646 I., Public Works.

When it is stated that the revenue dependent on irrigation works "for which neither Capital nor Revenue accounts are kept" is 36 per cent. greater than that derived from the whole of the large delta systems and other works for which Capital and Revenue accounts are kept, and amounts to three-fifths of the entire irrigation revenue of the presidency, the importance of maintaining them in a state of efficiency comes prominently forward both in the interests of the State and of the people. Although it may be conceded that they have not been wholly neglected, it is certain that they have not, for a long series of years, received anything like the attention which their importance deserves.

2. The investigations of the conditions of a typical series of these irrigation works in the Madura district shows—

(1) That the works have deteriorated to an extent which will require an expenditure of one year's gross revenue to bring them up to the standard of efficiency;

(2) That, without taking into account the probability of the whole area commanded being brought under irrigation by the restoration of the works, the anticipated increase of revenue in consequence of this expenditure is nearly 6 per cent. on the gross revenue, or estimated outlay;

and it has been clearly shown by Colonel Montgomerie, in the able report submitted by him, that what has been done in this typical instance can, and should, be done for the whole presidency.

3. These figures are encouraging, and place beyond doubt the expediency of pushing forward, as rapidly as financial considerations will allow, the task of restoring every tank and channel to a state of thorough efficiency.

4. This is the first time that this important question has been systematically and scientifically treated. The result of the work done is that there is now, in connection with these works, a permanent and scientific record for the area dealt with, such as is furnished by the Revenue Survey Department in connection with the cultivated area. The nature of this record is described in paragraph 3 of the note by the Chief Engineer for Irrigation, and it will be found of infinite value to both the Revenue and Public Works Departments. The Government are decidedly of opinion that all the maps should be lithographed and the descriptive memoirs printed and bound up by main river basins as suggested by Colonel Montgomerie.

5. The objects to be arrived at are to bring every work to the standard of efficiency, and to maintain it in this state; and it appears to the Government that these objects can be attained without recourse being had to the measures recommended by Colonel Montgomerie, which, as pointed out by the Chief Engineer for Irrigation, would involve a radical change in the constitution of the Public Works Department.

6. It was originally intended that the officers of the so-called Tank divisions should not only prepare the way for the work of restoration by the necessary professional investigation, but should themselves carry it out. It clearly appears that this would be a waste of power, and that the work of investigation would thereby be indefinitely delayed. The proposal that the officers of the Tank division should confine their attention to the preparation of the irrigation record and the plans and estimates for the works, and the execution of the works should be handed over to the ordinary staff of the department, is therefore approved.

7. As the investigations proceed it will be a simple matter to decide which of the works are of such importance as to require professional supervision in future; these works, which will be styled Imperial Works, will remain in charge of the Public Works Department, and all other works, to be styled Minor Irrigation Works, will be placed in charge of the Revenue Department. The lists, which, it is understood, have already been prepared under instructions conveyed in G.O., No. 284 I., dated 5th May 1880, will therefore need revision as the investigation of each minor basin is completed, and the revised lists prepared by Superintending Engineers in communication with Collectors will be submitted for the approval of Government. The question of handing over the smaller works entirely to the villagers can be considered hereafter.

8. The rules proposed by the Chief Engineer for Irrigation in paragraph 20 of his note are generally approved. The Public Works Department, on taking up for restoration the works in any minor basin, will assume entire charge of them, and retain it until the work of restoration is completed, when they (with the exception of those works selected as Imperial) will be handed over to the Revenue authorities, who will be responsible for their conservancy, and under recent arrangements for furnishing Collectors with funds for minor irrigation repairs, and for providing them with an establishment to supervise expenditure, they should be able to undertake the duty.

9. The question of conservancy establishments required for the maintenance of minor irrigation works will be referred to the Revenue Department for discussion with the Board of Revenue, and it will be considered in that department what steps should be taken towards recording and utilising the "customary labor," or cess in lieu thereof, which may be in force in the locality.

10. Ordered that a copy of these proceedings be forwarded to the Government of India.

(Here enter No. 647 I., dated 12th July 1884.)

(True Extract.)

(Signed) J. O. HASTED, Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

To Superintending Engineers.
To the Chief Engineer for Irrigation.
" Superintendent of Works, Tank Maintenance Scheme.
" Examiner, Public Works Accounts.
" Revenue Department.

