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# AMIL NADU ARCHIVES

## VERNMENT OF TAMIL NADU

Public Works DEPARTMENT

G.O. No. 2018 W Press.
B.P. No. Mis.

Dated 8-8-1882 197

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2018/1

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

General.
Account.

No. 62.

Read—the following G.O., dated 29th July 1882, No. 826, Financial.

*Read*—the following papers:—

| | | | | | | |
|---|---|---|---|---|---|---|
| Letter from the Chief Engineer for Irrigation, dated | 19th | April | 1882, | No. | 28 | W. |
| Memo. to the Public Works Department, dated | 13th | May | 1882, | No. | 533. | |
| Endorsement from | do. | dated | 3rd June | „ | „ | 197 E. |
| Memo. to the | do. | „ | 24th „ | „ | „ | 450. |
| G.O., | do. | „ | 13th July | „ | „ | 1771 W. |
| Memo. from | do. | „ | 21st „ | „ | „ | 458 E. |

*Order*—dated 29th July 1882, No. 826, Financial.

Recorded and communicated to the Accountant-General. The adjustment for the current year will be carried out by the Accountant-General in the Civil Department estimates. The charge should be shown in the Regular Estimate when that is submitted.

(True Extract.)

(Signed) G. S. FORBES,
Acting Under Secretary.

To the Public Works Department.

No. 63.

Order—dated 8th August 1882, No. 2018 W., Public Works.

Communicated to the Examiner, Public Works Accounts, and to the Chief Engineer for Irrigation.

(True Extract.)

Under Secy. to Govt., P.W.D.,
Irrigation Branch.

To the Examiner of Public Works Accounts.
„ Chief Engineer for Irrigation.

Exd. A. F. Goodall.
Spare Copies

GENERAL.
ACCOUNT.

Govt. of {1882} Madras.

PUBLIC WORKS.

*Dated August, 8th.*

*Recd.* *Encl.*

**G.O., 8th Aug. 1882, No. 2018 W.**

**AUGUST.**

**Nos. 62-63.**

**Madras Water Works Project;**

*Proceedings, Financial Department, relative to the manner of carrying out the refund to Imperial of the share of the cost of the —,* communicated to the Examiner, Public Works Accounts, and Chief Engineer for Irrigation.



2018
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*Proceedings of the Madras Government, Public Works Department, 11th April 1866.*

No. 149. Read the following letter from W. FRASER, [Esq., C. E., Special Executive Engineer, to the Secretary to Government, Public Works Department, dated Mount Road, 26th February 1866, No. 50 :—

1. I have the honor to forward my first Report on the Madras Water Works, with one volume of detailed plans, and an abstract of the estimate. I trust that these papers will be found satisfactory.

2. A detailed specification and estimate will be furnished when required. The other volumes are being bound.

3. I send this volume in a deal case, as it is large and easily injured.

## FIRST REPORT ON THE MADRAS WATER WORKS

By William Fraser, Esq., c. e.

1. The supplying of Madras with an abundance of pure water is a question which has occupied the attention of the Government for many years; and numerous reports and suggestions have been submitted by professional Engineers and others, either under the direct orders of Government, or from having their attention directed to the subject by the repeated complaints of the gradually increasing impurity of the water drawn from the wells, which, at present, form the only source of supply.

The gradual deterioration of the Madras wells is so notorious, that it is unnecessary to enlarge on this part of the subject, for the purpose of establishing the necessity for obtaining a supply of water from some other source. Many reasons have been assigned for this deterioration of the Black Town wells, but there is no occasion to search for obscure causes, when we are familiar with the fact that Madras is built upon a portion of the belt of silicious sand which runs along the Coromandel coast; and which, in its uncontaminated state, yields, nearly every where, a very pure fresh water. At Black Town and other parts of Madras it has been thickly covered with human habitations, the surface has rarely been in any but a filthy state, and, considering the porous nature of the soil, it is but reasonable to suppose that during every monsoon a portion of the surface impurities is washed down to the water-bearing strata; and there can be no doubt too, but that the very efforts recently made to keep the town clean by flushing the drains with water from Cochrane's Canal, has hastened the deterioration of the wells; for these drains were too uneven and broken to be successfully flushed, and the diluting of the sewage only enabled the porous sub-soil to absorb it the more readily. The result has been that many of the wells which were slowly becoming impure have, of late, rapidly become not only unfit for use but offensive.

2. The troops in Fort Saint George are supplied with water through pipes from the "Seven Wells," which are in an open piece of ground at the north side of Black Town, about two miles from the Fort.

The waters of these wells, and of several others throughout Madras, have been analized by Doctor Wyndowe, the Government Chemical Examiner. The following copy of his analyses has been kindly placed at my disposal by the Madras Sanitary Commission.

The work on which Dr. Wyndowe is engaged, "*The Analysis of the waters of Madras,*" is not yet completed. In writing of the wells of the 1st, 2nd, 3rd, and 4th Police Divisions, he says:—"The results show that, with very few exceptions, "the drinking water in Madras is as bad as it possibly can be. I am also informed "that the poorest only make use of these wells for drinking purposes, others "obtaining their supply from the few good wells, and paying for the same." This remark quite coincides with the result of my own enquiries amongst the people; those who can afford to do so send for water to the wells north of Tondiarpet, where the belt of sand has been either not at all, or only partially built upon.

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Tabular Statement of the results of Analyes of the following Drinking Waters in use at the Presidency, arranged according to the Police Divisions.

| Number. | Locality. | Sensible Properties. | | | Re-action to test Paper. | Solid ingredients in one Imperial Gallon. | | | Chemical Properties. | | | | | | | | | | | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Appearance. | Odour. | Taste. | | Organic. | Inorganic. | Total. | Hardness to soap test. | | | Chlorides determined as Chloride of Sodium in one Imperial Gallon. | Bases in solution by Carbonic Acid. | | | In solution after boiling. | | | | | | |
| | | | | | | | | | Temporary | Permanent. | Total. | | Iron. | Lime. | Magnesia. | Lime. | Magnesia. | Chlorides. | Sulphates. | Nitrates. | | |
| | *1st Police Division.* | | | | | Grains | Grains. | Grains. | | | | | | | | | | | | | | |
| 1 | *Well.*—In China Bazaar Street, Monument Esplanade, China Bazaar Tannah. | Not clear from particles of dust, &c., suspended, clear after filtration. | None. | Slightly brackish. | Neutral. | 4 | 79 | 83 | 2° | 14° | 16° | 60·21380 grains. | Fair.. | Fair... | Fair... | Large. | Much above average. | Very large. | Large. | None. | | |
| 2 | *Well.*—One of the two wells on the North Glacis of the Fort, near the Windmill. | Clear ... | do. | Not unpleasant. | do. | 3 | 75 | 78 | 3½° | 14° | 17½° | 52·90630 | do. | do. | Above average. | Much above average. | do. | Small. | do. | do. | do. | |
| 3 | *Well.*—One of two wells in Cunnee Covil Street, near the Water Gate Tannah. | do. ... | do. | No particular taste, if any, a very faint brackish taste. | do. | 4 | 60 | 64 | 5½° | 15° | 20½° | 40·62970 | do. | Average. | do. | Traces | do. | do | do. | do. | do. | |
| 4 | *Well.*—Inside Darmaraja Covil, Linga Chetty Street, Royapooram Gate Tannah. | do. ... | do. | Agreeable not unpleasant. | do. | 5 | 62 | 67 | 2½° | 16° | 18½° | 40·92200 | do. | do. | Average. | Average. | do. | Average. | do. | do. | do. | |
| 5 | *Well.*—Thumboo Chetty Street, Royapooram Gate Tannah. | do. ... | do. | Slightly brackish. | do. | 4 | 75 | 79 | 3° | 16° | 19° | 52·61400 | do. | do. | do. | do. | do. | do. | do. | do. | do. | |
| | *2nd Division.* | | | | | | | | | | | | | | | | | | | | | |
| 1 | *Well.*—Old Jail Street, near the Mint Gate Tannah. | do. ... | do. | Agreeable not brackish. | do. | 5 | 28 | 33 | 3½° | 7° | 10½° | 13·10350 | do. | A little above average. | Average. | Average. | Little above average. | Traces. | Fair. | Fair. | do. | |
| 2 | *Well.*—Googely Bazaar road, in Durmaraja Covil compound. | do. ... | do. | Brackish. | Alkaline. | 6 | 150 | 156 | 6° | 24° | 30° | 102·80500 | do. | Average. | Considerable. | Above average. | Large. | Much above average. | Very large. | Large. | do. | |
| 3 | *Well.*—Narrainen Street... | do. ... | do. | Very brackish. | do. | 9 | 242·1 | 251·1 | 8° | 19° | 27° | 180·64140 | do | Under average. | do. | Large. | Considerable. | Large. | Considerable. | Very large. | do. | |
| 4 | *Well.*—Ramalingen Street, (private property.) | Before & after filtration opaque. | do. | Rather sweetish. | Neutral. | 3 | 27·30 | 30·3 | 2½° | 8° | 10½° | 9.06130 | do. | Above. | Small average. | Average. | Small average. | Average. | Fair. | Fair. | do. | |
| 5 | *Well.*—Old Jail Street, in the Cotton Godown. (Mr. Barrow's.) | Clear ... | do. | Agreeable not brackish. | do. | 6·5 | 27·8 | 34·30 | 2° | 7° | 9° | 7·30750 | do. | Little above average. | do. | do. | do. | do. | do. | do. | do. | |
| 6 | *Well.*—Seven Well's Street, Big Parcherry Tannah. | do. ... | do. | Slightly brackish. | Faintly alkaline. | 5 | 38·3 | 43·30 | 5° | 10° | 15° | 22·50710 | do. | Under. | Large (not very.) | Little above average. | Large. | Little above average. | Large. | Large. | do. | |
| 7 | *Well.*—Within the Barracks, East of "Seven Wells" compound, Monegar Choultry Tannah. | do. ... | do. | do. | do. | 7 | 39·30 | 46·30 | 4½° | 14° | 18½° | 21·63120 | do. | do. | Fair... | Average. | do. | Average. | do. | do. | do. | |

Tabular Statement of the results of Analyses of the following Drinking Waters in use at the Presidency, arranged according to the Police Divisions.

| Number. | Locality. | Sensible Properties. | | | Chemical Properties. | | | | | | | | | | | | | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Appearance. | Odour. | Taste. | Re-action to test Paper. | Solid ingredients in one Imperial Gallon. | | | Hardness to soap test. | | | Chlorides determined as Chloride of Sodium in one Imperial Gallon. | Bases in solution by Carbonic Acid. | | | In solution after boiling. | | | | | |
| | | | | | | Organic. | Inorganic. | Total. | Temporary. | Permanent. | Total. | | Iron. | Lime. | Magnesia. | Lime. | Magnesia. | Chlorides. | Sulphates. | Nitrates. | |
| | *2nd Division—(Concluded).* | | | | | Grains. | Grains. | Grains. | | | | | | | | | | | | | |
| 8 | *Well.*—Googely Bazaar Esplanade, Googely Bazaar Tannah. | Clear .. ... | None. | Brackish ... | Alkaline. | 3 | 122 | 125·0 | 13° | 25° | 38° | 90·90530 grains. | Under. | Very large considerable. | Large. | Considerable. | Above average. | Very large. | Very large. | None. | |
| | *3rd Division.* | | | | | | | | | | | | | | | | | | | | |
| 1 | *Well.*—Ice House road, West of Hindu burial ground, Ice House Tannah. | do. | do. | Slightly brackish. | Very faintly alkaline. | 9 | 39·00 | 48·00 | 5° | 18° | 23° | 21·04560 do. | Average. | Fair. | Small. | Fair. | Much above average | Large. | Large. | do. | |
| 2 | *Well.*—Ice House road, inside the Hindu burial ground. | do. | do. | do. | do. | 5 | 31·30 | 36·30 | 3° | 13° | 16° | 17·52800 do. | Under. | Average. | Average. | do. | large. do. | do. | Fair. | Distinct evidence obtained. | |
| 3 | *Well.*—Hall's garden, near the Market Tannah. | Before and after filtration opalescent. | do. | Rather sweetish astringent. | Neutral. | 4 | 34·30 | 38·30 | 4½° | 14° | 18½° | 19·58450 do. | Average. | Fair. | Small. | do. | Large. | do. | Not too large. | None. | |
| 4 | *Well.*—Baboo or Bo-Begum street, North gate of Patter's garden, Club-House Tannah. | Clear. | do. | Slightly brackish. | Faintly alkaline. | 7 | 44·30 | 51·30 | 8½° | 15° | 23½° | 27·18390 do. | do. | Rather large | Average. | do. | do. | do. | Rather large. | do. | |
| 5 | *Well.*—Soopary Goontah street, Club-House Tannah. | do. | do. | Not unpleasant. | Neutral. | 5 | 31·30 | 36·30 | 3½° | 13° | 16½° | 14·61500 do. | do. | Fair about average. | Small. | do. | do. | Fair. | Fair. | do. | |
| 6 | *Well.*—Adjoining the tank in Isan Moolk's garden, South of the Royapettah Police compound. | After filtration clear. | do. | Very faintly brackish. | Faintly alkaline. | 5 | 34·30 | 39·30 | 3½° | 10° | 13½° | 22·21480 do. | do. | do. | do. | do. | do. | Fair. | Large. | do. | do. |
| 7 | *Well.*—Wood's road, Patter's garden. | Clear. | do. | Agreeable. | Neutral. | 4 | 24·30 | 28·30 | 3½° | 9° | 12½° | 9·93820 do. | do. | do. | Average. | do. | do. | Fair. | Not very large. | do. | |
| 8 | *Well.*—Chepauk Palace compound, used by the inhabitants south of Chepauk. | do. | do. | None | Very faintly alkaline. | 4·5 | 36·30 | 40·80 | 6° | 12° | 18° | 19·29180 do. | Small. | Rather large. | Fair above average. | Not too large. | do. above. | Large. | do. | do. | |
| 9 | *Well.*—Chepauk Palace compound, used by the inhabitants north of Chepauk. | do. | do. | Rather brackish. | Alkaline. | 5 | 48·30 | 53·30 | 5½° | 18° | 23½° | 24·55320 do. | Average. | do. | do. | Large. | Large rather. | do. | Large. | do. | |
| | *4th Division.* | | | | | | | | | | | | | | | | | | | | |
| 1 | *Well.*—Cabalisparawan Covil Maday Street, Brodie's road, Ayatoray Pillay Tannah, (used by Hindoos only.) | Opalescent both before and after filtration. | Rather muddy | Earthy like tank water, or water kept in a new pot. | Faintly acid. | 2 | 10 | 12 | ½° | 5½° | 6° | 4·38450 do. | Above. | Under. | Under. | Under. | Little above. | Small. | Average. | do. | |

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Tabular Statement of the results of Analyses of the following Drinking Waters in use at the Presidency, arranged according to the Police Divisions.

| Number. | Locality. | Sensible Properties. | | | | Solid ingredients in one Imperial Gallon. | | |
|---|---|---|---|---|---|---|---|---|
| | | Appearance. | Odour. | Taste. | Reaction to Test Paper. | Organic. | Inorganic. | Total. |
| | | | | | | Grains. | Grains. | Grains. |
| | *4th Division.—(Continued.)* | | | | | | | |
| 2 | *Well.*—In the same locality used by all other castes except Hindoos. | Turbid, suspended matters large Iron and alumina after filtration clear. | Earthy or muddy smell. | Earthy of the unfiltered, of the filtered brisk pleasant. | Acid. | 3 | 12 | 15 |
| 3 | *Well.*—Behind Ayaboray Pillar Cowl. | Clear. | None. | None. | Very faintly alkaline. | 3 | 23 | 26 |
| 4 | *Well.*—Daberood Dowlah's ground in Coonnoor Muthia Moodelly's street, Meer Saib pettah Tannah. | do. | do. | Faint brackish. | Alkaline. | 5 | 33 | 38 |
| 5 | *Well.*—In Abdool Cawder's garden, Cossapet Tannah. | Clear. | do. | Agreeable not unpleasant. | Very faintly alkaline. | 3 | 29 | 32 |
| 6 | *Well.*—Candasawmy Moodelly's ground. Peter's road Royapettah Tannah. | do. | do. | Tasteless. | Faint alkaline. | 6 | 37 | 43 |
| 7 | *Well.*—Chenaloodeen Saib's garden Royapet Tannah. | do. | do. | Sharp, very pleasant. | Acid. | 4 | 17 | 21 |
| 8 | *Well.*—Mowbray's road, Mowbray Tannah in Rungiah Naik's garden. | Turbid, suspended matters large, clear after filtration. | do. | Earthy, after filtration agreeable. | do. | 3 | 18 | 21 |
| 9 | *Well.*—Kistnampett Venkata Rungapilley street, Aroonachella Chetty's ground. | Clear. | do. | Sharp brisk | do. | 4 | 48 | 52 |
| 10 | Do. do. do. in the garden of Parthasarathy's Pagoda. | Opalescent. | do. | Agreeable. | Faintly acid. | 6 | 53 | 59 |
| 11 | *Well.*—Edward Elliott's road near its junction with Meeran Saib's street. | do. | do. | None. | Very faint acid. | 5 | 52 | 57 |
| 12 | *Well.*—Beemana Moodelly Pettah, Sawmynada Moodelly's ground. | Clear. | do. | do. | do. | 5 | 38 | 43 |
| 13 | *Well.*—Vellala Tanampettah, Moottiah Moodelly's street. | do. | do. | Agreeable. | Faintly acid. | 5 | 25·8 | 30·8 |
| 14 | *Well.*—Calathia Moodelly's garden, Saint George's Cathedral road, in Mr. Sim's compound. | do. | do. | Brackish. | Neutral. | 4 | 61·43 | 65·43 |
| | *5th Division.* | | | | | | | |
| 1 | *Well.*—Narrain Moodelly's garden near Nungumbaukum Tannah. | do. | do. | Rather brackish. | Faintly alkaline. | 5 | 48 | 53 |
| 2 | *Well.*—Nungumbakum tank road, Nungumbaukum Tannah. | do. | do. | Agreeable. | Neutral. | 5·1 | 29·40 | 34·5 |

| Number. | Chemical Properties. | | | | | | | | | | | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hardness to soap test. | | | Chlorides determined as Chloride of Sodium in one Imperial Gallon. | Bases in solution by Carbonic Acid. | | | In solution after boiling. | | | | | | |
| | Temporary. | Permanent. | Total. | | Iron. | Lime. | Magnesia. | Lime. | Magnesia. | Chlorides. | Sulphates. | Nitrates. | | |
| | | | | | | | | | | | | | | |
| 5 | 6 | 11 | 4·38450 grains. | | Large. | Above. | Traces. | Average. | Small. | Small. | Average. | None. | | |
| 6 | 7½ | 13½ | 12·27660 | do. | Under. | do. large. | Average. | Fair. | Average. | Fair. | Fair. | do. | | |
| 4 | 17 | 21 | 17·83030 | do. | Average. | Average. | do. | Large. | Little above. | Large. | Large. | do. | | |
| 7 | 11 | 18 | 12·86120 | do. | do. | Large. | do. | Not too large. | do. | Fair. | do. | do. | | |
| 6½ | 11½ | 18 | 18·70720 | do. | do. | do. | Above. | do. | Large. | Large. | do. | do. | | |
| 5 | 6½ | 11½ | 6·13830 | do. | do. | Large above. | Average. | Fair. | Average. | Average. | Fair. | do. | | |
| 3½ | 5 | 8½ | 8·47670 | do. | Above. | About average. | do. | Small average. | do. | do. | do. | do. | | |
| 2½ | 14 | 16½ | 24·84550 | do. | Large. | Small | Fair. | Not too large. | Large. | Large. | Large. | do. | | |
| 3 | 20 | 23 | 36·82980 | do. | Above. | Above average. | Above. | Large. | do. | Very large. | do. | do. | | |
| 3 | 17 | 20 | 31·78370 | do. | Much above. | do. | Average. | do. | do. | do. | do. | do. | | |
| 5 | 10 | 15 | 16·95340 | do. | Average. | Large above. | do. | Fair. | Above average. | Not too large. | Fair. | do. | | |
| 4½ | 14 | 18½ | 18·99950 | do. | do. | do. | do. | do. | Much above average | do. | Not very large. | do. | | |
| 5 | 17 | 22 | 38·58360 | do. | do. | Large. | Little above. | Large. | Above | Considerable. | Large. | do. | | |
| 5 | 15 | 20 | 27·47620 | do. | Under. | do. | Average. | Fair. | Much above average | Large. | Fair. | do. | | |
| 4½ | 10 | 14½ | 20·46100 | do. | Small. | Fair. | Small. | Not too large. | Average. | do. | Not too large. | do. | | |

Tabular Statement of the results of Analyses of the following Drinking Waters

| Number. | Locality. | Sensible Properties. | | | Re-action to test Paper. | Solid ingredients in one Imperial Gallon. | | |
|---|---|---|---|---|---|---|---|---|
| | | Appearance. | Odour. | Taste. | | Organic. | Inorganic. | Total. |
| | *5th Division—(Concluded.)* | | | | | Grains. | Grains. | Grains. |
| 3 | *Well.*—Pilliar Covil, Codumbaukum road, Codumbaukum Tannah. | Opalescent otherwise clear. | None. | Slightly brackish. | Alkaline. | 6·2 | 34·50 | 40·7 |
| 4 | *Well.*—Chetput, Vydee Moodelly's garden, Amjeekaree Tannah. | After allowing to stand for 12 hours clear. | do. | Of the clear water very agreeable. | Faintly acid. | 4 | 11 | 15 |
| 5 | *Well.*—Gengoo Reddy street Egmore, near the Darogah's Tannah. | Clear ... | do. | Not unpleasant. | Alkaline. | 5 | 23 | 28 |
| 6 | *Tank.*—In compound of Lying-in-Hospital. | Turbid, after filtration, opalescent. | Earthy. | Earthy ... | Acid ... | 7 | 10 | 17 |
| 7 | *Tank.*—Egmore High road, near Darogah's Tannah. | Opaque reddish. | do. | Sweetish earthy. | Acid (Faint.) | 5 | 14 | 19 |
| 8 | *Well.*—Egmore, Soondararamanjedoo's garden, Gengoo Reddy street. | Opalescent. | None. | Agreeable. | Neutral ... | 2 | 13 | 15 |
| 9 | *Tank.*—Arcoongherry Moodelly's garden, opposite the Police Commissioner's Office. | Turbid, reddish brown. | do. | Rather earthy. | Acid ... | 8 | 10 | 18 |
| 10 | *Well.*—Nungumbaukum in Mr. Hunter's compound. | Clear ... | do. | Drinkable. | Alkaline .. | 4 | 30 | 34 |



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in use at the Presidency, arranged according to the Police Divisions.

| Chemical Properties. | | | | | | | | | | | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hardness to soap test. | | | Chlorides determined as Chloride of Solium in one Imperial Gallon. | Bases in solution by Carbonic Acid. | | | In solution after boiling. | | | | | | |
| Temporary. | Permanent. | Total. | | Iron. | Lime. | Magnesia. | Lime. | Magnesia. | Chlorides | Sulphates. | Nitrates. | | |
| 6o | 12½o | 18½o | 29·23000 grains. | Average. | Large. | Average. | Fair. | Above. | Large. | Not too large. | None. | | |
| ½o | 8½o | 9o | 3·50760 do. | do. | Small. | Traces. | Average. | Under. | Small. | Average. | do. | | |
| 5o | 17o | 22o | 11·69200 do. | Small. | Large. | do. | Above. | Small. | Fair. | Above. | do. | | |
| ½o | 7½o | 8o | 6·13830 do. | Above. | Small average. | do. | Fair. | Traces. | Small. | Fair. | Traces. | | |
| 3o | 8o | 11o | 3·21530 do. | do. | Fair. | do. | do. | do. | do. | do. | Small. | None. | |
| 5o | 10o | 15o | 5·26140 do. | do. | Large. | do. | do. | Average. | do. | Fair. | do. | | |
| 2o | 11o | 13o | 2·92300 do. | do. | Average. | do. | Average. | do. | Very small. | do. | Abundant. | | |
| 4o | 16o | 20o | 10·81510 do. | Average. | Above. | Average. | Large. | Above. | Fair. | Large. | None. | | |

2018/7

Tabular Statement of the results of Analyses of the following Drinking Waters from the "Seven Wells" enclosure.

| Number. | Locality. | Sensible Properties. | | | | Solid ingredients in one Imperial Gallon. | | |
|---|---|---|---|---|---|---|---|---|
| | | Appearance. | Odour. | Taste. | Re-action to Test Paper. | Organic. | Inorganic. | Total. |
| 1 | Well No. I ... | To the unassisted sight, clear transparent. | Distinct, reminding one of water which has stood some days in a goblet. | There is an absence of that grateful and pleasant briskness that good water should impart to taste. | Perfectly neutral. | 7·25 | 28·90 | 36·15 |
| | Do. ,, II ... | Clear transparent. | Void of ... | Not so fresh as good pure water should be; but in this respect it is better than No. I. | Decidedly acid, becoming alkaline after boiling some time. | 6·90 | 24·70 | 31·60 |
| | Do. ,, III ... | Perfectly clear and transparent. | Free from odour. | Has a taste slightly saline. | Decidedly acid in the cold. | 5·00 | 33·00 | 38·65 |
| | Do. ,, IV ... | Clear & transparent. | Do. ... | Slightly unpleasant. | Neutral... .. | 5·90 | 45·05 | 50·95 |
| | Do. ,, V ... | Clear ... | Not free from. | Not pleasant after swallowing. | Slight acid ... | 3.90 | 19·20 | 23·10 |
| | Do. ,, VI ... | do. ... | Do. ... | Do. ... | Do. ... ... | 7·10 | 26·90 | 34·00 |
| | Do. ,, VII... | do. ... | None ... | Faintly acid ... | Acid ... ... | 7·85 | 21·65 | 29·50 |
| | Do. ,, VIII. | do. ... | Do. ... | None. ... | Neutral ... | 6·70 | 28·30 | 35·00 |
| | Do. ,, IX ... | Not clear from numerous minute particles. | Free from ... | Not remarkable ... | Acid ... ... | 5·25 | 22·95 | 28·20 |
| 10 | Do. ,, X ... | Clear, but impurity still present. | Do. ... | Brackish ... | Do. ... ... | 5·70 | 64·40 | 70·10 |

| Number. | Chemical Properties. | | | | | | | | | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hardness to soap test. | | | Chlorides determined as Chloride of Sodium in one Imperial Gallon. | Bases in solution by Carbonic Acid. | | | In solution after boiling. | | | | |
| | Temporary | Permanent | Total. | | Iron. | Lime. | Magnesia. | Lime. | Magnesia. | Chlorides. | Sulphates. | Nitrates. | |
| 1 | 3° | 11° | 14° | 12·86 grains. | Traces | Average quantity. | In quantity rather more than the average of waters | In rather large quantity. | In rather large quantity. | Shown above quantitatively | Not large quantity. | None detected. | Gave clear evidence of the presence of animal life as well as vegetable growth. |
| | 3·5° | 9·5° | 13° | 11·1 do. ... | do. | Average in fair quantity. | Rather above the average quantity. | Rather large amount | Rather large amount | Already determined quantity. | Present but not in excess. | None | Gave evidence of the presence of animal life as well as vegetable growth. |
| | 3° | 10° | 13° | 14·615 do. ... | do. | Average. | Average. | Average. | Large | Not determined. | Large | Nil. | Individual forms of animal organic life, besides the other appearances as described in Nos. I and II. |
| | | | | | | | | do. | Very large. | do. | Very large. | do. | As described in Nos. I and II. |
| | 17° | 11° | 18° | 19·461 do. ... | More than traces. | Large. | do. | do. | Small. | Not determined here | Little under. | do. | Much vegetable and animal life. |
| | 0 | 6° | 8° | 4·38150 do.... | Traces. | Small (average.) | Under average. | do. | do. | do. | Little above. | None | Rotaforia plentiful, animal and vegetable life abundant. |
| | | | | | do. | do. | do. | Large. | do. | do. | Large. | do. | Animalculæ prtsent species not recognizable. |
| | | 13½° | 9·35360 do.... | | do. | Average. | Traces. | Average. | do. | Not determined. | do. | do. | Less amount of animal life present but oscillatoria distinctly observed |
| | | ½° | 8·47670= 14·5° | | do. | do. | Small ... | do. | do. | do. | do. | do. | Animal and vegetable matters present, the latter in larger proportions. |
| | | 5° | 9·06120 grains | | do. | do. | About average. | Small. | do. | do. | Fair | do. | |
| | | 7·5° | 9·93820 do. | | do. | do. | | | | | | | Same as No. 9. |
| | | 26·5° | 26·95160 do. | | do. | Very large. | Rather large above. | Not too large. | Above average. | do. | Much above average. | do. | |

3. Almost every one who has suggested a plan for supplying Madras with water, more especially the portion lying to the north of the Kuam river, has recommended the use of the Red Hill Lake, as a storage reservoir; but it was not until 1854, when the Government placed the investigation of the subject in the hands of Colonel (then Lieutenant) O'Connell of the Madras Engineers, that plans or sections were prepared. Colonel O'Connell's plans and reports were published in 1855; but no action was taken upon them, and the matter was allowed to drop, until October 1861, when the Municipal Commissioners drew attention to, and recommended a project put forward by Mr. Peter Orr of Madras. The Government in their Proceedings of the 20th December 1861, referred the subject for the consideration of the Public Works Department, and in May 1862, Mr. Roberts, Civil Engineer, was appointed to re-investigate the whole project.

As, with the exception of one trial line of levels, Mr. Roberts confined his observations to the ground previously examined by Colonel O'Connell, it will be sufficient to describe briefly the plan proposed by the latter Officer.

Colonel O'Connell's plan.

4. Colonel O'Connell proposed to put an anicut or dam across the Cortilliar river at Pushali, some distance above the crossing of the Madras railway, and three or four miles below the Kasavaram dam, which now turns the surplus water of the Cortilliar into the Kuam river. The supply channel, which was to be about 28 miles in length, was, on its course to the Red Hill Lake, to supply the following eight tanks: Senji, Pudumvalungie, Kadambatoor, Puttiloor, Taneerkolam Pakkam, Palvadee, and Mettanamallee.

After supplying these irrigation tanks the surplus water, for the supply of Madras, was to be stored in the Red Hill Lake, which was to be raised nine feet. An open channel was to convey the water from the lake to two basins in Madras, where it was to be pumped up into settling reservoirs, filtered, and passed into the mains for distribution. No detailed plans of this scheme were prepared.

5. To Colonel O'Connell's plan there are two vital objections, namely, making the storing of water for Madras a secondary matter to that of filling the eight irrigation tanks; and taking off the supply channel from the Cortilliar so close under the Kasavaram dam, which is supposed to turn most of the flood, and all the summer water of the Cortilliar into the Kuam river for the supply of the Chembrambakkam and other tanks. I am aware that Colonel O'Connell did not intend to make the supplying of Madras the secondary question, but it would have come practically to that by the arrangement he adopted. Besides, the quantity of water obtained at that point, would have been insufficient for either purpose.

It was proposed to raise the Red Hill Lake nine feet, but as this was calculated from the crown of the calingulah (surplus weir), it would have been practically only an increase of 4½ feet, as the Mirassidars (land owners) have a right to raise the water, and do so when there is sufficient rain, to the tops of the dam stones which stand 4½ feet above the crown.

Plan now proposed.

6. In a matter so important as that of supplying Madras with water, the extension of irrigation should be considered as of little importance compared with securing an abundant supply for the city, and to accomplish this it is evident that the supply channel should be taken off the river at the lowest point which would give sufficient fall into the storage reservoirs. But it so happens that, in this case, the two objects of water supply and irrigation can be combined without endangering the success of the former; because, between the reservoirs now proposed and the sea there are from 20,000 to 25,000 acres of land lying waste for want of water, and there could be no more convenient places for storing it than Cholavaram and Red Hill Lakes; but by filling them first, the quantity required for Madras is made secure.



7. With these objects in view, I examined frequently and carefully the country between Madras and the Cortilliar, and many trial lines were surveyed and levelled. It was soon ascertained that besides the *Red Hill* another artificial lake, *Cholavaram*, could be made available for storage, as it lay in the best line for the supply channel, and was fifteen feet higher than the former.

General design.

8. The general design then, which I now submit, is simply this—*See the portions marked in red on sheet No.* 1:—

I. To place a dam across the Cortilliar at the point marked A, which is just high enough to give a fall of two feet per mile to Cholavaram Lake.

II. To cut a supply channel 8½ miles in length from the dam to Cholavaram Lake.

III. To enlarge this lake by raising its level six yards above the present calingulah or surplus weir.

IV. To connect Cholavaram with the Red Hill Lake by a channel 2¾ miles in length, and with an inclination of three feet in a mile.

V. To enlarge the Red Hill Lake by raising its level to five yards above the present calingulah.

VI. To cut a delivery channel from this lake to the Spur Tank in Madras, a portion of which tank would be converted into the last settling reservoir.

Here we propose to stop for the present. The works connected with the filtering, raising, and distribution of the water will form the subject of another report. The observations for which have been partly made.

Detailed drawings furnished.

9. The volume of plans furnished with this Report contains the following detailed drawings:—

Sheet No. 1.—Index plan, and section, is appended to this Report.
Do. ,, 2.—Plan, longitudinal section, and cross sections of the Cortilliar river, for some distance above and below the site of the proposed anicut.
Do. ,, 3.—Plan showing details of anicut, and head works of supply channel.
Do. ,, 4.—Details of head sluice.
Do. ,, 5.—Plan and longitudinal section of supply channel.
Do. ,, 6.—Continuation of do.
Do. ,, 7.—Do. do.
Do. ,, 8.—Do. up to Cholavaram Lake.
Do. ,, 9.—Plan, longitudinal section, and cross section of the Katenkal drainage channel.
Do. ,, 10.—Do. do. of the Boosykal drainage channel.
Do. ,, 11.—Details of the proposed aqueduct across the Boosykal.
Do. ,, 12.—Map of Cholavaram Lake, with details of the proposed calingulah or surplus weir.
Do. ,, 13.—*Cholavaram Lake.* Longitudinal and cross sections of the present and proposed bunds.
Do. ,, 14.—Do. Details of head sluice, also design for cart bridges in brick and stone.
Do. ,, 15.—Do. Details of proposed irrigation sluices.
Do. ,, 16.—Plan and longitudinal section of the channel from Cholavaram to the Red Hill Lake.
Do. ,, 17.—Map of the Red Hill Lake.

Sheet No. 18.—*Red Hill Lake.* Longitudinal and cross sections of the bund.

Do. „ 19.—Do. Cross sections of the bund.

Do. „ 20.—Do. Detailed plan showing the present calingulah and details of the proposed one.

Do. „ 21.—Do. Details of proposed alterations to Polal irrigation sluice.

Do. „ 22.—Do. Details of proposed alterations to the northern sluice.

Do. „ 23.—Do. Plan and details of proposed head sluice.

Do. „ 24.—*Delivery channel.* Plan and longitudinal section.

Do. „ 25.—Do. Continued.

Do. „ 26.—Do. do. up to the Spur Tank in Madras.

Do. „ 27.—Map and longitudinal section of the Otary nulla, with details of the proposed aqueduct.

Do. „ 28.—Details of the design for cattle and foot timber bridges on the supply channel.

Do. „ 29.—Do. of brick cart bridges, and timber foot and cattle bridges on the delivery channel.

Do. „ 30.—Design for irrigation and drainage under-tunnels.

Do. „ 31.—Do. for culverts for road crossings in Madras.

Quantity of water required for the supply of Madras.

10. The population of Madras is supposed to be about 470,000, but for our purposes we may assume it to be half a million.

It has been generally allowed that for such a class of people 20 gallons a head per day, on the gross population, is a very liberal allowance, this would amount to 21,692,085 cubic yards per annum; but to make allowance for waste, evaporation, special cases of consumption, &c., &c., I propose that forty millions of cubic yards be stored, per annum, for the supply of the city.

Capability of the Cortilliar.

11. Of the capability of the Cortilliar to supply this quantity during average years there can, I think, be no doubt. I have had the river gauged during two monsoons, and have obtained much information regarding its floods from personal observation, and from inquiries amongst those who live upon its banks, and the result is, that at the site of the proposed dam, the average discharge during thirty or forty days of the north-east monsoon within the last ten years, was between four and five hundred millions of cubic yards.*

The floods keep up to their maximum height for four or five days, and run about three feet deep for thirty or forty days more, when the river gradually retires to its small summer channel which runs full all the year round.

