MADRAS RECORD OFFICE.

Government Records.

Local & Municipal Department.

G. O. (Printed).

Dated 30-11-1891.

No. 2113 M

10-12-23 BIII ✓

2-1-24 BIII

30-7-26 BIII ✓

4-3-27 BIII ✓

20-11-28 BIII ✓

27-5-29 BIII ✓

24-7-31 ✓

16-3-32 BIII ✓

8-6-32 ✓

28-8-32 III

27-4-40 III

Water-Supply.

Passing orders on the distribution of the Cost of the extended-Scheme of Trichinopoly now proposed by the Sanitary Engineer.

M.R.O. 1—77,006—8-3-37.

(1) Number of pages 30

(2) Date of repair 7-10-38

(3) Initials of the Referencer

MADRAS RECORD OFFICE.

Government of Madras.

Local and Municipal DEPARTMENT.

Municipal

G.O. No. 709 M Press / Mis.

Dated 12-5-1891.

Not to be folded or roughly handled

FORM A.

No. 272

GOVERNMENT OF MADRAS.

OFFICE OF SANITARY ENGINEER,

Fort St. George, 10th April 1891.

GOVERNMENT No. 882 Mn

From

J. A. JONES, ESQ., MEM. INST. C.E., F.R.S.E.,

SANITARY ENGINEER TO GOVERNMENT,

To

The Chief Secretary to Government,

Local and Municipal Department

SIR,

I have the honor, with reference to G.O, dated 15th November 1890, No 1705, L, to report as follows regarding the water supply of the town of Kurnool.

2. The questions of water supply and improvement of the subsoil drainage in this town can hardly be considered separately. They are indeed intimately connected with each other and an improvement in the former will, I think, be undoubtedly followed by an improvement in the latter.

3. To admit of this being explained it is necessary to sketch briefly the geological conditions which obtain under

town site -

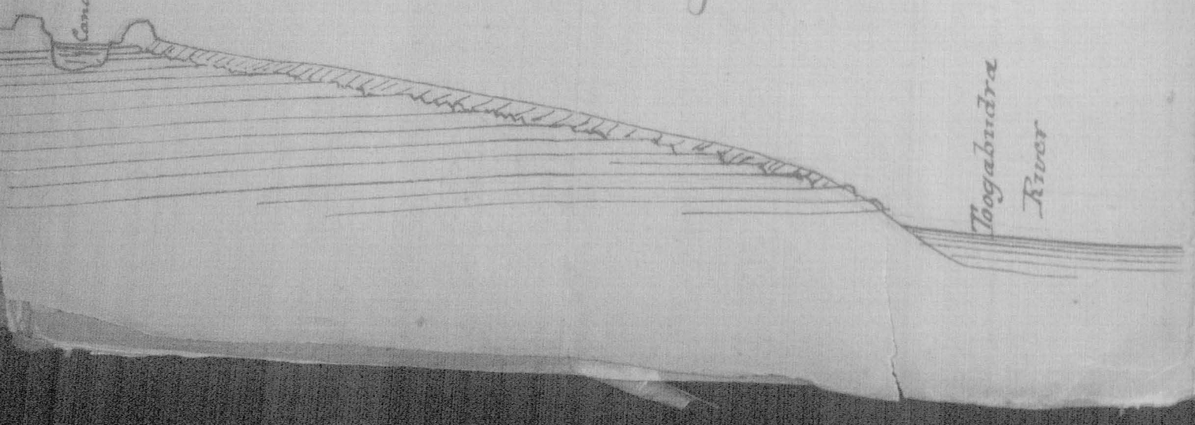
4. The town is situated at the confluence of the Toongabudra & Hindri Rivers - The Toongabudra River flows to the north & then to the east of the town; the Hindri flows to the south of it. In the peninsula thus formed is situated the town of Kurnool - crossing the peninsula on the west of the town is the Kurnool Canal which has its level considerably above that of the mean level of the town site -

5. The surface of the town area slopes from the canal on the west towards the Toongabudra on the east.

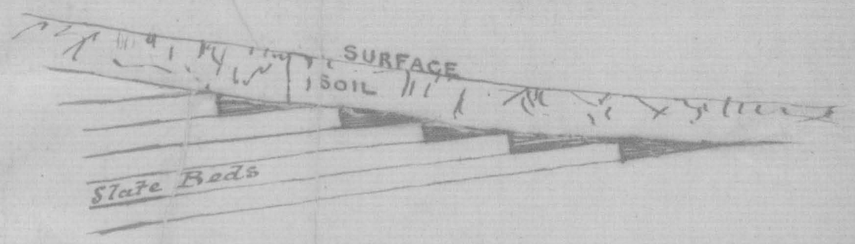
6. There is but a small depth of soil at any place within the town area.