ENDORSEMENT—dated 12th July 1884, No. 647 I., Public Works.

Forwarded.

(Signed) J. O. HASTED, Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

Exd. E. Fernandez.
Spare Copies

IRRIGATION.

Govt. of [1884] Madras.

PUBLIC WORKS.

Dated July, 12th.

Recd. *Encl.*

G.O., 12th July 1884, No. 647 I.

JULY.

Minor Irrigation Works

Copy of orders on Lieut.-Colonel. P. Montgomerie's scheme for the repair and conservancy of the — in the Madras presidency, forwarded to the Government of India.

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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following letter from Colonel H. L. PRENDERGAST, R.E., Superintending Engineer, V Circle, to the Chief Engineer for Irrigation, dated Chepák, 19th August 1884, No. 1935:—

I have the honor to submit copies of letters that have passed between the Collector of Chingleput and the Superintendent of Works, Tank Maintenance Scheme.

The proposals are that the Revenue Department shall withdraw from charge of minor irrigation works—

in cancelling estimates for works that have not been commenced and handing over the estimates to the Executive Engineer;

in measuring up and paying for works partly carried out, the remaining work to be taken up by the Executive Engineer;

in surrendering funds that will thus not be utilised in the Revenue Department;

in dispensing with the establishment employed by the Revenue Department for supervision of minor irrigation works, when the works are taken over by the Executive Engineer.

2. The Collector has no objection to make, but considers that the sanction of Government is required to the measures proposed.

I recommend that sanction be given. There appears to be no difficulty as regards the first three propositions, but the question of the disposal of the Revenue Maramat establishment while the Engineer Department are in charge of the minor works remains to be determined by the Revenue Department.

ENCLOSURES.

From C. D. MACLEANE, Esq., Acting Collector of Chingleput, to the Superintendent of Works, Tank Maintenance Scheme, dated Saidápet, 25th July 1884, No. 3512 (Eng.)

With reference to your letters as per margin, I have the honor to observe that you propose that the Revenue agency carrying out minor irrigation works should withdraw from each "minor basin" as it is taken on hand by your department; when doing so, the Revenue agency will have some sanctioned works half done, and others not commenced. A "minor basin" is not conterminous with a taluk.

No. 1136 T., dated 27th June 1884, and two enclosures.
No. 1161 T., dated 2nd July 1884.

In these circumstances the following questions arise:—

(1) Do you propose to carry out such unfinished and uncommenced works according to our sanctioned scheme?

(2) How do you propose to pay for the same? Whether from your own budget allotment or from our funds. In the latter case, how are they to be drawn since inter-departmental cash payments may not be allowed? In the former, our allotments will have to be surrendered, which will necessitate reference to higher authority.

(3) What is to become of our establishment of taluk irrigation maistry when more than one minor basin which cover a whole taluk are taken on hand by your department?

From Lieut.-Colonel J. PENNYCUICK, R.E., Superintendent of Works, Tank Maintenance Scheme, to the Collector of Chingleput, dated Chepák, 1st August 1884, No. 1348 T.

In reply to your letter, No. 3512 (Eng.), of 25th ultimo (received this day), I have the honor to state that I should propose as follows :—

(1) In the case of works not commenced, that your estimate should simply be cancelled, though a copy of it if communicated to the Executive Engineer, No. 2 Tank division, will doubtless be of service to him. Our estimates will probably cover all work which would be included in yours and in most cases something more.
In the case of works commenced but not completed, that you should measure up and pay for all work actually done by your agency, the remainder of your estimate being cancelled. We shall then take up the work it is left by you, and bring it up to the standard decided on.

(2) From our own budget allotment. As remarked above, our estimates will in most cases provide something more than yours will do, as they will include provision for escapes, &c., and for raising the bunds to certain determined standards, and your funds could probably not bear these charges without detriment to other parts of the district. There will, I should imagine, be no difficulty in obtaining sanction of the Board of Revenue or of Government to the cancelment of the unspent balances of your estimates, and to their reallotment elsewhere.

(3) This is a point on which I am hardly competent to offer an opinion, but I should suppose the establishment can follow the money, and be employed where the latter is spent.

As the work goes on, the tank maintenance operations will cover so large a part of the district that the money and establishment set free therein cannot be profitably employed in the remaining portion. When this becomes the case the money must of course be surrendered to Government; the case of the establishment will have to be specially considered but these conditions will not arise just yet.