The south-west monsoon is scarcely felt in this river.

12. By placing the dam at the lowest possible point we secure the discharge due to 30 miles of the Cortilliar proper, that is, from the proposed dam to the Kasavaram dam, and also that from the Trittani and Nagiri rivers.

The area of the catchment basin of the Cortilliar would be no aid in calculating the quantity of water discharged at any point below the Kasavaram dam,

* Note.—The actual result of the observations is 441,8$\frac{1}{2}$,610 cubic yards; but I consider it unnecessary to perplex the reader with elaborate calculations of this kind.



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which turns its surplus into the Kuam; besides, the Cortilliar occasionally receives an addition from the Palar river through the Cauverypak tank. The basins of the Trittani and Nagiri rivers, however, discharge their surplus water by the site of the proposed dam, and we must depend principally on them for a constant supply as they include within their area the greater portion of the Nagiri mountains.

These basins are about 770 square miles in extent, and over this area the quantity observed to flow through the Cortillar during the north-east monsoon, would be only 6½ inches in depth, probably not one-fifth of the whole depth which falls upon the Nagiri hills.

Katenkal and Boosykal.

13. It will be observed that the supply channel crosses two drainage streams, the *Katenkal*, and the *Boosykal*, which carry to the Cortilliar the surplus waters from a large number of tanks which lie on the north of the railway.

Observations on these channels show that they discharge about 20 millions of cubic yards per annum, and it is proposed to divert them into the supply channel.

Cholavaram and Red Hill Lakes.

14. Cholavaram and Red Hill Lakes were both formed centuries ago, by bunding across valleys surrounded by low hills of laterite rock and gravel.

The Red Hill Lake had formerly a supply channel (see Index Plan), but for many years both lakes have been dependent for their supply on the surface drainage during the monsoons. Each has a calingulah or surplus weir, but the dam stones (stone-uprights built into the weir) enable the land owners to raise the water; in the case of Cholavaram, 3 feet; and in that of the Red Hill Lake, 4½ feet above the crown of the weir. For eight or ten years past, however, (with the exception of last year,) the water has rarely risen above the level of the weirs.

15 On sheets 12 and 17 in the volume of plans, are actual surveys of these two lakes, and of the adjoining villages, carefully contoured by lines at every yard in height, up to seven or eight yards above the level of their respective calingulahs.

These contours will show the extent to which the surrounding land will be swamped, and the villages affected in each case by the proposed enlargements.

The red contours show the level of the present calingulahs, and the contours shaded red or purple, show the level of the proposed calingulahs.

The following tables show the capacities, areas, and circumferences at each contour:—

CHOLAVARAM LAKE.

| Contour 1 yard. | Area at each contour in yards. | Area in acres and decimals. | Area in miles and decimals. | Circumference in miles. | Cubical contents between each two contours. | Total cubical contents up to each contour. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | | | | 55,207,929 | |
| 8 | 10,381,220 | 2144·088 | 3·35 | .. | 9,873,208 | 45,334,721 | |
| 7 | 9,368,196 | 1935·577 | 3·023 | .. | 8,907,248 | 36,427,473 | Level of proposed calingulah. |
| 6 | 8,449,300 | 1745·072 | 2·726 | 9 nearly | 7,958,504 | 28,468,969 | |
| 5 | 7,467,708 | 1542·894 | 2·409 | .. | 6,944,687 | 21,524,282 | |
| 4 | 6,421,667 | 1326·790 | 2·071 | .. | 5,891,049 | 15,633,233 | |
| 3 | 5,360,431 | 1107·527 | 1·729 | .. | 4,948,279 | 10,684,954 | |
| 2 | 4,536,128 | 937·216 | 1·464 | .. | 4,103,623 | 6,581,331 | |
| 1 | 3,671,118 | 758·392 | 1·184 | .. | | | Level of the top of the dam stones. |
| 0 | 2,760,738 | 570·400 | 0·890 | 4·644 | 3,215,928 | 3,365,403 | Level of calingulah. |
| 1 | 1,235,035 | 369·800 | 0·623 | .. | 2,397,886 | 967,517 | |
| 2 | Take half | 199·900 | 0·310 | .. | 967,517 | | |

RED HILL LAKE.

| Contour 1 yard each. | Area at each contour in yards. | Area in acres and decimals. | Area in miles and decimals. | Circumference in miles. | Cubical contents between each two contours. | Total cubical contents up to each contour. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | | | | Cubic yards. | Cubic yards. | |
| 7 | 28,594,962 | 5908·050 | 9·231 | ... | | 154,061,302 | |
| 6 | 26,001,446 | 5372·200 | 8·393 | ... | 27,298,204 | 126,763,098 | Orakadam summit. |
| 5 | 23,567,120 | 4869·239 | 7·607 | 17·333 | 24,781,283 | 101,981,815 | Seitapet summit and level of proposed calingulah. |
| 4 | 19,599,278 | 4049·437 | 6·310 | ... | 21,580,199 | 80,401,616 | |
| 3 | 17,667,956 | 3650·404 | 5·703 | ... | 18,633,617 | 61,767,999 | |
| 2 | 15,231,942 | 3147·094 | 4·917 | ... | 16,449,949 | 45,318,050 | Soorapodu summit at head sluice. |
| 1½ | | | | ... | 15,775,136 | | |
| 1 | 12,318,330 | 2545·109 | 3·967 | ... | | 38,430,482 | Top of dam stones. |
| 0 | 9,813,430 | 2027·818 | 3·167 | 10·767 | 11,065,880 | 31,542,914 | |
| 1 | 7,360,725 | 1520·810 | 2·375 | ... | 8,587,077 | 20,477,034 | Level of calingulah. |
| 2 | 5,848,306 | 1212·460 | 1·893 | ... | 6,601,515 | 11,889,957 | |
| 3 | 2,833,544 | 585·442 | 0·914 | ... | 4,310,928 | 5,288,442 | |
| 4 | ½ to be taken | 195·147 | 0·304 | ... | 944,514 | 0,904,514 | |

Height to which the lakes should be raised.

16. It is probable that differences of opinion will exist as to the heights to which these lakes should be raised; but as the water is plentiful, and as there is an abundance of waste land which can be irrigated from these lakes, it seems to be desirable to enlarge them to the fullest extent to which they can be enlarged, without incurring any extraordinary expenditure.

17. It is proposed to raise Cholavaram 18 feet above the crown of the calingulah, because if raised higher it would involve the cost of embanking along a considerable portion of the supply channel.

The Red Hill Lake is proposed to be raised 15 feet above its calingulah, because a greater height would place Cholavaram head sluice inconveniently in back-water, and occasion the cost of constructing a large embankment across the valley at Seitapet, and at one or two other places.

18. The capacity of the two lakes up to these proposed heights is 138,409,288 cubic yards. If from this quantity we deduct the capacity at the level of the dam stones, to which the Mirassidars have a right to raise the water, the difference will be 93,397,475 cubic yards; but if we deduct only the quantity to the level of the calingulahs, beyond which they have rarely had the power to raise the water, the balance will be 114,566,851 cubic yards.

We may safely assume that, in addition to the quantity to which the Mirassidars have a right, we can store 100 millions of cubic yards, leaving 60 millions for irrigation after supplying Madras.

This quantity, it is calculated, will be thrown into the reservoirs in only thirty or forty days of the monsoon, nothing being allowed for the constant run there will be in the summer channel for the greater part of the year; but neither do I take evaporation nor absorption into account, and until we have had experience of the actual working of the reservoirs, I am disposed to let one stand against the other.

19. Most of the waste land under these lakes is of an unusually fruitful character, being, for the most part, alluvial deposit; it is also well suited for irrigation, as it descends in a slightly inclined plane towards the sea.

Area of land that may be irrigated.

20. There are various opinions as to the quantity of water required to bring to maturity an acre of rice, but most people allow that if carefully husbanded it would go much farther than it does. Colonel Sir Arthur Cotton takes 7,000



cubic yards as sufficient, (see "*Public Works of India*," page 171,) and if this be correct, 60 millions of cubic yards would be sufficient for 8,571 acres, which is not one-half of the waste land available.

The general difference between the assessment on dry and wet cultivation in the vicinity of Madras is 5 Rupees an acre, but as the land to which this water could be applied pays nothing now, we may take the increase at 7 Rupees an acre, which on 8,571 acres would amount to nearly 60,000 Rupees a year. If this calculation is even nearly correct, the return on the irrigation part of the project alone would yield a fair per centage on the entire amount proposed to be expended. I may here mention that of course the irrigation sluices, as well as those on the supply channels, would be under the control of Officers appointed for the purpose, so that the water could not be wasted as it is now.

Proposed works.

21. I now come to the description of the proposed works, and which I shall make as brief as possible.

Anicut or dam on the Cortilliar.

Where the Cortilliar flows between its ordinary banks, its width, at the flood level, is about 500 feet. I propose to put the dam right across, and to make it 600 feet in length, and to raise it to the flood level of the last ten years.

The water may rise nine feet over this height without injury to the lands above, as the banks, either immediate or remote, are high; but the highest flood observed in 1863 and in 1864 if discharged over the dam, would have a depth of only 3¼ feet. As this flood, however, was rather under the average, (yielding only 840,000 cubic feet a minute,) and as the Cortilliar is subject to sudden inundations from the breaching of the Kasavaram dam, as happened last year, I consider it best to give a safe length to the dam.*

Site of the dam.

22. The site of the dam was originally fixed lower down the river, but on boring there we found over 40 feet of sand.

This led to an examination of the bed of the river for three or four miles, and the site now proposed was found to be the only place where, *in that distance, the clay approached.*

From what I have seen I believe that, at the present rate of destruction, the jungles will soon disappear altogether from the Nagiri hills, and I believe that one effect of this will be to shorten the period of floods, and to increase the time of minimum discharge, although perhaps the rain-fall may not be seriously diminished.

About seven years ago I drew the attention of the Government to this subject in my reports on the Coimbatore jungles, and I still think that the question is deserving of serious consideration.

The surface: whether this clay underlies all the sand, or is only a stratum within it, I do not know, as we had no means of boring into it, but it is compact and indurated, and is the best foundation we could get. The detailed drawings on sheet No. 3 will show that it is proposed to carry the concrete retaining walls of the dam into this clay substratum.

Cortilliar Head sluice.

23. The general plan of the head sluice is shown on sheet No. 3, and the details on No. 4. The sill of the sluice is to be six feet below the crown of the dam, and ten openings of five feet each in the clear are proposed.

* NOTE.—To those acquainted with the phenomena of rivers, the present condition of the Cortilliar, the height of its floods compared with its cross section, &c., &c., must seem abnormal, but this is explained by the fact that the channel is now what it was made many years ago, before its waters were turned into other courses, or tanks upon its tributaries were so numerous as they now are. It is quite evident that within a recent period its floods rose 12 to 15 feet higher than they do now.

This diminution is said by the people, to be caused by the cutting of the jungles from the slopes of the Nagiri hills, and no trees being planted in their stead.

The whole space within the cut waters, and the faces of the openings are to be in dressed gneiss; all the rest of the work, as also the stone work of the dam, to be in laterite.

Supply channel to Cholavaram Lake.

24. On sheets 5, 6, 7, and 8, the detailed plan and section of the supply channel are shown.

The inclination is two feet in a mile. The bottom breadth thirty feet, and the side slopes one and a half to one.

The berms are to be 15 feet each, so as to admit of any future widening if necessary; and the excavated material is to be formed into embankments at the low places.

25. It is unnecessary to give here the calculations by which these dimensions were obtained. I need only state that the channel is intended to supply, at least, 100 millions of cubic yards in about thirty-five days. The dimensions and, of course, the cost would be diminished if a longer time were taken, but I do not think it would be right to estimate for a smaller channel than that now proposed, although the power of a smaller one might be tried for a season or two; for it is only by long experience that we can obtain any actual knowledge of the floods of a river like the Cortilliar, whose principal source is in a mountain country close at hand.

26. The excavation of this channel will be in ordinary soil, with occasional bits through laterite gravel.

In making it out advantage was taken of natural lines of drainage, and it was kept as much as possible out of irrigated or other valuable land.

The Katenkal. See sheet No. 9.

27. This drainage channel is proposed to be crossed on the level; but about 120 yards higher up, the stream will be diverted into the supply channel as shown on sheet No. 9.

The Boosykal. See Nos. 10 and 11.

28. This drainage stream is so low at the place of crossing, and it must be diverted so far up from the supply channel, that it must be crossed by an aqueduct. The general plan and section, and the details of the aqueduct, are shown on sheets Nos. 10 and 11.

Cholavaram Lake. Sheets 12 and 23.

29. The present bund is about one mile in length, and is proposed to be extended and raised as shown on sheets 12 and 13. At the south end the extension will be very short as the ground rises rapidly.

At the north end the extension must be longer, but advantage is taken of the remains of an old bund which, in consequence of a dispute about a supply channel, became disused about 120 years ago.

30. Most of the land to be swamped by the raising of this lake is waste, and is covered with low, scrubby jungle; and even that portion which is under cultivation, either wet or dry, is of very little value, as the soil is poor and the supply of water precarious.

One village, *Allamady*, will be nearly altogether swamped, and must be purchased; but it is of little value.

31. The facilities afforded for the proposed enlargement of the bund are very great.

At both ends the extension will rest upon hills of laterite rock and gravel, from which almost any quantity of material required can be obtained.

Cholavaram Calingulah.

32. The new calingulah is proposed to be placed at the north end, where the extension of the bund runs out in laterite rock; the fall will thus not exceed 3 feet; the details are shown on sheet No. 12.



The length of this calingulah or surplus weir has been fixed at 200 feet.

As the safety of the reservoir and of the country lying under it very much depends on the length of the surplus weir, it is important that it should be accurately determined.

I have ascertained by enquiring amongst the people, that both Cholavaram and Red Hill Lakes have, by a sudden burst of the north-east monsoon, been filled to the level of their calingulahs by twenty-four hours' rain.

Such a heavy rain-fall is of rare occurrence; but as it might happen when the reservoirs were full, we must make ample provision for its discharge. In a matter of this kind the safety of the works must be beyond suspicion.

33. The capacity of Cholavaram Lake to the level of the calingulah is about $3\frac{1}{2}$ millions of cubic yards. The proposed surplus weir would discharge this quantity in 24 hours without allowing the water to rise more than 12 inches over it.

Red Hill Lake Calingulah.

The capacity of the Red Hill Lake to the level of the calingulah is about $20\frac{1}{2}$ millions of cubic yards. The length of the surplus weir proposed for this lake is 400 feet, which would keep the surface down to about $2\frac{3}{4}$ feet above its own level; but in this case the action of the weir would be aided not only by the two large irrigation sluices, but by the head sluice, which would draw off a large body of water which could be diverted into some of the lower tanks.

Cholavaram Head Sluice.

34. This head sluice is shown on sheet 14. It is to correspond in all respects, except in height, with the head sluice at the Cortilliar:—

Cholavaram Irrigation Sluices.

The existing sluices are of a very rude description, and would be too small for the enlarged conditions of the lake. Two new sluices are proposed to be built according to the detailed plan on sheet 15. The head or nut will be worked with a lever not shown on the drawing.

Channel from Cholavaram to Red Hill Lake.

This channel will be $2\frac{3}{4}$ miles in length, with a fall of three feet per mile. The other dimensions are proposed to be the same as those of the channel from the Cortilliar, as it is desirable that Cholavaram Lake should be drawn from rapidly during the early part of the floods.

The greater part of this channel must be excavated through laterite rock, but this will be rather a convenience, as we shall want the material for building purposes.

Red Hill Lake.

35. The remarks already made about the map of Cholavaram apply to the Red Hill Lake. The length of the present bund is about 3,000 yards, and as there is rapidly rising ground at each end, the extension, consequent on the proposed raising, will be very short.—*See the longitudinal section on sheet* 18. In this case, as in that of Cholavaram, the required material is very convenient, laterite, gravel, and rock being had in the hills at each end of the bund.

Houses at the Red Hills.

36. Some years ago the Red Hill Lake was a favorite retreat for Europeans, and some nine or ten houses were built for their accommodation. The opening of the railway to the Shervaroy Hills and to Bangalore has, however, led to almost the total abandonment of the place, and not one of the houses is, I believe, now tenanted, and some of them are falling into ruin.

Three small ones which are built upon the bund, and four others which are upon a promontory inside the line of bund, will be swamped by the proposed raising of the lake; ample compensation for these houses is included in the estimate. Portions of three or four villages will be swamped, but they are of little value.

Red Hill Lake Irrigation Sluices.

37. There are two very good irrigation sluices in the bund of this tank. Under the altered circumstance of the lake they cannot be worked, with plugs, as they now are; they are therefore proposed to be altered as shown on sheets 21 and 22; the details of the sluice gates will be the same as those of the Cholavaram irrigation sluices.

Reservoir Bunds.

38. The mode of raising the bunds of these two lakes is shown on sheets 13, 18, and 19. The old revetment is proposed to be removed, the old work stepped out where the slope is quick, and the new earth laid in thin layers sloping inwards; a puddle wall, on the lake side, to be carried up at the same time; outside the puddle a layer of gravel and stones, 12 inches thick; and outside that, the stone pitching 18 inches in thickness.

Red Hill Lake Head Sluice.

39. This will be placed in the low bund which must be constructed along the summit at Soorapoddoo tank, at the south-east side of the lake.—See sheet 24 for the general position, and sheet 23 for the details of the sluice.

Delivery channel of Madras.

40. On sheets 24, 25 26, are shown the plan and longitudinal section of the delivery channel to the Spur Tank in Madras. The dimensions of the channel are shown on the section. It is calculated to deliver considerably more than will be required daily for the use of Madras.

Otary Nulla.

41. Where the delivery channel crosses the Otary nulla the banks are very low. It had been proposed to shut up this nulla altogether, but as some land is irrigated from it lower down, I propose to cross it by an aqueduct. A map and longitudinal section of the nulla, and the details of the aqueduct are shown on sheet 27.

Bridges.

42. On the supply channel from the Cortilliar to the Red Hill Lake it is proposed to construct nine cart bridges and five foot and cattle bridges.

The design for the former is shown on sheet No. 14, and that for the latter on sheet 28.

On the delivery channel between the Red Hill Lake and Madras five cart bridges and two foot and cattle bridges are proposed to be erected: the details of these are shown on sheet 20.

For the details of the bridges required in Madras see sheet 31.

Tunnels.

43. On the supply channel two under-tunnels will be required both for irrigation and drainage purposes. The design for these is shown on sheet No. 30. On the delivery channel ten under-tunnels will be required. These will be similar in design, but much smaller than those on the supply channel.

Estimate.

44. The following is an abstract of the estimate for the works enumerated above:—



2018/12

Abstract Estimate for Madras Water Works.

| No. | Description of works | No. | Amount of each work. Rs. A. P. | Total. Rs. A. P. |
|---|---|---|---|---|
| 1 | Cortilliar anicut | 1 | 30,709 14 0 | 30,709 14 0 |
| 2 | Do. head sluice | 1 | 10,928 12 3 | 10,928 12 3 |
| 3 | Channel from Cortilliar to Cholavaram Lake | 1 | 75,637 2 1 | 75,637 2 1 |
| 4 | Diversion of Kattenkal including dam across channel | 1 | 657 8 0 | 657 8 0 |
| 5 | Boosykal aqueduct | 1 | 3,733 8 6 | 3,733 8 6 |
| 6 | Do. diversion and dam across channel | 1 | 3,339 15 0 | 3,339 15 0 |
| 7 | Cart bridges for main channel crossings | 6 | 2,029 10 6 | 12,177 15 0 |
| 8 | Foot do. do. do. 3½ feet road-way | 4 | 837 10 0 | 3,350 8 0 |
| 9 | Irrigation under-sluices do. do. | 11 | 1,111 4 9 | 12,224 4 3 |
| 10 | Cholavaram Lake bund | 1 | 1,24,515 4 6 | 1,24,515 4 6 |
| 11 | Head sluice for supply channel to Red Hill Lake | 1 | 11,121 13 4 | 11,121 13 4 |
| 12 | Irrigation sluices to Cholavaram Lake | 2 | 851 10 0 | 1,703 4 0 |
| 13 | Cholavaram Lake calingulah | 1 | 1,411 10 0 | 1,411 10 0 |
| 14 | Channel between lakes | 1 | 56,815 3 4 | 56,815 3 4 |
| 15 | Cart bridges for supply channel crossings | 3 | 2,029 10 6 | 6,088 15 6 |
| 16 | Foot do. do. do. | 1 | 837 10 0 | 837 10 0 |
| 17 | Irrigation under-sluices do. do. | 2 | 1,111 4 9 | 2,222 9 6 |
| 18 | Red Hill Lake bund | 1 | 96,791 1 6 | 96,791 1 6 |
| 19 | Bunds across the valleys around the Red Hill Lake | 3 | 13,876 8 0<br>2,911 14 0<br>704 7 9 | 17,492 13 9 |
| 20 | Red Hill Lake irrigation sluices | 2 | 426 1 6<br>620 7 6 | 1,046 9 0 |
| 21 | Do. calingulah | 1 | 2,603 2 0 | 2,603 2 0 |
| 22 | Head sluice of delivery channel to Madras | 1 | 2,893 2 1 | 2,893 2 1 |
| 23 | Delivery channel to Madras | 1 | 10,497 13 3 | 10,497 13 3 |
| 24 | Cart bridges for delivery channel crossing | 5 | 331 11 0 | 1,658 7 0 |
| 25 | Foot bridges do. do. | 2 | 251 10 2 | 503 4 4 |
| 26 | Irrigation under-sluices for delivery channel crossings | 10 | 832 11 0 | 8,326 14 0 |
| 27 | Otary nullah aqueduct | 1 | 1,392 6 6 | 1,392 6 6 |
| 28 | Railway culvert | 1 | ..... | ..... |
| 29 | Poonamallee road bridge | 1 | 742 13 0 | 742 13 0 |
| 30 | Road bridge from Aminjicary to Chetput | 1 | 421 11 0 | 421 11 0 |
| 31 | Harrington's road culvert | 1 | 594 11 0 | 594 11 0 |
| 32 | Nabob's garden culvert | 1 | 421 11 0 | 421 11 0 |
| 33 | Macknical's road do. | 1 | 574 9 0 | 574 9 0 |
| | | | | 5,03,446 13 8 |
| | Contingence, superintendence, and sundries | ... | ..... | 50,343 2 4 |
| | Compensation for damage to land, &c. | ... | ..... | 83,140 0 0 |
| | Total estimate | ... | ..... | 6,36,930 0 0 |

Compensation for damage to land.

45. In this estimate is included a sum of 83,140 Rupees for compensation for damage to land, villages, &c. This includes compensation for the houses at the Red Hill Lake.

As regards the land to be swamped by raising the lakes, much of it would still be available for cultivation every year as the water subsided, and the remain-

der would be valuable as pasturage : this would be an important set off against the sum to be paid for damages, but I have not considered it necessary to take it into account.

The Red Hill houses were valued by the Municipal Commissioners' Assessor. The villages and lands by a Revenue Inspector. My own opinion is that if these works are ever carried out, the amount to be paid for compensation for damages will not exceed 60,000 Rupees.

Quality of the Red Hill and Cortilliar water.

46. Doctor Wyndowe has analyzed the water of the Red Hill Lake, and has made the following observations about it :—

Paragraph 3. "As regards sensible properties, the water was free from odour "or taste, but cloudy (even after filtration) from suspended impurities. This no "doubt will subside after some time if the water be left at rest. Chemically "speaking, *this is by far the best specimen of drinking* water I have yet examined in "Madras. The salts are very small in amount, viz., 6·98 grains in one gallon, and "the amount of organic impurity is not great, and would be still further diminish-"ed by care and proper storage.

"The tank abounds in a species of chara : although this plant acts bene-"ficially by precipitating the carbonate of lime, its presence is objectionable by "adding to the organic impurity, and also from its tendency to generate a noxious "gas, which still further deteriorates the water."

47. With regard to these remarks of Doctor Wyndowe I have to observe :—

*First.*—That the italics are mine.

*Second.*—That the Red Hill Lake is now solely supplied from the surface drainage of the land lying around it.

*Third.*—That being now comparatively shallow, vegetation is more vigorous than it would be if increased in depth as proposed.

*Fourth.*—The water which is proposed to be supplied to Madras, is the rain which falls upon the Nagiri hills, which are almost wholly composed of gneiss, and the channels through which it flows consist nearly altogether of pure silicious sand.

48. The grosser particles held in suspension by the water would be deposited in Cholavaram Lake, the finer particles in the Red Hill Lake, so that water comparatively pure would be delivered to the Spur Tank, where it would pass through properly prepared filter beds into the pure water basin, which would be covered in from light and dust. From this basin, which would hold three or four days' supply, the water would pass to the pump well, placed at some central point where it would be raised, probably into an elevated cistern, and thence distributed, through iron pipes, to the several parts of the city.

Taking into account the purity of the source from which the water would be drawn, the process sketched above would probably give to Madras a purer water than is supplied to any city in the world.

49. The works, if gone about actively, might be completed in two years.

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No. 150. Minute by the Honorable the President.
(Here enter 5th March 1866.)

No. 151. Minute by the Honorable T. PYCROFT.
(Here enter 5th March 1866.)

No. 152. Minute by the Honorable H. D. PHILLIPS.
(Here enter 5th March 1866.)

2016
13



No. 153. ORDER THEREON, 11th April 1866, No. 1,102.

CIVIL WORKS, No. 24.

1. Attention has long been directed to the Red Hill Lake as the source from which an ample supply of wholesome water might be derived for the use of the Town of Madras, and Lieutenant (now Lieutenant-Colonel) O'Connell of the Royal Engineers having been deputed to investigate the subject, submitted a report with plans and estimates in 1855, showing that the scheme was perfectly feasible of execution at a cost of Rs. 43,39,476. No action was, however, taken on his proposals, nor on those subsequently put forward by other parties, till Mr. Fraser, Civil Engineer, suggested the probability of improving upon Colonel O'Connell's designs, and was forthwith directed to undertake the re-investigation of the whole project.

2nd July 1863, No. 1,741.

2. His scheme consists of :—

| | | Rs. | A. | P. |
|---|---|---|---|---|
| I. | The construction of a dam across the Cortilliar | 30,709 | 14 | 0 |
| II. | The construction of a channel with head and other sluices, bridges, and all requisite works from the anicut to the Cholaveram tank a distance of 8½ miles | 1,22,054 | 9 | 1 |
| III. | The enlargement of the capacity of this tank by raising its bund six yards | 1,38,751 | 15 | 10 |
| IV. | The construction of a channel with sluices, bridges, &c., from the Cholaveram to the Red Hill tank, 2¼ miles in length | 65,964 | 6 | 4 |
| V. | The enlargement of the capacity of this tank by raising its bund five yards | 1,17,933 | 10 | 3 |
| VI. | The construction of a channel with its sluices, accommodation bridges, &c., from the Red Hill Tank to the Spur Tank in Madras | 28,032 | 6 | 2 |
| | Sundries, compensation for lands and houses, superintendence, &c. | 1,33,183 | 2 | 4 |
| | | 6,36,930 | 0 | 0 |

3. Mr. Fraser shows clearly that instead of taking off the head of supply from the Cortilliar at Pushali, a distance of 28 miles from the Red Hills, and raising the bund of the tank at that place only nine feet as proposed by Colonel O'Connell, it will be better to place the anicut across the Cortilliar much lower down at a spot about 12 miles from the Red Hills, and having an elevation just sufficient to give an average fall per mile of from two to three feet.

4. The advantages of this site for the anicut are, that the discharge due to the greatest possible length of the Cortilliar below the Kasaveram dam, which turns all the ordinary freshes of that river into the Coum, is gained, that it is situated below the confluence of the Trittani and Nagari rivers, which are streams draining large tracts of a hilly wooded country and therefore to be relied on, and that the natural configuration of the country favors the excavation of a channel in the required direction, filling, in its course to the Red Hill tank, an intermediate reservoir at Cholaveram, the capacity of which as well as of the Red Hill Tank, could be readily enlarged to the required extent by raising the bund of the former six yards, and of the latter five yards.

5. The works, so far as they are now laid before Government, appear to be projected in a careful manner, and the Government have no doubt of their perfect practicability. The anicut across the Cortilliar, 600 feet in length, will not differ from other works of the kind which have been successfully constructed in this Presidency, and no difficulty seems likely to beset the execution of the other portions of the proposed scheme.

*Proceedings of the Madras Government, Public Works Department,*
*11th April* 1863.

6. By the enlargement of the two tanks in which Mr. Fraser proposes to store the water conveyed into them by a channel from the Cortilliar, he calculates that their joint capacity will be in round numbers 140 millions of cubic yards. Of this quantity the Meerassidars owning existing wet lands have a right to about 40 millions of cubic yards, leaving for the supply of Madras and for extension of wet cultivation, 100 millions of cubic yards. Assuming the population of Madras to be half a million, and allowing each individual twenty gallons per day, the total quantity required for the use of the population will be less than twenty-two millions of cubic yards, and, making all allowances, there seems no reason to doubt that if forty millions be reserved for Madras, an ample residue would remain for distribution for increasing the area of wet cultivation under the two tanks. Mr. Fraser states that there are from 20,000 to 25,000 acres of suitable waste land that might be irrigated between Cholaveram and Madras, and he shows that if the 60 millions of cubic yards of water, which will be available after reserving 40 millions for Madras, are used for irrigation, they will suffice for between 8,000 and 9,000 acres and yield a return of some Rupees 60,000 per annum.

7. The Government do not question the correctness of these calculations, and as, by actual close observation of the Cortilliar during the three years in which he has been engaged on his investigations, Mr. Fraser has ascertained that the quantity of water which is required will be readily obtained from that river during the 30 or 40 days that it is filled by the north-east monsoon, without taking into consideration the much longer periods that a diminished stream continues to flow, the Government are satisfied that, as far as can be judged without detailed specifications and estimates, the project will prove a remunerative one, irrespective of its value as a means of improving the comfort and sanitary condition of the inhabitants of Madras.

8. If the cost of the works be taken at seven lacs of Rupees, instead of the Rupees 6,36,930 estimated by Mr. Fraser, the interest on the outlay will be Rs. 35,000 per annum, or Rupees 25,000 less than the revenue to be derived from irrigation by the surplus water stored in the two tanks. As an irrigation project, therefore, the portion of the scheme now brought under the consideration of Government is likely to be very profitable; and the works remaining to be designed and estimated being the least expensive and at the same time the most remunerative, it is very desirable that, by carrying out what is now ready for execution, the Government should be able to secure a balance of returns with which to meet the interest of such monies as it may be necessary to raise to complete the scheme for providing a full supply of water to the inhabitants of Madras.

9. Mr. Fraser will lose no time in submitting the detailed specifications and estimates, and, on their receipt, His Excellency in Council will propose to the Government of India and the Secretary of State, that the money required for carrying out the works should be borrowed on the responsibility of Government with a view to the works being given out on contract, and completed as rapidly as possible.

10. Mr. Fraser will be requested also to expedite the preparation of the remainder of the project in communication with Captain Tulloch, and to submit as early as practicable that portion of the general scheme which provides for the supply of water to the Southern Districts of Madras from the Adyar and the Cooum, as well as for the formation of a high level canal to connect these rivers and the Northern and Southern Coast Canals.

(True Extract.)

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

To W. Fraser, Esq., Special Executive Engineer
,, Captain H. Tulloch, R. E.
To the Superintending Engineer, 4th Division
—a—Public Dept
Frd. S. T. Augustin.
—a—Military Dept

2018/14

# MADRAS WATER WORKS.

*Specification for the works included in the Volume of Plans which accompanied the first Report.*

1. PLANS, DIMENSIONS, &c.—The several works are delineated on the plans numbered from 1 to 31 inclusive. The details are generally shown on a scale sufficiently large to be clearly understood; but should any details have been accidentally omitted, which may fairly be supposed to form a part of such works, they are to be understood, and are to be constructed.

Should there be any difference between any portions of the works as they are drawn, and the sketches or descriptions in this specification, or any difference between the dimensions figured on the drawings and those in this specification, the latter, in both cases, are to be taken as correct; and should there be any difference between the scaling of the plan and the dimensions figured thereon, the figures are to be taken as correct.

2. SITES.—The sites of the several works are marked on the plans, but it will be competent for the Engineer to alter the sites, under the authority of Government, should he consider it advantageous to do so.

3. MATERIALS.—Unless where it is distinctly stated to the contrary, all materials are to be of the best description afforded by the locality of the works.

4. LIME.—Shell lime is generally understood to be the description used; but the Engineer in charge may permit or insist on the use of any of the stone limes, which are found at certain places along the line of works.

Whichever is used it must be supplied to the works freshly burned, as required; and when brought to the work it must on no account be left exposed to the weather, but must be either housed at once, or covered over carefully with sand.

5. SAND.—No sea sand nor sand containing any proportion of saline matter is to be used in any portion of the work; clean, sharp, river or pit sand shall alone be used; and it must be free from clay and silt.

6. CLAY.—Burned clay is to be used in the preparation of mortar and concrete or beton. It is unnecessary that it should be quite pure, as ordinary earth free from sand and silt will do. Care must be taken that it is burned only until it becomes red, when the fires must be immediately extinguished, and the clay kept covered and hot until required.

7. BRICKS.—In all cases bench-moulded bricks, of the English size, are intended. But the Engineer in charge may, in some portions of the works, allow bricks of the ordinary native manufacture to be used. All bricks irregular in shape, having a twist, or sand, or other cracks will be rejected.

8. STONE LATERITE.—Wherever laterite is used it must be of the dark colored and thoroughly indurated description.

The soft white description must not be used on the works, except by the special permission of the Engineer.

9. GRAVEL AND BROKEN STONES.—Wherever *gravel* is specified, dark colored, indurated, small laterite gravel is understood: and wherever *broken stone* is mentioned, angular fragments of gneiss or other hard rock, and not more than one and a quarter inches in diameter, are intended.

10. Concrete of beton.—This is to be made with lime, burned clay, sand, laterite gravel, and broken stone, in such proportion as may be directed by the Engineer.

The exact proportions will depend principally on the quality of the lime which can most readily be procured; but should shell lime or one equally pure be used, the following proportion will probably be adopted:—

| | | |
|---|---|---|
| Lime ... ... ... ... | 6 | Cubic feet. |
| Burned clay ... ... ... | 10 | ,, |
| Sand ... ... ... ... | 6 | ,, |
| Laterite gravel ... ... ... | 6 | ,, |
| Broken stones ... ... ... | 4 | ,, |
| | 32 | |

This quantity will probably make one cubic yard of concrete or beton.

11. Whatever proportions are used, the following mode of preparation must be adopted. If rich lime is used it may be slaked in the usual way, with just water enough to convert it into a fine powder. Should the lime possess hydraulic properties to any considerable extent it must be ground before slacking. In this case too, the process of slacking should be continued from twelve to twenty-four hours, according to the quality of the lime, and in both cases the lime must be thoroughly slaked before it is used. After slaking, the rich limes may be kept for sometime, but the poor limes must be used immediately. The slaked lime, powdered clay, and sand must then be sifted together, so that they shall be thoroughly and equally mixed in their due proportion. For this purpose the common native bamboo sieve will not answer, and must not be used; but wire lime-sieves, of the English pattern, must be provided, and used in the ordinary rocking frame.

Sufficient water is to be added, and the whole is to be turned over and thoroughly mixed, or beaten in the usual way, until a thick pasty mortar is produced, which falls from the trowel or shovel in the manner which indicates that the incorporation is complete: the laterite gravel and broken stone are then to be added, and the whole turned over until the gravel and stone are equally distributed through the mortar.

12. As soon as possible after this, the concrete is to be wheeled into its place. It is not to be thrown from a height, but to be laid in quietly, spread, and levelled to the required thickness, and then beaten down with heavy rammers. If any portions yield under the punning, fresh concrete is to be laid in and beaten down, so that when completed the surface of the concrete shall be level. In all cases the punning is to be continued until the water begins to spurt up through the surface.

Should the concrete be particularly dry when laid in, water may be sprinkled over it as it is beaten down; but great care must be taken that no more water is added at any time than is sufficient to produce a thick pasty substance.

13. If possible the whole of the concrete of any one work, or of any one part of a work, should be begun and finished within one day. If such however, be impossible, each layer of the proper thickness should be completed in one day, so that there shall be no vertical joint in any part of the work.

