[L. & M. 2,000—4-5-97.]

Local & Munl (1897) Department.

MISCELLANEOUS.

G.O., No. 1771 M

DATED 13-8-97

INDEXED. CR

DESPATCHED

[Despatch Abstract.]

Appointment of Secretary

Requesting the Mul: Council of Trichinopoly to revise its proposals regarding the —— for the Mully: with reference to the Collector's remarks thereon, & to report the nature & extent of the powers the Council proposes to delegate to its Secretary.

Reply to Rc. 116/Bg of 1897

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.
Cuo	3360 M/97						

Local & Munl. (1897) Department.

CURRENT No. 2724 M

Current Nos 2724 M & 2746 M. From The Chairman, Municipal Council Trichinopoly

Misc Order No. 1771 M. mis. dt 13.8.97 11/8/97

No. 28

The municipal council requested to revise its proposals with reference to the Collector's remarks, with which the Government ~~entirely~~ concurs. H.E.M.C. which however object to the pay of the appt being fixed at Rs 200 rising to Rs 250

2. The chairman is requested to report which of its other powers in addition to those specified in section 42 of the Madras District municipalities Act IV of 1884, as amended by Act III of 1897, the Council proposes that he should delegate to the secretary under clause (d) of sub-section (3) of Section 39-A.

Dated 21-7-97

Received 28th July 1897

Registered 28-7-1897.

Enclosures /

Spare copies.

SUBJECT.

submitting proposals regarding the appointment of a secretary to the Council.

V.R. 6/8/97

9/8

Note The average annual income for the three successive financial years ending with 1895-96 being Rs 1/2/34, the maximum salary of the secretary in accordance with the scale suggested in G.O. No 1465 M dt 21-6-1897 is Rs 250

To The Chairman M.C. Trichinopoly through the Collector of Trichinopoly

Dispd 18/8/97

BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.

Proceedings of the Municipal Council, Trichinopoly passed at the meeting held on the 15th July 1897

Present

Khan Bahadur Khadir Nawaz Khan Sahib, Chairman, M.C.

2. Surgeon Lt. Col. W. O'Hara .. Councillor
3. F.G. Oliver Esqr M.A. .. ..
4 Reverend J.D.W. Sewell S.J ..
5 Lieutenant A.V.W. Hope .. ..
6 J. H. de Mesurier .. .. ..
7 Mr. V. Ramaswami Aiyar Avl M.A. ..
8. Reverend S. Gnanamuttu M.A. ..
9. Mahomed Yusan Sahib .. ..
10. Mr. A.C. Chidambara Mudaliar Avl ..
11 " R.G. Gopala Aujar .. ..
12 " J. Venkatarama Naujalu Chettiar .. ..
13 " J.V. Annaswami Mudaliar .. ..
14 " J.S. Narayanaswami Pillai .. ..
15 " J.M. Subramania Pillai .. ..
16 " S.J. Kristnaswami Aujar .. ..
17 " J.S. Umamaheswara Aujar .. ..
18 " V.S. Chellappa Chettiar .. ..
19 " C. Vythilingam Pillai .. ..
20 " A. Ayyakannu Pillai .. ..
21. Mahomed Assadulla Sahib ..
22. Mahomed Sirajuddin Sahib ..
23 Mahomed Jamaludin Sahib ..

No 68. Read G.O. No 1268 M. dated 21st June 1897 requesting the Council to submit its

opinion on the question of appointing a Secretary, restoring to this Council the privilege of electing its Chairman and publishing certain draft rules for the interpellation of the Chairman by the Councillors.

Resolved that the thanks of the Council be conveyed to the Government for restoring the privilege of electing its Chairman

Proposed by Mr. Le Mesurier and seconded by Father Sewell that it is desirable that a Secretary be appointed with pay of Rs 200 rising to Rs 250 and that the post be advertized for.

Amendment proposed by Reverend Gnanamuthu and seconded by MRRy Narayansami Pillai Avargal that the pay should be Rs 150 to Rs 200 and that the post be advertized for.

Amendment carried by majority

The following Councillors dissenting Surgeon Lt Col W. O'Hara, Father Sewell, the Chairman, Dr Oliver, Lieutenant Hope, MRRy Chidambara Mudaliar, Mr Le Mesurier and the Revenue Divisional Officer -

(True extract)

Municipal Office
Trichinopoly
21st July 97

[signature]
Chairman M.C.

2724 M of 1897

No 28.

Municipal Office
Trichinopoly
21st July 1897

LOCAL & MUNICIPAL DEPT
COMMITTEE No. 2724 M

From

Khan Bahadur Khadir Navaz Khan Sahib
Chairman,
Municipal Council
Trichinopoly

To

The ~~Chief~~ Secretary to Government
Local & Municipal Department
Madras

Sir,

With reference to G.O. No 1465 M dated 21st June 1897, I have the honor to submit for the information and orders of the Government copy of a resolution of the Municipal Council of Trichinopoly passed at its meeting held on the 15th Inst. It will be seen that as to the question of pay for the Secretary, the Council was divided. One section was in favour of beginning from Rs 150 a month and their reasons were a progressively diminishing income due to the operation of the revised Schedule of the Profession tax and

the possible exclusion of the Cantonment and a progressively increasing expenditure on all sides. The other section contended that the pay should be fixed high enough to make it worth the while for really efficient men offering their services and that this sum may be compensated by increased efficiency in the municipal administration. The majority however was in favour of the lower scale of pay.

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

[signature]
Chairman M.C.

Ref. (e) on Current No. 116/Rev of 97
Dy 26-7-97.
Despd 27-7-97.

Forwarded.

2. The difficulties specified in the letter for fixing a low pay to the Secretary are improbable. A Council with a good Secretary can steer its way through possible difficulties by making a careful retrenchment of its expenditure on various sides.