From C. D. MACLEANE, Esq., Acting Collector of Chingleput, to the Superintendent of Works, Tank Maintenance Scheme, dated Saidapet, 12th August 1884, No. 501.

With reference to correspondence ending with your letter, No. 1348 T., dated 1st August 1884, I have the honor to state that I have no objection to any of the proposals, but they appear to require the sanction of Government.

Order—dated 12th September 1884, No. 834 I., Public Works.

The Superintendent of Works, Tank Maintenance Scheme, will from time to time acquaint the Collectors of districts, in which the Tank division establishments have commenced operations, of the position and limits of the minor basins in which the investigation of the requirements of tanks is undertaken by the Tank division establishments.

2. The Collectors will then see that their establishments cease to repair works in those minor basin until such of the works as may be finally decided on as not requiring professional supervision are transferred to them again, after complete restoration to a standard of efficiency by the Public Works Department. The sanctioned estimates prepared by the Revenue Department for repairs to minor irrigation works which have not yet been commenced, as well as the unspent balances of the estimates for works in progress, will be cancelled, the work done being fully paid for by the Revenue authorities. The estimates for works not commenced will be forwarded to the Superintendent of Works, Tank Maintenance Scheme, for use in preparing complete estimates.

3. Immediately the Revenue Máramat establishment have retired from a minor basin, &c., from the time the Tank divisions commence operations, the tanks in the basin will be entirely looked after by the Public Works Department. Any emergent repairs, such as prevention or closing of breaches, which may be required to the works in those basins will be estimated for by the Tank division establishment, while the work will be carried out by the ordinary divisional establishments.

4. Orders have already been issued by the Chief Engineer for Irrigation to the effect that, when the Tank divisions commence their operations in any basin, the ordinary divisions should cease to attend to the requirements of the Imperial tanks in

that basin. Under G.O., No. 646 I., of 12th July 1884, the Tank divisions will not, however, actually carry out works, and the ordinary divisions will, therefore, execute any emergent work that may be necessary from time to time, on estimates prepared by the Tank divisions as laid down in the preceding paragraph.

5. If, owing to the provisional transfer of works hitherto under the charge of Collectors to the Public Works Department for the purpose of complete restoration, the Collectors cannot fully utilise the amounts sanctioned for repairs to minor irrigation works, the amounts not required for expenditure will be surrendered to the Board of Revenue, who will re-appropriate them to other districts where they can be spent to the best advantage.

6. With regard to the Revenue Maramat establishment thus temporarily set free for employment on other work, orders will issue in the Revenue Department. The Executive Engineers of the ordinary divisions, under whom the works connected with the Tank Maintenance Scheme will be carried out, will probably be able to employ some part of that establishment, but it is unlikely that they will be able to make any use of the untrained men employed therein.

(True Extract.)

(Signed) J. O. HASTED, Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

To Superintending Engineers.
To the Superintendent of Works, Tank Maintenance Scheme.
" Chief Engineer for Irrigation.
" Revenue Department.
" Examiner, Public Works Accounts.

Exd. E. Fernandez
Spare Copies

IRRIGATION.

Govt. of 1884 Madras.

PUBLIC WORKS.

Dated September, 1884.

Encl.

Read.

G.O., 12th Sept. 1884, No. 834 I

SEPTEMBER

Tank Maintenance Scheme

Issuing orders in connection with the working of Tank divisions.

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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

General Establishment.

READ—the following paper:—

No. 192 I.

Note by the Chief Engineer for Irrigation.

In applying to the Government of India for a renewal of the sanction for the temporary establishment, employed on the Tank Maintenance Scheme, in accordance with the request contained in Mr. Walker's letter, No. 741 G., dated 21st May 1883, printed with proceedings of Madras Government, No. 1700 W., dated 16th June 1883, and in requesting sanction for the establishment necessary to start another Tank division during the ensuing year, it seems advisable to review briefly the original proposals made regarding establishment of the Tank Maintenance Scheme, and to note in what particulars these proposals have been modified.

2. In letter, No. 40 I., dated 20th January 1883, printed with proceedings of Madras Government, No. 143 I., dated 12th February 1883, the Government of India accepted the programme laid down in paragraph 14 of the Note by the Chief Engineer for Irrigation, dated 27th November 1882,* wherein it was estimated that the establishment of each Tank division would cost Rs. 32,000, and that an officer of experience, with a suitable establishment, would also be necessary to start the work of the Tank divisions until they could be finally handed over to the charge of the Superintending Engineers in whose circle they happened to be working.