14. The layers of concrete laid in foundations are to fill the foundation trench from side to side, care having previously been taken to cut the trench to the exact dimensions. Should the trench, through carelessness, have been cut too large, it must be filled with the concrete as described above, but where the sides of the trench will not stand, or where from any other sufficient reason there would be a useless waste of material by filling in the whole trench, the sides of the concrete may be confined by any other means, and, as the layers are finished, sound earth is to be carefully packed in at the sides and well rammed down; water being used, if necessary, to make a sound, perfect job. Special care must be observed that the layers previously laid in are not disturbed.

15. Should any delay take place in building over the concrete, or in cases where it has to be carried up in layers, (as in the retaining walls of the Cortilliar dam,) it must be completely covered with bundles of straw at least fifteen to eighteen inches in thickness, and which are to be kept constantly wet until the work is finished, or the concrete is built upon.

16. Mortar.—The mortar used in all the works is to be composed of lime, burned clay, and sand, in such proportions as the Engineer shall direct.

The ingredients are to be sifted dry, and mixed with water as described in paragraph No. 11, and particular care is to be taken that no more water is used than that necessary to form a thick strong paste.

17. Excavation for foundation.—The excavations for foundations are to be made to the dimensions marked upon the Drawings. All unsound earth is to be removed, and replaced with such material as the Engineer may direct. If necessary the whole is to be well rammed down, until the bottom is equally hard throughout.

In no case is the building to be commenced until the Engineer has inspected and approved of the trenches.

18. Puddle.—The puddle must be of the best clay to be had in the locality of the works. None is to be used which is not approved of by the Engineer, and any rejected by him must be immediately removed from, or used up in some other part of the works.

The clay is to be puddled near the work, and when laid in must be puddled again and thoroughly united with the previous layer, which must be kept wet for this purpose.

19. Mason work and Brick-work.—Unless where otherwise shown on the Drawings, all mason and brick-work are to be built in courses horizontal and vertical in their beds and joints. the offsets of the footings are not, on any side, to exceed one-fourth the height of the course. In brick-work the total height of four courses must not exceed the height of the bricks by more than one inch. Every part of a wall must be equally soundly built, and every course must be levelled off before another is commenced, and every course in mason work, and every second course in brick-work, must be grouted with fluid mortar.

In this Presidency it is customary to use stone and bricks dry in building, but to use the mortar in a very fluid state. This system of working will not be permitted. Laterite stone and bricks must be thoroughly wetted, until they will absorb no more water before they are built in, and the mortar must be of the consistency of a thick paste, sufficiently strong to remain in position when spread upon a brick or stone to form a joint.

During the progress of a work, the portion on which the workmen are not engaged must be kept constantly covered with mats and wet straw, as before described in paragraph 15.

Every portion of a work or wall must be equally soundly built; and should the use of two sizes of bricks be permitted in any case, the whole of the work up to the same level must be built with bricks of the same size.

20. Cortilliar dam.—The form and dimensions are shown on the Drawing Sheet No. 3.

The trenches for the retaining walls are to be carried down two or three feet into the stratum of clay which under-lies the sand, as shown in the Drawing.

If possible the trenches are to be excavated to the full depth and length before any of the concrete is laid in. The only difficulty in the way of accomplishing this is the quantity of water which may have to be dealt with; but it is so important that the two retaining walls should be unbroken, that this mode of construction must be adopted unless it is found to be impracticable except at a greatly increased cost. During the dry weather the quantity of water in the Cortilliar is so very small, that I believe three or four picottas, or a couple of Gwynnes' pumps, worked by a small steam engine, would suffice to keep it down.

As this dam would probably be the last work executed, the river could be bunded across above the site, and a large quantity of the water drawn off through the supply channel and into the river, by a small deep ravine which is close by. The concrete in the retaining walls is to be carried up in layers not exceeding twelve inches in height, according to the instructions under the head "concrete."

21. As much of the sand as will stand between the two retaining walls, when the trenches are excavated, may be allowed to remain; but as the walls are carried up, the space between them and the core of sand are to be filled in with layers of earth, gravel, refuse of lime, &c. The layers are to correspond in height with those of the concrete, and are to be watered and rammed down.

22. The stone work of the dam and the concrete under it are to be carried up together, the stones to be embedded in the concrete, and cemented with mortar, prepared as described in paragraph 16. According as the stone work is completed, the joints are to be raked out at least two inches in depth, and the whole must be pointed with mortar prepared as before described, with the addition of being ground fine. This pointing must be done before the work dries; but at the same time, the stones and joints must be sprinkled with water before the pointing is laid in.

23. To cover so large a work as this dam with wet straw would be very expensive, but as it is essential that it should dry very slowly, it may, as the pointing is completed, be covered with sand to a depth of two feet, which is to be kept moist for fifteen days.

24. The rough stone work at the toe of the slopes is to consist of the largest blocks that can be conveyed by ordinary means to the site. They are to be carefully laid.

25. Head Sluice.—This work is designed to be built with laterite. The flooring, to the extent shown on the Drawings, is to be rough dressed blocks of gneiss, and the face of the recess for the gates, and the faces of the spandrel walls, so far as the gates shall slide upon them, are to be of fair dressed gneiss.

The paving is to be embedded in concrete.

The timber work is to be of teak.

26. Supply Channel.—The dimensions of the supply channel are shown on he Drawings.

2018/16

There is to be a berm of five yards on each side, and at all low places the spoil must be formed with a bank at each side, rising to at least the height of the proposed bunds around Cholavaram and Red Hill lakes. The inner slope of the spoil bank is to be one to one, the outer slope may be anything the quantity of materials will allow of, but the bank must not at any place be less in section than one to one on the inner side, three feet broad on the top, and one and a half to one on the outer side.

Where the surface of the land is sufficiently high not to require the side banks, the spoil shall be disposed of as the Engineer shall direct.

27. Bridges of stone and bricks.—The drawings of the bridges are sufficiently in detail to show clearly how they are to be built, but the following remarks are necessary. The centers are to be eased when the arches are closed, and they are to be removed altogether before any work higher than the crown of the intrados is built.

The joints in the back of the arch are to be raked out, the whole swept clean and then covered with six inches in thickness of concrete.

This must be done after the arch has settled, but before it has thoroughly dried, and the whole must be kept moist for ten or twelve days.

28. When the bridge is of stone, the work is to be carefully pointed as described in paragraph 22; only the joints need not be raked out to more than an inch in depth.

When the bridges are of brick, they may be either pointed or plastered according to the quality of the bricks. In all cases where it is decided that the brick work shall be plastered, each day's work, as it is completed, must be white-washed.

29. Plastering.—The plastering is to consist of two coats, a rendering and floating coat.

For the rendering coat the work is to be prepared by raking out the joints as for pointing, and the surface of the work and insides of the joints must be well wet when they are swept clean.

The rendering coat may consist of the ordinary mortar described in paragraph 16, but the floating coat, though of the same materials, must be ground fine in the usual way. In preparing the mortar for plastering and pointing, the lime must be a perfect hydrate before it is used. For this purpose rich lime is to be used, and it must be kept in water, and reduced to a pasty state before it is mixed with the clay and sand.

The floating coat is to be polished in the usual way.

30. Tank bunds.—The manner in which these bunds are to be raised is shown on the cross sections.—See sheets 13, 18, and 19.

The old revetment and other stone or gravel work on the inner face are to be removed, and the old earth-work cut to the slope of one and a half to one.

The face of the new bund will consist of—

I. An outer revetment of roughly squared laterite, eighteen inches in thickness.

II. Next to this, twelve inches thick of stones and gravel, hand laid, and closely packed together, and filling up the spaces between the stones used in the revetment.

III. At the rear of this there is to be four feet in thickness of puddle, well worked in, as described in paragraph 18, and closely connected (by the use of water, &c.,) with the materials of the old bund.

The puddle wall and revetment are to be founded in the solid earth.

31. The outer slope of the old bund is to be stepped out to receive the new material, and the top of the bund is to be picked up to at least twelve inches in depth, and if it be of gravel it must be removed, and the whole thoroughly wetted before the new material is laid on. The new material is to be carried up in layers not exceeding one foot in thickness, and they are to incline towards the center, as shown on the Drawing.

32. So much of the bund as lies on the tank side of a vertical line drawn down from the center of the top of the bund, is to be formed with materials as nearly impervious to water as it is possible to get them within a reasonable distance. This portion of the bund is to be made with great care, and should the Engineer consider it necessary, water is to be used in laying the earth in. The remainder of the bund may be of materials of a looser but heavier description, such as gravel stones, &c., but the outer slope must be covered with earth to at least one foot in thickness.

PARAPET.—A low parapet wall, as shown in the Drawings, is to be built upon the revetment all along the tank bund. The parapet is to be built with mortar.

33. No material for the bund is to be excavated in the bed of the tanks without the written sanction of the Engineer, and even then the excavation is not to approach nearer than within fifty feet of the toe of the revetment.

The same distance is to be observed with regard to excavations on the other side of the bund.

34. CALINGULAHS, SLUICES, &c.—The calingulahs, irrigation sluices, and the Red Hill head sluice, call for no particular remarks.

The stone work in the calingulahs is to be laid in mortar, and pointed as described in the case of the Cortilliar dam.

For the form and dimensions of those works see the Drawings.

35. TIMBER BRIDGES.—One of these only, the foot bridge across the main channel, and forty-five feet in span, need be particularly alluded to.

Each girder is composed of two pieces of teak, fifty feet in length and six inches by six inches. They are laid parallel to each other and connected at the ends by blocks, on which they are prevented from sliding by keys of hard wood and wrought-iron straps.

The straps are to be put on hot, and when this part is finished the bottom and top pieces are to be sprung asunder in the center, to the extent shown on the Drawing; and a straining piece, six inches by six inches, inserted. A similar straining piece is to be inserted at every standard, and at the same places the top and bottom pieces are to be bolted together, as shown in detail on the Drawings. Care must be taken that the top and bottom girders are not injured. The whole work is to be built of teak.

36. DELIVERY CHANNEL TO MADRAS.—The channel to Madras is to have a berm on each side of four yards, and the spoil is to be arranged in embankments, as before described, to the height shown on the section.

37. BRIDGES AT MADRAS, &c.—The bridges proposed to be built in Madras and on the delivery channel call for no particular remarks; neither does the design for the irrigation and drainage under-tunnels.

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

MADRAS,
*7th May* 1866.

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Exd. S. T. Augustin.

P.W. 1866 Department
Proc. of Govt. for April

No. 1102

Pro. of the Madras
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*Proceedings of the Madras Government, Public Works Department,*
*27th July* 1866.

No. 629. Read the following Telegram from Colonel DICKENS, Simla, to Colonel ORR, Secretary to Government, Public Works Department, Madras, dated 14th July 1866 :—

Project for Water Supply of Madras and re-appropriation to the work sanctioned.

No. 630. ORDER THEREON, 27th July 1866, No. 2,374.

CIVIL WORKS, No. 94.

1. Communicated to the Superintending Engineer of the 4th Division, and to Mr. Fraser. The work being of a special character, and entirely designed by Mr. Fraser will be under his sole control and management.

2. In view to the probability of its being necessary to find employment for large numbers of persons flocking to the Presidency in search of the means of subsistence by labor, Mr. Fraser will, without delay, take measures for putting the work in hand, and engaging upon it such parties as may present themselves in search of work.

3. It was the intention of Government so to carry out the undertaking as to make it immediately remunerative, by first constructing the anicut across the Coortillar and completing the channels from it to the Sholaveram tank and thence to the Red Hills Lake, but circumstances having now rendered it expedient to proceed in such a manner as will afford the readiest and greatest amount of work fitted for unskilled labor, the Government are of opinion that the project should be laid out so as to admit, in case of necessity, of gangs of workmen being distributed over the whole of it. Keeping this in view, it is desirable that, beginning from the Spur tank, the channels, throughout, and the earthwork required to strengthen the tank bunds, should be marked out ready to be commenced, although, unless the necessity arise, the original intention should be adhered to.

4. As it is advisable that the work people should be congregated as little as possible in very large bodies, arrangements should be made for locating and employing them in parties of moderate strength distributed over the different sections of the work and kept apart from each other. Revenue and Magisterial Officers will be appointed to assist in procuring hutting materials and supplies of all descriptions, as well as in maintaining order and enforcing sanitary precautions, and the Government will, if necessary, be prepared to apply to His Excellency the Commander-in-Chief for a certain number of Sappers and Miners as Superintendents and Directors of working parties.

5. Mr. Fraser will observe that the services of Mr. Brosnahan have been placed at his disposal.

(True Extract.)

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

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

Exd. T. O'Connor.

No. 378. Read the following letter from the Government of India, Public Works Department, (Civil Works—Miscellaneous,) to the Secretary to the Government of Madras, in the Public Works Department, dated Simla, 19th July 1866, No. 626 C:—

1. The report and plans connected with the water-supply of Madras, together with the Resolution of the Madras Government on the subject, which were forwarded with your letter No. 1,376, dated 30th April last, having been laid before the Governor General in Council, I am directed to communicate the following observations and orders thereon.

2. The project, as submitted, includes such portions of the works as are necessary for the delivery, in the Spur Tank at Madras, of the full amount which will, on a liberal estimate of the wants of the population, be required for the water-supply of the town of Madras and Fort Saint George, but it is intended that the arrangements for filtering and distribution shall form the subject of a separate report and estimate.

3. The works now proposed provide, moreover, for the supply and storage of a considerable amount of water in excess of that required for the supply of Madras, and this, it is proposed, to utilize in the irrigation of lands now lying waste between the storage reservoirs and the sea, and from this part of the scheme alone a return of about 8 per cent. on the amount of the present estimate is anticipated.

4. The Governor General in Council recognizes fully the important nature of the work now brought forward for execution, and sees no reason to doubt that the scheme, as a whole, will prove fairly remunerative. The great benefit which will accrue to Madras from the substitution of pure water from the hills for the present well-water, to the unwholesome nature of which such ample testimony has been borne, is sufficiently manifest from the papers submitted.

5. The project has been drawn up with much ability and care, and the Governor General in Council considers that much credit is due to Mr. W. Fraser, to whom its preparation was entrusted.

6. In the statement of the cost of the various parts of the work, as given in Mr. Fraser's report, a sum of 10 per cent. has, I am to observe, been added for "Contingencies, Superintendence and Sundries." Although in calculating the probable returns from a scheme of this nature, allowance should be made for the cost of establishments to the extent of at least 15 per cent. in addition to the charge for contingencies, the cost of establishments being separately provided for in the Budget estimate should not be included in the estimates for works, and an allowance of 5 per cent. should, as usual, suffice for contingencies. The amount of the estimate after this correction has been made will be Rupees 6,11,759 as shown in the margin,* and to this amount His Excellency in Council is pleased to accord sanction.

| | Rs. |
|---|---|
| * Dam across Cortilliar River ... | 30,710 |
| Channel to Cholavaram lake, 8½ miles ... ... ... ... | 1,22,055 |
| Enlargement of do. do. | 1,38,752 |
| Channel to Red Hill Lake, 2¾ miles | 65,964 |
| Enlargement of do. do. ... | 1,17,934 |
| Channel to Spur Tank, 8 miles ... | 28,032 |
| | 5,03,447 |
| Add 5 per cent. for contingencies... | 25,172 |
| Do. compensation for land ... | 83,140 |
| Total ... | 6,11,759 |

7. In the absence, however, of a complete estimate or even of an abstract showing the quantity and rates of the various kinds of work, the Governor General in Council desires that the rates adopted may be carefully scrutinized by the Madras Government, so that there may be good grounds for confidence in the sufficiency of the estimates for properly carrying out the work. In similar cases, in future, the estimate as well as the reports and plans should be sent to this Office.

8. The Governor General in Council further desires me to observe, that he will be prepared to consider favorably any scheme which may be proposed by the Madras Government for the supply of funds for carrying on this work speedily to completion. It is presumed that it is the intention of that Government that the Municipality should bear a fair share of the cost of the scheme, either by a grant towards the works in the first instance, or by an annual payment for water supplied, the sum to be paid in either case being fixed with reference to a fair share of the cost of the entire project, and not that of the works for filtering and distribution alone. On this point the Governor General in Council will be glad to receive a further exposition of the views of the Madras Government.

9. The re-appropriation of Rupees 1,10,800 of the Budget grant of the current year towards this object, which was proposed in your letter under reply, is sanctioned. The usual re-appropriation statement should be submitted.

10. I am to remark on the great delay which has been occasioned in this case by the submission of plans on an unnecessarily large scale, and in the unwieldy form of an Atlas in stiff covers, the letter with which the plans were despatched having been received in this office on the 17th May, whereas the plans did not arrive till the 7th instant. Drawings on a smaller scale, and on tracing cloth, of the principal parts of the project would have been sufficient to have enabled the Government of India to judge of the merits of the proposal.

11. I am to suggest, for the consideration of His Excellency the Governor in Council, that a copy of the present papers, with drawings on a small scale sufficient to illustrate the project, be sent to Major Medley, R. E., at Roorkee, for publication in the Professional Papers edited by that Officer.

12. The sanction accorded in this letter has been registered as No. 36 C of 1866-67.

13. The plans are returned.

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No. 379. ORDER THEREON, 16th October 1866, No. 3,298.

CIVIL WORKS, No. 72.

1. Ordered that the letter from the Secretary to the Government of India in the Public Works Department above recorded be communicated to Mr. W. Fraser, Special Executive Engineer, who will observe that the amount sanctioned for the Madras Water Supply project is Rupees 6,11,759.

2. The orders in paragraph 9 and the suggestion in paragraph 11 will receive attention in due course.

*Proceedings of the Madras Government, Public Works Department,*
*16th October* 1866.

3. The special attention of the Superintending Engineers will be drawn to the instructions contained in paragraph 10, which they will be careful to attend to in the preparation of projects requiring the sanction of the Government of India.

Ordered that the following letter be sent:—

(Here enter No. 3,299, dated 16th October 1866.)

(True Extract)

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

To W. Fraser, Esq., C. E., Special Executive Engineer.
To the Controller of Public Works Accounts.
" Accountant General.
To Superintending Engineers.

Exd. S. T. Augustin.



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PUBLIC WORKS DEPARTMENT.
FORT SAINT GEORGE,
16th *October* 1866.

No. 380. No. 3,299.

To

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

SIR,

CIVIL WORKS, No. 73.

1. I am directed by the Right Honorable the Governor in Council to acknowledge the receipt of your letter No. 626 C, dated 19th July 1866, conveying sanction to the project of supplying the Town of Madras with water, and, with reference to paragraph 8, to forward for the information of the Government of India copies of the papers noted in the margin, from which it will be seen that this Government have recommended to the Right Honorable the Secretary of State for India that the entire work, including the distribution of water in the town, should be entrusted, without a guarantee, to a private Company in England.

G. O. No. 2,925, dated 13th September 1866.
To Secretary of State, No. 46 of 1866.

2. I am to add that the orders in paragraph 9, and the suggestion in paragraph 11 of your letter will be duly attended to.

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

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

Exd. T. O'Connor.

No. 126. Read the following letter from the Secretary to the Government of India, Public Works Department, (Irrigation), to the Acting Joint-Secretary to the Government of Madras, Public Works Department, Irrigation Branch, dated Simla, 10th November 1871, No. 695 I. :—

In reply to your letters, Nos. 2,172 and 2,393, dated respectively the 23rd August and 20th September last, submitting the revised estimate for the Red Hill Tank Project for combined water-supply to the city of Madras and irrigation of the neighbouring country, and reporting that the works have not been stopped, I am directed to state as follows :—

2. The Government of India regrets to find that the estimates have proved so unreliable that the cost of the project is now double what was originally expected, while the income expected from it is reduced to scarcely more than half of what was at first calculated on.

3. In regard to the estimated returns the Government of Madras has been convinced by the Revenue authorities that the cultivators cannot be expected to pay more than an additional sum of Rs. 24,877 per annum for the water supplied them, while the city of Madras taxed it is understood only at the same rate bulk for bulk of water supplied as to the cultivators will pay 32,000 Rupees per annum. The total returns thus available will be Rupees 56,877, from which, deducting Rupees 11,500 for maintenance, there will be a surplus of only Rupees 45,377 per annum to meet the charge for interest.

4. It appears that it is intended to supply 32,000,000 cubic yards, or 5,400 million gallons of water to the city of Madras at a charge of only 32,000 Rupees per annum. In regard to this low charge the Government of Madras remark that they cannot expect a higher price for the water from the Municipality of Madras than that which is paid by the cultivators.

5. But I am to remark that the project was undertaken principally in behalf of the city of Madras, and that if a proper return for the outlay cannot be got from the cultivators, it is reasonable to look to the city for such an additional payment as will make up the deficit, and afford the Government a reasonable reimbursement for the outlay incurred.

6. The city of Calcutta pays about 5½ lakhs per annum for its water-supply, which, at present, is at the rate of about 1,300 millions of gallons per annum, and at which rate the consumption of water is rapidly increasing. The price, which is willingly paid by the city, is therefore about 2,440 gallons per Rupee.

7. The city of Bombay has a supply of water not requiring continuous pumping as in Calcutta, but more resembling that under construction for Madras. At Bombay the supply is about 9,600,000 gallons per diem, or 3,300 millions of gallons annually. The city pays nearly 4 lakhs per annum for this, being at the rate of rather more than 8,000 gallons for the Rupee. But even this price, which is scarcely one-fourth of the price willingly paid in Calcutta, is twenty times the rate which the Government of Madras think cannot be increased in the case of the city of Madras.

8. I am therefore directed to request a reconsideration of the matter in this point of view. It is proposed in one of your letters under reply to charge 4 lakhs of the cost of the project to the Provincial Funds assigned to Madras, which is to deprive the people of that Presidency of 4 lakhs of the general taxation assigned for their benefit. But it seems unfair thus to tax the public in the Madras Presidency generally with one-third of the cost of this project undertaken principally on behalf of the city of Madras, and for which, as seems to the Government of India, there is no doubt the city can well afford to pay.

9. Pending your reply the Government of India will not object to the works going on on the revised estimate.

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No. 127. ORDER THEREON, 10th January 1872, No. 65.

IRRIGATION, No. 4.

ORDERED that the Government of India be addressed on the subject of this letter :—

Here enter No. 66, dated 10th January 1872.

(True Extract.)

(Signed) J. CARPENDALE, Colonel, R.E.,
*Secretary to Government.*

To the Chief Engineer for Irrigation.
,, Controller of Public Works Accounts.
,, Superintending Engineer, 4th Division.
,, Revenue Department.

Ed. E. C. Shunker.

3/7/82.

Govt. of 1872 Madras.

PUBLIC WORKS.

To

THE CHIEF ENGINEER FOR IRRIGATION.

&c., &c., &c.

Dated January, 10th.

Rcd.

Read.

G. O., 10th January 1872, No. 65.

JANUARY.

Nos. 126-127.

*Madras Water Supply Project.*—Passing orders on the observations of the Government of India in connection with the revised estimate for the Madras Water Supply Project.

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PUBLIC WORKS DEPARTMENT,
FORT ST. GEORGE, 10*th January* 1872.

No. 128.

No. 66.

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,

PUBLIC WORKS DEPARTMENT.

IRRIGATION, No. 5.

SIR,—I am directed to acknowledge the receipt of your letter of the 10th November 1871, No. 695, communicating the observations of the Government of India on the revised estimate for the Madras Water Supply Project, and suggesting for consideration the question as to whether the Municipality of Madras should not be required to contribute a larger sum than Rupees 32,000 per annum for the water-supply to the city of Madras.

2. In reply, I am directed to remark that the resources of the Madras Municipality bear no comparison with those of the Municipalities of the other Presidency cities, possessing as it does but little industry or trade, while it is burdened with a large indigent population, and has an unmanageable area. It was with much hesitation that this Government were induced to sanction to the Municipality a loan for the works necessary for the distribution of the water in the city, and as the payment of interest on that loan will tax the income of the Municipality to the utmost, no larger participation in the cost of head and storage works than that already agreed upon can reasonably be expected.

3. It must be remembered that it was on the assurance of Government, that the Municipality would not have to pay more than the agricultural price for water, that they contracted their recent loan from the Government of India and ordered the pipes for distribution, which have been already delivered; and to require the Municipality now to make a larger contribution would not be consistent with equity or good faith.

4. The Government of India have remarked that, in proposing to charge a restricted amount of the cost of head works and storage works to Loan Funds, and to reimburse 4 lakhs from Imperial (not Provincial) appropriations by annual instalments, this Government are proposing to charge against the general interests of the Presidency an outlay chiefly incurred for the local benefit of Madras.

5. I am to remark that works for the benefit of a capital city, the seat of Government and of the chief public establishments, have really a national interest, and that the whole country may not improperly be called upon to contribute towards them, especially when the circumstances of the capital, as is the case here, do not enable it to undertake such works without assistance.

6. His Excellency in Council trusts that, on a consideration of these circumstances, the Government of India will not press for a larger contribution than Rs. 32,000 from the city of Madras for its water-supply.

I have the honour to be,

Sir,

Your most obedient servant,

(Signed) J. CARPENDALE, Colonel, R.E.,

*Secretary to Government.*

Exd. E. C. Shunker.

3/c/82.

Govt. of 1872 Madras.

PUBLIC WORKS.

To

THE SECRETARY TO THE GOVERNMENT

OF INDIA

Dated January 10th.

Read. Encl.

G. O., 10th January 1872, No. 65.

JANUARY

No. 128

Opening explanation in connection with the revised estimate for the Madras Water Supply Project.

*Proceedings of the Madras Government, Public Works Department, 25th January 1872.*

No. 466. Read the following letter from the Deputy Secretary to the Government of India, Public Works Department, (Account—Irrigation,) to the Secretary to the Government of Madras, Public Works Department, dated Fort William, 20th December 1871, No. 296-A. I.:—

In continuation of Public Works Department letter No. 695-I., dated 10th November 1871, permitting of the prosecution of the Madras Water Supply Project on the revised estimate amounting to Rupees 12,25,558, I am directed to state that until it is shown that the project will prove fairly remunerative, the outlay on it must be provided for from the ordinary grant, and that arrangements should be made to meet the charge accordingly.

No. 467. ORDER THEREON, 25th January 1872, No. 240.

IRRIGATION, No. 40.

COMMUNICATED to the Chief Engineer for Irrigation and to the Superintending Engineer, 4th Division, in continuation of G. O., No. 65, dated 10th January 1872.

(True Extract.)

(Signed) J. CARPENDALE, Colonel, R.E.,
*Secretary to Government.*

To the Acting Chief Engineer for Irrigation.
" Superintending Engineer, 4th Division.
" Controller of Public Works Accounts.

Erd. E. C. Shanker.

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Read the following papers :—

No. 321cc.

From Colonel C. H. DICKENS, R.A., Secretary to the Government of India, Public Works Department (Account—Irrigation), to Colonel G. W. WALKER, R.E., Secretary to the Government of Madras in the Public Works Department, dated Simla, 4th November 1873, No. 271-A.—I.

I AM directed to acknowledge receipt of your letter No. 2,350-B, dated 22nd September 1873, forwarding a rough estimate of the funds required for irrigation works under the Government of Madras for 1874-75, and in reply to state as follows.

2. Under "Extraordinary" the demand amounts to ten lakhs, of which Rupees 75,000 is for the works noted in the margin, for which estimates have not been sanctioned by competent authority. Disallowing this amount, the demand is reduced to Rupees 9,25,000, of which sum Rupees 1,50,000 may be considered as being available from the refund that has to be made to the Extraordinary grant on account of the expenditure from that grant on the Madras Water Supply Project. The balance that has to be allotted under the head "Extraordinary" is thus Rupees 7,75,000, and this amount will accordingly be allowed in the orders distributing the agricultural allotment for 1874-75.

| | Rs. |
|---|---|
| Central Delta improvements in the Godavery ... ... ... ... | 25,000 |
| Eastern and Western Delta improvements in the Kistna ... ... ... | 50,000 |
| | 75,000 |

3. A separate communication will be addressed to the Government of Madras relating to the refund to be made to the Extraordinary grant of the outlay incurred on the Madras Water Supply Project. Meanwhile it may be noted that the Budget Estimate for next year under the head "Extraordinary" should be prepared *in detail* for an aggregate of Rupees 9,25,000, a deduction being made from this amount of the refund of Rupees 1,50,000 referred to.

4. Of the demand made under "Extraordinary," one lakh is for the Streevigunta Anicut Project, on which it seems likely that there will be an excess outlay of about a lakh of rupees. The revised estimate for this project was called for in the orders on the Madras Budget Estimate for 1873-74, but it has not been received as yet. I am to ask that the Government of Madras may be moved to take such steps as will ensure the submission of the revised estimate at a very early date.

5. Under "Ordinary" the demand is as follows compared with the grant for 1873-74 :—

| | Demand. 1874-75. | Grant. 1873-74. |
|---|---|---|
| | Rs. | Rs. |
| Works ... ... ... ... ... ... ... | 5,00,000 | 3,55,000 |
| Repairs ... ... ... ... ... ... ... | 14,00,000 | 13,60,000 |
| Establishment ... ... ... ... ... ... | 5,00,000 | 5,12,000 |
| Plant ... ... ... ... ... ... ... | 50,000 | 23,000 |
| | 24,50,000 | 22,50,000 |

6. Financial reasons render it necessary to reduce the demand for next year to Rupees 22,50,000, which amount includes a sum of Rupees 1,50,000 to be refunded to the loan grant on account of the Madras Water Supply Project. The Government of India is aware that this refund will trench largely on the Public Works allotment of the Madras Presidency, but even allowing for the refund, the balance of the allotment of twenty-one lakhs will be Rupees 61,730 more than what was spent under the head "Ordinary" on irrigation works in Madras during 1872-73.

It is left to the Government of Madras to distribute the allotment amongst the several heads of service as the circumstance of the case may require.

7. In the preparation of the Budget Estimate for irrigation works for the grant* herein assigned, it is requested that the instructions contained in the memorandum accompanying Public Works Department Circular No. 64 of 1871, and in paragraphs 11 to 13 of the orders on the Madras Budget Estimate for 1873-74, may be allowed as far as possible. The memorandum required by paragraph 7 of Public Works Department letter No. 333-A.—I., dated 30th October 1872, showing the probable revenue due to irrigation works, should also be submitted with the Budget.

| | Rs. |
|---|---|
| * Extraordinary ... ... ... | 7,75,000 |
| Ordinary ... ... ... ... | 22,50,000 |
| | 30,25,000 |

8. It is to be noted that the sums assigned, provide for expenditure to be incurred in England on stores for irrigation works, and the Budget Estimate should therefore be prepared accordingly.

No. 321D. From the Government of India, Public Works Department (Account—Irrigation), dated Simla, 4th November 1873, Nos. 279-88-A.—I.

*Public Works Budget Grant for Agricultural Works for* 1874-75.

Read again—

Orders on the several Irrigation Budget Estimates for 1873-74.

RESOLUTION.—The Government of India having had under consideration the question of the amount that can be allotted from Imperial revenues for expenditure on irrigation and agricultural works during 1874-75, have decided that the grant for this purpose shall be fixed as follows :—

| | During 1874-75. £ | | During 1873-74. £ |
|---|---|---|---|
| From ordinary revenues ... ... | 769,600 | against | 769,600 |
| ,, loan funds ... ... ... ... | 1,310,000 | ,, | 1,266,000 |
| Total... | 2,079,600 | ,, | 2,035,600 |

2. The grant assigned for 1874-75 has been distributed as follows as compared with the demands from the several Local Governments and Administrations, and the grant for the current official year :—

| | Ordinary. | | | Extraordinary. | | | Total. | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1874-75. | | 1873-74. | 1874-75. | | 1873-74. | 1874-75. | | 1873-74. |
| | Demand. | Grant. | Grant. | Demand. | Grant. | Grant. | Demand. | Grant. | Grant. |
| | £ | £ | £ | £ | £ | £ | £ | £ | £ |
| Madras .. | 245,000 | 225,000 | 225,000 | 100,000 | 77,500 | 92,000 | 345,000 | 302,500 | 317,000 |
| Bombay .. | 210,000 | 142,500 | 142,500 | 232,500 | 122,500 | 105,000 | 442,500 | 273,000 | 247,500 |
| Bengal .. .. | 134,100 | 90,000 | 90,000 | 555,800 | 467,500 | 410,000 | 689,900 | 547,500 | 500,000 |
| North-Western Provinces .. | 228,740 | 147,500 | 147,500 | 578,100 | 320,000 | 295,500 | 806,840 | 467,500 | 443,000 |
| Punjab .. | 141,600 | 124,500 | 124,500 | 570,000 | 460,000 | 437,300 | 711,600 | 584,500 | 561,800 |
| Central Provinces. | 1,500 | 1,000 | 1,000 | 25,000 | .. | .. | 26,500 | 1,000 | 1,000 |
| British Burmah .. | 31,700 | 29,000 | 29,000 | .. | .. | .. | 31,700 | 29,000 | 29,000 |
| Rajpootana .. | 12,569 | 10,000 | 10,000 | 22,860 | 2,500 | 15,200 | 35,369 | 12,500 | 26,200 |
| Coorg .. .. | 100 | 100 | 100 | .. | .. | .. | 100 | 100 | 100 |
| Total.. | 1,005,249 | 769,600 | 769,600 | 2,084,260 | 1,310,000 | 1,266,000 | 3,089,309 | 2,159,600 | 2,125,600 |
| Less amount to be provided from contributions for Sirhind Canal in the Punjab .. | .. | .. | .. | .. | 80,000 | 30,000 | .. | 80,000 | 30,000 |
| Net Imperial Grant | 1,005,249 | 769,600 | 769,600 | 2,084,260 | 1,310,000 | 1,266,000 | 3,089,309 | 2,079,600 | 2,035,600 |



3. The grants herein assigned provide for all agricultural works, as well as for the maintenance of irrigation works generally, and the charges on account of establishment and tools and plant employed on the works. The amount of probable expenditure in England on stores for irrigation works is also included in the grants, and the Budget Estimate should, therefore, be compiled accordingly.

4. Orders have been issued to the Local Governments and Administrations noted in the margin, to provide for the expenditure of a Supplementary grant of Rupees 8,40,000, under the head "Ordinary," in case it is found to be possible hereafter to assign such a grant. The provision for the additional allotment should be embodied in the Regular Budget Estimate under the heads of service to which they appertain, but the amounts making up the additional allotment should be entered in the Budget Estimate in a column distinct from the regular grant of the year. This may be done by an additional column according to the form annexed, showing how the extra allotment is proposed to be distributed. Two copies of Parts I. and II. should be submitted; the first to show the distribution of the grants originally herein assigned, and the other, which should be in manuscript, to include the original and supplementary allotment.

| | Rs. |
|---|---|
| Bombay ... ... ... | 2,75,000 |
| Bengal ... ... ... | 2,00,000 |
| North-Western Provinces ... | 2,00,000 |
| Punjab ... ... ... | 55,000 |
| British Burmah ... ... | 10,000 |
| Rajpootana ... ... ... | 1,00,000 |
| | 8,40,000 |

5. Endeavours should be made to prepare the revenue portion of the Budget Estimates as accurately as possible. The complete Budget Estimate should be submitted on the prescribed date, viz., the 1st January.

6. Separate orders will be issued to the several Local Governments and Administrations concerned, regarding the reduction made in their demands for agricultural works.

ORDER.—Ordered that this Resolution be communicated to the several Local Governments and Administrations noted in the margin for information and guidance, and to the Financial Department for information.

Governments of Madras, Bombay, Bengal, North-Western Provinces, and Punjab, in the Irrigation Branch.
Chief Commissioners of the Central Provinces, British Burmah, and Coorg.
Governor-General's Agent for Rajpootana.

(Signed) C. H. DICKENS, Colonel, R.A.,
*Secy. to the Govt. of India.*

GOVERNMENT OF _____

BUDGET ESTIMATE OF THE IRRIGATION DEPARTMENT FOR 1874-75.

Part III.

*Detail of Estimate for Original Works, Irrigation, for the year 1874-75.*

| Executive Divisions. | No. | Detail of Work and Locality. | Amount of Estimate. | Computed Expenditure to 31st March 1874. | ESTIMATE 1874-75. | | | Remarks or References. | Amount of Supplementary Estimate for 1874-75. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. | Ordinary. | Extra-ordinary. | | Ordinary. | Extra-ordinary. |
| | | | | | | | | | | |

NOTE.—Should it be considered necessary, when preparing the Budget, to distribute a portion of the proposed Supplementary grant to either Repairs, Establishment, or Tools and Plant, an additional column should be added to those parts of the Budget in a manner somewhat similar to that done here.