7. A few feet below at all places is found the rock which is of, or allied to, the series of limestones known as "Cuddapah Slates".

8. The dip of this stratum is in the reverse direction to that of the surface slope. The dip is not great & a section from the canal towards the Toongabudra would be somewhat like the following:-



9. The effect of this arrangement of the rock and surface is that any water falling on the town area or any water which percolates into the town area is held up as it were in a series of tanks of which the following would be an exaggerated section:-



the dark shading showing where the water lodges & where it will remain undisplaced by the entry of fresh water.

10. We have here circumstances in which it is impossible to effect much improvement. A small quantity of the water no doubt drains off through below the different layers of the stratum & there is probably a small flow from the surface of strata at those portions have no superincumbent layers as the strata has also a slight inclination from south to north; in fact this flow can be observed at the exposed sections of the strata which abut the Toongabudra River - Some of this flow may come fr

town site.

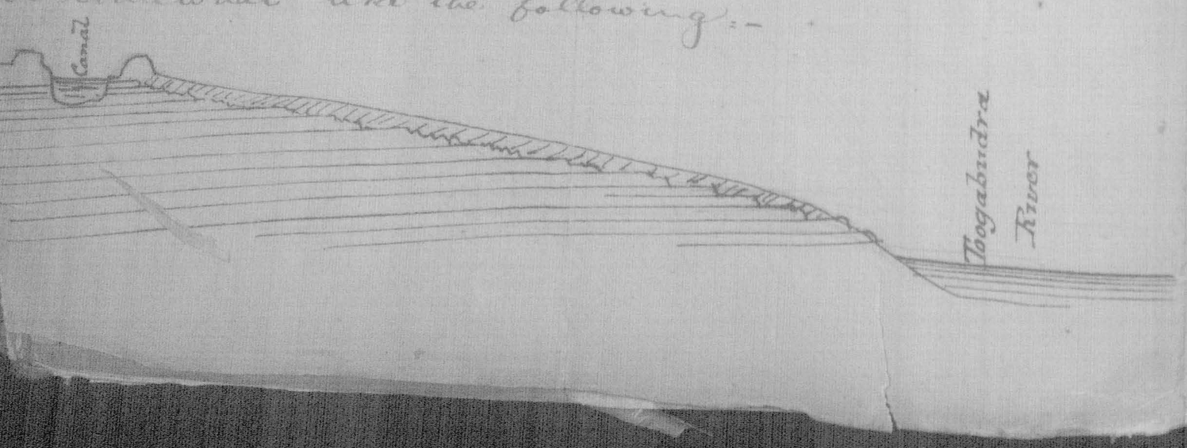
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5. The surface of the town area slopes from the Canal on the west towards the Toongabudra on the east.

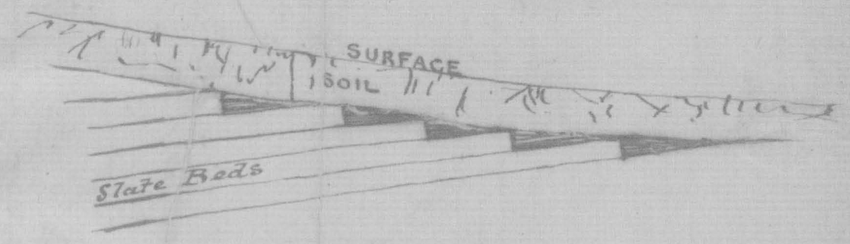
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9. The effect of this arrangement of the rocks and surface is that any water falling on the town area or any water which percolates into the town area is held up as it were in a series of small tanks of which the following would be an exaggerated section:-



the dark shading showing where the water lodges & where it will remain undisplaced by the entry of fresh water.