* Forwarded to the Government of India, with proceedings of Madras Government, No. 3273 W., dated 11th December 1882.

3. Acting on this programme the grants and expenditure for establishment in 1883-84 were as follows:—

	Original Grant.	Revised Grant.	Expenditure.
	Rs.	Rs.	Rs.
Tank division establishment	32,000	25,364	16,657
Superintending Engineer and his establishment	33,600	25,891	26,063
Total ...	65,600	54,255	42,720

The operations of the Tank division were confined to the Madura district, and from various causes, which have already been detailed, the expenditure on works was very small.

4. At the end of the official year 1883-84 a second Tank division was formed, and began work in the Chingleput district. The grants for temporary establishment for the year 1884-85 were as follows:—

	Rs.
No. 1 Tank division	32,000
No. 2 do.	32,000
Superintending Engineer and his establishment	36,630
Total ...	1,00,630

5. As settled in G.O., No. 646 L., dated 12th July 1884, the investigation and execution of works are now carried out by different agencies—the temporary establishment of the Tank Maintenance Scheme being employed solely in investigation, while the ordinary permanent establishment executes the works.

6. This arrangement, it is considered, is the only practicable solution of the problem of restoring the minor irrigation works of the presidency within a reasonable space of time, and is strictly analogous to the principle on which the Project divisions prepare schemes for works, which are eventually carried out by other agency, and the establishment charges of which are in no way comparable with expenditure on works. It, therefore, involves the charging to Imperial Funds of the cost of the establishment of these divisions, in addition to the contribution to Provincial Funds on account of establishment and general tools and plant at 23 per cent. and 1 per cent., respectively, on the expenditure incurred by the ordinary establishment on works of the Tank Maintenance Scheme.

7. At the end of the current year it will be necessary to form a third Tank division, in accordance with the original scheme sketched out. This division will work in the Kurnool district, and the necessary sanction for the establishment required for the three divisions should now be applied for. Experience, up to the present time, has shown that, in order to secure uniformity in the method of dealing with the different works, it is absolutely necessary that the operations should be under the control of a single officer, and should not be handed over to the charge of the Superintending Engineer of the circle, while the extension of the area over which the operations are taking place renders it impossible for them to be under the immediate control of the Chief Engineer for Irrigation. It, therefore, becomes necessary to continue the employment of a special officer of sufficient standing to exercise the powers of a Superintending Engineer, and it is accordingly proposed that an Executive Engineer, 4th grade, be sanctioned for the No. 3 Tank division, in place of one of the 3rd grade as sanctioned for No. 1 and No. 2 divisions, and that the saving thus effected be made available for the payment of a local allowance of Rs. 100 as the salary of the Superintendent of Works now in charge of the Tank Maintenance Scheme.

CHEPAK,
15th December 1884.

(Signed) A. S. RUSSELL,
for Chief Engineer for Irrigation.

To the Joint Secretary to Government,
Public Works Department, Irrigation Branch.

ORDER—dated 20th December 1884, No. 3132 W., Public Works.

		Rs.
Local allowance to Superintendent of Works		100
2 Executive Engineers, at Rs. 650	each.	1,300
2 Assistant Engineers, at Rs. 450	,,	900
2 Sub-Engineers, at Rs. 300	,,	600
		2,900

THE Government of India will be requested to renew the existing sanction for the temporary engineer establishment for the Tank Maintenance Scheme, as noted in the margin, and to accord sanction for the establishment for the No. 3 Tank division as follows:—

	Rs.
1 Executive Engineer	550
1 Assistant Engineer	450
1 Sub-Engineer	300
Total ...	1,300

2. Ordered that the following letter be sent:—

(Here enter No. 3133 W., dated 20th December 1884.)

(True Extract.)

(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Chief Engineer for Irrigation.
" Superintendent of Works, Tank Maintenance Scheme.
" Examiner, Public Works Accounts.
" Revenue Department.

Exd. W. H. French.

Spare Copies

GENERAL.
ESTABLISHMENT.

Govt. of {1884} Madras.

PUBLIC WORKS.

Dated December, 20th.

Read. *Encl.*

G.O., 20th Dec. 1884, No. 3132 W

DECEMBER.