2018
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No. 321E. From Colonel C. H. DICKENS, R.A., Secretary to the Government of India, Public Works Department (Irrigation), to Colonel G. W. WALKER, R.E., Secretary to the Government of Madras in the Public Works Department, Irrigation Branch, dated Fort William, 9th December 1873, No. 854-I.

I AM directed to forward, herewith, copy of a despatch from the Secretary of State, No. 59, dated 10th July 1873, reviewing the particulars of the case connected with the Madras Water Supply Project, and to observe as follows.

2. As regards the probable cost of the work, the Government of India are much disappointed to learn from a report made by the Accountant-General, Public Works Department, that the total outlay on the work is likely to amount to more than fifteen lakhs instead of Rupees 12,25,558, the increase being due to no provision having been made in the estimate for establishment and tools and plant. The actual outlay on the project to end of 1871-72 is reported to have amounted as follows :—

| —— | From Loan Funds. | From Ordinary Grant. | Total. |
|---|---|---|---|
| | Rs. | Rs. | Rs. |
| Works ... ... ... ... ... ... | 8,45,616 | 2,02,106 | 10,47,722 |
| Establishment ... ... ... ... ... | 1,64,231 | 60,030 | 2,24,261 |
| Tools and Plant ... ... ... ... | 7,901 | 6,000 | 13,901 |
| | 10,17,748 | 2,68,136 | 12,85,884 |

The actual outlay of 1872-73, and the grant for 1873-74, both from Ordinary Funds, is as follows :—

| —— | Works. | Establishment. | Tools and Plant. | Total. |
|---|---|---|---|---|
| | Rs. | Rs. | Rs. | Rs. |
| 1872-73, Outlay ... ... ... ... | 92,883 | *20,000 | *2,000 | 1,14,883 |
| 1873-74, Grant ... ... ... ... | 77,000 | 25,015 | 1,123 | 1,03,138 |
| | 1,69,883 | 45,015 | 3,123 | 2,18,021 |

*Approximate.

Combining the actual outlay with the probable charges, the result is as follows :—

| —— | Loan Funds. | Ordinary Funds. | Total. |
|---|---|---|---|
| | Rs. | Rs. | Rs. |
| Works ... ... ... ... ... ... ... | 8,45,616 | 3,71,989 | 12,17,605 |
| Establishment ... ... ... ... ... ... | 1,64,231 | 1,05,045 | 2,69,276 |
| Tools and Plant ... ... ... ... ... | 7,901 | 9,123 | 17,024 |
| | 10,17,748 | 4,86,157 | 15,03,905 |

The Government of India must beg of the Government of Madras to take immediate steps to have a report submitted, to show how the omission of the charges for establishment and tools and plant in the last revised estimate occurred, and escaped notice. A detailed report should also be submitted, showing what the eventual total cost of the project [including charges for simple accumulated interest, and capitalization of the revenue lost by the land taken up for the work] under all heads is likely to amount to.

3. The increased outlay on the project renders it less likely than ever that the returns from the work will be such as to justify the debit of any portion of the expenditure incurred to Loan Funds. It, therefore, becomes necessary to give effect to the wishes of the Secretary of State, that the sum already spent under "Extraordinary" should be refunded from the Ordinary grant, the amount to be so refunded being, as above shown, Rupees 10,17,748.

4. The Government of India being desirous to afford every assistance in its power to the Government of Madras to make such a refund, have authorized the Accountant-General, Public Works Department, to debit the Ordinary grant and credit the Extraordinary grant with a sum of Rupees 5,70,000 in the accounts of 1872-73 for the Madras Water Supply Project. This adjustment leaves a sum of Rupees 4,47,748 to be credited to the Extraordinary grant, and the Governor-General in Council thinks it would be proper, in the interests of financial regularity, to require that the amount should be made good partly from Provincial Funds, and partly from the Imperial Ordinary grant for agricultural works.

5. Of the total sum to be recovered it is consider that two lakhs should be made good from Provincial Funds by annual instalments of Rupees 50,000, each commencing from 1874-75. The work is more "Miscellaneous Public Improvement" (being chiefly connected with the supply of water to the town of Madras) than Irrigation, and it would, therefore, seem to be quite appropriate to require that a portion of the outlay should be made good from Provincial Funds. This proposal, I am to add, is somewhat in accordance with that suggested in paragraph 21 of your letter No. 312, dated 23rd August 1871, in which it was proposed that a sum of Rupees 4 lakhs should be recovered from the Government of Madras on account of this project.

6. As regards the balance of the sum of Rupees 2,47,448 that would have to be made good to Loan Funds, the Government of India have no objection to its being recovered in three instalments from the Ordinary grant for agricultural works. The assignment made in the Madras Budget for 1873-74 for the Madras Water Supply Project is Rupees 1,03,138, and proceeding on the assumption that the project will be completed during the current official year, it requires only the continuance of the provision in the Budget Estimates of the next two years, and providing sufficient to meet the remainder in the third year to give effect to the proposal.

7. Before issuing final orders to this effect, the Governor-General in Council desires to receive and consider an expression of the views of the Government of Madras on the subject.

8. It is understood that the work has been nearly completed, and the Government of India are naturally anxious to learn what immediate prospect there is of getting the small return expected from the large outlay invested. The



Governor-General in Council would be glad to receive a report on the subject at an early date from the Government of Madras. The principal source of revenue is from the Madras Municipality. The terms on which the Corporation are being supplied with water are that they are to pay 1 Rupee for every 1,000 cubic yards which the Municipality may use out of the 32,000,000 held at their disposal. It is not known what arrangements have been made by the Government of Madras to ascertain the quantity of water used, nor from what year the Municipality should commence to pay for the water consumed. In all probability the payment should have effect from the current year, but in the estimate of Public Works revenue for 1873-74 no provision is made for the receipt of this payment. An explanation on this point is specially desired, and it should be stated at the same time whether the estimate made of the cost of revenue expenses, amounting to Rupees 11,500 per annum, is trustworthy, or not. The estimate does not provide for the cost of collection, and there would, therefore, seem to be some reason to doubt whether it is complete.

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From the Right Honourable the Secretary of State for India, to His Excellency the Right Honourable the Governor-General of India in Council, dated India Office, London, 10th July 1873, No. 59.

YOUR Excellency's letter, dated the 21st of February, No. 27, transmits an explanation regarding the charges which the Municipality of Madras will have to meet on account of the project for the supply of water to that city.

2. In the letter addressed to me by your Government on the 16th of February 1872, No. 20, which apparently reviewed the whole history of the scheme, no allusion was made to the loan of about thirteen lakhs to the Municipality for the purpose of carrying out the works for distributing the water; and my attention was, in consequence, not drawn to the circumstances connected with that part of the transaction.

3. On referring however to the papers which accompanied the letter from your Government of the 3rd of September 1869, No. 120, I learn that two alternative plans were submitted to the Municipality, by the one of which they were to become joint proprietors with the Government in the works which were being carried out under the title of the Madras Water Supply Project, and were to be entitled to the free use of a certain supply of water; while by the other they were to borrow, at six per cent. interest, a sum of Rupees 12,80,000, for the construction of the distribution works, and, further, were to pay at the rate of 1 Rupee for every 1,000 cubic yards of water which they might use out of the 32,000,000 cubic yards held at their disposal. Although the first of these proposals had been submitted to the Municipal Commissioners as embodying the more favourable terms, they nevertheless elected the second, because they anticipated that the works, over which they had no control, would cost far more than the estimate.

4. In your Resolution of the 1st of February 1869 orders had been given for the revision of certain calculations, with the view of ascertaining, before final orders were passed, whether there was sufficient water for the project. I do not find it stated in the papers that any steps were taken to satisfy your doubts on this point; but, notwithstanding, on the choice of the Municipality being intimated to your Government, final orders were issued on the 25th of June 1869 granting them the loan on the terms originally proposed.

5. Bearing this in mind, I must admit it to be impossible to demand from the Municipal Commissioners a higher payment, now that it has been found, as they anticipated, that the works have been more expensive than was estimated by the Government Engineers. It was only under a misapprehension of the position of affairs that the consent to such a demand was given in my despatch of the 18th of April 1872, No. 35.

6. The following, then, appears to be the actual state of the project. The works have cost Rupees 12,25,558; the receipts are estimated at Rupees 29,772 from the irrigation of waste lands, to be supplemented by a payment at the rate of 1 Rupee for each 1,000 cubic yards which the Municipality may use out of the 32,000,000 held at their disposal. Assuming that they take the whole, and therefore pay Rupees 32,000, the aggregate gross receipts will be Rupees 61,772, and the net receipts, after allowing for the deductions mentioned in the 15th paragraph of your Government's letter of the 16th of February 1872, will be about 4 per cent. on the total outlay.

7. It being clear that such a result is not one which justifies the debit of the expenditure against Loan Funds, your Excellency proposes to charge in that manner the eight lakhs which formed the estimate for the revised project, and to recover the remainder gradually from the ordinary agricultural and provincial assignments to Madras, this being, in your opinion, the only course which will avoid the effect of crippling the operations of the Public Works Department in Madras for some years to come.

8. I regret that I cannot concur with your Excellency as to the mode in which the difficulty should be met. It is entirely opposed to the policy under which expenditure on remunerative works of irrigation is permitted to be undertaken from borrowed money, that any portion of the cost of a work which is shown to be unremunerative should be debited against Loan Funds. One of the most wholesome checks on the tendency to be over-sanguine in preparing projects of irrigation would be removed if the local authorities had reason to think that, whether the work should eventually prove remunerative or not, the amount of the original estimate would be obtained from borrowed money, and that the allotments for other works would only be curtailed to the extent by which that first estimate might have been exceeded.

9. In the case of the Madras Water Supply Project, I leave it to your Excellency to determine in what manner the cost may be met with least detriment to the public interests; but no part of either the principal or interest of the money laid out in such a scheme should be eventually debited to Extraordinar funds. If unfortunately the result of your orders should be to cripple the operations of the Public Works Department at Madras for a time, I can only look on it as an evil which is the necessary consequence of an arrangement entered into by the Madras Government without due care in the examination of the estimates, and without sufficient forethought as to the receipts likely to be realized.

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Read the following papers:—

No. 321F. From the District Engineer, Vizagapatam, through the Chief Engineer for Irrigation, dated 9th December 1873, No. 1,696.
No. 321G. From do. do. Godavery, do. do. dated 22nd Nov. 1873, No. 2,526.
No. 321H. From do. do. Kistna, do. do. „ „ „ „
No. 321I. From do. do. Nellore, do. do. „ 28th Oct. „ „ 107.
No. 321J. From do. do. Kurnool, do. do. „ 5th Nov. „ „
No. 321K. From do. do. Chingleput, through the Chief Engineer for Irrigation, dated 17th November 1873, No. 2,194.
No. 321L. From do. do. North Arcot, do. do. „ 30th Oct. „ „ 2,389.
No. 321M. From do. do. South Arcot, do. do. „ 1st „ „ „ 220.
No. 321N. From do. do. do. do. do. „ 29th „ „ „ 144.
No. 321O. From do. do. do. do. do. „ 14th „ „ „ 131.
No. 321P. From do. do. Tanjore, do. do. „ 20th „ „ „ 724.
No. 321Q. From do. do. Tinnevelly, do. do. „ 17th „ „ „ 110.
No. 321R. From do. do. Presidency, do. do. „ 20th Dec. „ „ 4,508.



2018/31

No. 321S. ORDER THEREON, 24th January 1874, No. 162B.

IRRIGATION, No. 32.
*Account.*

IN the letter and Resolution above recorded, the Government of India make the allotments of funds for Irrigation Works for the year 1874-75 to this Presidency, and to the several Provinces. Under "Extraordinary" it is observed that, as all works for which estimates have not been already sanctioned have been struck out, the grant of Rupees 7,75,000 will more than suffice.

2. Under "Ordinary" the sum asked for was Rupees 24½ lakhs, and this has been reduced to 22½ lakhs, the grant of 1873-74; while, in their letter of the 9th December, No. 854-I., a refund of 1½ lakhs to Loan Funds, on account of the expenditure from that source on the Madras Water Works Project, has been directed by the Government of India to be made.

3. His Excellency the Governor in Council is of opinion that it is not practicable to make a refund of 1½ lakhs out of the grant assigned. In the Budget Estimates as compiled by the Chief Engineer for Irrigation the entries for Major Works under "Capital Ordinary" are eight in number, and their total is Rupees 1,10,000. Of these works the only two of any magnitude are the Madras Water Works, and the Chembrumbaukum Tank, to which Rupees 30,000 and 50,000 have been allotted respectively. The other six entries are for small works in progress, for two head-sluices intended to prevent a repetition of the damage caused by floods in the Tambrapoorney a few years ago, and the construction of which has been already too long delayed, and for concrete and cement experiments which are necessary in order that the lime-stones used on the Godavery Delta Works may be properly treated. There is manifestly not much room for retrenchment here, and it has accordingly not been found practicable to provide the one lakh directed to be entered for village drainage in the Godavery Delta (*Vide* G. O., No. 1,267, dated 10th December 1873, Public Department), nor the Rupees 20,000 promised in G. O., No. 3,081-A., dated 30th December 1873, for the Polaveram embankment. Under "Capital Ordinary" the other provisions are for—

| | Rs. |
|---|---|
| Minor Works ... ... ... ... ... ... ... | 1,03,550 |
| Tools and Plant ... ... ... ... ... ... ... | 25,000 |

Of the former, Rupees 30,000 are intended to meet the required appropriations for Incomplete Works of the current year, and the contingent demands for works which it may be necessary to sanction during the year, while the balance is for the Petty Works in the shape of sluices, escapes, and distributaries which ought to be provided for faster than any such assignment will permit. The entry for tools and plant needs no remark as such appliances cannot be dispensed with. Establishments are estimated at five lakhs.

4. Under "Repairs" the Budget Estimates show—

| | Rs. |
|---|---|
| For Repairs of Works ... ... ... ... ... ... ... | 13,67,050 |
| Tools and Plant ... ... ... ... ... ... ... | 30,000 |

The first is greater by Rupees 7,050 than the grant of 1873-74, which there is every probability will prove inadequate. For the security of the revenue and

to make up for past neglect, it is necessary that the grant should be liberal, and that District Officers should be required to pay more, rather than less, attention to a matter of so much importance. The area of irrigation in this Presidency was, for the year 1871-72, 4·829 millions of acres, with a revenue of 193 lakhs. This area has certainly not decreased since then, but it is on the other hand constantly on the increase, and a frequent and reasonable remark on the part of those who pay this special revenue, and do not get the water they require, owing to funds not being available to effect clearances or carry out repairs, is that, so long as they are called upon to pay for water, the Government ought to ensure its reaching them.

5. The Budget Estimates provide for a refund of one lakh, and the Government of India will be requested to accept them as they stand. If a larger refund be considered necessary, in order that Loan Funds may be recouped for unremunerative outlay, His Excellency in Council considers that the assignment should be increased. The grants for New Works have year by year been greatly reduced, owing to such works being now to a considerable extent carried out from Loan Funds, and, consequently, there is very little money left under "Ordinary" from which a retrenchment can be made. Should the Government of India decline to accede to this proposition the allotment to the Madras Water Works must be cancelled, and that for the Chembrumbaukum Tank reduced to Rupees 30,000.

(Here enter No. 162c., dated 24th January 1874.)

(True Extract.)

(Signed) G. W. WALKER, Colonel, R.E.,
*Secretary to Government.*

To the District Engineers.
To the Chief Engineer for Irrigation.
" Revenue Department.
" Board of Revenue.
" Accountant-General.
" Officiating Controller of Public Works Accounts.
" PL Dept

Exd. W. H. French.
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3/1/84.

Govt. of 1874 Madras.

PUBLIC WORKS.

To

DISTRICT ENGINEERS,

&c., &c., &c.

Dated January 24th.

Read

Encl.

G. O., 24th January 1874, No. 162B.

JANUARY.

Nos. 321OC-321S

*Irrigation Budget Estimate.*—Passing orders on the Budget Estimate of the Irrigation Department for 1874-75.

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PUBLIC WORKS DEPARTMENT,

FORT ST. GEORGE, *24th January* 1874.

No. 321T.

No. 162C.

FROM

COLONEL G. W. WALKER, R.E.,

*Secretary to the Government of Madras,*

*Public Works Department,*

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,

*Public Works Department.*

| IRRIGATION, No. 33. |
|---|
| *Account.* |

SIR,—I am directed to forward herewith the Budget Estimate of the Irrigation Department for the year 1874-75, together with a copy of Proceedings of Government thereon.

2. It is hoped that the estimate as now submitted will be found to approximate more closely than that of the previous year to the requirements of the Government of India, but the explanations furnished in letter of the 3rd November 1873, No. 2,684, and in the memorandum of the Chief Engineer for Irrigation recorded in the accompanying copy of G. O., No. 2,731, of 10th November 1873, will, it is confidently expected, satisfy that Government that, while every effort is being made for the gradual adoption of the forms laid down for guidance under systems of administration which are so essentially different, it is not at present possible to conform to those forms in their entirety; and in consideration of the grounds which are so fully and clearly set forth in Colonel Mullins' memorandum, His Excellency the Governor in Council requests that the Budget Estimate for the cufrent year, as now submitted, may be accepted.

3. The grants as made by the Government of India and as apportioned in the Budget are given below; the works on which it is proposed to utilize the grants being also shown:—

*Agricultural Extraordinary.*

| — | — | — | Proposed allotment. |
|---|---|---|---|
| | Rs. | | Rs. |
| Grant for Extraordinary Works from Loan Funds. | 7,75,000 | *Godavery*.—Eastern Delta ... | 1,59,300 |
| | | *Do.* —Western do. ... | 1,95,000 |
| Add refund from Ordinary Grant on account of the Madras Water Supply Project. | 1,00,000 | *Kistna*.—Pulleru Channel ... | 12,645 |
| | | *Do.* —Masulipatam Canal ... | 30,000 |
| | | *Do.* —Seetanagaram do. ... | 23,254 |
| | | *Do.* —Ryves' Channel ... | 30,000 |
| | 8,75,000 | *Nellore*.—Pennair Anicut Survapally Project. | 22,774 |
| Deduct for Establishment ... ... | 1,75,000 | *South Arcot*.—Palandorai Project. | 20,000 |
| | 7,00,000 | *Tinnevelly*.—Streevigunturn do. | 1,09,590 |
| Do. for Tools and Plant ... | 30,000 | | 6,02,563 |
| | | Not required .. | 67,437 |
| | 6,70,000 | | 6,70,000 |

*Ordinary.*

| — | Grants as made by Government of India. | — | Amount Applied for by District Engineers. | Proposed allotment. |
|---|---|---|---|---|
| | Rs. | | Rs. | Rs. |
| For Original Works ... | 3,55,000 | *Godavery*.—Concrete Experiments. | 2,000 | 2,000 |
| ,, Repairs ... ... | 13,60,000 | *Kistna*.—Budam Project ... | ... | 6,000 |
| ,, Establishment... ... | 5,12,000 | *Do.* Peddakuncherla Tank | 2,680 | 2,000 |
| ,, Tools and Plant ... | 23,000 | *Chingleput*.—Madras Water Supply Project. | 31,469 | 30,000 |
| | 22,50,000 | *Do.* Chembrumbaukum Tank Project. | 67,166 | 50,000 |
| Deduct refund to Extraordinary Grant on account of the Madras Water Supply Project. | 1,00,000 | *North Arcot*.—Seesamungalam Tank. | 8,000 | 8,000 |
| | | *Tinnevelly*.—Murdur Anicut Head-sluice. | 6,000 | 6,000 |
| | | *Do.* Cannadien Channel do. | 6,000 | 6,000 |
| | | | 1,23,315 | 1,10,000 |
| | | Minor Works .. ... ... | ... | 1,03,560 |
| | | Repairs .. ... ... | ... | 13,67,050 |
| | | Establishment ... ... | ... | 5,00,000 |
| | | Tools and Plant (Capital) ... | ... | 25,000 |
| | | Do. Repairs ... ... | ... | 30,000 |
| | | State outlay on guaranteed Irrigation works. | ... | 14,400 |
| | 21,50,000 | | .. | 21,50,000 |

4. It will be observed from the Proceedings herewith forwarded that His Excellency the Governor in Council is of opinion that it is not practicable to make a refund to "Extraordinary" of more than one lakh out of the Ordinary grant on account of expenditure on the Madras Water Works Project. Of the eight works provided for in the Budget Estimate under "Capital Ordinary" it will be perceived that there are only two of any magnitude, viz., the Madras Water Works and the Chembrumbaukum Tank, for which Rupees 30,000 and Rupees 50,000 have been respectively assigned, and if the Government of India insist on the refund of the full amount fixed in their letter, No. 271-A.—I., dated 4th November 1873, I am to request that the grant may be increased, or His Excellency in Council will be reluctantly compelled to omit entirely the Madras Water Works Project and reduce the grant for the Chembrumbaukum Tank Project to Rupees 30,000. There being no room for retrenchment from the other six small works entered or from the sums set apart for Minor Works or Tools and Plant. On the other hand, it is anticipated that the requirements under "Minor Works" as well as "Repairs" will exceed the provisions which have been made for these services.

5. The question of the apportionment of establishment charges and of those on account of tools and plant are still under consideration, and without entailing the delay which their settlement will unavoidably involve, it is not possible to prepare Parts V. and VI. of the new forms in the detailed manner which the Government of India require. The necessary steps have however, as will be seen, been taken to ensure those details being made out.

I have the honour to be,

Sir,

Your most obedient servant,

(Signed) G. W. WALKER, Colonel, R.E.,

*Secretary to Government.*

Exd. W. H. French.

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Govt. of Madras. 1874

PUBLIC WORKS.

To

THE SECRETARY TO THE GOVERNMENT OF INDIA

Dated January 24th.

Read. Encl.

G. O., 24th January 1874, No. 1620.

JANUARY.

No. 321

Forwarding, with remarks, Budget Estimate of the Irrigation Department for 1874-75, together with a copy of Proceedings of Government thereon.

*Proceedings of the Madras Government, Public Works Department, 30th January 1874.*

219/35

Read the following papers:—

No. 816A.

No. 432. *Note by the Chief Engineer for Irrigation.*

THE views of the Accountant General of the Public Works Department with regard to the accounts required appear to be likely to deprive the State of much of the benefit it would otherwise derive from Public Works outlay, by taking up far too much of the time of the professional officers of the department on matters foreign to their proper duties, thus directly leading to insufficient supervision and to wasteful and consequently unnecessary expenditure. Added to this the Accounts Branch of the Public Works Establishments is becoming a most serious charge under that head, and it is not only my conviction but that of most of the officers of the department, with whom the subject has come under discussion, that the greater part of this charge is incurred for work which not only is of no value but which is a cause of loss. From a condition of next to no accounting at all, a re-action has carried the department into a state of affairs which threatens to leave nothing but accounts. Officers have to time their movements and make their arrangements, not with reference to the requirements of the works in their charge, but with regard to the numerous, I may say endless, accounts and returns which they now have to furnish. No one would desire to see any slackness in accounting for expenditure, but the works and not the accounts are, or rather should be, the first consideration, and this natural order of precedence has been, I think, far too much lost sight of.

2. Classifications of work and expenditure are a cause of much waste of time, and consequently of much unnecessary expense. It is perhaps useful to know what has been the cost of (1) providing or carrying a certain supply of water for irrigation, and (2) then of distributing it, also (3) the cost per acre of the project, and (4) the return per acre obtained, with some other particulars of the same kind, although it may be safely stated that even with regard to such general features no two projects are really comparable; but the classification of irrigation projects under scores of heads and sub-heads for main canals and branches, and distribution works, respectively, is of no use for purposes of direction, and must also be useless for those of comparison. Were they made any use of at all, which appears to be improbable, they would only mislead. In the same Presidency, in contiguous districts, in different parts of the same district, conditions and circumstances vary greatly, and comparison is impracticable.

3. The above apparent digression from the particular subject referred by the Government of India has seemed to me necessary to a right understanding of the propositions of the Accountant General, Public Works Department, with regard to provision for establishments in estimates of projects. He shows that establishments employed upon, or connected with, projects are of two kinds: the one those which are already in the service of the State and would be retained whether the projects were carried out or not, and the other those which are specially provided for employment on the works. It would seem that the former could affect in no way the question as to whether the works should be sanctioned or not, and that only

indirectly can the charges on their account be said to have anything to do with the cost of the works. In my opinion, therefore, no provision should be made in the estimate for a work on account of "direction and account." That estimate should show as completely as possible what total outlay the work will involve, but provide for no expenditure which is not due to the execution of the work. If the Government of India desire charges on those accounts to be ultimately debited to individual works, this may be done annually in the accounts office by a distribution by percentage to large works, and for the rest to classes of works. There is practically no limit to the amount of detail which the Accounts Department may demand, but the useful limit is not a very wide one, and I think it has long since been passed. A merchant who would not be content with knowing that he had invested Rupees 1,000 in, say, cotton, and had obtained Rupees 1,200 on its resale, but must have added to the cost of his investment a careful account of the share of his time, and of his 1st and 2nd and 3rd Clerks' time, a fraction of the office messenger's time, items for paper envelopes, wafers and postage stamps, etc., would soon find that the establishment needed for this minute investigation had seriously wasted his profits.

4. With regard to the provision in estimates for tools and plant, it appears to be quite proper that this should be made as accurately as possible, so far as large works are concerned; but it will be a matter of regret if much difficulty be experienced in varying the amount with the concurrence of the officers best able to judge of the propriety of the proposals. It is, I believe, quite impossible to judge accurately beforehand of the outlay on this account, and engineering works of difficulty cannot be successfully carried out under the hard and fast system which mere accountants may think suitable. In this Presidency there are however thousands of works carried out yearly for which no special provision for tools and plant can or should be made. It is much better and certainly much more economical that they should be furnished with such appliances as may be necessary out of lump sum grants, based on the experience of former years, but generally on a rather more liberal scale than has hitherto been customary; for I have observed all over the country that tools are not kept generally in an efficient state, and this means that those using them are doing less work, and that the latter is costing more than is right.

5. With regard to variations between estimated and actual cost of works, I would wish to remark that these are in a great measure due to circumstances for which the framers of the estimates are in no way responsible. The cost of a work within the limits of a very wide percentage depends much more upon the qualifications of the executive officers than upon any system of accounts and returns, or any care and pains taken with the preparation of the estimates. The latter may be ample for one officer and altogether inadequate for another, and it is perhaps not incorrect to say that, whatever their amount, some officers would by good management effect a saving, and others by bad management occasion excess.

ELLORE CANAL, (Signed) J. MULLINS, Lieut.-Colonel, R.E.,
21*st November* 1873. *Chief Engineer for Irrigation.*

*Proceedings of the Madras Government, Public Works Department,*
*30th January* 1874.

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Proceedings of the Government of India, Public Works Department, (Account—Irrigation,) dated Simla, 5th November 1873, No. 290-4 A—I.

*Provision for Establishment and Tools and Plant for Irrigation Projects.*

Read the following:—

*Note by* Lieutenant-Colonel P. P. L. O'CONNELL, R.E., *Officiating Accountant General, Public Works Department, on provision for Establishment and Tools and Plant for Irrigation Projects,— No.* 288 *I.* (*Account—Irrigation*), *dated 7th October* 1873.

I DEEM it my duty to bring to the notice of the Government of India the desirability for impressing upon Local Governments and Administrations the necessity for seeing that proper provision is made in their estimates of irrigation projects for charges for Establishment and Tools and Plant.

2. As showing the necessity for action in the matter, I would refer to a few cases in which no provision, or in which inadequate provision, has been made for the charges referred to:—

I.—Madras Water-supply project. No provision whatever made in the charges referred to.

II.—Sunkum Project. Inadequate provision.

III.—Orissa and Soane Projects. Inadequate provision. A mere reference to paragraphs 17 to 19 of the Irrigation Budget Orders for 1873-74 will show this to be the case.

IV.—Agra Canal Project. Most inadequate provision; which has already been exceeded, *vide* paragraph 17 of Irrigation Budget Orders for 1873-74.

V.—Lower Ganges Canal. Inadequate provision, *vide* paragraphs 15 and 16 of Budget Orders above mentioned.

VI.—Baree Doab Canal, Kussoor and Subraon Branches. Provision estimated at 12 per cent. of outlay on works, but office contingencies and tools and plant, as well as travelling allowance, said to be covered by the 10 per cent. for contingencies.

In the estimate for the Ravee weir and remodelling of this canal, Chief Engineer says 'Tools and Plant' are included in the general percentage. "Establishment is not included until I know the proportion which office contingencies and travelling allowances bears to establishment salaries; I cannot say whether the general contingencies will cover them," etc.

Similar remarks are applicable to the case of the Sirhind Canal.

3. I submit that this state of things calls for remedy. In some cases the establishment is provided at 10 or 12 per cent. of the provision for works, a most inadequate rate. In other cases, no provision is made for travelling allowances or contingencies, or for proportionate share of direction or account. In a few cases the period which it will take to complete the work is under-estimated, and the result is that the consequent charges for establishment are also under-estimated. It is not done purposely, but in ignorance really of what is required, or in the hope of its being possible to do the work for the amount provided.

4. So important does the subject seem to me that I issued a circular to Controllers requiring them to report in all cases when it is probable that the provision for establishment will be exceeded. I attach for information copy of that Circular No. 28 of 1873. The duty therein laid on Controllers consists in their having to pass the charges for establishment against the provision for the purpose made either in the estimate for the work, or in the report on the same, just in precisely the same way as they are required to audit the charges for earthwork or masonry, so have I required them to pass the charges for establishment. Thus there will be three limits on the charges for establishment, viz.:—

I.—The proper sanction of Government to the incurring of the charges, such sanction being given in the usual way as at present.

II.—The Budget grant for establishment.

III.—The provision for establishment as made in the estimate for the scheme on which the establishment is employed.

5. I venture to ask for the sanction of Government to what I have done. Anticipating such sanction, I proceed to state how I consider that practical effect should be given to it.

6. The establishment employed in incurring expenditure on capital account of irrigation works is of two kinds :—

I.—Establishment already existing, and which would have to be retained even if the new works were not commenced.

II.—Establishment to be employed especially on the project.

7. In the former class of establishment, the rules require that a certain percentage should be debited to capital account. These rules I would maintain. But I would require that in every such case the opinion of the Controller should first be obtained before the percentage is fixed.

8. In the second class of establishment, I would require that a regular detail of the establishment to be employed, and the period for which they are to be employed, should be furnished, and in both cases I would lay down that special care is taken to see that due and adequate provision is made for proportion of charges for direction and account.

9. To prevent omissions, I would lay down, as a rule, that after the total of the abstract of an estimate, the necessary provision for establishment and tools and plant should be added.

10. And to admit of a watch over the expenditure, I would add to the budget estimate and to the appropriation account the additional columns mentioned in paragraph 5 of my Circular No. 28 of 1873 as being necessary.

11. To provide for omissions and accidents, I would require that in concert with the Controller, every estimate already sanctioned for irrigation works should be over-hauled at once to see whether proper provision has been made for the charges referred to, and also for maintenance* charges which are sometimes so inadequately provided for as necessarily to mislead Government as to the financial prospects of projects recommended for sanction. If proper provision has not been made, I would require the immediate submission of a revised estimate. The matter is most important, and, to my mind, it would appear that immediate attention should be paid to it.

* i. e., repairs during and after construction of works, etc.

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Circular from Lieutenant-Colonel P. P. L. O'CONNELL, R.E., Officiating Accountant General, Public Works Department, to all Controllers of Public Works Accounts, dated Simla, 25th September 1873, No. 28 G. S., No. 3 I. S.

SEVERAL cases having recently occurred in which the absence of provision, or insufficient provision, for establishment and tools and plant in the general estimate of capital outlay on irrigation projects was not brought to notice by Controllers, I have the honour to intimate that for the future it will be looked upon as a serious portion of the duties of an Account Office to bring to notice cases in which it is found that there is no provision, or insufficient provision, for the charges referred to.

2. As you are aware the detailed estimate for a project is confined to providing for the actual charges on the work itself, including provision for its maintenance while the work is under construction. The probable charge for establishment and tools and plant, as also that for interest and capitalization of abatement of land revenue, is made in that portion of the report on the project in which the returns to be derived from it are estimated. For the present you should, in cases when you receive the estimate for a project, ask the Chief Engineer for the report on the same, to ascertain the amount, if any, provided for the heads of charge referred to.

3. The amount thus provided should be considered by you as the basis on which your debits to capital for establishment and tools and plant should be compared. If there is any excess, or tendency to excess, over such provision, it will become your duty to bring the fact to the notice of the Local Government or Administration, as well as to this Office.

4. As regards tendency to excess there ought to be no difficulty to ascertain the circumstances on this point. Thus the provision for establishment is either made on a certain scale for a certain number of years, or according to a percentage based on the outlay on works. If you find that the work is likely to be in progress for a longer period than is anticipated, and that the provision for establishment will be exceeded in consequence, a report of the circumstance should be made at once. If in any case the percentage of the amount is too low, that fact should be reported,



and if no provision is made for charges for direction and account, or for travelling allowances and contingencies, or if two Executive Engineers are employed when one only is provided for in the scale, your duty consists in bringing the matter to notice. In fact, just in precisely the same way as you watch the expenditure on earthwork or masonry work connected with a project, so are you expected to watch the charge for establishment and tools and plant.

5. The question of making establishment and tools and plant a sub-head of work in the estimate is now under consideration. If the proposal be sanctioned, the check now enjoined would be much simplified. Meanwhile you are expected to take such measures as will admit of that check being exercised. In this view your immediate attention should be devoted to ascertaining whether the provision made for establishment and tools and plant for works in progress is sufficient or not. The point is most important, and after this warning no excuse will be accepted if what is required is not attended to. On this point I would invite your attention to paragraphs 5 and 6 of my Circular No. 41 of 1872. I may add that to complete the check enjoined, I shall suggest to the Government of India the desirability of adding certain columns to Appendix Part V. as well as to Part VI. of the Budget Estimate to show—

Rs.

Amount of sanctioned estimate ... ... ... ...
Computed charge to end of ... ... ... ...
Probable charge for ... ... ... ... ...

and to add columns in the corresponding portions of the appropriation account to show actual charges compared with estimate.

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ORDER.—Ordered, that the Note read be communicated to the Local Governments noted in the margin, for an expression of opinion as to how the requirements of the case can be most appropriately met.

Governments of Madras, Bombay, Bengal, North-Western Provinces, and Punjab, in the Irrigation Branch.

(Signed) C. H. DICKENS, Colonel, R.A.,
*Secretary to the Government of India.*

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No. 433. ORDER THEREON, 30th January 1874, No. 219.

IRRIGATION, No. 44.
*Account.*

His Excellency the Governor in Council is of opinion that the views expressed by the Chief Engineer for Irrigation regarding the questionable utility of the great and increasing elaboration of the accounts ordered to be prepared in the Irrigation Branch of the Public Works Department, and the multiplication of forms and statements, are worthy of careful consideration. Not only is the cost of the Accounts Department proper rapidly on the increase, but a large portion of the office establishments of the directing and executive officers is occupied with accounts, and the time of those officers themselves is diverted far too much from their more legitimate and important professional duties. His Excellency believes that Government must look rather to the professional officers of the department than to any system of accounts to secure fair accuracy in estimates of the cost of works, and that there is danger in supposing that any estimates for large irrigation projects can be more than the best approximations, based on the best available data. The preliminary enquiries may easily be made to cost more, and yet the estimates be not any the more reliable.

*Proceedings of the Madras Government, Public Works Department,*
*30th January* 1874.

2. The Government concur with the Chief Engineer for Irrigation in thinking that no advantage can accrue from including in the cost of works charges which do not directly appertain to them. These, as charges of the Public Works Department, may, if thought advisable, be ratably distributed on any principle which may be thought desirable, but, inasmuch as they can never be correctly determined for individual works, it is believed that such items of indirect cost, as those relating to direction and account, would be better left out of consideration. It is indeed manifest that to obtain an even apparently complete summary of all charges direct and indirect a portion of the cost of most of the branches of administration both in India and in England would need to be included.

3. His Excellency in Council considers that provision for tools and plant should be made in the estimates of all large works, and that reasonable discretion should be left to directing officers to vary the charge on this account. In this Presidency the majority of the works need no such provision individually, and their very moderate wants should be met from the general plant of the districts which should be supplemented or replaced from time to time out of lump sum grants.

4. Ordered that a copy of these Proceedings be forwarded to the Government of India with reference to their Resolution of the 5th November 1873.

No. 290-4 A.—I.

(True Extract.)