3. The Council has been incurring from the 14th December 1895 an expenditure of about Rs. 350 per mensem on account of its official Chairmen. If the instructions contained in G. O. No. 1465/21.6.97 regarding the discontinuance of carriage allowance to the Chairman and the substantial reduction of pay to the Manager, are carried out, the Council will get a saving of about Rs. 100 a month. This Municipality whose importance is enhanced by its large population, good revenue and the water works lately introduced requires the services of an officer of administrative abilities and experience for the post of its responsible Secretary who has multifarious and onerous duties to perform. The pay

must be made as attractive as possible so as to secure the services of an Officer who can successfully cope with his work and be independent. I accordingly recommend that the pay of the Secretary may be fixed at Rs. 250.

Bannatyne Macleod
Ag. Collector.

JM

Local & Munl. (1897) Department.

ANS

CURRENT No. 2746M.

From H. A. Sim Esq. I.C.S.
Ag Private Secretary to
H. E. the Governor.

Order

No.

Dated 27th July 1897
Received 30-7-1897
Registered 30.7.97
Enclosures
Spare copies

SUBJECT.

Transfers a petition without date from certain ratepayers of the Irichinopoly Municipality, regarding the appointment of a paid Secretary for the Municipality.

(By order)

[signature]

Ag Private Secretary

BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.

LOCAL & MUNICIPAL DEPT.
2746/14

To

His Excellency The Right Honorable
The Governor in Council
Fort St. George
Madras

The humble petition of the undersigned

Most Respectfully Sheweth

The Tpichinopoly Municipal Council met on the 15th of July and resolved to have a paid Secretary on Rs. 150 a month. This amount was proposed by Rev. S. Gnanamuthu M.A a Fellow of the Madras University, and this proposal was carried by a majority of 15 Members composed of gentlemen well acquainted with the details of Municipal administration and its present involved financial condition.

The opposing 8 Members consisting of Government nominated members voted for fixing the pay at Rs 200. This was in a measure due to the letter written to the Council by the Collector who suggested the appointment of one of his Tahsildars to the Secretaryship and the official members thought they were bound to say ditto to the

Collector's Suggestions.

From a paid official chairman to a paid official Secretary there is really no change; and the majority of the members thought it would not further the interests of the rate payers by appointing a Tahsildar as Secretary, though such an appointment would afford a comfortable berth for mediocre Tahsildar and would create a vacancy in the English Head Clerkship whose present acting incumbent Mr. Koil Pillai would be confirmed. It was this gentleman that drafted the letter to the Council referred to above and who was vigorously telling up the nominated Councillors to vote for having a Tahsildar on a high pay.

The old argument that the increased pay to the Secretary will be more than compensated for by increased Savings by reducing Expenditure and increasing the receipts of the Municipal revenues was put forward by the dissenting Councillors Lieut. Stopford including. This argument has been proved by our recent experience to be quite fallacious. These two years we have been favoured by Government with the services of Experienced Deputy Collectors to administer our Municipality. These Deputy Collectors are trained in every branch of the administration, and with all that no improvements are seen, but the Municipality on account of the high pay which it has been paying to these Chairmen and the consequent high Expenditure, has been reduced to a state of insolvency, so much so that even the establishment is paid only on the 20th and there is not even so much as Rs 100 to the credit of the Council with the Treasury officer. This has been the financial condition of the Council for some months past. The menial Servants, threaten to strike work on account of this late payment. We humbly request Government to ascertain if this is a fact or not by a few questions addressed to the Collector.

Any Government official that may be shunted on to the Secretary will simply look upon the change as a banishment & will always be looking out for an opportunity to join his regular department. He will thus have no interest in his work and will regard the Secretary's place as a stepping stone to future promotions. In our opinion no official should be appointed as Secretary who does not bind himself to serve the Council for some years together, as constant changes will bring inefficiency on the administration.

We therefore respectfully pray that Your Excellency in Council will

Commiserate Your regime by giving free voice to the Municipalities and require Collectors not to interfere in the actions of the Councils and restore to the rate payers the privilege of electing their representatives in the Council and not appoint to the Councils as Councillors Gentlemen who do not attend meetings regularly and are ignorant of the financial condition of the Councils and who muster strong on occasions to obstruct & overcame the elected Councillors and who wish to support the Collector's views in any thing and every thing to the great detriment of the benign policy of Government with regard to local Self-Government.

We beg to remain

Your Excellency's most obedient Servants

Muhyaruntamber. Merchant +

Rajaram Davai

Kobalaswamy Mudaliar

T. V. Sthumachetty

V. Ramaswamy

A. G. Hari Rao

When given for copying ____ When copied ____ When examined ____ When signed 17/8/97	189 .						
AD AGAIN G.O., No. 189 . DATED							
CURRENT No.							
SURES TO C. No.							
ORDER OF GOVERNMENT	A	A	A	A	A	A	A
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STATEMENT WITH DITTO							
PAPERS NOT FILED UP, BEING MEANT FOR DESPATCH IN ORIGINAL.							

N.B.—

A = Copy in full.
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P = Copy abstract only.
Q = Copy heading only.

21-5-07
11-3-11
9-11-11

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Regd. } 1897. *Spare copies*

G.O., No. 1772 M., 13th August 1897.

N. P.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41 33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	„ „	0·090
Chlorine	„ „	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	„	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

N. P.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

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To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

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2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

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1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	„ „	0·090
Chlorine	„ „	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	„	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S.*, *dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

Enclosure.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41 33
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1881	29·64	1894	29·69
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It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
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Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

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$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

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The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

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There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

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Compensation for land	900
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Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	RS.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
,, Sanitary Board.
,, ,, Commissioner.
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LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Read. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

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No.—3397.