10. We have here circumstances on which it is impossible to effect much improvement. A small quantity of the water no doubt drains off through below the different layers of the stratum & there is probably a small flow from the surface of strata at those portions have no superincumbent layers as the strata has also a slight inclination from south to north; in fact this flow can be observed at the exposed sections of the strata which abut the Toongabudra River. Some of this flow may come fr

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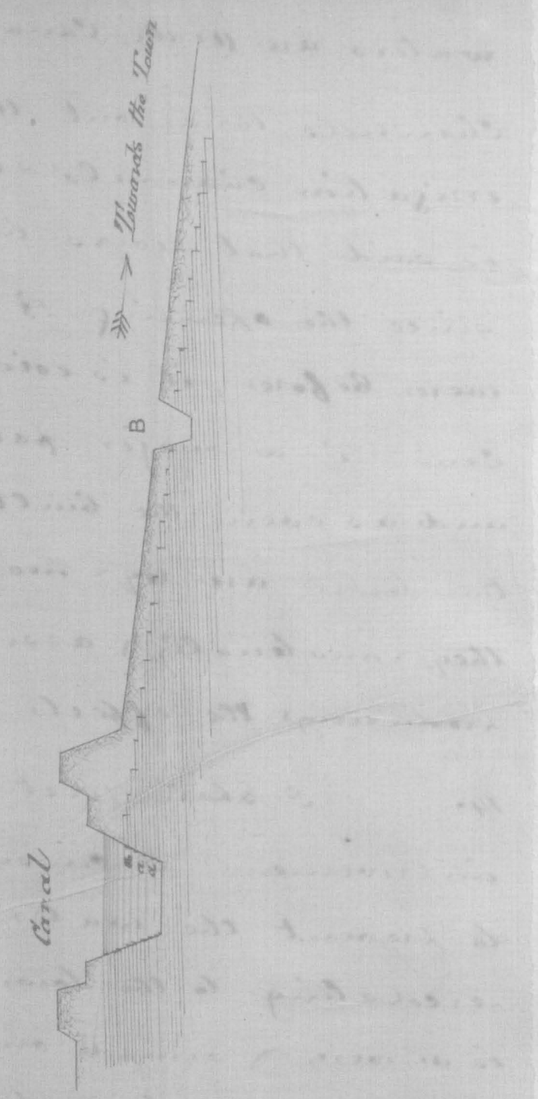
Tundri River which is at a much higher level towards the western end of the town.

12. But that flow is not so great as to carry off any but a small proportion of the water which lodges in the depressions illustrated; hence we have a subsoil which if not water logged — itself has water below it which remains for a state of stagnation for many months at a time & which, I believe, must be one of the causes of the large amount of fever for which Kurnool is somewhat notorious.

12. Now, if we cannot drain off the water (& as I said before that is almost impossible) & as it is almost if not equally impossible to keep up a flow or movement in the subsoil water during the whole year, the next best plan is to stop the flow of water to the positions indicated.

13. As regards the rainfall we cannot effect this; indeed the heavier rainfalls should be of advantage because they, by their great volume, will replace much stagnant water which has remained in <u>statu quo</u> for many months. The other sources of percolating waters are (1) the Canal, (2) the water in channels throughout the town & (3) the irrigation channels & the irrigation. As it is said that fevers have been much worse since the opening of the Canal than they were before, it is evident that the Canal is a major factor in their occurrence and as even the built channels through the town are by no means impervious they materially assist the canal in producing the effects referred to.

14. I shall first mention the improvement I consider necessary to prevent the water from the canal percolating to the town and the remedy is a very simple one. It consists merely in cutting a deep ditch parallel to the canal some 200 to 500 feet east of it; one portion of the drain would fall to the Tungabudra & the major portion to the Tundri. The following section illustrates the advantages of this proposal.



The canal water enters the layers at a a a and passes under pressure through between the layers falling over the stepped ends of the strata down towards the town. By placing a drain at B, we catch all this leakage & convey the water to the respective rivers mentioned above & we thus get rid of what I believe is one cause of unhealthiness by reducing the amount of subsoil water allowed to lie stagnant under the town & some will pass down to the town still - The lower

lower side of the drain would be
pierced or built.

15. The second source of percolating waters is from the channels, which are connected with the canal and carry its waters throughout the town. These channels are built in stone and chunam and they apart from their other defects, are not by any means watertight; indeed it has already been found necessary at certain places where the ground sets swampy in their vicinity to cut channels to lead away the water which had leaked from them. It is evident that their present state is one which demands remedy. As the conclusion at which I have arrived regarding them has reference to them rather as conduits for water supply than factors in the delivery of water into the subsoil, I reserve my proposals for a later paragraph.