(Signed) J. MULLINS, Lieut.-Colonel, R.E.,
*Joint Secretary to Government.*

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No. 434. (Docket No. 220, dated 30th January 1874.)

Copy of the above forwarded to the Government of India.

(True Extract.)

(Signed) J. MULLINS, Lieut.-Colonel, R.E.,
*Joint Secretary to Government.*

Exd. S. T. Austin.
Spare Copies

Govt. of 1874 Madras.

PUBLIC WORKS.

To

THE SECRETARY to the GOVERNMENT

of INDIA.

Dated January 30th.

Encl.

Read.

G. O., 30th January 1874, No. 220.

JANUARY.

Nos. 432-434

Forwarding copy of Proceedings on Note by the Chief Engineer for Irrigation on Resolution of the Government of India regarding the provision for establishment and tools and plant for irrigation projects.



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Read the following papers :—

No. 58. Read again letter from the Government of India, No. 3 A.I., dated 7th January 1875, recorded in G. O., No. 1,289, dated 5th May 1875.

No. 271.

MEMORANDUM.

*Madras Water Works Project.*

In their letter, No. 854 I., of the 9th December 1873, the Government of India asked for certain information regarding the Madras Water Works Project, in connection with a despatch from the Secretary of State. The points on which information is desired are—

1*st.*—Why in the revised estimate provision was not made for Establishment and Tools and Plant.

2*nd.*—What will be the eventual cost of the project, including charges for simple accumulated interest, and capitalization of the revenue lost by the land taken up for the work.

3*rdly.*—What immediate prospect there is of getting the small return expected from the large outlay invested.

Also in paragraphs 3 to 6 of the letter certain orders were passed for the transfer to ordinary of a part of the outlay which had been charged to Loan funds, and proposals were made for the adjustment of the remainder. These were that of such outlay, as estimated in paragraph 2 at Rupees 10,17,748, Rupees 5,70,000 should in the accounts of 1872-73 be charged to Ordinary, and that as regards the difference Rupees two lakhs were to be made good from Provincial funds by annual instalments of Rupees 50,000, while the rest was to be recovered in three instalments from the ordinary grant under Agricultural.

2. A complete reply to the reference made by the Government of India is not yet practicable, but the following particulars of the information obtained up to date will show how the matter stands :—

3. 1*st.*—The reason why no special provision was made for Establishment and Tools and Plant in the revised estimate of Rupees 12,25,558 appears to have been that it was intended only to show what the cost of completing certain works provided for in the original and subsequent estimates would be. It was as may be gathered from Proceedings, Madras Government, of the 23rd August 1871, drawn up by the late Major Ryves, though the abstract, appendix B, comparing this estimate with its predecessor is not signed by him. He made, however, an addition of Rupees 32,000 thereto, and the total then became that of the estimate submitted to the Government of India with letter, No. 2,172, of the 23rd August 1871, with which was transmitted among other papers a copy of the Proceedings containing this abstract. The allowance therein for Contingencies and Superintendence was Rupees 47,745, and it must be evident that this could have provided for nothing more than petty superintendence, as the regular Public Works Establishment has usually cost from 25 to 30 per cent. on the

outlay supervised, and taking half the above sum as the allowance for superintendence this would be 2·38 per cent.* There would seem to have been therefore nothing misleading about the estimate in respect of establishment. It is believed that the project has paid for all tools and plant used upon it, and the share of general charges for the Presidency had not up to the time referred to been taken into account.

* On Rupees 10,01,900 estimate for works exclusive of cost and superintendence Rupees 47,745, and compensation for land 1,75,917.

4. *2nd.*—The ultimate total cost of the project cannot be stated at present in the way which the Government of India desire, it being uncertain to some extent what further outlay will be required on works, and in the second place when the capital account will be closed, and upon this latter point will depend the charges for interest which are to be included in the total.

In paragraph 2 of their letter the Government of India estimate the outlay up to the end of 1872-73 at, exclusive of interest, the following figures :—

| | Rs. |
|---|---|
| Works ... ... ... ... ... ... ... ... | 11,40,605 |
| Establishment ... ... ... ... ... ... ... ... | 2,44,261 |
| Tools and Plant ... ... ... ... ... ... ... ... | 15,901 |
| Total ... | 14,00,767 |

The Controller of Public Works Accounts in his letter as per margin points out that the statements upon which the Government of India based the foregoing figures were approximate, and to a considerable extent, owing to the way in which the indirect charges were assessed, inaccurate. He puts the outlay in that letter as follows, the outlay on works being taken as stated by the Government of India, the Controller not having made any remark upon it :—

No. 8,112, 12th March 1874.

| | Rs. |
|---|---|
| Works ... ... ... ... ... ... ... ... ... | 11,40,605 |
| Establishment ... ... ... ... ... ... ... ... ... | 1,49,220 |
| Tools and Plant ... ... ... ... ... ... ... ... ... | 4,771 |
| | 12,94,596 |
| Showing a difference of ... | 1,06,171 |

The Controller adds that the figures thus given may be liable to some slight modifications within a limit of perhaps 5,000 Rupees. As regards outlay up to a later date the Controller furnished with his letter of the 29th May 1874, No. 1,797, a statement up to the end of 1873-74 giving the following particulars :—

| | Rs. |
|---|---|
| Works including expenditure by Civil Officers (land compensation) ... ... ... ... ... ... | 11,65,938 |
| Tools and Plant ... ... ... ... ... ... | 4,771 |
| *Establishment.* | |
| Construction, actual ... ... ... ... ... | 76,254 |
| ,, share of range ... ... ... ... | 27,955 |
| Direction, Superintending and District Engineers ... | 26,286 |
| ,, Secretariat ... ... ... ... ... | 14,479 |
| Accounts ... ... ... ... ... ... ... | 7,872 |
| | 1,52,846 |
| Total ... ... | 13,23,555 |



The outlay of the year 1873-74 is also given as—

| | Rs. |
|---|---|
| Works ... ... ... ... ... ... ... ... ... | 25,333 |
| Establishment ... ... ... ... ... ... ... ... ... | 3,626 |
| Tools and Plant ... ... ... ... ... ... ... ... ... | ... |
| Total... | 28,959 |

Deducting this from the total the outlay up to the end of 1872-73 agrees with that before given.

In this statement interest charges are shown to be to date Rupees 1,53,838. Under date the 25th August 1874, No. 4,579, the Controller forwarded the general return of capital expenditure on Irrigation works for March 1874, which gives, therefore, the outlay up to the end of 1873-74. This return will be found in Proceedings, Madras Government, 17th September 1874, No. 2,643, and in this the figures are altogether different, and would seem from some of the entries to have been based on the approximate statements of an earlier date, the incorrectness of which has been admitted. According to this return the outlay to the end of that official year had been on—

| | Rs. | Difference. Rs. |
|---|---|---|
| Works ... ... ... ... ... ... ... | 11,65,938 | ... |
| Establishment ... ... ... ... ... ... ... | 2,44,943 | 92,097 |
| Tools and Plant ... ... ... ... ... ... ... | 14,174 | 9,403 |
| | 14,25,055 | 1,01,500 |
| Interest... | 3,01,823 | 1,47,985 |
| Total Difference... ... | | 2,59,485 |

It appears, therefore, to be probable that material corrections are required in the later returns. The outlay on works in 1874-75 has been almost nominal. Regarding the amount to be added for capitalization of the revenue lost by the land taken up, the Controller says there is no information available. The orders require that particulars of assessment of lands acquired shall be exhibited in the land registers. Some 81,543 Rupees have been expended since June 1872 for land compensation, and for this outlay, as well as for that previously made on this account, the requisite particulars should be obtainable from the Collector under whose orders the disbursements appear to have been made. For want of more definite information that given in paragraph 6 of the Committee's letter, Proceedings, Madras Government, 23rd August 1871, No. 2,171, may be taken. There this assessment is said to be Rupees 4,895, and this capitalized at 25 years' purchase comes to Rupees 1,22,375.

Paragraph 3, No. 1,797.

5. As regards the probable cost of the works of the project, or amount of expenditure against the amount of the estimate of Rupees 12,25,558, the Superintending Engineer, Chingleput, gives his reasons for being unable to afford this information. This officer is doubtful as to the cost of—

No. 1,215, 11th July 1874.

1*st, the supply channel from the Cortilliar to the Cholaveram Tank.*—For widening this the revised estimate provides an additional 32,000 Rupees. In February 1873, after considering the subject, it appeared to the undersigned that widening, as

contemplated by the late Major Ryves, was unnecessary, and so far experience has confirmed this view. Important modifications of the arrangements of the channel as regards the disposal of upland drainage are absolutely necessary, the surplus weirs for the two streams called the Katankal and Boosykal being altogether inadequate, and the revision ought to have been determined and carried out long since. Detailed instructions on the subject have recently been given to the Superintending Engineer, and probably within a short time this matter will be settled; and on the treatment of the channel generally this officer has long since been furnished with instructions. He refers to the opinion of the villagers near the channel as to the results to them of making the channel banks secure from breaching, and he thinks that their fears of being drowned are reasonable. This view of the case is, it is thought, founded on a misconception. In 1872 the Cortiliar turned the head works and rose several feet above the crests of the surplus weirs already referred to. What it is proposed to do is to exclude Cortiliar flood waters altogether by the head works and channel bank on the one hand, and by modification of the weirs, which will be furnished with self-acting shutters on the other hand; 2*ndly*, to so lengthen the weirs as to enable them to discharge with facility all upland drainage when the river is not in high flood, and such part as may be practicable, as due to difference of water level, even in that case. The position of affairs will then be this. The channel works will in themselves offer but little obstruction to the discharge of upland flood water, indeed in the extreme case of very high floods in the Cortiliar probably no obstruction at all, and the channel below the Boosykal into the Cholaveram tank will afford a relief which was non-existent before the channel was constructed.

What the alterations will cost cannot at the present moment be stated, but the 32,000 Rupees provided in the estimate for widening the channel should go a long way towards making it in all respects efficient.

6. On the two principal works of the project, *viz.*, the Cholaveram and Red Hills tanks the Superintending Engineer is of opinion that very little difference between expenditure and estimated cost will occur. He has not, however, stated what savings are available as a set off against the heavy outlay incurred in rendering the southern part of the Cholaveram tank* bund safe after the serious slips of 1872, and for lengthening the anicut† across the Cortiliar; without some assurance on this point, it is doubtful whether the opinion expressed is reliable. Moreover, it is proposed to construct sluices at the north end of the Red Hills tank, to afford the power of lowering the water when necessary, and these sluices, if finally deemed necessary, will cost 10 to 12 thousand Rupees.

*G. O., No. 271, dated 4th February 1874. Estimated cost, Rupees 30,675.

† Estimate Rupees 25,300. G. O., No. 2,132, 26th August 1873.

7. Distribution is the next item regarding which there are no data for estimating the probable ultimate cost. Investigations are in progress, and as distributaries are essential to the spread of irrigation beyond the limits of the greatest extent of cultivation under the tanks in past years, they should be pushed on, and the channels should be decided upon as soon as possible. In the estimate Rupees 25,000 on this account have been provided, and but little, if any, expenditure against this sum has been incurred.



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8. Looking to the Controller's statement, it appears that the expenditure under the estimate up to the end of 1873-74 had amounted to Rupees ... ... ... ... 11,65,938

Letter, No. 1,797, 29th May 1874.

| | |
|---|---|
| In 1874-75 it will have been about Rupees. | 1,000* |
| The unexpended balance of land compensation at end of 1873-74 was Rs. 1,75,917 —1,35,182 = Rupees ... ... ... | 40,735 |
| | Rs. |
| The provision for widening supply channel which will be required for its improvement ... ... ... ... ... | 32,000 |
| | 25,000 |
| Distribution ... ... ... ... | 12,64,673 |
| To which may have to be added the sluices referred to, say ... ... ... ... | 12,000 |
| Total ... | 12,76,673 |

* Exclusive of land compensation if any.

9. It would therefore appear, first, that the works already executed including no doubt the restoration of the tank bunds at slips and the lengthening of the anicut have cost more than the last revised estimate; secondly that probably at the lowest computation about half a lakh will have to be spent on works in excess of the 12,25,558 of the estimate.

10. In the next place the charges other than for works and exclusive of interest up to 1873-74 amounted to 14 per cent. on works outlay. This appears to be a somewhat low estimate, and under recent orders the addition to be made for establishment will be about 3·0 per cent. Consequently the approximate total cost becomes:—

| | Rs. |
|---|---|
| Past outlay (1873-74) ... ... ... ... ... ... | 11,65,938 |
| Establishment, &c., charges ... ... ... ... ... ... | 1,57,617 |
| Total past ... | 13,23,555 |
| | 1,10,735 |
| Subsequent outlay ... ... ... ... ... | 33,220 |
| Establishment charges, 30 per cent. ... ... ... | 1,43,955 |
| | 14,67,510 |
| | 1,22,375 |
| Capitalized assessment ... ... ... ... ... ... | 15,89,885 |

The only comparison is between the Rupees 12,25,558 of the revised estimate and the approximate estimate of Rupees 12,76,673 above given; both are for the same objects. Interest manifestly cannot be calculated up to the final closure, and the Controller gives two very different statements* of it up to the end of 1873-74; indeed one account is but little more than half the other.

* Rupees 1,53,838.
" 3,01,823.

11. Thirdly, the last question in the form in which it has been put by the Government of India would be very easily answered thus. There is no immediate prospect of getting the small return expected from the large outlay upon this project.

No. 59, 10th July 1873.

In the Secretary of State's despatch, paragraph 6, the return from the project under irrigation is shown as Rupees 29,772

| | | |
|---|---|---|
| Adding town supply ... ... ... ... ... | " | 32,000 |
| Gross revenue ... ... ... ... ... ... | " | 61,772 |
| Cost of maintenance ... ... ... ... ... | " | 11,500 |
| Net revenue ... ... ... ... ... ... | " | 50,272 |

This sum differs from that shown in paragraph 15 of letter, No. 2,172, of the 23rd August 1871, to the Government of India, inasmuch as in the latter loss of assessment was deducted from revenue, while now it has been added to capital.

12. However, as regards irrigation revenue, the little information hitherto made available is not encouraging. Proceedings, Madras Government, Revenue Department, 27th November 1873, No. 1,313, indicate that up to fasli 1282 (1872-73) there had been no marked increase of area irrigated, and that, if Mr. W. T. Blair's report and the later returns were to be accepted, the irrigation of that year fell short considerably of the average of a former period. Thereupon the Board of Revenue was requested to obtain detailed statements enabling the real state of the case to be understood, since which time no fresh information has been received. No doubt the requisite facilities for extending irrigation have not as yet been afforded, but the supply of water has been abundant, and at any rate every acre up to the greatest extent of former years and as much double crop as has ever been cultivated might without difficulty have been irrigated. If the returns under preparation by the Board give other results, it may be well to ascertain the reason.

13. Next comes the Municipal water-supply which was expected to yield about 32,000 Rupees. On this account, so far as is known, no payment has been made. As yet no complete statement of the total issues of water to the Municipality from the time that the town sluice was first opened has been received. It was asked for* in this office memorandum, No. 312, of the 9th May 1874, required by G. O., No. 1,386, of the 23rd May 1874, and again called for in G. O., No. 108,† miscellaneous, of the 12th February 1875. Moreover as yet no report has been made by the Superintending Engineer of the quantity of water received by the tanks, of that discharged to waste, of the quantity used for irrigation, &c., and of that to be accounted for by evaporation and absorption. The necessary instructions were given in Proceedings, Madras Government, 13th October 1873, No. 2,503.

* From the Superintending Engineer, Chingleput.

† Financial Department, No. 182, dated 30th January 1875.

14. As regards the current year, the President of the Municipal Commission reports, in a letter now under the consideration of Government, that the quantity of water taken by the Municipality from the 1st April to 31st December 1874 amounted to only 4 millions of cubic yards. The estimate of the year was 10 millions, and this being less than one-third of the quantity which had been supposed to be required for the city of Madras, inquiry was made with the result of showing that the estimate of 10 millions was about double the actual supply. Without the Superintending Engineer's

No. 1,283—2,647, 12th February 1875.



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report, and a review of the receipts and issues of water, the undersigned cannot offer an opinion on the subject; but if the Municipality does not require more than 5 or 6 millions of cubic yards, the sooner the quantity reserved for them is reduced and made available for irrigation or other purposes the better possibly the explanation of the vast discrepancy between actual and estimated required supply is not far to seek. First the Municipal distribution works are not complete; secondly it was, it is believed, assumed that nearly 600,000 inhabitants of Madras would need 20 gallons each per day, a probably excessive average, as the purer water would be fetched from a distance only for drinking and cooking; in round numbers the 32 millions would give 20 gallons a head to 583,500 people. It becomes a matter of importance that the future and ultimate demands of the Municipality should be carefully determined. There has been a good deal of road and tree watering out of the 5 or 6 millions of cubic yards and, as there must be, some waste. It is not known in this office to what proportion of the people of Madras water has been supplied; but probably the Commission possesses information on this point, and from it something fairly reliable could be deduced as to the future wants of the town.

15. It may, it is thought, be taken for granted that there is no necessity for restricting irrigation under the Cholaveram and Red Hills tanks; and that at any rate until it has been extended very much beyond its present limits and until the town demand shall have very greatly increased, there will be a great deal of water annually which will not be turned to any useful account, and it is highly desirable, in the present eminently unsatisfactory financial condition of the Madras Water Works Project, to secure as much as may be possible.

G.O., No. 2,173-F, 29th August; and No. 2,503, 13th October 1873.

16. No reliable estimate of the average cost of repairs can as yet be given, but the experience hitherto indicates that the allowance of Rupees 11,500 considered sufficient in 1871 may not be enough. The actual outlay charged to Repairs in the last three years has been as follows:—

| | 1871-72. | 1872-73. | 1873-74. |
|---|---|---|---|
| | Rs. | Rs. | Rs. |
| Works ... ... ... ... ... ... ... | 21,153 | 6,667 | 93,642 |
| Conservancy Establishment ... ... ... ... ... | * 477 | 636 | 853 |
| Total .. | 21,630 | 7,303 | 94,495 |

* Note.—No charge for conservancy previous to 1871-72.

In his Budget Estimate for 1875-76 the Superintending Engineer, Chingleput, has made no separate provision for the maintenance of the Madras Water Works. In future years for this work and for the Chembrambaukum tank also, distinct items should be shown.

It would manifestly be useless, under the circumstances noticed in the foregoing paragraphs, to attempt a calculation of the probable future returns for the outlay on this project. For the next few years at any rate the net returns will be nominal. All that can be done is to take care that irrigation is extended as rapidly as may be practicable up to the limits of the water-supply available, and if under ordinary

arrangements the lands capable of being irrigated are not taken up, it will become necessary to devise other means of bringing such lands under cultivation. It is in the highest degree improbable that cultivators will not be forthcoming if the lands are thrown open to all-comers.

17. Lastly, with regard to the proposal of the Supreme Government to charge part of the cost of the project to Provincial funds, it would seem that these should fairly take their share of the burden. It can hardly be doubted that the project would not have been sanctioned but for the advantages which the abundant supply of good water to Madras was expected to secure to that city. It may be admitted that the idea would have been given up as too costly had not a considerable return from irrigation been likewise expected, but the fact that disappointment will be experienced in this direction also is perhaps the greater reason why Agricultural funds should not have to bear the entire loss and outlay. With the town supply Agricultural funds have properly nothing to do, and Provincial funds appear to be the only other source from which this share of the cost can be defrayed What that share should be cannot be determined until the quantity of water which the Municipality will take and pay for has been settled, but on this being known a decision may easily be arrived at. The additional quantity of storage provided in the tanks of the project is 85·439 millions of cubic yards, say 85½ millions, and the quantity appertaining to the town supply will be the 15 millions below the sill of the Municipal sluice added to the supply to be reserved above that level for the use of the town. Supposing this latter to be 15 millions instead of 32 as before supposed, and that also 14¾ lakhs of Rupees will be the cost of the scheme exclusive of interest, the Provincial share would be in round numbers 5 lakhs, and perhaps the only feasible way of adjusting the account would be to get the Government of India to make an additional grant of this, or of any amount which may ultimately be fixed, to Provincial. The money will have been spent and, as it is not an agricultural charge rightly, it would seem to be desirable that it should not appear as such in the Capital and Revenue accounts of Irrigation works.

CAMP AT KAVALLI, (Signed) JOHN MULLINS, Lieut.-Colonel, R.E.,
*8th March* 1875. *Chief Engineer for Irrigation.*

NOTE.—Paragraph 11, Proceedings of Madras Government, 26th April 1870, No. 1,100.

No. 59. Note by the Honorable the Governor, dated 7th May 1875.

No. 60. ORDER THEREON, 2nd June 1875, No. 1,548.

IRRIGATION, No. 3.

THE Honorable the Governor in Council has learnt with much dissatisfaction from the foregoing memorandum, drawn up by the Chief Engineer for Irrigation, that the information required by the Government of India regarding the Madras Water Works Project is still so far from being forthcoming that on no single important particular can a reliable report be submitted.

2. Whatever may be the conclusion to be drawn as to the returns from this project in the future, and as to the outlay on work at present unforeseen which may ultimately

*Statement showing how the figures in connection with Expenditure on the Madras Water Works Project to end of 1875-76 have been arrived at.*

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| Expenditure up to end of 1874-75. | | Expenditure up to end of 1875-76. | | Remarks. | Copy of Note by Examiner of Public Works Accounts. |
|---|---|---|---|---|---|
| | | As per Examiner's Supplemental Return of Capital Expenditure for March 1876, prepared after the Annual Accounts for 1875-76 were closed. | | | |
| | | Rs. | Rs. | | |
| Reports, &c. | 6,387 | 6,119 | 6,387 | | "The figures in columns 2, 7 and 8 of the statement agree with those of the Preliminary Abstract of the system on which still continue to be shown in the Monthly Returns submitted to the Accountant-General, Public Works Department, and Chief Engineer for Irrigation, pending instructions from the Accountant-General, Public Works Department, who has been addressed in this office letter No. 22-A of 17th May 1876 as to the manner in which the adjustments (consequent on the revision of the Preliminary Accounts) are to be shown in the month's accounts |
| Establishment | 1,347 | 1,370 | 1,347 | | |
| Tools and Plant | 144 | 62 | 144 | | |
| Suspense Account | ,, | ,, | ,, | | |
| Total | 6,878 | 7,567 | 6,878 | | |
| Less receipts on Capital Account | ,, | ,, | ,, | | |
| Net Total | 6,878 | 7,567 | 6,878 | | |

| Expenditure up to end of 1874-75. | | Expenditure up to end of 1875-76. | | Remarks. | |
|---|---|---|---|---|---|
| | | As per Examiner's Supplemental Return of Capital Expenditure for March 1876 prepared after the Annual Accounts for 1875-76 were closed. | | | |
| | | Rs. | Rs. | | |
| Works | ,, | 11,96,160 | 2,54,260 | | As per correct statement received from the Examiner with his letter printed in Proceedings, Madras Government, No. 342 of 8th February 1876 copy of Proceedings, Madras Government, was furnished to the Government of India with despatch No. 343 of 8th Feb. 1876. |
| Establishment | ,, | 2,54,260 | 14,174 | | |
| Tools and Plant | ,, | 14,174 | 468 | | |
| Suspense Account | ,, | ,, | ,, | | |
| Total | 14,66,634 | 14,64,594 | 13,82,192 | | |
| Less receipts on Capital Account | ,, | ,, | 1,167 | | |
| Net Total | 14,66,634 | 14,64,594 | 13,81,025 | | |

| Expenditure up to end of 1874-75. | | Expenditure up to end of 1875-76. | | Note. | Remarks. |
|---|---|---|---|---|---|
| | | As per Examiner's Supplemental Return of Capital Expenditure for March 1876 prepared after the Annual Accounts for 1875-76 were closed. | | | |
| | | Rs. | Rs. | | |
| Works | ,, | 11,78,335 | 11,79,057 | | These figures agree with those shown in the letter from the Government of India now under reference as having been given to the Examiner by the Accountant-General, Public Works Department. Total of columns 2 & 4. |
| Establishment | ,, | 2,66,936 | 1,65,663 | | |
| Tools and Plant | ,, | 14,236 | 4,841 | | |
| Suspense Account | ,, | ,, | 468 | | |
| Total | 14,74,391 | 14,74,391 | 13,70,049 | | |
| Less receipts on Capital Account | ,, | ,, | 1,167 | | |
| Net Total | 14,74,391 | 14,74,391 | 13,68,882 | | |

| Expenditure up to end of 1874-75. | | Expenditure up to end of 1875-76. | | Note. | Remarks. |
|---|---|---|---|---|---|
| | | As per Examiner's Supplemental Return of Capital Expenditure for March 1876 prepared after the Annual Accounts for 1875-76 were closed. | | | |
| | | Rs. | Rs. | | |
| Works | ,, | 11,78,335 | 11,79,057 | | "The figures in columns 2, 7 and 8 of the statement agree with those of the Preliminary Abstract of the system on which still continue to be shown in the Monthly Returns submitted to the Accountant-General, Public Works Department, and Chief Engineer for Irrigation, pending instructions from the Accountant-General, Public Works Department, who has been addressed in this office letter No. 22-A of 17th May 1876 as to the manner in which the adjustments (consequent on the revision of the Preliminary Accounts) are to be shown in the month's accounts |
| Establishment | ,, | 2,66,936 | 1,65,663 | | |
| Tools and Plant | ,, | 14,236 | 4,841 | | |
| Suspense Account | ,, | ,, | 468 | | |
| Total | 14,74,391 | 14,74,391 | 13,70,049 | | |
| Less receipts on Capital Account | ,, | ,, | 1,167 | | |
| Net Total | 14,74,391 | 14,74,391 | 13,68,882 | | |

| Expenditure up to end of 1874-75. | | Expenditure up to end of 1875-76. | | Note. | Remarks. |
|---|---|---|---|---|---|
| | | As per Examiner's Supplemental Return of Capital Expenditure for March 1876 prepared after the Annual Accounts for 1875-76 were closed. | | | |
| | | Rs. | Rs. | | |
| Works | ,, | 11,78,335 | 11,79,057 | | "The figures in columns 2, 7 and 8 of the statement agree with those of the Preliminary Abstract of the system on which still continue to be shown in the Monthly Returns submitted to the Accountant-General, Public Works Department, and Chief Engineer for Irrigation, pending instructions from the Accountant-General, Public Works Department, who has been addressed in this office letter No. 22-A of 17th May 1876 as to the manner in which the adjustments (consequent on the revision of the Preliminary Accounts) are to be shown in the month's accounts |
| Establishment | ,, | 2,66,936 | 1,65,663 | | |
| Tools and Plant | ,, | 14,236 | 4,841 | | |
| Suspense Account | ,, | ,, | 468 | | |
| Total | 14,74,391 | 14,74,391 | 13,70,049 | | |
| Less receipts on Capital Account | ,, | ,, | 1,167 | | |
| Net Total | 14,74,391 | 14,74,391 | 13,68,882 | | |

| Expenditure up to end of 1874-75. | | Expenditure up to end of 1875-76. | | Note. | Remarks. |
|---|---|---|---|---|---|
| | | As per Examiner's Supplemental Return of Capital Expenditure for March 1876 prepared after the Annual Accounts for 1875-76 were closed. | | | |
| | | Rs. | Rs. | | |
| Works | ,, | 11,78,335 | 11,79,057 | | "The figures in columns 2, 7 and 8 of the statement agree with those of the Preliminary Abstract of the system on which still continue to be shown in the Monthly Returns submitted to the Accountant-General, Public Works Department, and Chief Engineer for Irrigation, pending instructions from the Accountant-General, Public Works Department, who has been addressed in this office letter No. 22-A of 17th May 1876 as to the manner in which the adjustments (consequent on the revision of the Preliminary Accounts) are to be shown in the month's accounts |
| Establishment | ,, | 2,66,936 | 1,65,663 | | |
| Tools and Plant | ,, | 14,236 | 4,841 | | |
| Suspense Account | ,, | ,, | 468 | | |
| Total | 14,74,391 | 14,74,391 | 13,70,049 | | |
| Less receipts on Capital Account | ,, | ,, | 1,167 | | |
| Net Total | 14,74,391 | 14,74,391 | 13,68,882 | | |

As Government have since ordered that the Capital and Revenue Accounts shall be kept for Madras Water Works, the matter has been allowed to rest undisposed of.
*The figures in column 10 are correct so far as they relate to the final Capital Accounts printed with G.O. No. 341 of 8th February 1876.

(Signed) JOHN MULLINS, Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

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11th November 1877.

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be required, it is highly discreditable that the facts of the past have not yet been ascertained conclusively and beyond all liability to serious error. The Governor in Council must therefore insist upon expenditure under Capital and Revenue respectively up to the end of 1874-75, and Revenue particulars from 15 years before the commencement of improvements, and for each year subsequent thereto up to fasli 1283 (1873-74) being determined without further delay.

3. The first part of the foregoing information has to be prepared in the Controller's Office, as also particulars of outlay on repairs during the 15 years from which the net standard revenue will have to be deduced. The Controller will take care that it is made the special duty of some portion of his office establishment to work steadily at these statements until they have been properly completed, and it is expected that no more discrepancies like those shown in the interest charges, and no more grave errors like those in the statement of revenue charges for 1873-74 will be allowed to appear in the accounts which may be submitted in the future.

4. The detailed statements of revenue derived from the land under the tanks must be similarly taken up by the Revenue Officers and completed, and the Revenue Board are requested to see that this is done without delay. As yet even the marked discrepancies pointed out $1\frac{1}{2}$ years ago have not been explained, and up to the present time the Government have absolutely no information whatever with regard to the effect on cultivation and revenue, of the storage of an amount of water so greatly in excess of that before available.

5. It is clearly a most important duty of the Collector of a district to see what the results of large expenditure on Irrigation works have been, and he should from year to year take care that the irrigation statistics of every village affected are brought before him, and that all peculiarities which the returns may exhibit are fully investigated.

6. The Superintending Engineer, Chingleput, will take immediate steps for submitting at the earliest possible date a statement showing what further outlay on *works* will be required to complete this project. It is understood that the requirements of the several parts of the scheme, as indicated by the high floods and freshes of 1872 and 1874, have been ascertained, so that there is nothing now to prevent a final estimate being prepared, and Colonel Moberly will be particular to report in detail upon all savings or excesses exhibited in the statement, so that there may be no need for further references. It is expected also that the details of distribution works required for the utilization of the water stored for irrigation purposes in the Cholaveram and Red Hills tanks shall be determined at an early date, and thereafter the additional channels required should be pushed forward as rapidly as possible.

7. Colonel Moberly will inform the Collector as soon as his scheme of distribution has been fairly made out, and the latter should then depute either an Assistant or a Deputy-Collector to go over all the villages and ascertain what modifications, if any, will be desirable, and what the prospects of extension of irrigation are.

8. The Collector of Chingleput will furnish the Controller of Public Works Accounts immediately with particulars of the assessment of lands taken up for the project in order that the addition to Capital outlay on this account may be calculated and included in the accounts. It is believed that the compensation payable for the land has not yet been fully disbursed, and the Collector will send to the Controller a

memorandum showing for what area compensation remains to be paid, reporting at the same time when the final payment will be made.

9. There has now been considerable experience of the requirements of the channels and tanks of this project as regards repairs, and the Superintending Engineer, Chingleput, will therefore draw up as accurate an estimate as possible of the probable annual outlay on maintenance, exclusive of conservancy establishment. He will be careful to explain what part of the estimated cost is for ordinary, and what for extraordinary repairs.

10. These papers will be referred to the Board of Revenue through the Revenue Department with a view to prompt measures being taken for the settlement of all questions relating to the disposal of waste lands commanded by the tanks. They will report whether the right of occupancy of waste should be sold as has been done in Tinnevelly, whether any revision of Inam settlements is expedient, and lastly determine a fair assessment for newly irrigated land. Mr. R. K. Puckle, whose experience of matters of this kind is great, will be able to render valuable service in effecting a speedy settlement of these questions.

11. The Honorable the Governor in Council expects that with the exception of the distribution arrangements and the settlement of the questions referred to in the foregoing paragraph, all the information required by this order will be ready within three months, and should any of the several officers concerned be unable to submit his portion of this information within that time he will afford full explanation of the probable cause of delay at the earliest possible moment.

12. Information regarding the immediate and ultimate demands of the Madras Municipality for water has been already called for, and should be furnished as soon as possible. Both the Municipal and the Superintending Engineer's accounts of water actually taken up to the 31st March last are awaited.

G. O., No. 919, dated 7th April 1875.

13. Ordered that a copy of these Proceedings be transmitted for the information of the Government of India with reference to their letters recorded above.

(True Extract.)

(Signed) J. O. HASTED, Major, R.E.,
*Offg. Joint Secretary to Government.*

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No. 61. (DOCKET No. 1,549, dated 2nd June 1875.)

COPY of the above forwarded to the Government of India.

(True Extract.)

(Signed) J. O. HASTED, Major, R.E.,
*Offg. Joint Secretary to Government.*

Exd. E. C. Shunker.

Spare Copies

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GOVERNMENT OF MADRAS.

## PUBLIC WORKS DEPARTMENT.

10th November 1877, No. 475 I.

Irrigation.

Read the following paper:—

No. 31. From Captain G. T. SKIPWITH, R.E., Assistant Secretary to the Government of India, Public Works Department, (Civil Works—Irrigation,) to the Secretary to the Government of Madras, Public Works Department, dated Simla, 30th August 1877, No. 254 I.

I AM directed to acknowledge the receipt of your letter No. 2,651, dated the 2nd October last, furnishing certain information in connection with the Madras Water Works Project, and in reply to say that the early submission of the revised estimate is considered very desirable by the Government of India.

2. The figures entered in the Chief Engineer's note, received with your letter under reply showing the expenditure to end of 1875-76 on this work, do not agree with those given in the returns submitted by the Examiner of Public Works Accounts at Madras to the Accountant-General, as will be seen below, and I am to request that the causes of the discrepancies may be explained:—

| | Examiner's Accounts. | Chief Engineer's Note. |
|---|---|---|
| | Rs. | Rs. |
| Works ... ... ... ... ... ... | 12,03,822 | 11,78,355 |
| Establishment ... ... ... ... ... | 2,56,093 | 1,85,324 |
| Plant ... ... ... ... ... ... | 14,318 | 4,923 |
| Suspense ... ... ... ... ... | ... | 468 |
| Total ... | 14,74,233 | 13,69,070 |
| Less receipts on Capital Account ... ... | ... | 1,167 |
| Total ... | 14,74,233 | 13,67,903 |

3. I am also to inquire whether the Government of Madras concurs in the view of the Chief Engineer that 46 per cent. of the outlay on the work is due to Municipal and Provincial Funds, and if so to request that it may be explained how it is proposed to make good the large refund to Imperial Funds which such a view entails.

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No. 32. ORDER THEREON, 10th November 1877, No. 475 I.

THE subject of the manner in which the refund to Imperial of the share of the cost of the Madras Water Works to be charged to Provincial Funds is to be carried out, will be referred for consideration in the Financial Department with reference to the orders marginally noted.

5th January 1876, No. 21.
1st May " " 1,090.
2nd October " " 2,650.

2. Ordered that the following letter be sent.

(Here enter No. 476 I, dated 10th November 1877.)

(True Extract.)

(Signed) JOHN MULLINS, Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

To the Financial Department.
" Superintending Engineer, Chingleput.
" Examiner, Public Works Accounts.
" Chief Engineer for Irrigation.

Erd. E. C. Shunker.
Spare Copies

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IRRIGATION.

Govt. of {1877} Madras.

PUBLIC WORKS.

To

The SECRETARY to the
GOVERNMENT of INDIA.

Dated November 1877.

Rec'd.

Read.

G. O. 16th November 1877, No. 474 I.

NOVEMBER.

No. 33.

MADRAS Water Works Project.

7/82

# Govt. of {1875} Madras.

## PUBLIC WORKS.

To

THE SECRETARY TO THE GOVERNMENT

OF INDIA

Dated June 2nd.

Issued

Recd. Encl.

G. O., 2nd June 1875, No. 1,519.

JUNE.

Nos. 58-61

FORWARDING for information Proceedings on memorandum of the Chief Engineer for Irrigation on the subject of the Madras Water Works Project.

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Circular No. 38 Public Works.

GOVERNMENT OF INDIA.

## PUBLIC WORKS DEPARTMENT.

ACCOUNT.

General.

Simla, June 5, 1879.

Copy of the following forwarded to the Local Governments and Administrations and Officers marginally noted, for information and guidance, with special reference to paragraph 25 of the resolution.