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A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

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Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

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Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944	L. ft.	of 7 inches	pipes.
945	„	of 6 „	„
1,206	„	of 4 „	„
6,786	„	of 3 „	„

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Read. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

Read—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. Jones, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

Enclosure.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41 33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	„ „	0·090
Chlorine	„ „	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	„	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet $1\frac{1}{2}$ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

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945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

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Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

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HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S.*, *dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
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Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Read. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

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Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

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A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

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Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

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1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
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1880	40·34	1893	39·23
1881	29·64	1894	29·69
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It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

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Total solids	Grms. per litre	0·470
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Total hardness ..	Clark's scale	5·950
Permanent hardness ..	„	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅙ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

Read—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. Jones, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

Enclosure.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41 33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	„ „	0·090
Chlorine	„ „	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	„	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet $1\frac{1}{2}$ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

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$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

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The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

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There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

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Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

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HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
,, Sanitary Board.
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Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

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READ—the following papers :—

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Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

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A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

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Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

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1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
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1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

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Total hardness	Clark's scale	5·950
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Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
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Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet $1\frac{1}{2}$ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{8}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below :—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

Read—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. Jones, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

Enclosure.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41 33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	„ „	0·090
Chlorine	„ „	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	„	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0 056
Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
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$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

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The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

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There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

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Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
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Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

Enclosure.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
,, Sanitary Board.
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Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

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Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

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1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
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1881	29·64	1894	29·69
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It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
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Total hardness	Clark's scale	5·950
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Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

...solution of the ...,
...tion and orders of Government.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{6}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below;—

		RS.
Infiltration works		6,940
Engine and boiler house		2,080
Quarters for engine drivers and coolies		2,000
Engines, pumps and boilers		7,500
Service reservoir		6,500
Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	RS.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

No. 1772 M., 13TH AUGUST 1897.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
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G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	" "	0·090
Chlorine	" "	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	"	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{6}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

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944 L. ft. of 7 inches pipes.
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1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

		RS.
Infiltration works		6,940
Engine and boiler house		2,080
Quarters for engine drivers and coolies		2,000
Engines, pumps and boilers		7,500
Service reservoir		6,500
Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	RS.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
,, Sanitary Board.
,, ,, Commissioner.
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Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

No. P.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

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Read—the following paper :—

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To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

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1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	" "	0·090
Chlorine	" "	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	"	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{6}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

		RS.
Infiltration works		6,940
Engine and boiler house		2,080
Quarters for engine drivers and coolies		2,000
Engines, pumps and boilers		7,500
Service reservoir		6,500
Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	RS.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

Enclosure.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
,, Sanitary Board.
,, ,, Commissioner.
,, ,, Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

Read—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. Jones, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

Enclosure.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41 33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

			Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre		0·470
Volatile solids ..	„ „		0·090
Chlorine	„ „		0·040
Total hardness ..	Clark's scale		5·950
Permanent hardness ..	„		trace.
Free ammonia ..	Mlgrms. per litre		trace.
Albuminoid ammonia	„ „		0·056
Nitric acid	„ „ (as ammonia)		2·400
Apparent quality of the water as inferred from the results obtained on examination			Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
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The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

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The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

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Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

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Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

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Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
,, Sanitary Board.
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Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd.	1897.	*Enclosures*
Regd.		*Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

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Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
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With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

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A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

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Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

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1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	" "	0·090
Chlorine	" "	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	"	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below :—

		RS.
Infiltration works		6,940
Engine and boiler house		2,080
Quarters for engine drivers and coolies		2,000
Engines, pumps and boilers		7,500
Service reservoir		6,500
Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	RS.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

Enclosure.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
,, Sanitary Board.
,, ,, Commissioner.
,, ,, Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd.	1897.	*Enclosures*
Regd.		*Spare copies*

G.O., No. 1772 M., 13th August 1897.

N. P.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41 33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	" "	0·090
Chlorine	" "	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	"	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

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There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

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Engine and boiler house		2,080
Quarters for engine drivers and coolies		2,000
Engines, pumps and boilers		7,500
Service reservoir		6,500
Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	RS.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
,, Sanitary Board.
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Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

[N. P.]

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

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Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
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No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

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A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

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1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
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Chlorine	" "	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	"	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	" " (as ammonia)	0·056
Nitric acid	" "	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	RS.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	RS.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam (through the Collector of North Arcot).
,, Sanitary Board.
,, ,, Commissioner.
,, ,, Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

N. P.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	" "	0·090
Chlorine	" "	0·040
Total hardness ..	Clark's scale	5·950e
Permanent hardness ..	"	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅙ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

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There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

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Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
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Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

No. 1772 M., 13TH AUGUST 1897.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
" Sanitary Board. (through the Collector of North Arcot).
" " Commissioner.
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Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

N. P.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

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Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

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A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

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1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	" "	0·090
Chlorine	" "	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	"	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet $1\frac{1}{2}$ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{8}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944	L. ft.	of 7 inches	pipes.
945	„	of 6 „	„
1,206	„	of 4 „	„
6,786	„	of 3 „	„

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

N. P.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

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Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
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1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	" "	0·090
Chlorine	" "	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	"	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

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Dated—the 30th March 1897.
No.—Cur. 312.

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There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below :—

	RS.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	RS.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

No. 1772 M., 13th August 1897.

Enclosure.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
,, Sanitary Board.
,, ,, Commissioner.
,, ,, Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

Read—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. Jones, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

Enclosure.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	„ „	0·090
Chlorine	„ „	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	„	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
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There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

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Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

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Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
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HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

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Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

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Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
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With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

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Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
,, Sanitary Board. (through the Collector of North Arcot).
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LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
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Water-supply Scheme.

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Total hardness ..	Clark's scale	5·950
Permanent hardness ..	„	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
Nitric acid	„ „ (as ammonia)	2·400
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Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

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Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

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Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

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Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S.*, *dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

No. 1772 M., 13TH AUGUST 1897.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
" Sanitary Board. (through the Collector of North Arcot).
" " Commissioner.
" " Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
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G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	,, ,, ...	0·090
Chlorine	,, ,, ...	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	,, ...	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	,, ,, ...	0·056
Nitric acid	,, ,, (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total ..	48,460
Tools and plant	650
Contingencies	2,390
Total ..	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total ..	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S.*, *dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

No. 1772 M., 13TH AUGUST 1897.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * * *

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IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

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To the Chairman, Municipal Council, Gudiyáttam.

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Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
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Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

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" Sanitary Board. (through the Collector of North Arcot).
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LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

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Water-supply Scheme.

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Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	" " (as ammonia)	0·056
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Contingencies		2,390
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Asst. Sanitary Engineer to Government.