Temporary Engineer Establishment

Ordered that the Government of India be requested to renew the existing sanction for the — for the Tank Maintenance Scheme.

563
45

PUBLIC WORKS DEPARTMENT.

General Establishment.

LETTER—from

COLONEL J. SHAW-STEWART, R.E.,
Secretary to the Government of Madras,
Public Works Department,

To

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

SIR,

In forwarding, herewith, a copy of proceedings of Madras Government, No. 3132 W., dated 20th December 1884, I am directed to request that the Government of India will be so good as to renew the existing sanction for the temporary engineering establishment, noted in the margin, for the Tank Maintenance Scheme for 1885-86, and will sanction the following temporary establishment, required for the No. 3 Tank division, to be formed in the Kurnool district early in the next official year:—

	RS.
Local allowance for Superintendent of Works	100
2 Executive Engineers at Rs. 650 each	1,300
2 Assistant Engineers at Rs. 450 "	900
2 Sub-Engineers at Rs. 300 "	600
Total ...	2,900

	RS.
1 Executive Engineer, ...	550
1 Assistant Engineer	450
1 Sub-Engineer	300
Total ...	1,300

2. As it is considered very desirable that the services of the Superintendent of Works should be retained, I am to state that this Government attach great importance to the recommendations of the Chief Engineer for Irrigation on this head, which have accordingly been embodied in the scale of establishment now asked for.

I have the honor to be,
Sir,
Your most obedient servant,

(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

FORT ST. GEORGE,
20th December 1884.

Exd. W. H. French.

Spare Copies

GENERAL ESTABLISHMENT.

Govt. of [1884] Madras.

PUBLIC WORKS.

Dated December, 20th.

Read.

20th Dec. 1884, No. 3133 W.

DECEMBER.

Temporary Engineer Establishment

Requesting renewal of existing sanction for the — for the Tank Maintenance Scheme and for temporary establishment for No. 3 Tank division to be formed in the Kurnool district.

5483/W C. No. 1387

Note 583/87

Including the sanctions now given & the three sanctions ordered from May 1885 there will be altogether the following vacancies in the temp. Engg. Establ:-

3 Asst. Engrs on Rs: 650
4 " " " " 450

Temp. Asst: Engrs. Rajagopalaya Vaidyanatha Aiyar, & Subrahmanya Aiyar will in May either have to revert to the Meteor Subordinate grades or be placed on the temp: Engrs: Establishment &.

If Messrs. Popson & Declosel, who only draw Rs. 250 per mensem were brought on the temp: Estab: as Sub Engineers, two more temp: Asst: Engineerships

would be made available for men on the permanent Upper Subordinate Establishment.

W.
17.2.

Rolls of Upper Subordinates recommended for temporary Engineership submitted herewith.

W.

These questions will be given into for them up when rolls of Upper Subordinates are received.

W.

All communications should be addressed to the Secretary.

No. 229 G

543
1885

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

GENERAL.

To

The Secretary to the Government of Madras,
Public Works Department.

Fort William, 11th February 1885.

Sir,

In reply to your letter No. 3122 W. dated 20 December 1884, I am directed to communicate the sanction of the Government of India to the employment of

2 Temporary Engineers on Rs. 600 per month each
1 ——— do ——— 550 per month
3 ——— do ——— 450 per month each
3 Upper Subordinates ——— 300 per month each

sanction of the Government of India to the employment of
Temporary Engineers and
Upper Subordinates

Establishment noted on the margin for Numbers I II and III Tank Divisions, for a period not exceeding one year, and to state that the salaries should be considered personal.

2. I am also to sanction the continued employment, for another year, of a Superintendent of Works with an additional allowance of Rupees 100 per month for the supervision of the Divisions referred to above and to request that a report of the progress made up to date

date may be submitted on an early date for the information of the Secretary of State for India.

3 The names of the persons appointed and the dates of their joining their appointment should be reported.

I have the honor to be,
Sir
Your most obedt servant

W B Sampson

Under Secy to the Govt of India

No 543. W & I 9th March 85

Communicated to the officers concerned.

2. The Chief Engr: for Irrgn: will submit the report called for in para. 2 of the letter from the Government of India

9.3.85

4.3.85

To The Chief Engr: for Irrgn:
Examiner of Accts
Supt of Works, Tank, Kelu

Govt. of Madras

PUBLIC WORKS.