The Governments of Madras, Bombay, and Bengal, in the Public Works Department,
General, Irrigation, and Railway Branches.
The Governments of the North-Western Provinces and Oudh, and the Punjab, in the
Public Works Department, General and Irrigation Branches.
The Chief Commissioners, Central Provinces, British Burmah, Mysore and Coorg, and
Assam.
The Resident, Hyderabad.
The Agents to the Governor General for Central India and Rajputana.
The Superintendent of Port Blair, and Chief Commissioner, Andaman and Nicobar
Islands.
The Directors of State Railways.
The Director of State Railway Stores.
The Consulting Engineers for Railways, Calcutta and Lahore.

A. J. FILGATE, Major, R.E.,

Offg. Dy. Secy. to the Govt. of India.

No. 3667, dated Simla, 26th October 1878.

RESOLUTION—By the Government of India, Financial Department.

READ again the following Resolutions :—

(1) No. 1886, dated 28th March 1877.
(2) „ 1072, „ 20th February 1878.
(3) „ 1137, „ 23rd „ „
(4) „ 1911, „ 18th March 1878; and the appended Financial Statement for 1878-79.
(5) „ 2098, „ 29th „ „

RESOLUTION.—By the earliest of these Resolutions, the separate Provincial Revenue and Expenditure, and, by the second and fifth, the separate Local Revenue and Expenditure, were incorporated in the General Estimates and Accounts of the Empire, in order that these Estimates and Accounts might exhibit, in suitable detail, the whole Public Revenue and Expenditure.

2. The General Accounts, thus expanded, continue to show the true result of a comparison between the Imperial Revenue and Expenditure only, the Surplus or Deficit of Imperial Revenue brought out upon the General Accounts being exactly the same as would appear if the Provincial and Local transactions were not thus incorporated, or were again eliminated.

3. To produce this result, the incorporated transactions are brought into exact equilibrium, the incorporated revenues being made precisely equal to the incorporated expenditure : this is effected by the entry under an Adjusting or Transfer Head, of the actual difference between the incorporated Provincial and Local Revenue and Expenditure, any Surplus of such Provincial and Local Revenue being added to the Provincial and Local Balances, and, therefore, appearing as Imperial Expenditure, and any Deficit being made good from those Balances to the Imperial Treasury, and, therefore, appearing as Imperial Revenue.

4. At the same time, by the third Resolution now read again, careful precautions have been taken against the inclusion, under the Imperial Adjusting Revenue Head *"Provincial Deficits,"* of any sum in excess of the balances actually in possession of any Local Government or Administration. In the 24th paragraph of the present Resolution, analogous precautions are prescribed against the credit under the same Adjusting Head, as a Local Fund Deficit, of any sum in excess of the balance at credit of any Local Fund.

5. The incorporation in the General Accounts, of the Provincial and Local Transactions, made no change in the relations between the Imperial, Provincial, and Local Finances, whose separate rights and responsibilities are in no way affected by their consolidation into one General Account. This is clearly explained in the fifth paragraph of the Financial Statement for 1878-79, and also in the fifth paragraph of the fifth Resolution now read again.

6. It is now necessary to issue instructions to insure—

(1) the separate methodical record of the Provincial, and also of the Local, Revenue and Expenditure;

(2) that contributions from one of three separate Funds to either of the others, shall be so treated that there shall be no double entries of Revenue or Expenditure, in connection with such transactions, in the General Account.

7. In what follows, the Governor General in Council intends only to indicate the general principles to be observed, and the general results to be ascertained: it will be for the Comptroller General to determine by what detailed accounting methods effect may most conveniently be given to the instructions of the Government.

8. With effect from the beginning of the current year, 1878-79, four separate Accounts must be prepared and submitted to the Government of India by each Accountant General and Deputy Accountant General in independent charge for his own Province (through the Comptroller General), and by the Comptroller General for the treasuries in direct account with him:—

*I.—An Account of the Imperial Revenue and Expenditure reserved under the control of the Government of India.*

*II.—An Account of the Provincial Revenue and Expenditure.*

*III.—An Account of the Revenue and Expenditure of those Local Funds of which the transactions are, under Resolution No. 2098, dated 29th March 1878, incorporated in the* General Accounts.

*IV.—A General Account combining Accounts Nos. I, II, and III.*

9. Each of these four Accounts will be prepared in precisely the same form, in detail of the major heads in use for the Imperial Accounts only, without any variation whatever. The entry under each major head in the *General Account No. IV* will be the sum of the entries under the same major head in the three Accounts *Nos. I, II,* and *III*.

10. Besides the Major Heads of Account common to all four Accounts, certain Adjusting or Transfer Heads will be necessary for the record of transactions between Provincial Funds and Local Funds, and Provincial Funds and Imperial Funds. No transfer transactions will be allowed directly between the Imperial Treasury and Local Funds: if any contribution is made from the Imperial Treasury to Local Funds, or *vice versâ*, it must be adjusted through the Provincial Accounts in the manner described in the 20th paragraph. Direct payments from a Local Fund to the Imperial or Provincial Treasury for services received—as, for instance, rent of an Imperial or Provincial building occupied by a Local Committee, or interest on an Imperial Loan to a Local Fund—will, however, be treated as Local Expenditure and Imperial or Provincial Revenue, and not as a Contribution or Transfer; such transactions, and any like converse transactions in respect to services rendered by a Local Fund to the Imperial or Provincial Government, will, in short, be dealt with, in the manner described in the paragraph 30, as applicable to transactions between Imperial, Provincial or Incorporated Local Funds and Excluded Local Funds. But no transactions between the Imperial and Provincial Governments may be thus dealt with: such transactions may be adjusted only by transfer entries, upon the principle that Provincial Revenue and Expenditure is only a sub-division of Imperial Revenue and Expenditure.

11. Financial transactions between the Provincial and the Imperial Governments are of two kinds:—

*First.*—Transactions under quasi-contracts, as follows:—

(*a*) Allotments from the Imperial Treasury for Provincial Services, whether such allotments be fixed, or a share of some Imperial Revenue.

Contributions from Provincial Resources to the Imperial Treasury, as follows:—

(*b*) Interest on the capital expended by the Imperial Government on Provincial Productive Public Works, or as the Imperial share of the profits from those Works.

(*c*) The Imperial share of other Provincial Revenues:

(*d*) In aid of the surplus which the Government of India desires to maintain in ordinary times, to enable it to meet expenditure for counteracting Famine when, periodically, it occurs;

(*e*) For stamps and stationery supplied from the Imperial stores, the cost of which appears in the General Accounts as Imperial Expenditure.

*Second.*—Transactions in what may be called mutual aid or support: as when, for instance, the Imperial Government makes a grant to a Provincial Government in aid of, or undertakes to pay part of the cost of, a particular Provincial work of material improvement the cost of which appears in *Account No. II* as Provincial expenditure; or when, conversely, a Provincial Government contributes, under like circumstances, for an object the charge for which appears in *Account No. I* as Imperial Expenditure.



12. Clearly, all such transactions of either kind might be set against each other, and a single net transfer entry made in the Accounts, without affecting the Surplus or Deficit of the Accounts. Accordingly, in the *General Account No. IV*, no entry at all will be necessary or may be, and whatever their character, will be adjusted in *Account No. IV* by the entry under *Provincial and Local Surplus or Deficit.*

13. But, in *Account No. II*, such transactions will be recorded gross, under the following Transfer Heads, with corresponding entries in *Accounts No. I* and *No. III*. These Transfer Heads may be conveniently grouped together immediately above the Totals of Revenue and Expenditure.

I.—As Revenue—

(1) *Allotments from the Imperial Treasury;*
(2) *Contributions from Local Funds.*

II.—As Expenditure—

(3) *Contributions on account of Productive Public Works, viz., interest* on Imperial Capital and Imperial share of profit of Productive Public Works;*
(4) *Imperial Share of other Provincial Revenues;*
(5) *Contributions for Famine Insurance;*
(6) *Stamps and Stationery* supplied from Imperial Stores;*
(7) *Other contributions to the Imperial Treasury;*
(8) *Contributions to Local Funds.*

14. When, under the option allowed to it in paragraph 5 of Resolution No. 2009, dated 23rd March 1878, a Provincial Government expends Provincial Resources on Productive Public Works, such expenditure will be recorded in *Account No. II* above the Total Expenditure, and will operate to reduce the Provincial Surplus, or increase the Provincial Deficit. But in the *General Account No. IV*, any such Provincial expenditure upon Productive Public Works will be combined with the Imperial expenditure under the Head of *Productive Public Works*, below the Total Expenditure. It is not overlooked that the effect of this arrangement will be, in such cases, to make the remaining Imperial Surplus more, or the Imperial Deficit less, than it would otherwise be, and that this result is open to some objection. But the amounts are never likely to be large; and it seems better to submit to that inconvenience, than to break up the Head of "*Productive Public Works,*" and show the Provincial part of the expenditure on such works above the Surplus or Deficit of the year.

15. The *Provincial Account No. II* and the *Local Funds' Account No. III* will, each, begin and end with a balance. No Debt Heads must be admitted to the *Provincial Account No. II*: the separate rights and obligations of the Local Governments extend only to Revenue and Expenditure: in debt transactions carried out under their authority, the Local Governments represent the Imperial Government, and such debt transactions must be recorded in the Imperial Accounts only. But it does not appear possible to dispense with Debt Heads in the *Local Account No. III*: the debt transactions of Local Funds should be entered under a single Head on each side of *Account No. III* below the Total Revenue and Expenditure, and should not appear at all in the *General Account No. IV*, which is an account of Revenue and Expenditure only.

16. The original intention expressed by the Government of India in the second Resolution now read again, was to incorporate in the General Estimates and Accounts the transactions of only those Local Funds which are at the unfettered disposal of the Provincial Governments for provincial uses. It was found, however, that the several Provincial Governments do not exercise the same jurisdiction over Funds of the same character, and that it is not always possible to discover what are the precise powers of a Local Government over a particular Fund. Under these circumstances, it appeared that the incorporation of only those Funds which were at the absolute disposal of the Local Governments would produce incomplete and anomalous results. The original intention of the Government of India was, therefore, abandoned, and by the fifth Resolution recited in the preamble, all Funds of a general character were incorporated, whatever the powers of the Local Government over them.

17. It is, however, important to show, in one Account, the entire Revenues, more or less completely at the disposal of each Local Government for provincial purposes, and the expenditure therefrom; and the *Account No. II* now prescribed should be prepared on this basis, *Account No. III* being reserved exclusively for the Local Funds which are not at the free disposal of the Local Government for provincial purposes. Accordingly, each Local Government should determine, in consultation with the local Accountant General, whether any Local Funds may be conveniently transferred to the category of Provincial Funds, in order to the inclusion, in *Account No. II*, of the entire transactions of every Fund heretofore called "Local" which is, from beginning to end, at the disposal of Local Government for provincial purposes, unfettered by any law or orders of superior authority. The Accountant General will have no difficulty in maintaining, as hitherto, a separate Account of any Fund thus made Provincial, if the Provincial Government thinks that it is not enough to appropriate to it separate Minor

* Interest paid directly from Provincial Resources, as, for example, on a Provincial Debenture loan, must be shown in Account No. II, not as a Transfer, but as Expenditure under 1, Interest on Debt; and the cost of stationery bought in the market with provincial funds, and not procured from the Imperial Stores, must be shown in Account No. II, not as a Transfer, but as Expenditure under 24, Stationery and Printing.

(2) The Transfer Heads specified in paragraph 13 will all be placed together, immediately above the *Totals*.

(3) If necessary, a Head, *Productive Public Works*, will be introduced above the Total under which will be entered any expenditure from Provincial Resources on Productive Public Works.

(4) The Abstract will be replaced by two Abstracts, *viz.*:—

*Revenue and Expenditure of the Provincial Governments and Administrations*,

and

*Revenue and Expenditure, and Receipts and Disbursements, of Local Funds*.

Each of these Abstracts will open and close with a balance.

30. None of the orders contained in this Resolution affect contributions from Imperial, Provincial, or Local Resources, in aid of any of the Excluded Funds specified in paragraph 22, the transactions of which are not incorporated in the *General Accounts*; or, *vice versâ*, to contributions from any such Excluded Fund in aid of the Imperial, Provincial, or Local Resources. A contribution to such Funds must be recorded as Expenditure, under the Head appropriate to the object of the contribution, in the Imperial, Provincial, or Local Funds' Account, *Nos. I, II*, or *III*, as the case may be, and so in the *General Account No. IV*: and contributions from such Funds must be shewn in the same Accounts as *Revenue* under the Head "*XXI. Miscellaneous*," unless some other specific Head appears more suitable.

31. Nor do these orders refer to transactions between the Incorporated Local Fund and another: in respect to such transactions, no fresh instructions are needed.

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ORDERED, that this Resolution be distributed for information and guidance as follows:—

(1) To the Home, Revenue, and Public Works Departments of the Government of India.

(2) To the several Local Governments and Administrations, whose attention should be specially invited to paragraphs 17 to 21.

(3) To the Comptroller General, who should issue any supplementary instructions that may appear to him necessary, and report whether any action by the Government of India is necessary under paragraphs 17 to 21 in respect to the Provinces not administered by any Local Government.

(4) And to the several Accountants General, and Deputy Accountants General in independent charge, who should take action under paragraph 21 without delay.

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Proc. 4637

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

ACCOUNT.

General.

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To

Circular No. 38 Public Works.

Dated, SIMLA, June 5, 1879.

Received

Bdle 1663 of 19-5-79

Rules for the preparation of the Accounts of Imperial and Provincial Revenue and Expenditure.

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Govt. C. B. Press, Simla.—No. 92, P. W. D.—9-6-79—750.

2018/83

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

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17th April 1878, No. 1,881 W.

Buildings and Roads.

Civil Works.

Read the following papers:—

No. 195. Proceedings of the Madras Government in the Financial Department, dated 4th April 1878, No. 640.

Read Proceedings of the Madras Government in the Public Works Department, dated 10th November 1877, No. 475 I.

ABSTRACT.—*Madras Water Works Project.*—The subject of the apportionment between Imperial and Provincial Funds of the cost of the — referred for consideration in the Financial Department, and the Government of India addressed on the rest of the points referred to.

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THE refund must be carried out by means of yearly instalments from the amount placed at the disposal of the Public Works Department when the annual budget is under preparation.

(True Extract.)

(Signed) H. B. GRIGG,
Acting Under Secretary.

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17th April 1878, No. 1,881 W.

No. 196. ORDER THEREON, 17th April 1878, No. 1,881 W.

RECORDED.

2. The Government of India have been informed* that the exact percentage of outlay debitable to Provincial has not yet been finally settled. An understanding on this point will probably have been arrived at by the time the next year's Provincial Budget is under preparation.

* Letter, No. 476 I, dated 10th November 1877.

(True Extract.)

(Signed) E. A. FOORD, Colonel, R.E.,
Secretary to Government, P.W.D.

To the District Engineer, Chingleput.
" Chief Engineer for Irrigation.
" Examiner of Public Works Accounts.

Pkd. A. F. Goodall.
Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of [1878] Madras.

PUBLIC WORKS.

To

The DISTRICT ENGINEER,
CHINGLEPUT.
&c., &c., &c.

Dated April 17th.

Rcd. Exch.

G. O., 17th April 1878, No. 1,981 W.

APRIL.

Nos 195-196.

*Madras Water Works Project.*—Financial proceedings anent the apportionment between Imperial and Provincial Funds of the cost of the —, recorded with remarks.

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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

9th December 1881, No. 850 I.

Irrigation Account.

Read the following paper :—

No. 16. No. 150 I.

*Note by the Chief Engineer for Irrigation.*

In the subjoined note is recorded the total expenditure on the Madras Water Supply and Irrigation Extension System to the end of 1880-81, and a comparison is drawn between the revised estimate and that sanctioned by the Government of India in their letter No. 695 I., dated 10th November 1871, the cause of excess on individual items or of additional expenditure being duly explained.

Statement of Total Outlay on the Madras Water Supply and Irrigation Extension Project to the end of 1880-81.

| Particulars of Charges. | To end of 1874-75 as per G.O., No. 341, dated 8th Feb. 1876. | 1875-76. | 1876-77. | 1877-78. | 1878-79. | 1879-80. | 1880-81. | Total to end of 1880-81. |
|---|---|---|---|---|---|---|---|---|
| | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. |
| Works .. .. | 11,73,436 | 6,119 | (a)15,541 | (a)2,530 | (b)24,410 | 9,141 | 11,533 | 12,42,710 |
| Establishment .. | 1,83,977 | 1,676 | 3,885 | 683 | 6,102 | 2,285 | 2,285 | 2,00,853 |
| Tools and Plant .. | 4,779 | 62 | 389 | 63 | 610 | 229 | 229 | 6,361 |
| Suspense .. .. | (c) | .. | .. | .. | .. | .. | .. | .. |
| Total .. | 13,62,192 | 7,857 | 19,815 | 3,226 | 31,122 | 11,655 | 14,057 | 14,49,924 |
| Receipts on Capital Account .. .. | 1,167 | .. | .. | .. | .. | .. | .. | 1,167 |
| Net Total .. | 13,61,025 | 7,857 | 19,815 | 3,226 | 31,122 | 11,655 | 14,057 | 14,48,757 |
| Capitalization of abatement of Land Revenue. | 1,95,647 | (d) | (d) | (d) | (d) | (d) | (d) | 1,95,647 |
| Interest .. .. | 71,904 | .. | .. | .. | .. | .. | .. | 71,904 |
| Grand Total .. | 16,28,576 | 7,857 | 19,815 | 3,226 | 31,122 | 11,655 | 14,057 | (e) 17,16,308 |

(a) The charges up to 1875-76 stand debited to Capital, but from 1876-77 to Irrigation and Navigation Works for which Capital and Revenue Accounts are not kept. The Establishment and Tools and Plant charges were not calculated from 1876-77, no administrative accounts being kept up for this project. The amounts now shown are specially calculated for the purpose of this statement.

(b) Of this amount Rs. 23,214 are debited to Provincial grant and the remainder, Rs. 1,196, to Irrigation and Navigation Works for which Capital and Revenue Accounts are not kept.

(c) Suspense balances have been removed, *vide* Office Note dated 20th November 1879.

(d) The abatement of land revenue during these years is not known, and the charges for "Leave and Pension Allowances" have been omitted as they are not intended for works for which Capital and Revenue Accounts are not kept, *vide* G.O., No. 1,949, dated 2nd August 1876.

(e) Rs. 3,00,000 have been paid on account of this project from Provincial Funds to Loan Funds (Capital Productive Public Works).

2. The principal causes of excess expenditure on this project are as follow :—

1*st*.—The extension or modification of several of the component works.

2*nd*.—The omission of essential items from the former estimate.

3. Under the head of Direct Charges the excess under Works is shown to be Rs. 1,96,697. Of this amount the items not provided for in the estimate last sanctioned aggregate Rs. 188,158,* so that the actual increase on items previously sanctioned is Rs. 8,539.

* Exclusive of the erroneous Establishment debit of Rs. 24,866.

| | RS. |
|---|---|
| On the other hand the decreases shown amount to Rs. 79,305, making the net excess on *works* to be ... | 1,17,392 |
| Add for Establishment ... ... ... ... ... | 2,19,255 |
| Add for Tools and Plant .. .. ... ... | 8,201 |
| | 3,44,848 |
| Deduct receipts on Capital Account ... ... ... | 1,167 |
| Total amount of Direct Charges requiring sanction ... | 3,43,681 |
| To which add total amount of Indirect Charges ... | 2,85,224 |
| Grand total of Direct and Indirect Charges requiring sanction in excess of the estimate sanctioned in letter No. 695 I., dated 10th November 1871 ... ... | 6,28,905 |

4. The total amount of the revised estimate including both charges is therefore Rs. 18,54,463,† of which the Provincial share, for the supply of the City of Madras, is Rs. 8,72,358, leaving a balance of Rs. 9,82,105, to be met from Imperial Funds.

† *Vide* Abstract B.

5. Under the head of Compensation the land taken up for the project is 4,919·08 acres, valued at Rs. 1,87,349-3-6, and may be particularised as follows :—

| | | ACRES. | RS. A. P. |
|---|---|---|---|
| | *Chingleput District.* | | |
| Collector's letter No. 2,399, dated 20th June 1881. | For all works other than the Delivery channel ... | 4,762·10 | 1,45,079 4 8 |
| | For the open Delivery channel ... ... ... | 133·70 | 14,542 14 0 |
| | *Madras District.* | | |
| Collector's letter No. 893, dated 15th November 1879. | For the open Delivery channel ... ... ... | 20·82 | 17,891 6 0 |
| | For Municipal works below the end of the open Delivery channel ... ... | 2·46 | 9,835 10 10 |
| | Total Municipal ... | 156·98 | 42,269 14 10 |
| | Grand Total ... | 4,919·08 | 1,87,349 3 6 |

6. The amount paid by Government for land taken up for Municipal purposes is as under :—

| | ACRES. | RS. |
|---|---|---|
| Chingleput District ... ... ... ... ... | 125·36 | 12,438 13 8 |
| Madras District ... ... ... ... ... | 19·02 | 24,623 15 4 |
| | 144·38 | 37,062 13 0 |
| Total paid for ... ... ... ... ... ... | 12·60 | 5,207 1 10 |
| Do. not paid for ... ... ... ... ... | | |
| Total Municipal ... | 156·98 | 42,269 14 10 |



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ABSTRACT A—*cont.*

| Particulars. | Amounts in the Estimate sanctioned by the Government of India in letter No. 695 I., dated 10th Nov. 1871, embodied in Proceedings of Madras Government No. 65, dated 10th Jan. 1872. | Amount spent up to end of 1880-81. | Amount required to complete each work. | Total Revised Estimate or Totals of Columns 3 and 4. | Increase. | Decrease. |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| PROVINCIAL. | RS. | RS. | RS. | RS. | RS. | RS. |
| IX.—Items chargeable to Provincial, on *Works* .. .. .. | 30,832 | 84,804 | 11,769 | 96,573 | 65,741 | .. |
| | 12,25,558 | 12,67,576 | 1,00,240 | 13,67,816 | 2,21,563 | 79,305 |
| Deduct amount charged to Works, which properly belonged to Establishment .. .. .. | .. | 24,866 | .. | 24,866 | 24,866 | .. |
| | 12,25,558 | 12,42,710 | 1,00,240 | 13,42,950 | 1,96,697 | 79,305 |
| Establishment .. .. .. | .. | 2,90,853 | 18,492 | 2,19,255 | 2,19,255 | .. |
| Tools and Plant .. .. .. | .. | 6,361 | 1,840 | 8,201 | 8,201 | .. |
| | 12,25,558 | 14,49,924 | 1,20,482 | 15,70,406 | 4,24,153 | 79,305 |
| Deduct Receipts on Capital Account. | .. | 1,167 | .. | 1,167 | 1,167 | .. |
| Total, Direct Charges .. | 12,25,558 | 14,48,757 | 1,20,482 | 15,69,239 | 4,22,986 | .. |
| Capitalisation of abatement of Land Revenue .. .. .. | .. | 1,95,647 | 17,673 | 2,13,320 | 2,13,320 | .. |
| Interest .. .. .. | .. | 71,904 | .. | 71,904 | 71,904 | .. |
| Total, Indirect Charges .. | .. | 2,67,551 | 17,673 | 2,85,224 | 2,85,224 | .. |
| Grand Total .. | 12,25,558 | 17,16,308 | 1,38,155 | 18,54,463 | 7,08,210 | 79,305 |
| Deduct amount of estimate sanctioned by the Government of India in letter No. 695 I., dated 10th November 1871, embodied in Proceedings of Madras Government, No. 65, dated 10th January 1872. | .. | .. | .. | 12,25,558 | 79,305 | .. |
| Net amount requiring sanction .. | .. | .. | .. | 6,28,905 | 6,28,905 | .. |

ABSTRACT B.

| Particulars. | Direct Charges. Works. | Establishment. | Tools and Plant. | Total. | Indirect Charges. Capitalised abatement of Land Revenue. | Interest. | Total. | Grand Total. |
|---|---|---|---|---|---|---|---|---|
| | RS. | RS. | RS. | RS. | RS. | RS. | RS. | RS. |
| I.—Imperial .. .. | 70,230 | 17,557 | 1,755 | 89,542 | 4,401 | .. | 4,401 | 93,943 |
| II.—Imperial and Provincial .. .. | 11,74,980 | 1,95,830 | 5,860 | 13,76,670 | 1,96,171 | 71,904 | 2,68,075 | 16,44,745 |
| III.—Provincial .. .. | 96,573 | 5,868 | 586 | 1,03,027 | 12,748 | .. | 13,748 | 1,16,775 |
| | 13,41,783 | 2,19,255 | 8,201 | 15,69,239 | 2,13,320 | 71,904 | 2,85,224 | 18,54,463 |
| | | | | | | Total, Revised Estimate .. | | 18,54,463 |

| | | | Imperial. | Provincial. | | | |
|---|---|---|---|---|---|---|---|
| | | | RS. | RS. | | | RS. |
| I.—Items chargeable wholly to Imperial. | Direct charges | .. | 89,542 | .. | Amount chargeable to Provincial .. | | 8,72,358 |
| | Indirect do. | .. | 4,401 | .. | Amount already met from &c.— | | |
| II.—Items chargeable to Imperial and Provincial by the shares 54 and 46 respectively. | Direct charges. | RS. 13,76,670 | 7,43,402 | 6,33,268 | By transfer in 1876-77.. | 50,000 | |
| | | | | | Do. in 1878-79.. | 50,000 | |
| | | | | | Do. in 1879-80.. | 1,00,000 | * |
| | Indirect do. | 2,68,075 | 1,44,760 | 1,23,315 | Do. in 1880-81.. | 1,00,000 | |
| | | | | | From the Reserve, G.O., No. 823 W., 1st March 1879 .. .. | 23,314 | |
| III.—Items chargeable wholly to Provincial. | Direct charges | .. | .. | 1,03,027 | | | 3,23,314 |
| | Indirect do. | .. | .. | 12,748 | Balance due to Imperial .. | | 5,49,144 |
| | | | 9,82,105 | 8,72,358 | | | |
| | Total Revised Estimate .. | | 18,54,463 | | * Refund to P. P. W. | | |

14. In paragraph 3 above it was shown that the revised estimate includes works not previously provided for, which are estimated to, or have cost Rs. 1,88,158.

The principal items are:—

| | | Rs. |
|---|---|---|
| (1). | Lengthening Thamarapak anicut ... ... ... ... | 23,437 |
| (2). | Cholaverm Tank channel. Increasing capacity of Kattankal surplus weir ... ... ... ... ... ... ... | 19,000 |
| | Do. Increasing capacity of Boosikal surplus weir ... ... ... ... ... ... ... | 17,400 |
| (3). | Reconstructing a portion of the bund of Cholaveram tank ... | 29,832 |
| (4). | Surplus sluices, Red Hills Tank ... ... ... ... | 20,023 |
| (5). | Drainage of rear part of bund, &c., of do. ... ... ... | 9,880 |

and the following remarks, in addition to the brief explanations given in the comparative statement, are submitted regarding these. All these items have been specially approved by Government.

15. ITEM 2 OF COMPARATIVE STATEMENT.—*Extension of the Thamarapak Anicut.*—The insufficient length, 474 feet, of the anicut as originally constructed was made evident by the fresh of November 1872 in the Kortalayár. The river having risen to 13 feet above the crest and to several feet above the level of the country on the north side, a large breach was made through the bank behind the north wing, though but little damage was sustained by the anicut. The work was inspected by the Inspector-General of Irrigation and he concurred in the necessity for lengthening the anicut by 150 feet, so as to carry it across the breach to the new line of the river bank. A still higher fresh occurred in 1874 and showed that the additional length of weir had not been provided without sufficient reason.

G.O., No. 2,132, dated 26th August 1873.

16. ITEMS 11 and 29 OF COMPARATIVE STATEMENT.—*Alteration of the Kattankal and Boosikal Surplus Weirs.*—The requirements for cross drainages were in the first instance very inadequately provided for. The areas of the drainage basins were not properly ascertained, while up to 1872 the maximum flood level in the Kortalayár was not even approximately known, the calculations made when the project was originally drawn up being very far from correct. The result has been that the Cholaveram Tank supply channel has suffered on several occasions very extensive damage. The circumstances unfortunately do not admit of completely satisfactory arrangements at a reasonable cost. Should the river be in extreme fresh when the local rainfall approaches a maximum, the discharge of the drainages will not be capable of being disposed of without exceeding the intended maximum water level in the channel, and on the rare occasions when these unfavorable circumstances may be expected to occur, the left bank of the channel will probably breach at places which will be left exceptionally low so as to fix the site of the breaches.

G.O., No. 2,785, dated 17th October 1876.

17. ITEM 39 OF COMPARATIVE STATEMENT.—*Reconstructing a portion of the bund of the Cholaveram Tank.*—The bund of this tank before its enlargement was a small one, and the new earthwork was placed partly inside and partly outside the old bund. This led to slips in the rear slope, and it was found necessary to secure stability by turning over the rear part near the south end and thus reforming the bank on the inside of the old bund. The bund has given no trouble since this was done. The length dealt with was 1,100 feet.

G.O., No. 271, dated 4th February 1874.

18. ITEM 47 OF COMPARATIVE STATEMENT.—*Surplus Sluices of ten vents. Red Hills Tank.*—These sluices which have been built in the southern part of the surplus weir of the tank were deemed necessary as a safeguard, owing to the unsatisfactory condition of the bund of this large reservoir. The surplus weir is of ample capacity to discharge all the water to be disposed of, but it does not come into action until the water rises above full tank level. On several occasions there have been extensive slips in the bund, which were occasioned by subsoil leakage, as also by water getting into the bund itself above ground level, and considerable anxiety was expressed lest the breaching of the tank should inundate Madras. It was considered therefore to be desirable to

G.O., No. 2,322, dated 11th August 1875.



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provide means for rapidly lowering the water level should the bund be in danger of giving way, as also to allow of the discharge of surplus without necessitating the rise of the water level in the reservoir to as great a height above full tank level as would be necessary were all such surplus to be passed over the weir. Although Madras would not be inundated were the tank to breach, such an accident would be a very serious matter, whether the damage to property, the cost of repairs, or the loss of water, with the consequent cessation of irrigation and of the water-supply to the city, be considered. The construction of the sluices was therefore sanctioned by Government, but so far, owing to bad work, and badly set up gear for working the shutters, they have been of little use. The defects are being remedied.

The excess on the ring-bund in connection with these sluices is explained in the Comparative Statement Item No. 47.

19. ITEM 58 OF COMPARATIVE STATEMENT.—*Drainage of rear part of bund of the Red Hills Tank.*—The slips which have from time to time occurred, and the state of the bund at the slips, indicated that, unless the leakage which had caused these could be prevented from saturating the base of the rear part of the bund, and the leakage conveyed away, accidents would continue to occur. Borings which were made showed that much of the old bund, as well as of the additions made thereto, was formed of bad soil, and as the bund rests for a large part of its length on porous laterite there is not only leakage through the bund, but also through the subsoil to be provided against. After consideration, the conclusion was arrived at that a suitable puddle wall could not be inserted in the bund without lowering the water level in the tank to a greater extent, and keeping it down for a much longer period than could be allowed without great inconvenience to the City of Madras. As, in any case, drains would be needed to dispose of subsoil leakage, it was decided (G.O., No. 406 I., 24th June 1880,) that, at any rate in the first instance, these drains should be constructed and their effect ascertained before any final decision against or for a puddle wall was come to.

The work is in progress, and the regular estimate for it was sanctioned in G.O., No. 498 I., dated 6th August 1881.

20. In preparing this revised estimate it has been considered desirable to show distinctly:—

1*st*.—The total amount to be divided between Imperial (Irrigation) and Provincial.

2*nd*.—The amount chargeable to Provincial only.

With regard to the division of the former, it was estimated in the papers printed in Proceedings of Madras Government, No. 2,650, of the 2nd October 1876, that the Provincial share would be 46 per cent. and the Imperial share 54 per cent. of the total, the shares being based on the quantity of water required to be reserved for Municipal purposes, and on that therefore left for irrigation. There was for a time a doubt as to whether the quantity required for Madras might not have to be increased, in connection with the drainage arrangements of the city, but by G.O., No. 598-A I., of the 10th October 1879, it was settled that no more water would need to be reserved. It is believed therefore that no closer approximation than that already given can be made to the shares appertaining to Provincial and Imperial respectively. The amount to be divided is that for the part of the project common to both services. That part which belongs exclusively to the supply of Madras and which therefore belongs entirely to Provincial, and that part* which provides for distributaries and which belongs exclusively to Irrigation, have not been included in the amount to be divided.

* Items 37, 51, 52, 53, 60, 61 to 64 and 65 of Comparative Statement.

21. Two of the entries under Direct Charges appertaining to Provincial solely may require brief explanation.

*Land Compensation. Item 71 of Comparative Statement.*—The cost of the land taken up for the Municipal delivery channel from the Red Hills Tank and for the subsidiary works has been finally settled, and it was at first determined that the Municipality should refund to Provincial Rs. 29,422, the value of the land in excess of

the 56·2 acres required for the original design at the average rate for the 156·98 acres actually taken up. The Municipality for their own convenience adopted a line quite different from that originally determined on, but they nevertheless objected to the enforcement of this claim. Though there is no doubt that the claim was equitable the Government have (Proceedings of Madras Government, No. 492 I., of 5th August 1881,) determined not to enforce it, in consequence of the impecunious state of the Municipality. The whole of the land compensation for the delivery channel, amounting to Rs. 42,270, forms therefore a charge against Provincial.

*Pumping and dismantling Pumps.* *Item 74 of Comparative Statement.*—The water in the Red Hills Tank in 1876 having fallen to an unusually low level pumping had to be resorted to in order to keep up the supply to the City of Madras, and the cost was ordered, in Financial G.O.,

G.O., No. 623 W., dated 1st March 1879.
" " 1,415, dated 7th June 1876, Financial.
" " 620, dated 4th April 1876 "

No. 82, dated 18th January 1879, to be debited to Public Works, Provincial.

22. It has been shown that the Capital expenditure debitable to Imperial (Irrigation) will amount to for—

| | Rs. |
|---|---|
| Direct Charges ... .. ... ... ... ... ... | 8,32,944 |
| Indirect " ... ... ... ... ... ... ... | 1,49,161 |
| Total .. | 9,82,105 |

In Appendix C will be found a statement showing the maintenance charges from 1870-71, when the project first came into operation, up to 1879-80. The average outlay for this period of ten years excluding 1871-72 and 1873-74 which were abnormal years has been Rs. 8,969 yearly, from which deducting Rs. 1,704, the assumed cost* of maintenance of the old tanks, the increased cost of upkeep to be distributed becomes Rs. 7,265, and of this 54 per cent. or Rs. 3,923 is chargeable to Irrigation. The increase of revenue being, up to 1879-80, Rs. 5,365 per annum on the average, as shown in paragraph 10 above, this increase was sufficient to cover the maintenance expenses.

* Proceedings of Madras Government, No. 2,650, 2nd October 1876.

| | Rs. |
|---|---|
| Works, calculated at 10 per cent. on average old revenue ..... .. | 1,311 |
| Establishment, &c., at 30 per cent. on works... ... ... ... | 393 |
| | 1,704 |

23. But there is no probability of the returns from the project covering the interest on the outlay.

The gross income necessary to make the project properly remunerative would be—

| | Rs. |
|---|---|
| 4½ per cent. on Rs. 8,32,944 ... ... ... ... ... ... | 37,482 |
| Maintenance charges 3,923 } ... ... ... ... ... ... | 5,704 |
| Collection do. 1,781 } | |
| Total ... | 43,186 |

| | Acs. |
|---|---|
| Total irrigable area, *vide* paragraph 1 of Note in Proceedings of Madras Government, No. 2,650, 2nd October 1876 ... ... ... ... ... | 9,852 |
| Deduct average old irrigated area, *vide* paragraph 9 of this Note ... ... | 3,829 |
| | * 6,023 |

and the water-supply is not likely to suffice for more than 6,023* acres of additional irrigation. The estimated ultimate direct revenue (water-tax) amounts to only Rs. 24,741, and this would leave a yearly deficit of Rs. 18,445. The actual return from the works, after paying maintenance and collection charges would on this estimate be Rs. 19,037, which is equivalent to 2·28 per cent. on the Direct Charges or to 1·9 per cent. on Direct and Indirect Charges.