Resolution—No. 19-S., dated 7th January 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

No. 1772 M., 13TH AUGUST 1897.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
" Sanitary Board. (through the Collector of North Arcot).
" " Commissioner.
" " Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
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G.O., No. 1772 M., 13th August 1897.

No. P.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	,, ,,	0·090
Chlorine	,, ,,	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	,,	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	,, ,,	0·056
Nitric acid	,, ,, (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-S., dated 7th January 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

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Secretary to Government.

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Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

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(through the Collector of North Arcot).
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LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
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N. P.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

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A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

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HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

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(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
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G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	" "	0·090
Chlorine	" "	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	"	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet $1\frac{1}{2}$ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{8}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

		RS.
Infiltration works		6,940
Engine and boiler house		2,080
Quarters for engine drivers and coolies		2,000
Engines, pumps and boilers		7,500
Service reservoir		6,500
Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	RS.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-S., dated 7th January 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

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Referred to the Municipal Council, Gudiyáttam, for early remarks.

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Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

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LOCAL AND MUNICIPAL DEPARTMENT

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N. P.

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G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
" Sanitary Board. (through the Collector of North Arcot).
" " Commissioner.
" " Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
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G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41 33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	,, ,,	0·090
Chlorine	,, ,,	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	,,	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	,, ,,	0·056
Nitric acid	,, ,, (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet $1\frac{1}{2}$ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{8}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944	L. ft.	of 7 inches	pipes.
945	„	of 6 „	„
1,206	„	of 4 „	„
6,786	„	of 3 „	„

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
" Sanitary Board. (through the Collector of North Arcot).
" " Commissioner.
" " Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30*th Mar.* 1897, *No.* 312.
" " " " " 15*th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at $4\frac{1}{4}$ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — with[out] any definite period, and that if the Municipal Council cannot carry out the work without such as[sis]tance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

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READ—the following papers :—

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Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

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HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
" Sanitary Board. (through the Collector of North Arcot).
" " Commissioner.
" " Engineer.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30*th Mar.* 1897, *No.* 312.
" " " " " 15*th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at 4¼ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

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To the Chairman, Municipal Council, Gudiyáttam.

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Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
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To the Chairman, Municipal Council, Gudiyáttam
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LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

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Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

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In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Regd. } 1897. *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet $1\frac{1}{2}$ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{5}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below :—

		Rs.
Infiltration works		
Engine and boiler house		6,940
Quarters for engine drivers and coolies		2,080
Engines, pumps and boilers		2,000
Service reservoir		7,500
Compensation for land		6,500
Supply and delivery of pipes		900
Laying and jointing pipes		18,620
		3,920
Tools and plant	Total	48,460
Contingencies		650
		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

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(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

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IV

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The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

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Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
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With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

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Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
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LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

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In G.O., No. 1027 M., dated 18th June 1896.

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In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

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[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Regd. } 1897. *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

Read—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. Jones, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

Enclosure.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896..

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41 33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97.
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	" "	0·090
Chlorine	" "	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	"	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅙ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

		Rs.
Infiltration works		6,940
Engine and boiler house		2,080
Quarters for engine drivers and coolies		2,000
Engines, pumps and boilers		7,500
Service reservoir		6,500
Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
" Sanitary Board. (through the Collector of North Arcot).
" " Commissioner.
" " Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at 4¼ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41 33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	„ „	0·090
Chlorine	„ „	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	„	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944	L. ft.	of 7 inches	pipes.
945	„	of 6 „	„
1,206	„	of 4 „	„
6,786	„	of 3 „	„

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below :—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total ..	48,460
Tools and plant	650
Contingencies	2,390
Total ..	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5·96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total ..	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

No. 1772 M., 13TH AUGUST 1897.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
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With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

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In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
,, Sanitary Board.
,, ,, Commissioner.
,, ,, Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
,, ,, ,, ,, ,, *15th June* ,, ,, 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

Of the four schemes referred to in the above notes, No. [illegible], which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at $4\frac{1}{4}$ per cent. repayable in thirty years the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows:—

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution:—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Read. *Regd.* } 1897. *Enclosures* *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	" "	0·090
Chlorine	" "	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	"	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944	L. ft.	of 7	inches pipes.
945	„	of 6	„ „
1,206	„	of 4	„ „
6,786	„	of 3	„ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total ..	48,460
Tools and plant	650
Contingencies	2,390
Total ..	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total ..	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at $4\frac{1}{4}$ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Regd. *Spare copies*

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The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

		Rs.
Infiltration works		6,940
Engine and boiler house		2,080
Quarters for engine drivers and coolies		2,000
Engines, pumps and boilers		7,500
Service reservoir		6,500
Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

Hormusji Nowroji,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. Parsons,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

Enclosure.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
" Sanitary Board. (through the Collector of North Arcot).
" " Commissioner.
" " Engineer.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13th AUGUST 1897.

[Subject.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at 4¼ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

**Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	„ „	0·090
Chlorine	„ „	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	„	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944	L. ft.	of 7 inches	pipes.
945	„	of 6 „	„
1,206	„	of 4 „	„
6,786	„	of 3 „	„

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at $4\frac{1}{4}$ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Read. *Regd.* } 1897. *Enclosures* *Spare copies*

G.O., No. 1772 M., 13th August 1897.

N. P.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

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Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	,, ,,	0·090
Chlorine	,, ,,	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	,,	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	,, ,,	0·056
Nitric acid	,, ,, (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet $1\frac{1}{2}$ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{6}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

		Rs.
Infiltration works		6,940
Engine and boiler house		2,080
Quarters for engine drivers and coolies		2,000
Engines, pumps and boilers		7,500
Service reservoir		6,500
Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

Hormusji Nowroji,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. Parsons,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government,

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
" Sanitary Board. (through the Collector of North Arcot).
" " Commissioner.
" " Engineer.