24. The estimate of growth of irrigation and of Revenue Receipts and Charges has been drawn up with reference to the Proceedings of the Board of Revenue, No. 9,678, dated 5th November 1881, (*Vide* Appendix D). This estimate is in



Comparative Statement of the Madras Water-supply and Irrigation Extension Project—*cont.*

| Number of Item. | Name of Work. | Amounts in the Estimate of 1871 sanctioned by the Government of India in letter No. 695 I., dated 16th Nov. 1871, embodied in G.O., No. 66, dated 19th Jan. 1872. | Amount spent up to end of 1880-81. | Amount required to complete each work. | Total Revised Estimate or total of Columns 4 and 5. | Increase. | Decrease. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | RED HILLS TANK—*cont.* | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | |
| | MASONRY WORKS—*cont.* | | | | | | | |
| 50 | Constructing a parapet wall from the Polal to ten-vent sluice. | .. | 2,385 | .. | 2,385 | 2,385 | .. | To prevent the waves caused by high winds washing over the bund when the tank is full, it was considered desirable to raise the original low parapet wall of laterite stone at the top of the revetment 2 feet, making it 3 feet high and 1½ feet thick, for a distance of 5,546 feet in length. The amount of the estimate for the work was sanctioned in G.O. No. 307 I., dated 10th May 1881, to be included in the present estimate |
| 51 | Irrigtn. sluice, north. | 30,171 | 30,215 | .. | 30,215 | 44 | .. | Chargeable to Imperial. |
| 52 | Do. do., south. | | | 4,200 | 4,200 | 4,200 | .. | Do. do. Required to allow of water being passed into the Vilankadupakam channel. |
| 53 | Extension of north sluice. | .. | .. | | | | | |
| | EARTHWORK. | | | | | | | ..... |
| 54 | Red Hills tank bank. | 1,43,799 | 1,43,744 | .. | 1,43,744 | .. | 55 | ..... |
| 55 | Soorapedoo bank .. | 26,110 | 25,040 | .. | 25,040 | .. | 1,070 | |
| 56 | Puddle to toe of main bank. | 16,500 | 14,800 | .. | 14,800 | .. | 1,700 | Originally sanctioned as an emergent estimate on somewhat rough data. |
| 57 | Planting trees along the toe of the bund of the Red Hills tank. | .. | 113 | .. | 113 | 113 | .. | *Vide* explanation against item No. 4. |
| 58 | Drains under rear part and in rear of bund. | .. | 6,795 | 3,085 | 9,880 | 9,880 | .. | Sanctioned in G.O., No. 406 I., dated 24th June 1880. The bund being insecure from leakage which has occasioned several slips, an approximate estimate was sanctioned for immediate execution, and in G.O., No. 498 I., dated 6th August 1881, the amount of the regular estimate for the work was directed to be included in the present estimate. |
| | Total .. | 2,65,254 | 2,82,365 | 15,744 | 2,98,609 | 41,904 | 8,549 | |
| | VI. DISTRIBUTARIES, &c. | | | | | | | ..... |
| 59 | Drainage channel at Cholaveram tank bund. | .. | 560 | .. | 560 | | .. | |
| 60 | Channel from north sluice of Cholaveram tank to Villivoil tank. | .. | 44 | .. | 44 | | .. | Chargeable to Imperial. |
| | *Below Cholaveram Tank.* | | | | | *2,201 | .. | * A lump sum amount was entered for distributaries in the original estimate. |
| 61 | Marembedu channel. | | 38 | 3,000 | | | .. | |
| | *Below Red Hills Tank.* | | | | | | .. | Chargeable to Imperial. |
| 62 | Vilankadupakam channel. | 25,000 | .. | 3,550 | 20,821 | | .. | |
| 63 | Madaveram channel. | | 395 | 7,600 | | | .. | |
| 64 | Channel leading to Soorapedoo Irrigation sluice. | | 1,238 | .. | | | .. | |
| 65 | Soorapedoo sluice .. | .. | 5,776 | .. | 5,776 | | .. | Do. Estimate of Rs. 5,463 sanctioned against the lump sum of Rs. 25,000 for distributaries in G.O., No. 307, of 17th Mar. 1871. |
| | Total .. | 25,000 | 8,051 | 19,150 | 27,201 | 2,201 | .. | |

Comparative Statement of the Madras Water-supply and Irrigation Extension Project—*cont.*

| Number of Item. | Name of Work. | Amounts in the Estimate of 1871 sanctioned by the Government of India in letter No. 695 I., dated 10th Nov. 1871, embodied in G.O., No. 66, dated 10th Jan. 1872. | Amount spent up to end of 1880-81. | Amount required to complete each work. | Total Revised Estimate or total of Columns 4 and 5. | Increase. | Decrease. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | VII. | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | |
| 66 | Land other than for Madras Municipality. | 1,75,917 | 1,30,218 | 14,861 | 1,45,079 | .. | 30,838 | This decrease is only nominal, the rest of the compensation, viz., for the Madras Municipal channel being shown separately under charges appertaining to Provincial. |
| | Total .. | 1,75,917 | 1,30,218 | 14,861 | 1,45,079 | .. | 30,838 | |
| | VIII. MISCELLANEOUS. | | | | | | | |
| 67 | Constructing new tank in Alamady village. | .. | 9,066 | .. | 9,066 | 9,066 | .. | This tank was constructed to replace the one submerged by the Cholaveram tank; no provision in the revised estimate sanctioned by the Government of India in 1871. An estimate, amounting to Rs. 9,260, was sanctioned by the local Government. —*Vide* G.O., No. 422, dated 7th February 1877. |
| 68 | Contingencies and superintendence. | 47,746 | 47,405 | 341 | 47,746 | .. | .. | ..... |
| 69 | Removing calingulah at lower end of surplus channel of Red Hills tank near Shadiyankupam lock. | .. | 369 | .. | 369 | 369 | .. | The calingulah was a hindrance to the free flow of drainage. Sanctioned in G.O., No. 873, dated 2nd April 1875. |
| 70 | Providing a Stoney's equilibrium valve. | .. | .. | 1,415 | 1,415 | 1,415 | .. | This valve was obtained from England under Government sanction and placed in 1875 in a convenient situation at the Red Hills tank for the purpose of carrying out a preliminary trial. The result of this trial is recorded in G.O., No. 846 I., dated 23rd October 1878. As the sluice valve cannot at present be utilized at any of the deep tanks in other districts of the Presidency, the Committee appointed to investigate and report on the superfluous stock of the Public Works Department recommended in their report printed in Proceedings, Madras Government, No. 914 W., dated 4th April 1881, that the valve be charged to the work to which it was issued and on which it stands. |
| | Total .. | 47,746 | 56,840 | 1,756 | 58,596 | 10,850 | .. | |
| | IX. ITEMS CHARGEABLE TO PROVINCIAL. | | | | | | | |
| 71 | Land for Municipal Delivery channel. | .. | 30,501 | 11,769 | 42,270 | 42,270 | .. | Covered in part by the saving of Rs. 30,838 shown against item 66 above. |
| 72 | Contribution to do. being part of original estimate. | 30,832 | 30,832 | .. | 30,832 | .. | .. | ..... |
| 73 | Gauge weir below municipal sluice. | .. | 257 | .. | 257 | 257 | .. | Required for the purpose of gauging the supply of water to Madras.—*Vide* G.O., No. 2,503, dated 13th October 1873. |
| 74 | Pumping and dismantling pumps. | .. | 23,214 | .. | 23,214 | 23,214 | .. | Expenditure incurred when the Red Hills tank was low during the famine to supply the city of Madras.—*Vide* G.O., No. 523 W., dated 1st March 1879. |
| | Total .. | 30,832 | 84,804 | 11,769 | 96,573 | 65,741 | .. | |



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7. The amount paid for land taken up for the project for other than Municipal purposes is as follows:—

| | | ACRES. | RS. | A. | P. |
|---|---|---|---|---|---|
| Land paid for ... ... ... ... ... | | 4,330·95 | 1,30,218 | 2 | 9 |
| Do. not paid for ... ... ... ... ... | | 431·15 | 14,861 | 1 | 11 |
| | Total ... | 4,762·10 | 1,45,079 | 4 | 8 |
| Total land paid for in both cases ... | | 4,475·33 | 1,67,280 | 15 | 9* |
| Total land not paid for in both cases. | | 443·75 | 20,068 | 3 | 9 |
| | Grand Total ... | 4,919·08 | 1,87,349 | 3 | 6 |

*Of this sum only Rs. 1,60,719 have been booked by the Examiner up to end of 1880-81.

8. It was anticipated many years ago that there would be a considerable increase in the estimated amount of land compensation, and in G.O., No. 2,783, dated 10th September 1867, it was stated that the compensation for land would amount to Rs. 2,06,000, which is a fair approximation to the actual demand.

9. The following statement shows the area irrigated and the revenue derived under the project both before and after the construction of the work. Correct figures are only available up to the end of 1879-80 (Fasli 1289).

Proceedings of the Board of Revenue, Mis. No. 11,356, dated 2nd December 1879.
Do. do. No. 3,606, dated 5th April 1881.

| | Fasli. | Area Irrigated. First Crop. | Area Irrigated. Second Crop. | Revenue exclusive of Remissions. Land. | Revenue exclusive of Remissions. Water. | Revenue exclusive of Remissions. Total. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | ACS. | ACS. | RS. | RS. | RS. | |
| Years prior to the construction of the work. | 1265 ... | 2,283 | Not known. | 2,588 | 4,968 | 7,556 | |
| | 1266 ... | 3,441 | | 4,038 | 7,711 | 11,749 | |
| | 1267 ... | 3,534 | | 4,179 | 8,361 | 12,540 | |
| | 1268 ... | 3,763 | | 4,499 | 8,825 | 13,324 | |
| | 1269 ... | 4,131 | | 4,853 | 9,539 | 14,392 | |
| | 1270 ... | 3,811 | | 4,632 | 8,964 | 13,596 | |
| | 1271 ... | 4,101 | | 4,863 | 8,968 | 13,831 | |
| | 1272 ... | 4,255 | | 5,082 | 9,265 | 14,347 | |
| | 1273 ... | 4,423 | | 5,326 | 9,652 | 14,978 | |
| | 1274 .. | 4,379 | | 5,263 | 9,861 | 15,124 | |
| | 1275 ... | 4,626 | | 5,617 | 10,171 | 15,788 | |
| | 1276 ... | 3,997 | | 4,888 | 9,431 | 14,319 | |
| | 1277 .. | 3,383 | | 3,919 | 7,552 | 11,371 | |
| | 1278 ... | 3,027 | | 3,306 | 6,181 | 9,487 | |
| | 1279 ... | 4,283 | | 5,099 | 9,198 | 14,297 | |
| | Total ... | 57,437 | ... | 68,052 | 1,28,647 | 1,96,699 | |
| | Average ... | 3,829 | ... | 4,537 | 8,576 | 13,113 | |
| Years subsequent to the construction of the work. | 1280 ... | 4,008 | ... | 4,947 | 10,082 | 15,029 | |
| | 1281 ... | 4,622 | ... | 5,922 | 8,512 | 14,434 | |
| | 1282 ... | 5,553 | ... | 7,355 | 10,392 | 17,747 | |
| | 1283 ... | 5,120 | 1,029 | 6,768 | 10,228 | 16,996 | |
| | 1284 ... | 5,742 | 1,403 | 7,279 | 12,161 | 19,440 | |
| | 1285 ... | 5,747 | 1,578 | 7,308 | 13,511 | 20,819 | |
| | 1286 ... | 4,862 | 1,004 | 6,011 | 1,391 | 7,402 | Famine year. |
| | 1287 ... | 6,142 | 547 | 6,493 | 13,433 | 19,926 | |
| | 1288 ... | 5,818 | 2,214 | 6,249 | 18,909 | 25,158 | |
| | 1289 ... | 6,477 | 2,769 | 7,105 | 20,725 | 27,830 | |
| | Total ... | 54,091 | 10,544 | 65,437 | 1,19,344 | 1,84,781 | |
| | Average .. | 5,409 | 1,054 | 6,543 | 11,934 | 18,478 | |

10. The extended works may be considered to have come into operation in Fasli 1280 (1870-71), and the following table shows the increase of area and revenue for each year from that date inclusive—

| Periods. | Area Irrigated. | | | Revenue exclusive of Remissions. | | | Difference. | |
|---|---|---|---|---|---|---|---|---|
| | First Crop. | Second Crop. | Total. | Land. | Water. | Total | Area. | Revenue. |
| Average for the fifteen years 1855-56 to 1869-70. | Acres. 3,829 | .. | Acres. 3,829 | Rs. 4,537 | Rs. 8,576 | Rs. 13,113 | Acres. .. | Rs. .. |
| Fasli 1280 (1870-71) .. | 4,008 | .. | 4,008 | 4,947 | 10,082 | 15,029 | 179 | 1,916 |
| ,, 1281 (1871-72) .. | 4,622 | .. | 4,622 | 5,922 | 8,512 | 14,434 | 793 | 1,321 |
| ,, 1282 (1872-73) .. | 5,553 | .. | 5,553 | 7,355 | 10,392 | 17,747 | 1,724 | 4,634 |
| ,, 1283 (1873-74) .. | 5,120 | 1,029 | 6,149 | 6,768 | 10,228 | 16,996 | 2,320 | 3,883 |
| ,, 1284 (1874-75) .. | 5,742 | 1,403 | 7,145 | 7,279 | 12,161 | 19,440 | 3,316 | 6,327 |
| ,, 1285 (1875-76) .. | 5,747 | 1,578 | 7,325 | 7,308 | 13,511 | 20,819 | 3,496 | 7,706 |
| ,, 1286 (1876-77) .. | 4,862 | 1,004 | 5,866 | 6,011 | 1,391 | 7,402 | 2,037 | — 5,711 |
| ,, 1287 (1877-78) .. | 6,142 | 547 | 6,689 | 6,493 | 13,433 | 19,926 | 860 | 6,813 |
| ,, 1288 (1878-79) .. | 5,818 | 2,214 | 8,032 | 6,249 | 18,909 | 25,158 | 4,203 | 12,045 |
| ,, 1289 (1879-80) .. | 6,477 | 2,769 | 9,246 | 7,105 | 20,725 | 27,830 | 5,417 | 14,717 |
| Total .. | .. | .. | 64,635 | .. | .. | 1,84,781 | 24,345 | 53,651 |
| Average .. | .. | .. | 6,463 | .. | .. | 18,478 | 2,434 | 5,365 |

11. The cause of the great falling off in revenue in 1876-77 is owing to Government, in April 1876, having adopted measures in consequence of the continued drought to diminish the offtake. The Collector was directed to limit cultivation and to prevent further use of water for irrigation purposes.

G.O., Revenue Department, No. 841, dated 8th April 1876.
G.O., Public Works Department, No. 165, dated 25th April 1876.

In March 1877 Government directed the immediate closure of all the irrigation sluices.

G.O., Public Works Department, No. 703, dated 1st March 1877.

12. The possibility of restrictive orders of the above-mentioned nature having to be issued has necessarily exercised a prejudicial effect on the area irrigated and the revenue obtained.

13. The Comparative Statement, Appendix A, shows the difference between the last sanctioned estimate (recorded in Proceedings of Madras Government, No. 2,171, 23rd August 1871, and permission to carry out which was communicated with G.O., No. 65, dated 10th January 1872,) and the present revised estimate, the cause of excess being briefly explained in each case. An abstract of this statement is subjoined.

ABSTRACT A.

| Particulars. | Amounts in the Estimate sanctioned by the Government of India in letter No. 695 I., dated 10th Nov. 1871, embodied in Proceedings of Madras Government No. 65, dated 10th Jan. 1872. | Amount spent up to end of 1880-81. | Amount required to complete each work. | Total Revised Estimate or Totals of Columns 3 and 4. | Increase. | Decrease. |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 9 |
| IMPERIAL AND PROVINCIAL. | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. |
| I.—Anicut and Head Works .. | 67,550 | 95,839 | .. | 95,839 | 29,951 | 1,762 |
| II.—Cholaveram Tank supply channel . | 2,40,692 | 2,08,710 | 36,960 | 2,45,670 | 39,830 | 34,852 |
| III.—Cholaveram Tank .. .. | 2,40,078 | 2,67,367 | .. | 2,67,367 | 30,593 | 8,304 |
| IV.—Red Hills Tank supply channel .. | 1,32,389 | 1,32,882 | .. | 1,32,882 | 493 | .. |
| V.—Red Hills Tank .. .. .. | 2,65,254 | 2,82,865 | 15,744 | 2,98,609 | 41,904 | 8,549 |
| VI.—Distribution, &c., below the two tanks .. .. .. | 25,000 | 6,051 | 19,150 | 27,201 | 2,201 | .. |
| VII.—Land other than for Madras Municipality .. .. .. | *1,75,917 | 1,30,218 | 14,861 | 1,45,079 | .. | 30,838 |
| VIII.—Miscellaneous .. .. .. | 77,746 | 56,840 | 1,756 | 58,596 | 10,850 | .. |
| | 11,94,726 | 11,82,772 | 88,471 | †12,71,243 | 1,55,822 | 79,305 |

* This was for all the land. † Includes Rs. 70,230 chargeable wholly to Imperial.—*Vide* paragraph 20.



Form 3, modified to suit the circumstances of the present case, of Circular No. 17 of 1880 from the Government of India. The enhanced land revenue, or Indirect Receipts, has not been included for the reason assigned by the Board of Revenue in paragraph 2 of their Proceedings.

25. This Note is followed by Appendices showing:—

Appendix A. Comparative Statement.
B. Particulars of Land taken up for Project.
C. Abstract of annual Maintenance Charges.
D. Estimate of growth of Irrigation.
E. List of Component Works.
F. Sketch Map of System.

OFFICE OF THE CHIEF ENGINEER FOR IRRIGATION, CHEPAUK, 17th November 1881.

(Signed) JOHN MULLINS, Colonel, R.E., Chief Engineer for Irrigation.

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

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## APPENDIX A.

### CHINGLEPUT DISTRICT.

COMPARATIVE STATEMENT of the Madras Water-supply and Irrigation Extension Project.

| Number of Item. | Name of Work. | Amounts in the Estimate of 1871 sanctioned by the Government of India in letter No. 695 I., dated 10th Nov. 1871, embodied in G.O., No. 65, dated 10th Jan. 1872. | Amount spent up to end of 1880-81. | Amount required to complete each work. | Total Revised Estimate or total of Columns 4 and 5. | Increase. | Decrease. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | I. ANICUT AND HEAD WORKS. | RS. | RS. | RS. | RS. | RS. | RS. | |
| 1 | Anicut on the Kortalayár at Thamarapak. | 60,180 | 60,382 | .. | 60,382 | 202 | .. | The excess in this case is small and is due to increases in rates. |
| 2 | Do. extension.. | .. | 23,437 | .. | 23,437 | 23,437 | .. | A breach in rear of the left wing occurred in November 1872 and the height reached by the flood showed that the original length of the anicut was inadequate. It was therefore lengthened by 150 feet on an estimate of Rs. 25,300 sanctioned in G.O., No. 2,132, dated 26th August 1873. |
| 3 | Embanking the Kortalayár. | 4,800 | 3,038 | .. | 3,038 | .. | 1,762 | ..... |
| 4 | Planting trees on waste land on the south bank of the Kortalayár at Thamarapak anicut. | .. | 648 | .. | 648 | 648 | .. | *Vide* letters from the Superintending Engineer, Chingleput, Nos. 779 and 1,446, dated 21st February and 5th April 1878, respectively. Carried out in 1876-77. No provision in the revised estimate sanctioned by the Government of India in 1871. |
| 5 | Connecting right wing of anicut with left bank of Cholaveram tank supply channel by a flood bank. | .. | 1,338 | .. | 1,338 | 1,338 | .. | To prevent floods from the river entering the supply channel an estimate, amounting to Rs. 2,135, was sanctioned in G.O., No. 308 I., dated 3rd October 1877. |
| 6 | Office and store shed on line of works. | 2,670 | 4,638 | .. | 4,638 | 1,968 | .. | The excess is attributed to the loss in 1870 of a large quantity of materials (bricks) in stock (*vide* Superintending Engineer's letter No. 2,155, dated 17th April 1879). |
| 7 | Inspection house at Red Hills tank. | .. | 1,977 | .. | 1,977 | 1,977 | .. | Required for the accommodation of inspecting and executive officers, not provided for in the revised estimate sanctioned by the Government of India in 1871; but an estimate, amounting to Rs. 1,910, was sanctioned by local Government in G.O., No. 1,641, dated 6th July 1872. |
| 8 | Planting trees and constructing well in the compound of the inspection house at Red Hills tank. | .. | 381 | .. | 381 | 381 | .. | *Vide* explanation against Item 4. |
| | Total, Anicut and Head Works. | 67,650 | 95,839 | .. | 95,839 | 29,951 | 1,762 | |



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Comparative Statement of the Madras Water-supply and Irrigation Extension Project—*cont.*

| Number of Item. | Name of Work. | Amounts in the Estimate of 1871 sanctioned by the Government of India in letter No. 695 I., dated 10th Nov. 1871, embodied in G.O., No. 65, dated 10th Jan. 1872. | Amount spent up to end of 1880-81. | Amount required to complete each work. | Total Revised Estimate or total of Columns 4 and 5. | Increase. | Decrease. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | II. CHOLAVERAM TANK. SUPPLY CHANNEL. | RS. | RS. | RS. | RS. | RS. | RS. | |
| 9 | Head sluice .. | 32,563 | 33,113 | .. | 33,113 | 550 | .. | The excess is due to the increased cost of wood-work for shutters. |
| 10 | Kattankal surplus weir. | 7,145 | 4,293 | .. | 4,293 | .. | 2,852 | Saving owing to the modification of the design (*vide* G.O., No. 824, dated 20th March 1871). |
| 11 | Kattankal surplus weir extension. | .. | .. | 19,000 | 19,000 | 19,000 | .. | Entry of this item in the revised estimate approved in G.O., No. 2,785, dated 17th October 1876. |
| 12 | Bridge .. .. | | | | | | | |
| 13 | Do. .. .. | | | | | | | |
| 14 | Do. .. .. | | | | | | | |
| 15 | Do. .. .. | | | | | | | |
| 16 | Do. .. .. | | | | | | | |
| 17 | Inlet .. .. | | | | | | | |
| 18 | Do. .. .. | | | | | | | |
| 19 | Do. .. .. | 51,539 | 53,739 | .. | 53,739 | 2,200 | .. | Excess attributed to the extra cost of wood-work. The individual estimates cannot now be separated, as they are lumped together in the estimate of 1871. The original estimate was Rs. 53,502. |
| 20 | Do. .. .. | | | | | | | |
| 21 | Do. .. .. | | | | | | | |
| 22 | Do. .. .. | | | | | | | |
| 23 | Do. .. .. | | | | | | | |
| 24 | Do. .. .. | | | | | | | |
| 25 | Do. .. .. | | | | | | | |
| 26 | Do. .. .. | | | | | | | |
| 27 | Raising No. 2 bridge | .. | .. | 560 | 560 | 560 | .. | Required in connection with the calculated maximum water-level in the channel due to upland drainage. |
| 28 | Boosikal surplus weir. | 6,531 | 6,651 | .. | 6,651 | 120 | .. | Excess due to excavation of a small channel from the weir which was not provided for in the estimate of 1871. |
| 29 | Do. extension .. | .. | .. | 17,400 | 17,400 | 17,400 | .. | Entry of this item in the revised estimate approved in G.O., No. 2,785, dated 17th October 1876. |
| 30 | Alachuri aqueduct... | 6,286 | 6,286 | .. | 6,286 | .. | .. | ..... |
| 31 | Channel from Kortalayár to Cholaveram, including Boosikal diversion channel. | 89,813 | 89,813 | .. | 89,813 | .. | .. | ..... |
| 32 | Bank across Kattankal. | 765 | 765 | .. | 765 | .. | .. | ..... |
| 33 | Boosikal upper and lower bund. | 8,871 | 8,871 | .. | 8,871 | .. | .. | |
| 34 | Widening channel down to 5¼ miles. | 32,000 | .. | .. | .. | .. | 32,000 | Original estimate cancelled as unnecessary, the channel having been sufficiently enlarged by natural scour (*vide* G.O., No. 1,548, dated 2nd June 1876). |
| 35 | Maintenance during construction. | 5,179 | 5,179 | .. | 5,179 | .. | .. | ..... |
| | Total .. | 2,40,692 | 2,08,710 | 36,960 | 2,45,670 | 39,830 | 34,852 | ..... |
| | III. CHOLAVERAM TANK. MASONRY WORKS. | | | | | | | |
| 36 | Calingulah .. | 19,989 | 16,685 | .. | 16,685 | .. | 3,304 | Saving effected by reduction of the level of calingulah crest as per orders of the Chief Engineer for Irrigation issued in memorandum No. 58, dated 4th June 1872. |
| 37 | Irrigation sluice .. | 9,171 | 9,174 | .. | 9,174 | 3 | .. | Chargeable to Imperial. This item was included in the comparative statement of 1871. |

Comparative Statement of the Madras Water-supply and Irrigation Extension Project—*cont.*

| Number of Item. | Name of Work. | Amounts in the Estimate of 1871 sanctioned by the Government of India in letter No. 695 I., dated 10th Nov. 1871, embodied in G.O., No. 65, dated 10th Jan. 1872. | Amount spent up to end of 1880-81. | Amount required to complete each work. | Total Revised Estimate or total of Columns 4 and 5. | Increase. | Decrease. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | CHOLAVERAM TANK—*cont.* | RS. | RS. | RS. | RS. | RS. | RS. | |
| | EARTHWORK. | | | | | | | |
| 38 | Tank bank .. | 2,10,918 | 2,11,676 | .. | 2,11,676 | 758 | .. | The excess in this case is owing to the settlement of the earthwork which had to be raised. |
| 39 | Reconstructing a portion of the bund. | .. | 29,832 | .. | 29,832 | 29,832 | .. | This work was found to be necessary to meet the slipping of the bund. An estimate, amounting to Rs. 30,676, was sanctioned by the local Government.—*Vide* G.O., No. 271, dated 4th February 1874. |
| | Total .. | 2,40,978 | 2,67,367 | .. | 2,67,367 | 30,593 | 3,304 | |
| | IV. | | | | | | | |
| | RED HILLS TANK. | | | | | | | |
| | SUPPLY CHANNEL. | | | | | | | |
| | MASONRY WORKS. | | | | | | | |
| 40 | Head sluice .. | 31,177 | 31,468 | .. | 31,468 | 291 | .. | The excess in this case is attributed to an increase in rates. |
| 41 | Bridge .. .. | 6,782 | | | | | | |
| 42 | Under tunnel .. | 1,793 | 9,701 | .. | 9,701 | 202 | .. | Do. do. |
| 43 | Inlet .. .. | 324 | | | | | | |
| | EARTHWORK. | | | | | | | |
| 44 | Channel .. .. | 91,713 | 91,713 | .. | 91,713 | .. | .. | ..... |
| | Total .. | 1,32,389 | 1,32,882 | .. | 1,32,882 | 493 | .. | ..... |
| | V. | | | | | | | |
| | RED HILLS TANK. | | | | | | | |
| | MASONRY WORKS. | | | | | | | |
| 45 | Surplus weir at north end. | 10,245 | 5,878 | .. | 5,878 | .. | 4,367 | The saving was on account of the surplus channel from the weir not being any higher than weir level, further deepening being considered unnecessary. |
| 46 | Masonry dam with a small irrigation sluice attached. | 38,429 | 37,072 | .. | 37,072 | .. | 1,357 | ..... |
| 47 | Inserting ten vents in the surplus weir including ring bund. | .. | 16,823 | 3,200 | 20,023 | 20,023 | .. | Required to allow of the regulation of the water-level in the tank. An estimate, amounting to Rs. 17,100, was sanctioned by the local Government.—*Vide* G.O., No. 2,322, dated 11th August 1875. The excess is due to the ring bund having cost Rs. 3,800 instead of Rs. 600 as allowed in the estimate. The waves necessitated a much stronger bund than was at first intended to be thrown up. |
| 48 | Constructing a new apron in rear of the ten-vent sluice. | .. | .. | 2,499 | 2,499 | 2,499 | .. | As the condition of the rear apron of the ten-vent sluice was very bad, owing to a portion of the laterite on which it was built having been scoured out, it was decided to construct a new apron, the arrangement for the work having been approved of by the Chief Engineer for Irrigation in April 1881. |
| 49 | New screw gearing for the ten-vent sluice shutters. | .. | .. | 2,760 | 2,760 | 2,760 | .. | *Vide* paragraph 18 of note. |



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## APPENDIX B.

STATEMENT showing the Area, Compensation, Annual Assessment and Capitalized abatement of Land-revenue of the Land acquired for the Madras Water-supply and Irrigation Extension Project.

| — | LAND PAID FOR UP TO END OF 1879-80. | | LAND REMAINING TO BE PAID FOR. | | TOTAL. | | Annual Assessment. | Capitalized abatement of Land-revenue. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | Area. | Compensation. | Area. | Compensation. | Area. | Compensation. | | | |
| | ACS. CTS. | RS. A. P. | ACS. CTS. | RS. A. P. | ACS. CTS. | RS. A. P. | RS. A. P. | RS. A. P. | |
| 1. For all works other than the distribution and delivery channels. | 4,330 95 | 1,30,218 2 9 | 294 49 | 4,713 10 8 | 4,625 44 | 1,34,931 13 5 | 7,846 13 3 | 1,96,170 11 3 | *Vide* letters from Collector of Chingleput, No. 2,399, dated 20th June, and No. 3,056, dated 6th Aug. 1881. |
| 2. For the distribution channels. | .. | .. | 136 66 | 10,147 7 3 | 136 66 | 10,147 7 3 | 176 0 7 | 4,400 14 7 | |
| 3. For the delivery channel in the Chingleput district. | 125 36 | 12,428 13 8 | 8 34 | 2,104 0 4 | 133 70 | 14,542 14 0 | 405 14 0 | 10,146 14 0 | |
| Do. Madras district. | 19 62 | 24,623 15 4 | 4 26 | 3,103 1 6 | 23 28 | 27,727 0 10 | 104 1 2 | 2,601 13 2 | Do.—*Vide* letters from Collector of Madras, No. 893, dated 15th Nov. 1879, and No. 378, dated 7th April 1881. |
| Total .. | 4,475 33 | 1,67,280 15 9 | 443 75 | 20,068 3 9 | 4,919 08 | 1,87,349 3 6 | 8,532 13 0 | 2,13,320 5 0 | |

## APPENDIX C.

ABSTRACT STATEMENT of Annual Maintenance charges of the Madras Water Supply and Iirrgation Extension Project.

| Years. | Outlay on Repairs. | Establishment. | | | Tools and Plant. | Grand Total. |
|---|---|---|---|---|---|---|
| | | Share of Public Works. | Water Regulation. | Total. | | |
| | RS. | RS. | RS. | RS. | RS. | RS. |
| 1870-71 ... ... ... ... | 7,954 | 1,988 | ... | 1,988 | 199 | 10,141 |
| 1871-72 ... ... ... ... | 21,153 | 5,288 | 477 | 5,765 | 529 | 27,447 |
| 1872-73 ... ... ... ... | 6,463 | 1,616 | 636 | 2,252 | 162 | 8,877 |
| 1873-74 ... ... ... ... | 39,542 | 9,886 | 853 | 10,739 | 989 | 51,270 |
| 1874-75 ... ... ... ... | 8,537 | 2,134 | 1,192 | 3,326 | 213 | 12,076 |
| 1875-76 ... ... ... ... | 5,381 | 1,345 | 1,062 | 2,407 | 134 | 7,922 |
| 1876-77 ... ... ... ... | 11,411 | 2,853 | 1,139 | 3,992 | 285 | 15,688 |
| 1877-78 ... ... ... ... | 2,412 | 603 | 1,080 | 1,683 | 60 | 4,155 |
| 1878-79 ... ... ... ... | 2,936 | 734 | 1,074 | 1,808 | 73 | 4,817 |
| 1879-80 ... ... ... ... | 5,537 | 1,384 | 1,018 | 2,402 | 138 | 8,077 |
| Total ... | 1,11,326 | 27,831 | 8,531 | 36,362 | 2,782 | 1,50,470 |

MADRAS,
February 1881.

(Signed) D. H. TRAIL, Major, R.E.,
Offg. Examiner of Public Works Accounts

## APPENDIX D.

Proceedings of the Board of Revenue, dated 5th November 1881, Miscellaneous No. 9,678.

Read letters from the Chief Engineer for Irrigation, dated 4th October 1881, No. 176 M, and 17th October 1881, No. 189 M.

THE areas entered in the revised statement and the revenue shown for years up to 1879-80 are correct, but the Board think that the revenue for years subsequent to 1879-80 should be calculated, not with reference to the average rates of the district, but the average rate at which the revenue was actually raised on the lands in 1878-79 or 1879-80 after the introduction of the Settlement. Taking the rates* of 1879-80 and applying them to the increased areas subsequent to 1879-80, the figures stand as shown in the margin,† which may be adopted.

| | Rs. | A. | P. | |
|---|---|---|---|---|
| * First crop ... ... | 2 | 6 | 8 | per acre. |
| Second crop ... ... | 2 | 0 | 11 | do. |

| Years. | Revenue. Rs. |
|---|---|
| † 1880-81 ... ... ... ... | 13,405 |
| 1881-82 ... ... ... ... | 14,667 |
| 1882-83 ... ... ... ... | 15,925 |
| 1883-84 ... ... ... ... | 17,184 |
| 1884-85 ... ... ... ... | 18,443 |
| 1885-86 ... ... ... ... | 19,704 |
| 1886-87 ... ... ... ... | 20,960 |
| 1887-88 ... ... ... ... | 22,222 |
| 1888-89 ... ... ... ... | 23,480 |
| 1889-90 ... ... ... ... | 24,741 |

2. The Board have no information in regard to the land assessment of waste lands brought under irrigation subsequent to the work.

(True Extract.)

(Signed) E. GIBSON,
Acting Secretary.

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(FORM 3.—GOVERNMENT OF INDIA CIRCULAR No. XVII OF 1880.)

ESTIMATE of Growth of Irrigation and Revenue Receipts and Charges, Madras Water-supply and Irrigation Extension Project.

| Year. | Irrigated Area at end of Year. | | Revenue Receipts and Charges. Revenue due to Works. Direct Receipts. | | | | | Charges against Revenue Account. | | | Net Earnings due to Works. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | First Crop. | Second Crop. | Public Works Department. | Revenue Department. | Total. | Enhanced Land Revenue or Indirect Receipts. | Total. | Maintenance Charges in Public Works Department. | Collection Charges in Revenue Department. | Total. | Including enhanced Land Revenue. | Excluding enhanced Land Revenue. | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | | | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | |
| 1870-71 .. | 179 | .. | .. | 1,506 | 1,506 | .. | .. | 4,556 | 108 | 4,664 | .. | — 3,158 | Actuals. |
| 1871-72 .. | 793 | .. | .. | — 64 | — 64 | .. | .. | 13,901 | .. | 13,901 | .. | —13,965 | |
| 1872-73 .. | 1,724 | .. | .. | 1,816 | 1,816 | .. | .. | 3,873 | 131 | 4,004 | .. | — 2,188 | |
| 1873-74 .. | 1,291 | 1,029 | .. | 1,652 | 1,652 | .. | .. | 26,766 | 119 | 26,885 | .. | —25,233 | |
| 1874-75 .. | 1,913 | 1,403 | .. | 3,585 | 3,585 | .. | .. | 5,601 | 258 | 5,859 | .. | — 2,274 | |
| 1875-76 .. | 1,918 | 1,578 | .. | 4,935 | 4,935 | .. | .. | 3,358 | 355 | 3,713 | .. | 1,222 | |
| 1876-77 .. | 1,633 | 1,004 | .. | — 7,185 | — 7,185 | .. | .. | 7,551 | .. | 7,551 | .. | —14,736 | |
| 1877-78 .. | 2,313 | 547 | .. | 4,857 | 4,857 | .. | .. | 1,324 | 350 | 1,674 | .. | 3,183 | |
| 1878-79 .. | 1,989 | 2,214 | .. | 10,333 | 10,333 | .. | .. | 1,681 | 744 | 2,425 | .. | * 7,908 | |
| 1879-80 .. | 2,643 | 2,769 | .. | 12,149 | 12,149 | .. | .. | 3,441 | 875 | 4,316 | .. | 7,833 | |

NOTE 1.—The old cultivation averaging 3,829 acres and yielding a water-tax of Rs. 8,576 has been omitted from this table.
2.—The figures in column 5 for the years subsequent to 1879-80 have been taken from Proceedings, Board of Revenue, No. 9678, dated 5th November 1881.
3.—Statement D-I shows how the figures in column 9 have been obtained.
4.—The collection charges in the Revenue Department have been calculated at 7·2 per cent. on revenue, column 5.