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*
Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
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1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	,, ,,	0·090
Chlorine	,, ,,	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	,,	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	,, ,,	0·056
Nitric acid	,, ,, (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below :—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total ..	48,460
Tools and plant	650
Contingencies	2,390
Total ..	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total ..	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-S., dated 7th January 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

No. 1772 M., 13TH AUGUST 1897.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam (through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at $4\frac{1}{4}$ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. / *Regd.* } 1897. *Enclosures* / *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

Read—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. Jones, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

Enclosure.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	„ „	0·090
Chlorine	„ „	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	„	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below :—

	RS.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	RS.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high, at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

Enclosure.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13th AUGUST 1897.

[Subject.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at $4\frac{1}{4}$ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Read. *Regd.* } 1897. *Enclosures* *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

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Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
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No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

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It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
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Apparent quality of the water as inferred from the results obtained on examination		Usable.

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Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

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Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{6}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

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6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

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Quarters for engine drivers and coolies		2,000
Engines, pumps and boilers		7,500
Service reservoir		6,500
Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total ..	48,460
Tools and plant		650
Contingencies		2,390
	Total ..	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
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Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total ..	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at 4¼ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Read. *Regd.* } 1897. *Enclosures* *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

			Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre		0·470
Volatile solids ..	,, ,, ...		0·090
Chlorine	,, ,, ...		0·040
Total hardness ..	Clark's scale		5·950
Permanent hardness ..	,, ...		trace.
Free ammonia ..	Mlgrms. per litre		trace.
Albuminoid ammonia	,, ,, ...		0·056
Nitric acid	,, ,,	(as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination			Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

No. 1772 M., 13TH AUGUST 1897.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
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Dated—the 15th June 1897.
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With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
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LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at 4¼ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

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In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

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2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

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[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Read. / *Regd.* } 1897. *Enclosures* / *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

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Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

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1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	" "	0·090
Chlorine	" "	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	"	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet $1\frac{1}{2}$ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{6}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

		Rs.
Infiltration works		6,940
Engine and boiler house		2,080
Quarters for engine drivers and coolies		2,000
Engines, pumps and boilers		7,500
Service reservoir		6,500
Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30*th Mar.* 1897, *No.* 312.
" " " " " 15*th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at $4\frac{1}{4}$ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Read. *Rcgd.* } 1897. *Enclosures* *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	28·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	,, ,, ...	0·090
Chlorine	,, ,, ...	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	,, ...	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	,, ,, ...	0·056
Nitric acid	,, ,, (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅛ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

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945 „ of 6 „ „
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There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

		Rs.
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Quarters for engine drivers and coolies		2,000
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Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
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HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

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Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
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Dated—the 15th June 1897.
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Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " " Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at $4\frac{1}{4}$ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In G.O., No. 1027 M., dated 18th June 1896.

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	„ „	0·090
Chlorine	„ „	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	„	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	„ „	0·056
Nitric acid	„ „ (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet $1\frac{1}{2}$ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 " in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{6}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 " of 6 " "
1,206 " of 4 " "
6,786 " of 3 " "

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total ..	48,460
Tools and plant	650
Contingencies	2,390
Total ..	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at	2,000
Rs. 1 per million gallons raised one foot high	465
Repairs to machinery, fountains, etc. Total ..	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
" Sanitary Board. (through the Collector of North Arcot).
" " Commissioner.
" " Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at 4¼ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Reyd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers:—

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Read—the following paper:—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years:—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by proting a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

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It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below:—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
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Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	" " (as ammonia)	0·056
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Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

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Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

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Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2} \times$ 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

No. 1772 M., 13TH AUGUST 1897.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
,, Sanitary Board.
,, ,, Commissioner.
,, ,, Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
,, ,, ,, ,, ,, *15th June* ,, ,, 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at $4\frac{1}{4}$ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Regd. *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

Read—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. Jones, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

Enclosure.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government; and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	" "	0·090
Chlorine	" "	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	"	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ⅙ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below :—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

Hormusji Nowroji,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S.*, *dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. Parsons,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at 4¼ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

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Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896:

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids ..	" "	0·090
Chlorine	" "	0·040
Total hardness ..	Clark's scale	5·950
Permanent hardness ..	"	trace.
Free ammonia ..	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 " in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ¼ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944 L. ft. of 7 inches pipes.
945 " of 6 " "
1,206 " of 4 " "
6,786 " of 3 " "

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below :—

		Rs.
Infiltration works		6,940
Engine and boiler house		2,080
Quarters for engine drivers and coolies		2,000
Engines, pumps and boilers		7,500
Service reservoir		6,500
Compensation for land		900
Supply and delivery of pipes		18,620
Laying and jointing pipes		3,920
	Total	48,460
Tools and plant		650
Contingencies		2,390
	Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated* 7*th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

No. 1772 M., 13th August 1897.

Enclosure.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
" Sanitary Board. (through the Collector of North Arcot).
" " Commissioner.
" " Engineer.

Local and Municipal Department.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13th AUGUST 1897.

[Subject.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at 4¼ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government reg[illegible] its inability to hold out any promise of aid towards the Gudiyáttam — within any definite [illegible] and that if the Municipal Council cannot carry out the work without such assistance [illegible] of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.*

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
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1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

	Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids .. .. Grms. per litre	0·470
Volatile solids .. „ „	0·090
Chlorine .. .. „ „	0·040
Total hardness .. Clark's scale	5·950
Permanent hardness .. „	trace.
Free ammonia .. Mlgrms. per litre	trace.
Albuminoid ammonia „ „ (as ammonia)	0·056
Nitric acid .. .. „ „	2·400
Apparent quality of the water as inferred from the results obtained on examination	Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet 1½ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33{,}000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is ¼ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

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944 L. ft. of 7 inches pipes.
945 „ of 6 „ „
1,206 „ of 4 „ „
6,786 „ of 3 „ „

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below :—

	Rs.
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Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
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Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51{,}500}{2}$ × 5 96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
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Hormusji Nowroji,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S., dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. Parsons,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. Forbes,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from Sayyid Adam Sait, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 1897, on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1896, regarding the introduction of water-supply scheme, calling for remarks of the Council, I have the honour to forward herewith an extract of the resolution of the Council, dated 15th March 1897, for the favourable consideration and orders of Government.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 15th June 1897.
No.—Cur. 312.

With reference to Government Memorandum No. 518, dated 23rd April 1897, I have the honour to forward herewith a roll of plans relating to the water-supply scheme of this Municipality returned to me by the Collector for transmission to Government.

Order—No. 1772 M., dated 13th August 1897.

In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
(through the Collector of North Arcot).
" Sanitary Board.
" " Commissioner.
" " Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

From the Secretary, Sanitary Board, dated 4th March 1896, *No.* 658.
From the Chairman, Municipal Council, Gudiyáttam, dated 30*th Mar.* 1897, *No.* 312.
" " " " " 15*th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at 4¼ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to 7½ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. Raghava Charlu—3-8-97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[liss]—6-8-97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. Forbes—4-8-97.

[G.O., No. 1772 M., dated 13th August 1897.]

Government of Madras.

LOCAL AND MUNICIPAL DEPARTMENT

MISCELLANEOUS.

Recd. } 1897. *Enclosures*

Regd. } *Spare copies*

G.O., No. 1772 M., 13th August 1897.

Water-supply Scheme.

Stating that in the present state of the provincial finances the Government regrets its inability to hold out any promise of aid towards the Gudiyáttam — within any definite period, and that if the Municipal Council cannot carry out the work without such assistance the question of a water-supply for the town must stand over for the present.

GOVERNMENT OF MADRAS.

LOCAL AND MUNICIPAL DEPARTMENT.

READ—the following papers :—

I

Proceedings of the Sanitary Board, No. 19-S., dated 7th January 1897.

Read—the following paper :—

Letter—from J. A. JONES, Esq., M.I.C.E., Sanitary Engineer to Government.
To—the Secretary, Sanitary Board (through the Sanitary Commissioner, Madras).
Dated—Madras, the 4th December 1896.
No.—3397.

With reference to Sanitary Board's rule 16 embodied in G.O., No. 1698 L., dated 18th September 1896, I have the honour to send you report, plans and estimates for the Gudiyáttam water-supply scheme with connected papers.

ENCLOSURE.

Report on a scheme for the water-supply of Gudiyáttam, dated 4th December 1896.

A preliminary report on the water-supply of Gudiyáttam was made by the Assistant Sanitary Engineer to Government, and was submitted to Government with the Sanitary Board's Proceedings, No. 1343, of 1st May 1896. In its order, Mis. No. 1027 M., dated 18th June 1896, Government requested the Council to provide a sum of Rs. 100 for the preparation of detailed plans and estimates for the scheme, which form the subject of the present report.

2. The proposal for the water-supply of Gudiyáttam was first mooted by the Sanitary Commissioner in his inspection notes embodied in G.O., No. 1237 M., dated 1st August 1895. He suggested the substream of the Koundinia Nadi, which flows in close proximity to the town, as the source of supply. Also in view of the inability of the Municipality to afford a scheme permitting of complete distribution in the town, the Sanitary Commissioner indicated a cheap arrangement of distribution with a limited number of taps at important points of the town, an arrangement which would in the words of the Sanitary Commissioner "if not fulfilling the requirements of an engineering 'major work' be of considerable sanitary value to the people".

Source of supply.—The supply is to be obtained from the underflow in the bed of the Koundinia Nadi, which passes through and divides the Municipality of Gudiyáttam into two portions. The portions of the town nearest the river derive their present water-supply from spring channels excavated in the bed of the river. The river has also excellent spring channels, which are used for irrigation of lands. At the point selected for the head works the river is 590 feet broad. The level of its bed is 33·94 above M.S.L. and the depth of sand in the bed of the river is about 19 feet. *

Substream water level.—On the 16th July 1896, the water level under the sand was 27·29 above the M.S.L., which is 6·65 feet below the bed of the river. The subjoined statement gives the annual rainfall at Gudiyáttam for the past 25 years :—

* *Note.*—The depth of sand was ascertained by an open excavation down to water level, a well sunk 6 feet below water level, and by probing a further depth of 2 feet at the bottom of the well by a crowbar. Owing to the insufficiency of the length of the crowbar it was not possible to probe the sand further.

Year.	Rainfall in inches.	Year.	Rainfall in inches.
1870	30·00	1883	41·33
1871	39·42	1884	44·71
1872	47·25	1885	29·01
1873	36·52	1886	36·37
1874	59·94	1887	48·98
1875	27·68	1888	44·32
1876	14·71	1889	44·97
1877	37·81	1890	42·51
1878	42·04	1891	22·60
1879	38·88	1892	36·21
1880	40·34	1893	39·23
1881	29·64	1894	29·69
1882	37·68	1895	26·45

It will be seen that, during the last two years, the rainfall has been much below the average. The quantity that fell last year is the lowest but one on record excepting the famine year. It is not likely that in any year the water level will have fallen much lower than in 1895.

Quality of water.—The water has been analysed and pronounced "usable". The Chemical Examiner's report is given below :—

		Water from spring in the bed of the Koundinia Nadi, Gudiyáttam.
Total solids	Grms. per litre	0·470
Volatile solids	" "	0·090
Chlorine	" "	0·040
Total hardness	Clark's scale	5·950
Permanent hardness	"	trace.
Free ammonia	Mlgrms. per litre	trace.
Albuminoid ammonia	" "	0·056
Nitric acid	" " (as ammonia)	2·400
Apparent quality of the water as inferred from the results obtained on examination		Usable.

Quantity of water required.—The scheme provides for a supply of 6 gallons per head, this quantity being considered by the Sanitary Commissioner as the minimum likely to secure sanitary ends and the maximum that financial considerations permit. At the last census the population of Gudiyáttam was 18,745. For the purpose of this scheme the population is assumed at 19,000. The quantity of water required per day is $19{,}000 \times 6 = 114{,}000$ gallons.