Estimate of Growth of Irrigation and Revenue Receipts and Charges, &c.—*cont.*

| Year. | Irrigated Area at end of Year. | | Revenue Receipts and Charges. Revenue due to Works. Direct Receipts. | | | | | Charges against Revenue Account. | | | Net Earnings due to Works. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | First Crop. | Second Crop. | Public Works Department. | Revenue Department. | Total. | Enhanced Land Revenue or Indirect Receipts. | Total. | Maintenance Charges in Public Works Department. | Collection Charges in Revenue Department. | Total. | Including enhanced Land Revenue. | Excluding enhanced Land Revenue. | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| | | | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. | |
| 1880-81 .. | 2,985 | 2,984 | .. | 13,405 | 13,405 | .. | .. | 3,923 | 965 | 4,888 | .. | 8,517 | |
| 1881-82 .. | 3,323 | 3,200 | .. | 14,667 | 14,667 | .. | .. | 3,923 | 1,056 | 4,979 | .. | 9,688 | |
| 1882-83 .. | 3,660 | 3,416 | .. | 15,925 | 15,925 | .. | .. | 3,923 | 1,147 | 5,070 | .. | 10,855 | |
| 1883-84 .. | 3,998 | 3,631 | .. | 17,184 | 17,184 | .. | .. | 3,923 | 1,237 | 5,160 | .. | 12,024 | |
| 1884-85 .. | 4,335 | 3,847 | .. | 18,443 | 18,443 | .. | .. | 3,923 | 1,328 | 5,251 | .. | 13,192 | |
| 1885-86 .. | 4,673 | 4,063 | .. | 19,704 | 19,704 | .. | .. | 3,923 | 1,419 | 5,342 | .. | 14,362 | |
| 1886-87 .. | 5,010 | 4,278 | .. | 20,960 | 20,960 | .. | .. | 3,923 | 1,509 | 5,432 | .. | 15,528 | |
| 1887-88 .. | 5,348 | 4,494 | .. | 22,222 | 22,222 | .. | .. | 3,923 | 1,600 | 5,523 | .. | 16,699 | |
| 1888-89 .. | 5,685 | 4,710 | .. | 23,480 | 23,480 | .. | .. | 3,923 | 1,691 | 5,614 | .. | 17,866 | |
| 1889-90 .. | 6,023 | 4,926 | .. | 24,741 | 24,741 | .. | .. | 3,923 | 1,781 | 5,704 | .. | 19,037 | |

NOTE 1.—The old cultivation averaging 3,829 acres and yielding a water-tax of Rs. 8,576 has been omitted from this table.
2.—The figures in column 5 for the years subsequent to 1879-80 have been taken from Proceedings, Board of Revenue, No. 9678, dated 5th November 1881.
3.—Statement D-I shows how the figures in column 9 have been obtained.
4.—The collection charges in the Revenue Department have been calculated at 7·2 per cent. on revenue, column 5.

## STATEMENT D-I.

STATEMENT showing the way in which the entries in Column 9 of Estimate Form 3 have been obtained.

| Years. | Balance of Maintenance Charges after deducting Rs. 1,704 for old Irrigation. | Portion of Balance Chargeable to | | Remarks. |
|---|---|---|---|---|
| | | Imperial at 54 per cent. | Provincial at 46 per cent. | |
| 1 | 2 | 3 | 4 | 5 |
| | Rs. | Rs. | Rs. | |
| 1870-71 ... ... | 8,437 | 4,556 | 3,881 | |
| 1871-72 ... ... | 25,743 | 13,901 | 11,842 | |
| 1872-73 ... ... | 7,173 | 3,873 | 3,300 | |
| 1873-74 ... ... | 49,566 | 26,766 | 22,800 | |
| 1874-75 ... ... | 10,372 | 5,601 | 4,771 | |
| 1875-76 ... ... | 6,218 | 3,358 | 2,860 | |
| 1876-77 ... ... | 13,984 | 7,551 | 6,433 | |
| 1877-78 ... ... | 2,451 | 1,324 | 1,127 | |
| 1878-79 ... ... | 3,113 | 1,681 | 1,432 | |
| 1879-80 ... ... | 6,373 | 3,441 | 2,932 | |
| 1880-81 ... ... | 7,265 | 3,923 | 3,342 | |
| 1881-82 ... ... | 7,265 | 3,923 | 3,342 | |
| 1882-83 ... ... | 7,265 | 3,923 | 3,342 | |
| 1883-84 ... ... | 7,265 | 3,923 | 3,342 | |
| 1884-85 ... ... | 7,265 | 3,923 | 3,342 | |
| 1885-86 ... ... | 7,265 | 3,923 | 3,342 | |
| 1886-87 ... ... | 7,265 | 3,923 | 3,342 | |
| 1887-88 ... ... | 7,265 | 3,923 | 3,342 | |
| 1888-89 ... ... | 7,265 | *3,923 | 3,342 | |
| 1889-90 ... ... | 7,265 | | | |

* The average actual expenditure of eight years, exclusive of the expenditure incurred in 1871-72 and 1873-74, has been assumed to be the amount of maintenance charges in the Public Works Department.
The figures in column 3 of this statement have been entered in column 9 of the Estimate Form 3.

CHEPAUK,
9th November 1881.

(Signed) JOHN MULLINS, Colonel, R.E.,
Chief Engineer for Irrigation.

## APPENDIX E.

List of Component Works, Madras Water-Supply and Irrigation Extension Project.

| No. | Items. | Mileage. Miles. | Mileage. Chains of 66 feet. | Remarks. | Level above M.S.L. | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | | 4 | 5 | |
| 1 | Thamarapak anicut ... ... ... | ... | ... | ... | Crest | 69·86 |
| | Do. under sluice ... ... | ... | ... | ... | Sill | 63·86 |
| 2 | Inspection bungalow ... .. ... | ... | ... | ... | | |
| | Supply channel, Cholaveram tank ... | ... | ... | ... | Sill | 63·86 |
| | Head sluice, do. ... | ... | ... | ... | | 75·12 |
| | Inlet ... ... ... ... ... | 0 | 20 | ... | | 62·84 |
| | Bridge ... ... ... ... ... | 0 | 55 | ... | Crest | 65·86 |
| | Kattankal surplus weir ... ... | 1 | 60 | ... | Sill | 62·86 |
| | Do. do. ... ... | ... | ... | ... | | 67·86 |
| | Inlet ... ... ... ... ... | 1 | 66 | ... | | 67·24 |
| | Do. ... ... ... ... ... | 2 | 8 | ... | | 65·98 |
| | Do. ... ... ... ... ... | 2 | 39 | ... | | 64·12 |
| | Do. ... ... ... ... ... | 2 | 63 | ... | | 63·40 |
| | Do. ... ... ... ... ... | 2 | 69 | ... | | 58·30 |
| | Bridge ... ... ... ... ... | 3 | 3 | ... | | 62·81 |
| | Inlet ... ... ... ... ... | 3 | 26 | ... | | 63·05 |
| | Do. ... ... ... ... ... | 3 | 44 | ... | | 63·79 |
| | Do. ... ... ... ... ... | 3 | 68 | ... | | 65·23 |
| | Do. ... ... ... ... ... | 4 | 11 | ... | | |
| | Old Boosikal diversion ... ... | 4 | 53 | ... | Crest | 59·69 |
| | Boosikal surplus weir ... ... | 4 | 64 | ... | Sill | 56·69 |
| | Do. do. ... ... | ... | ... | ... | | 56·92 |
| | Ramapuram bridge across Boosikal floor. | 4 | 73 | ... | | 54·39 |
| | Bridge ... ... ... ... ... | 4 | 79 | ... | | 53·00 |
| | Do. ... ... ... ... ... | 5 | 55 | ... | | 52·10 |
| | Aqueduct, Alacheri ... ... ... | 6 | 12 | ... | | |
| | | 8 | 14 | Channel ends. | ... | |
| 3 | Cholaveram tank ... ... ... | ... | ... | Begins north end of bund. | ... | |
| | Do. north weir ... ... | 0 | 9 | ... | Crest | 63·62 |
| | Do. weir ... ... ... | 0 | 43 | ... | Crest | 61·68 |
| | Do. weir sluice ... ... | 0 | 43·84 | ... | Sill | 52·68 |
| | North sluice ... ... ... ... | 1 | 0 | ... | Sill | 41·83 |
| | South sluice ... ... ... ... | 2 | 3·63 | ... | ... | |
| | | 2 | 22 | Tank ends. | ... | |
| | Inspection bungalow .. ... | 2 | 45 | ... | ... | |
| 4 | Supply channel to Red Hills tank ... | ... | ... | ... | ... | |
| | Head sluice do. ... | 2 | 5 | Mileage of Cholaveram tank. | Sill | 45·33 |
| | | | | | | 46·20 |
| | Inlet ... ... ... ... ... | 1 | 25 | ... | | |
| | Girder bridge ... ... ... ... | 2 | 29 | ... | ... | |
| | | 2 | 50 | Channel ends. | ... | |
| 5 | Red Hills tank ... ... ... | ... | ... | Begins at left wing of weir (Mr. Fraser's). | ... | |
| | | | | | Crest | 46·31 |
| | Surplus weir, Red Hills tank ... | 0 | 11 | ... | | 31·42 |
| | Weir sluice (irrigation) ... ... | 0 | 15 | ... | | |
| | Ten-vent surplus sluice (in weir) ... | 0 | 21·06 | ... | Sill | 31·31 |
| | North sluice ... ... ... ... | 0 | 32·34 | ... | Sill | 20·66 |
| | Polal sluice ... ... ... ... | 1 | 27·07 | ... | Sill | 21·10 |
| | Inspection bungalow ... ... ... | 2 | 30 | ... | ... | |
| | Soorapedoo sluice ... ... ... | 3 | 3·25 | ... | Sill | 27·31 |
| | Municipal do. ... ... ... | 3 | 15 | ... | Sill | 31·31 |
| | | 3 | 27 | Tank ends. | ... | |



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No. 17. ORDER THEREON, 9th December 1881, No. 849 I.

THE report submitted by the Chief Engineer for Irrigation on the revised estimate for the Madras Water-supply and Irrigation Extension project fully explains the several differences between the present sanction for this project and the amount of the revised estimate. The latter amounts to Rs. 18,54,463.

2. Of the above sum the component items are—

| | | Rs. |
|---|---|---|
| (1.) Direct charges— | | |
| Works ... ... ... ... ... ... ... ... | | 13,42,950 |
| Establishment ... ... ... ... ... ... ... | | 2,19,255 |
| Tools and Plant ... ... ... ... ... ... ... | | 8,201 |
| | | 15,70,406 |
| Deduct receipts ... ... ... ... ... ... ... | | 1,167 |
| | | 15,69,239 |
| (2.) Indirect charges— | | |
| Capitalized abatement of Land Revenue ... ... ... | | 2,13,320 |
| Interest during construction ... ... ... ... ... | | 71,904 |
| | Total ... | 18,54,463 |

This total does not differ very materially from that given in Proceedings of Madras Government, No. 2650 of the 2nd October 1876, which was Rs. 18,06,720.

Of this total the amount chargeable to Imperial (Irrigation) is Rs. 9,82,105.
Provincial on account of the water-supply of the city of Madras „ 8,72,358.

The distribution of the charge has been made as follows :—

1*st.*—All items belonging exclusively to either service have been charged thereto.

2*nd.*—The shares of charges for items appertaining to both services have been fixed at 54 per cent. for Imperial and 46 per cent. for Provincial.

G.O., No. 2,650, dated 2nd October 1876.

3. The net excess over the present sanction under *Works* is Rs. 1,16,225, and this is more than covered by the aggregate Rs. 1,88,158 of the items not before provided for but found requisite as explained in detail in the report. There has been hitherto no sanction for establishment and this item amounts to Rs. 2,19,255 altogether; the charges to cover which additional sanction is required are—

| | Rs. |
|---|---|
| Direct charges ... ... ... ... ... ... ... ... | 3,43,681 |
| Indirect do. ... ... ... ... ... ... ... ... | 2,85,224 |
| Total ... | 6,28,905 |

4. With regard to the Imperial share of the project so far as can be at present judged the annual charges for interest on outlay, maintenance, and collection of revenue will amount to about ... Rs. 43,186* and the revenue (water-tax) to ... „ 24,741

| | Rs. | | |
|---|---|---|---|
| * Interest ... ... ... | 37,482 | | |
| Maintenance ... ... ... | 3,923 | Annual deficit ... „ | 18,445 |
| Collection ... ... ... | 1,781 | | |
| | 43,186 | | |

It is possible that the results may be ultimately more favorable, but it is tolerably clear that the probability of the revenue fully covering the interest charges is very remote.

5. Provincial will however be still less favorably circumstanced, viz.:—

| | Rs |
|---|---|
| | 7,36,295* |
| Interest on ... ... ... ... ... ... ... ... | 33,133 |
| At 4½ per cent. ... ... ... ... ... ... ... | 3,342 |
| Share of maintenance charges ... ... ... ... ... | |
| Total ... | 36,475 |

* Direct charges.

against which the receipts from the Municipality are not likely to exceed Rs. 12,000, so that the Government contribution to the water-supply of Madras will be but little under Rs. 24,500 a year, and at the present time it is considerably more.

6. It is observed from Statement D.I. that the Provincial share of maintenance charges up to the end of 1879-80 amounted to Rs. 61,378, and the Examiner of Public Works Accounts will see that this and the share for subsequent years are duly adjusted.

7. Ordered that the revised estimate be forwarded for the sanction of the Government of India with a copy of these Proceedings.

(True Extract.)

(Signed) JOHN MULLINS, Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

To the Superintending Engineer, Fifth Circle.
" Chief Engineer for Irrigation.
" Examiner of Public Works Accounts.
" Revenue Department.
" Financial do.

No. 18. (DOCKET No. 850 I., dated 9th December 1881.)

Forwarded accordingly.

(Signed) JOHN MULLINS, Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

Exd. S. T. Austin.
Spare Copies

64

IRRIGATION.
ACCOUNT.

Govt. of 1881 Madras.

PUBLIC WORKS.

To

THE SECY. TO THE GOVT.
OF INDIA.

*Dated December, 9th.*

*Issued*

*Read.*

*9th December 1881, No. 850 I.*

DECEMBER.
Nos. 16—18.

FORWARDING for sanction revised estimate for the Madras Water-supply and Irrigation Extension System.

[For Heads of Departments only.]

Circular No. XXVIII Public Works.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

ACCOUNT.
General.

Fort William, December 30, 1881.

The following is forwarded to the Local Governments, Administrations and Officers noted in the margin for information and guidance. Special attention is called to Rule IV laid down in the Finance Department Resolution. The Accountant General, Public Works Department, has been instructed to carry out the adjustments rendered necessary under the orders contained in Rule II and to advise the Examiners of all adjustments so effected.

(*For information and guidance.*)

The Governments of Madras, Bombay, Bengal, the North Western Provinces and Oudh, and the Punjab, in the Public Works Department.
The Chief Commissioners, Central Provinces, British Burma, and Assam.
The Agent to Governor General, Rajputana.
* The Accountant General, Public Works Department.
* The Director General of Railways.

(*For information only*).

The Resident at Hyderabad.
The Resident at Mysore (through Foreign Department).
The Agents to the Governor General for Central India, and Biluchistan.
The Superintendent of Port Blair and Chief Commissioner, Andaman and Nicobar Islands.
The Director General of Telegraphs.
The Inspector General of Military Works.
The Director-in-Chief, Indo-European Telegraph.
The Director, Persian Telegraph.
The Deputy Director, Persian Gulf Telegraph.
The Consulting Engineers to the Government of India for Guaranteed Railways, Calcutta, Lahore, and Lucknow.
The Comptroller General.
The Accountant General, Bengal.

A. J. FILGATE, Major, R. E.,

Depy. Secy. to the Govt. of India.

No. 3667, dated 22nd October 1881.

RESOLUTION,—By the Government of India, Dept. of Finance and Commerce.

Read the undermentioned correspondence relating to certain alterations in the method of preparing Productive Public Works accounts :—

Despatch to Secretary of State, No. 361, dated the 2nd November 1880.
" from " " No. 60 (Financial), dated the 10th February 1881.

RESOLUTION.—In accordance with the instructions of Her Majesty's Secretary of State, the following changes shall be made in the method of showing Profit and Loss accounts of "Productive Public Works," as recorded in Account No. I of the Finance and Revenue Accounts presented to Parliament and at the foot of Abstract II appended to the annual Financial Statements :—

I.—In the expenditure side of the Account, interest shall be calculated upon the whole Capital cost of all undertakings which are classed as Productive Public Works, whether recorded as extraordinary Capital expenditure on such works or under one of the "Ordinary" heads.

II.—The entry "Debt incurred for Productive Public Works" in the General Abstract prefixed to the Finance Accounts shall accordingly include in addition to the "Capital expenditure" outside the ordinary account, all sums spent on such works but debited to the ordinary account. And, in future, whenever an undertaking is admitted to the category of "Productive Works," an amount equivalent to that portion of the whole Capital outlay upon it which may have previously been charged as ordinary expenditure shall be transferred to the "Debt incurred for Productive Works."

But inasmuch as these entries will only appear in the General Abstract, and will not have to be passed through the books, they will not necessitate any adjustments in the accounts of ordinary Revenue and Expenditure.

III.—The Productive Public Works account shall be relieved of interest on the outlay incurred on those of the *existing* works which though originally admitted to the category of "Productive Public Works" have been eventually excluded from it, a corresponding reduction being made in the entry "Debt incurred for Productive Public Works."

IV.—All outlay, however, on any work which may, in the *future*, be undertaken as a Productive Public Work in accordance with the regulations, must always remain a portion of the debt, the interest on which is debitable as expenditure on productive Public Works, unless the Provincial Government responsible for the Project is called upon to repay in one or more years the total outlay thus incurred unproductively.

The Governor General in Council desires that these changes may be carried out in the accounts of 1880-81.

ORDERED, that this Resolution be communicated to the Public Works Department (a copy of the Despatches read in the preamble being also sent to that Department) and to the Comptroller General.

I.W.C. No. 137 ff/82

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

ACCOUNT.

General.

To

Circular No. XXVIII Public Works.

Dated December 30, 1881.

Received

Alterations in the method of preparing Productive Public Works accounts.

No. 521, P. W. D. Press—3-1-82—930.

2018
67



GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

No. 43.

READ—the following Note by Colonel J. O. HASTED, R.E., Acting Chief Engineer for Irrigation, dated Ootacamund, 11th May 1882, No. 41 I.:—

The Budget Estimates for Irrigation Productive Public Works, and for Irrigation and Navigation and Agricultural Works, for 1882-83, final issue, have been prepared in conformity with the orders of the Government of India contained in G.O., No. 287 I., dated 27th March 1882, and are submitted to Government with the following remarks on the several points noticed by the Government of India.

2. (*Paragraph* 2).—Superintending Engineers, in submitting future Budget Estimates, should explain fully the causes of variations between the estimates and actuals of revenue collected in the Public Works Department.

3. (*Paragraph* 3).—The Revenue accounts of the Godávari and Kistna Delta Systems, the Pennér Anicut, Chembrambakam Tank, the Pelandorai and Srívaikuntham Anicut Systems have been submitted by Mr. Wilson. The accounts of the first two systems have been reviewed in Proceedings of the Madras Government, No. 72 I., of 31st January 1882, and No. 347 I., dated 24th April 1882, respectively. Those of the four latter systems will be disposed of shortly. It is to be noticed that in the accounts of the Godávari and Kistna Systems only, is the water-rate shown separately from the land revenue; in other cases, as has often been explained before, the assessment is consolidated, and the work now in progress is the ascertainment of the share of this consolidated assessment due to irrigation.

4. The heading of the memorandum at foot of the Budget Estimate of revenue has been altered, as the figures therein entered represent merely irrigation revenue as distinguished from land revenue, and do not include the enhanced share of land revenue. The irrigation revenue should, as entered in the Budget Estimate for 1880-81, properly be classed as "Direct Revenue," but in the Budget for 1881-82 it was removed from the estimate of Direct Revenue, and entered in the memorandum at foot of the estimate as Indirect Revenue in compliance with paragraph 18 of the orders of Government of India, printed with Proceedings of the Madras Government, No. 246 I., of 4th April 1881. If the object of the Government of India is to show the irrigation revenue as Indirect Revenue until it is separated in the Civil Budget from land revenue, it seems necessary to take immediate action to effect such separation in the Civil Budget. Before doing this, however, it is desirable that the orders of the Government of India on the subject should be obtained.

5. The irrigation revenue, as given by the Board of Revenue, in their Proceedings, No. 3407, of 22nd December 1881, includes the portion due to old irrigation which existed before the construction or improvement of the works. The estimate of increase of revenue, due to the outlay incurred on Capital Account, has therefore been approximately deduced in this office for entry in Appendix B to the Budget Estimate.

6. (*Paragraph* 4).—The charges for collection of revenue in the Civil Department have, as shown in page 6 of the Preliminary Issue of the Budget Estimate for Productive Public Works, been calculated at 7·2 per cent., on the estimated Indirect Revenue. The Government of India have now directed that, in future, the collection charges should be deducted from the gross revenue, and the net revenue only shown, but their previous orders, contained in Proceedings of the Madras Government, No. 679 I.,

of 13th November 1879, directing the exhibition of the charges separately, have apparently been overlooked. It is observed that, in the order of the Government of India contained in G.O., No. 287 I., dated 27th March 1882, the collection charges in the Civil Department for 1880-81 have been deducted from the Indirect Revenue shown against Productive Public Works, but for other works, the gross Indirect Revenue is shown.

The forms prescribed for administrative accounts indicate that collection charges should be recorded separately. The percentage charge on Indirect Revenue on account of Public Works Establishment having been calculated by the Government of India on the gross revenue instead of on the net revenue, the charges are shown separately in the Budget Estimate of expenditure as usual, instead of deducting them from the estimate of revenue as directed. A change in this respect in future estimates is not considered desirable.

7. (*Paragraph* 5).—The Accountant-General, Public Works Department, having intimated to the Examiner, Public Works Accounts, Madras, that the balance of the outlay, incurred from Productive Public Works Funds, on the Madras Water Supply and Irrigation Extension Project, was wholly transferred to "33 Irrigation and Navigation" in the opening balance of the accounts for 1880-81, no further refund from Provincial grant to Productive Public Works is necessary. The Imperial grants, under the latter head of service for 1881-82 and 1882-83, will therefore have to be increased by Rs. 1,00,000 and Rs. 47,748 respectively. Pending sanction of the Government of India to this increase, no alterations have been made in the grants from Imperial Funds, it having been ruled in the previous orders of the Government of India that the figures in the final issue should accord with those adopted in the orders on the Preliminary Issue.

8. The percentage charge for establishment on expenditure having been reduced from 25 to 23 per cent., the grants for works have been increased as follows:—

| — | Grants for Works. | | Increase. |
|---|---|---|---|
| | Preliminary Issue. | Final Issue. | |
| | Rs. | Rs. | Rs. |
| Godávari Delta ... ... ... | 1,58,969 | 1,61,405 | 2,436 |
| Kistna do. ... ... ... | 2,56,859 | 2,60,543 | 3,684 |
| Sangam Project ... ... ... | 3,69,402 | 3,74,580 | 5,178 |
| Srivaikuntham Anicut ... ... | 30,000 | 30,478 | 478 |
| Total ... | 8,15,230 | 8,27,006 | 11,776 |

9. (*Paragraph* 7).—The total of Rs. 4,54,750, shown in the margin of paragraph 7 of the Government of India orders, is a misprint for Rs. 3,54,750. The distribution by systems of the amount of the Regular Estimate for 1881-82 has now been entered in the Budget Estimates.

10. (*Paragraph* 10).—The Regular Estimate for 1881-82, under the head Productive Public Works, Revenue Account, has been increased in the telegram from the Government of India, dated 16th February 1882, from Rs. 7,60,853 to Rs. 7,61,000, in order to make it a round sum.

11. (*Paragraph* 11).—It has already been explained to the Government of India, in letter No. 267 I., of 23rd March 1882, that the additional grant required for establishment chargeable to Productive Public Works, Revenue Account, should, according to the arrangements sanctioned in their letter No. 191 A.G., dated 20th February 1882, printed with Proceedings of the Madras Government, No. 810 W., dated 27th March 1882, be reduced from Rs. 3,36,261 to Rs. 2,30,560, the cost of Water Regulation, Navigation, and Special Revenue Investigation Establishments, being debited to Provincial Funds. The total grant for Productive Public Works, Revenue Account, has therefore been reduced from Rs. 10,97,111 to Rs. 9,91,410.



12. With the view of affording relief to Provincial Funds, the Government of India directed that 10 per cent. on Direct Revenue from all works, and 6 per cent. on Indirect Revenue due to Productive Public Works alone, should be charged to the Revenue Account of those works, and should be credited to Provincial Funds, as an additional contribution thereto, while all special establishments should be charged to Provincial, and the percentage charge on expenditure for general establishment should be reduced from 25 to 23 per cent. These alterations have now been carried out in the Budget Estimates.

13. In determining the charge against the Indirect Revenue on account of establishments, it will be necessary to take the revenue of the year preceding that for which the charges are to be calculated, as the revenue of the year concerned will not be known until long after the Public Works Accounts have been closed. The sanction of the Government of India will, however, be necessary in order that the Budget Estimates of such charges may be based on the Regular Estimates of revenue for the year preceding.

14. The transactions connected with the Dowlaishweram Workshops having, in G.O., No. 149 I., of 21st February 1882, been ordered to be included in the accounts of the Godávari Delta System, the Superintending Engineer, First Circle, should submit a statement showing the amount required to be provided for on this account.

15. (*Paragraphs* 12 *and* 13).—It is not clear how the amount of Rs. 80,50,809, shown by the Government of India as the sanctioned estimate for the Godávari Delta System, has been arrived at. The revised estimates for this system submitted to them, with Proceedings of the Madras Government, No. 259 I., of 21st March 1882, amount to Rs. 1,10,88,695, and in their telegram dated 31st March 1882, works in progress were authorised to be proceeded with in anticipation of sanction.

16. (*Paragraph* 14).—The sanction of the Secretary of State to the revised estimates for the Kistna Delta System has since been received and recorded in Proceedings of the Madras Government, No. 291 I., dated 28th March 1882. The Examiner, Public Works Accounts, should transfer, in his supplemental accounts for March 1882, the outlay on Navigation Works on the Commamur Canal from "33 Irrigation and Navigation" to "37 Productive Public Works, Capital Account." The Superintending Engineer, Second Circle, should expedite the submission of the revised estimates for the Ryves' and Commamur Canals for the sanction of Government.

17. (*Paragraph* 15).—The revised estimates for the Srivaikuntham Anicut Project are now before Government, and will soon be forwarded to the Government of India. The Superintending Engineer will understand that the provision made for this project will not be available for expenditure until the revised estimate is sanctioned.

18. (*Paragraph* 17).—The distribution of the grant of Rs. 60,000 for 1881-82 for Protective Public Works is shown in the Budget Estimate for Irrigation and Navigation and Agricultural Works as, directed in G.O., No. 531 W., dated 1st March 1882. The works to be classed under this head have not yet been definitely settled. The amount provided is wholly intended as a contribution to Provincial Funds.

19. (*Paragraph* 18).—The grants for Irrigation and Navigation Works, Capital Account, have been increased as follows, owing to the percentage charge for establishment having been reduced from 25 to 23 per cent. on the grant for works and repairs, and the share of the cost of the establishment of the Chief Engineer for Irrigation having been excluded from the total grant originally assigned, as noticed in paragraph 12:—

| — | Preliminary Issue. | Final Issue. | Increase. |
|---|---|---|---|
| | Rs. | Rs. | Rs. |
| Pálar Anicut System ... ... ... ... | 40,000 | 41,673 | 1,673 |
| Pelandorai Anicut System ... ... ... ... | 14,984 | 15,618 | 634 |
| Total ... | 54,984 | 57,291 | 2,307 |

20. (*Paragraph* 19).—The additional grant sanctioned by the Government of India is Rs. 4,66,000, and the sums rendered available by the recent alterations in the establishment-charges aggregate Rs. 86,479, as detailed in the margin, making a total additional grant of Rs. 5,52,479 in all. In G.O., No. 109 I., of 9th February 1882, statements showing the works on which the additional grant could be utilised were called for in G.O., No. 109 I., dated 9th February 1882, but hitherto the Superintending Engineers of the Fourth and Sixth Circles only have furnished the requisite information. Grants, as detailed below, have been made from the total available grant of Rs. 5,52,479, and the balance held in reserve will be distributed on receipt of the full information required :—

| Amount due to the omission of— | Rs. |
|---|---|
| (1) Share of the cost of establishment of the Chief Engineer for Irrigation ... ... ... | 35,823 |
| (2) Water Regulation and River Conservancy Establishment ... | 30,246 |
| (3) Difference of the percentage charge on expenditure between 25 and 23 per cent. ... ... | 22,471 |
| Total ... | 88,540 |
| Deduct amount provided at 10 per cent. on Direct Revenue. | 2,061 |
| | 86,479 |

| Division. | Description of Work. | Irrigation and Navigation Works for which neither Capital nor Revenue Accounts are kept. | Agricultural. |
|---|---|---|---|
| | | Rs. | Rs. |
| Bellary ... ... | Bukkapatnam tank improvements ... ... | 10,000 | ... |
| Coimbatore ... | Chitrachavady channel ... ... ... ... | * 7,554 | ... |
| Tinnevelly ... | Melakalur tank ... ... ... ... ... | 9,249 | ... |
| | Vellur tank improvements ... ... ... | 3,820 | ... |
| | Velleyar Periacolum tank surplus weir ... ... | 10,000 | ... |
| | Khanghyam channel ... ... ... ... | ... | 10,000 |
| Godávari Eastern ... | Vasista Godávari below Gunnaram aqueduct left bank ... ... ... ... ... | 68,979 | ... |
| | Reserve held at the disposal of Government ... | * 2,000 | ... |
| Coimbatore ... | Minor Original Works ... ... ... ... | ... | * 1,000 |
| Do. ... | Do. do. River Conservancy ... | * 8,500 | ... |
| Negapatam ... | Do. do. ... ... ... ... | 10,000 | ... |
| Madura ... ... | Do. do. ... ... ... ... | ... | * 1,000 |
| | Reserve ... ... ... ... ... ... | | |
| | *Repairs.* | | |
| Coimbatore ... | ..... | * 40,000 | ... |
| North Arcot ... | ..... | * 10,000 | ... |
| Negapatam ... | ..... | * 5,200 | ... |
| Madura ... ... | ..... | 40,000 | ... |
| Tinnevelly ... | ..... | * 30,000 | ... |
| Negapatam ... | River Conservancy ... ... ... ... | ... | * 5,000 |
| Do. ... | Do. Embankments ... ... ... ... | ... | * 15,000 |
| Trichinopoly ... | Do. do. ... ... ... ... | ... | * 5,000 |
| | Reserve ... ... ... ... ... ... | * 1,00,000 | * 13,000 |
| | Total ... | 3,70,302 | 50,000 |
| | Establishment at 23 per cent. ... ... ... | 85,169 | 11,500 |
| | Tools and Plant at 2½ per cent. ... ... ... | 9,258 | 1,250 |
| | Grants for repairs to Minor Irrigation Works ... | * 25,000 | ... |
| | Total ... | 4,89,729 | 62,750 |

Figures marked thus * represent the increase made to the grants in the Preliminary Issue.

21. The amounts entered in the Budget Estimates for the Madras Water Supply and Irrigation Extension Project, and for the River Embankments in the Tanjore



Division, will not be available for expenditure until the estimates for those works have been duly sanctioned. The revised estimate for the former work has been submitted for the sanction of the Government of India, with Proceedings of the Madras Government, No. 849 I., of 9th December 1881, and those for the latter should be submitted by the Superintending Engineer, Sixth Circle, as soon as possible.

22. (*Paragraph* 21).—The redistribution of the grants in the Regular Estimate for 1881-82 has now been entered in the Final Issue for 1882-83.

23. (*Paragraph* 23).—The revised estimates for the Pálár Anicut System are now under preparation. The Superintending Engineer, Fifth Circle, should report at once when the revised estimates for the Pelandorai Anicut System will be ready. The excess on the sanctioned estimate for the Commamur Canal will be sanctioned from the provision for unforeseen expenditure in the Kistna Delta Completion Estimates.

24. (*Paragraph* 24).—Completion estimates for the Buckingham Canal are now under preparation. The grant for Original Works has been reduced from Rs. 1,69,700 to Rs. 1,60,443, in order to provide for the increased charge for establishment at 10 per cent. on Direct Revenue. The Superintending Engineer, Fifth Circle, should, however, apply for such further grant as may be found to be necessary. The grant has now been distributed between Capital and Revenue Original Works, the corresponding share of Establishment and Tools and Plant charges being shown under Capital, and all other works under Revenue Account.

25. Superintending Engineers should see that no work is commenced without a sanctioned estimate except the emergency is real.

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No. 44.

ORDER—dated 26th May 1882, No. 408 I., Public Works.

The Budget Estimates (Final Issue) for 1882-83, as drawn up by the Chief Engineer for Irrigation, are approved, and 30 copies will be forwarded to the Government of India.

2. The attention of the officers concerned is drawn to paragraphs 2, 14, 16, 21, and 23 to 25 of the Chief Engineer's Note.

3. The orders of the Government of India will be requested with regard to the matters dealt with in paragraphs 4, 6, 7, and 13 of the above Note.

4. Ordered that the following letter be sent :—

(Here enter No. 409 I., dated 26th May 1882.)

(True Extract.)

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

To Superintending Engineers.
„ the Chief Engineer for Irrigation.
„ the Examiner of Public Works Accounts.
„ the Revenue Department.
„ the Board of Revenue.
„ all Collectors.
„ the Accountant-General.

Exd. A. F. Goodall.
Spare Copies

IRRIGATION.
ACCOUNT.

Govt. of [1882] Madras.

**PUBLIC WORKS.**

*Dated May, 26th.*

4764

*Read.* *Encl.*

**G.O., 26th May 1882, No. 408 I.**

**MAY.**
**Nos. 43-44.**

**Irrigation Budget Estimates for 1882-83.**

*Final Issue of the* — approved and 30 copies forwarded to the Government of India.

Financial Department

No 2018/70

PROCEEDINGS of the MADRAS GOVERNMENT.

READ the following —— :—

Letter from the Chief Engineer for Irrigation dy 19 April '82, No 28. W.

Memo to the Public Works Dept dy 13 May '82 No 533.

Endorsement from do do dy 3d June '82 No 197.E.

Memo to do do dy 24 June '82 No 450.

G.O. Public Works Department dy 13 July '82 No 771. W.

Memo from do do dy 21st July '82 No 458.E.

Order thereon 29th July 82 No 826.

Recorded and communicated

to the Accountant General. The adjustment for the current year will be carried out by the Accountant General in the Civil department estimates. The charge should be shewn in the Regular estimate when that is submitted

/True Extract/

for Ag
Ag Under Secretary

To.

The Public Works Department

Copies

Pw. Loc 5265

G.O.(Pwd) - 1102 - 8.4.66
2374 - 27.7.66
3298/3299 - 16.10.66
65/66 - 10.1.72
240 - 25.1.72
162B/162C - 24.1.74
1548/649 - 2.6.75
475/476 J. 10.11.74
1887 W. 7.4.79
849/850 J. 9.12.81
408 J. 26.5.82
1978 - 3.6.82
Opr. 1928 - 23.6.82
Cir. do. 162 - 27.6.82
1771 W. 13.7.82
4588 - 21.7.82

No 20188 W/ 8 Aug/82

Communicated to the Examiner Public Works Accounts, and to the Chief Engineer for Irrigation

Secretary

Secretary

Ex Secretary

71

11/7/29 B III

5265-

Govt. of {1882} Madras.

PUBLIC WORKS.

Dated

Rect. 29 Dated

G. O. 8th August 1882, No 2018

Nos.

Madras Waters Works

Panjeet.

Parp: Ind Dept^t
ful advice & Remarks
of Carrying out the
proposal of Imperial
to share of the
Cost of the ——— Commit
to Mr Ey: Pwa & Offord

A.G.E.
8/8

Sec 9/8

Ry Raleigh Rep