Quantity of water available.—It is impossible to reckon the yield with any accuracy. But the following statement of facts will lend some assurance as to the sufficiency of water. Two pot wells $2\frac{1}{2}$ feet in diameter were sunk in the bed of the river to a depth of 6 feet below water level. As a pump was not available men were employed to bail out water with pots. Fast as they could work, they found it impossible to lower the water in the well by more than 15 inches. A careful calculation was made of the quantity bailed out, which averaged 30 gallons per minute from each well. If the assumption that the yield from a well varies as the square of the head is correct, it should be possible to obtain about 150 gallons per minute from each well with the water lowered 3 feet in the well. This is about the supply required for the whole town. The infiltration gallery designed for Gudiyáttam is in its design, depth below lowest water level and nature of sand, very similar to the one constructed at Conjeeveram. At the latter place the gallery which is 550 feet long was tested to yield 1,320 gallons per minute with the water level lowered by 6 feet. The length of the gallery proposed for Gudiyáttam is 200 feet.

Site of head works.—The head works are located on the right bank of the river just above the village of Bodipet, which forms a portion of the Municipality. This site is 3,700 feet from the nearest point in the main portion of the town, and has received the approval of the Sanitary Commissioner.

Infiltration gallery.—The length of the proposed gallery is 200 feet, and consists of two rows of 9 inches stoneware pipes laid at the level of 19·29 or 8 feet below the lowest summer water level. The pipes will be bedded on a layer of broken stones 6 feet wide and 6 inches thick. Broken stones will also be laid to the same breadth over the pipes and carried up to the level of 27·29. The infiltration pipes will be led into a cistern 6′ × 3′, close to the bank of the river. From this cistern, the water will be conveyed by a single 12 inches iron pipe to the suction well placed between the cistern alluded to above and the pumping house.

Pumping house.—The pumping house will be 28 feet $1\frac{1}{2}$ inches from the centre of the suction well. The design consists of masonry foundations and basement and corrugated iron superstructure and roof. The basement is 1·68 feet above the highest known flood level.

Engines and pumps.—Pumping will take place only during the 12 hours of the day and night pumping will be avoided. The maximum quantities to be pumped will be—

114,000 gallons in 12 hours.
9,500 gallons in 1 hour.
160 „ in 1 minute.

The total lift will be 52 feet. The engines required will be of

$$\frac{160 \times 10 \times 52}{33,000} = 2{\cdot}6 \text{ P.H.P.}$$

Two engines each of 2·6 P.H.P. are provided in the estimate so as to have one always in reserve.

The engines shown on the plan are Messrs. John and Henry Gwynne's Twin Centrifugal pumping engines.

Pumping main.—The pumping main from the pumping station to the service reservoir is 3,700 feet long. It will be 7 inches in diameter and will discharge the required quantity of 160 gallons with a hydraulic gradient of 1·9 per 1,000.

Service reservoir.—The position of the service reservoir is shewn on plan No. 3. It is an elevated tank built entirely of masonry. Its inside dimensions are 30′ × 20′ with a depth of 5 feet. The maximum water level is 64·00 which is about 20 feet above ground level. The tank is capable of holding 18,750 gallons which is $\frac{1}{8}$ of a day's supply. The reasons for restricting the reservoir to this size are given in the previous report.

Distribution.—From the service reservoir water will be distributed by a system of pipes consisting of—

944	L. ft. of	7 inches	pipes.
945	„ of	6 „	„
1,206	„ of	4 „	„
6,786	„ of	3 „	„

There will be 14 fountains for the people to obtain water. These are marked in red circles on sheet No. 1. There will be 13 sluice valves on the pumping and distribution mains and branches, and these are shown in sheet No. 5.

Initial cost.—The scheme is estimated to cost as below:—

	Rs.
Infiltration works	6,940
Engine and boiler house	2,080
Quarters for engine drivers and coolies	2,000
Engines, pumps and boilers	7,500
Service reservoir	6,500
Compensation for land	900
Supply and delivery of pipes	18,620
Laying and jointing pipes	3,920
Total	48,460
Tools and plant	650
Contingencies	2,390
Total	51,500

Annual Cost.

On the assumption that Government will make a free grant of half the cost of the scheme the annual cost of the scheme will be—

	Rs.
Interest and sinking fund on Rs. $\frac{51,500}{2}$ × 5·96 per cent.	1,535
Cost of pumping 114,000 gallons daily 47 feet (average lift) high at Rs. 1 per million gallons raised one foot high	2,000
Repairs to machinery, fountains, etc.	465
Total	4,000

In the preliminary report on the scheme the cost of pumping was taken at As. 10 per million gallons lifted one foot high, which is too low for pumping a small supply. But in all probability the town consumption will not reach the maximum provided in this scheme for some years to come and until such time the annual expenditure will not exceed about Rs. 3,500 which is the sum reckoned in the original report.

HORMUSJI NOWROJI,
Asst. Sanitary Engineer to Government.

Resolution—No. 19-*S.*, *dated 7th January* 1897.

With his letter No. 3397, dated 4th December 1896, the Sanitary Engineer submits a report with plans and estimates for the Gudiyáttam water-supply scheme, prepared in accordance with the orders of Government contained in G.O., No. 1237 M., dated 1st August 1895, and the Sanitary Commissioner's Inspection Notes recorded therewith.

The scheme, which is estimated to cost Rs. 51,000, is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to only 6 gallons per head of the present population, and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government.

(True Extract.)

R. PARSONS,
Secretary, Sanitary Board.

To the Secretary to Government, Local and Municipal Department.

II

Endorsement No. 169, dated 16th February 1897.

Referred to the Municipal Council, Gudiyáttam, for early remarks.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

III

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
To—the Secretary to Government, Local and Municipal Department.
Dated—the 30th March 1897.
No.—Cur. 312.

With reference to Government Endorsement No. 169, dated 16th February 18 , on the Proceedings of the Sanitary Engineer, No. 3397, dated 4th December 1 , regarding the introduction of water-supply scheme, calling for remarks of the Co cil, I have the honour to forward herewith an extract of the resolution of the C ncil, dated 15th March 1897, for the favourable consideration and orders of Government.

No. 1772 M., 13TH AUGUST 1897.

ENCLOSURE.

Extract from the Proceedings of the Municipal Council, Gudiyáttam, dated 15th March 1897.

* * * * *

Read endorsement No. 169, dated 16th February 1897, of Government, on the Proceedings of Sanitary Engineer, No. 3397, dated 4th December 1896, about the water-supply scheme, for early remarks of the Council.

Resolution No. II.—The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities.

IV

Memorandum No. 518, dated 23rd April 1897.

The Chairman is requested to return the plans forwarded to him with Government endorsement No. 169, dated 16th February 1897.

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam.

V

Letter—from SAYYID ADAM SAIT, Esq., Chairman, Municipal Council, Gudiyáttam.
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Dated—the 15th June 1897.
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In the present state of the provincial finances, the Government regrets its inability to hold out any promise of aid within any definite period. If the Municipal Council cannot carry out the work without such assistance, the question of a water-supply for the town must stand over for the present.

(True Extract.)

G. S. FORBES,
Secretary to Government.

To the Chairman, Municipal Council, Gudiyáttam
" Sanitary Board. (through the Collector of North Arcot).
" " Commissioner.
" " Engineer.

LOCAL AND MUNICIPAL DEPARTMENT.

NOTES CONNECTED WITH G.O., No. 1772 M., DATED 13TH AUGUST 1897.

[SUBJECT.—*Gudiyáttam Water-supply Scheme*].

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From the Chairman, Municipal Council, Gudiyáttam, dated 30th Mar. 1897, *No.* 312.
" " " " *15th June* " " 312.

Please see the notes and orders in G.O., No. 1027 M., dated 18th June 1896.

Of the four schemes referred to in the above notes, No. 3, which had been approved by the Sanitary Board and recommended to the Municipal Council for adoption, was investigated by the Sanitary Engineer with reference to the Government Order quoted above. The initial cost of this scheme is given by the Sanitary Engineer as Rs. 51,500, and on the assumption that the Government will, as usual, make a grant of half the cost and lend the other half at $4\frac{1}{4}$ per cent. repayable in thirty years, the additional expenditure to the Municipality is put down at Rs. 4,000. The Sanitary Board in submitting this project remarks as follows :—

Vide the Sanitary Board's resolution No. 658, dated 4th March 1896.

"The scheme which is estimated to cost Rs. 51,500 is fully described in the Sanitary Engineer's report and is, in the opinion of the Sanitary Board, good as far as it goes; but the necessity for economy has caused it to be cut down to the lowest possible limits, the supply being reduced to 6 gallons per head of the present population and the service reservoir holding only one-sixth of a day's supply. The working expenses amount to Rs. 4,000 per annum, and to raise this sum, the house and land tax will have to be increased from 5 to $7\frac{1}{2}$ per cent. and a water-tax levied in addition. This seems a rather serious burden on the resources of the Municipality, but the Sanitary Board does not see its way to suggesting any reduction, and accordingly submits the project for the orders of Government."

The Municipal Council, to whom the resolution of the Sanitary Board and the connected papers were referred for remarks, passed the following resolution :—

"The Council have no objection to the introduction of the water-supply scheme in the town, but considering their financial circumstances and the condition of the town's people, most of whom are unable to bear the present taxes, it is hoped that the Government will be pleased to contribute more to this Municipality than they have done to other Municipalities."

In the notes and orders above referred to, this question has already been discussed from a financial point of view and it has been found that the Municipality can afford the scheme even under the old Act. Under the new Act, therefore, the Council will be better able to meet the additional cost, which will amount to Rs. 4,405 if the loan of half the initial cost is to be repaid in twenty years as now required by the Government of India, instead of thirty years. The water and drainage tax, if levied at the maximum rate, will alone bring in Rs. 6,960. The taxes on buildings and lands which are levied at the rate of 5 per cent. and the tax on carts which is levied at three-fourths the maximum rate can also be raised if necessary.

In G.O., No. 1027 M., dated 18th June 1896.

G.O., No. 1808 L., dated 30th September 1896.

In these circumstances, it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudiyáttam.

V. RAGHAVA CHARLU—3–8–97.

The preliminary question is whether Government will give a grant of half and a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time.

The matter must stand over for the present until we see our way to make a grant and loan.

H. W. B[LISS]—6–8–97.

2. If so, we can only approve the scheme and wait for a clearer financial horizon. The Gudiyáttam Municipal Council cannot raise the funds without assistance.

G. S. FORBES—4–8–97.

[G.O., No. 1772 M., dated 13th August 1897.]

LOCAL AND MUNICIPAL DEPARTMENT.

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G. S. FORBES—4–8–97.

[G.O., No. 1772 M., dated 13th August 1897.]

Subject
Gnoryattam water
scheme

Notes connected with G.O. 1722 M 18/8/97

Read cuts bo 1507 & 2288 M

From the Secy Sanit Bd no 658 of 4.3.96.
— Cmle Gnoryattam no 312 of 30.3.97
— do — no 312 of 15.6.97

For Orders

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be

Flag C

ide the Sanitary Board's
esolution No.658 dated
th March 1896 (Flag. C.)

Vide Sanitary Engineer's report.

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In

In Go. No 1027 M of 18-8-96

× Interest & Sinking fund Rs 1940
Cost of [illegible] 2000
Repairs to machinery 465
4405

Go. 1808L / 30.9.96 Flag D

In these circumstances it is submitted that the scheme recommended by the Sanitary Board may be approved and forwarded to the Public Works Department for sanction and the Council informed that the Government sees no reason to show any special consideration in the case of Gudyattam.

V. Raghava Charlu
3/8/97

H.M.

The preliminary question is whether Govt will give a grant of half & a loan of the other half of the cost of the scheme. At any rate it may be presumed that no promise can at present be made of aid within any definite time. If so we can only approve the scheme & wait for a clearer financial horizon. The Gudiyattam Mil cannot raise the fund without assistance

S.R. Orbes
4/8/97

The matter must stand over for the present until we see our way to make a grant & loan

[illegible] [illegible]
6/8/97

[Go. No 1772 M / 13/8/97]

Local Filmmaker

8-12

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13-8-97

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Press

The notes have not been put in type as already asked. Please do so now & send proof

[illegible] 17/4