16. The third source of percolating waters are the irrigation channels. Where cultivation has been stopped within the town, but there is a very large area of what is called dry cultivation which cultivation consists of crops, such as onions for example, which cannot be reared without a great deal of water;

no doubt true that the water necessary for such crops is not dammed up so as to stand on the surface so that there is a constant flow over the surface, but this does not lessen the quantity which will flow through the soil & remain in the rocks as already illustrated and the sooner this irrigation is stopped the better; I feel sure this measure will result in improving the health of the town - this irrigation is probably a greater factor in the continued existence of fever than either the actual canal itself alone or the closed conduits.

17. I now proceed to discuss the question of water supply per se.

Existing water supply works.

18. The supply is derived from the Kurnool-Cuddapah Canal. This canal is supplied from the Tungabudra, the head sluices being some 15 miles up the river from Kurnool. The canal waters are on account of the large amount of solids they contain (about 30·38 grs per pint during the monsoon & slightly less ordinarily) not suitable for a town's supply without treatment previous to distribution.

The water is conducted to the town from a point above the Kurnool Lock and sluices, firstly by means of a short length of open channel & then of covered conduits which in their course pass through a large number of built wells whence the inhabitants draw their supply - the conduits as already stated are of stone in chunam they are of square shape & as large as 2 feet square if not more in some places - they are not water-tight by any means; they are adjacent to drains, to roads & of course mostly below their level & it has been hinted by a Medical & Sanitary Officer of the district that perhaps the non-necessity of cleaning some of the 500 cesspools in the town is probably due to the fact that the foul water finds vent by the medium of porous rubble masonry chaupels intended for the conveyance of drinking water!" I am loath to believe that this is the case, but it is not by any means improbable and at any rate shows that the water conduits are by no means suited for their purpose - there are however, other reasons which I think demand their abandonment and here I must refer to the vexed question of the amount of water paid for by the Council. The sum paid is Rs 3,500 annually. The rate fixed is Rs 1 per 400 cubic yards so that if the Municipal Council is paying for no more

more than is supplied, it is being supplied with

$$\frac{3500 \times 400 \times 27 \times 6\frac{1}{4}}{365 \times 20{,}000^{*}} = 32 \text{ gallons per head per day.}$$

* Population.

an amount very much in excess of what it can use.

20. But if less water were passed through the conduits the velocity would be less & the deposit of silt greater while even now some perhaps many of the conduits have some 12" to 15" of silt in them with a luxurious crop of weeds above the silt - again the supply cannot well be regulated according to the hourly varying requirements & hence Government and the municipality are burdened with a heavy charge for water which they don't want & the more than ample supply instead of being as in ordinary cases a health growing blessing is in this case from the causes I have already described also a curse and the limitation of the supply is an obvious necessity.

21. I do not believe that any limitation can be made under existing circumstances large amounts may be spent in improving the channels by cementing & cementing them & but a large quantity of water must be sent through them and a larger amount of silt will be deposited & so long as that takes place the very large expenditure which improvements to them would entail will be of comparatively little advantage indeed.

22. The system again is open to other pollutions at each well & the channels & we have in Kurnool a system which does not obtain in Masulipatam or Cocanada where similar conduits exist, viz that of private distribution which is effected by small branch channels running from the main conduits to the backyards of houses where the water is received into uncovered reservoirs & in other cases these channels flow into gardens under street drains & then back again to the main channels - The water is therefore open to every contamination. For all these reasons I am of opinion that these channels can form no portion of any improved scheme of supply & I think for their abandonment, from the many reasons I have given, a very desirable matter -

23. Several schemes have been proposed for the improvement of the town supply and it will have been noticed that there are at least three possible sources, the two rivers & the Canal, which

Dr King has suggested a fourth source, viz the sub-soil waters on the south of the River Sindri. The Tungabudra is probably the best source and the one I would have selected were not financial consideration an important matter for the town of Kurnool. Its bed is however much lower than the bed of the Sindri River & therefore to obtain water from it would be a very much more expensive scheme than one using the Sindri.

24. The only scheme which has been worked out in detail is that of supplying the town from the canal; this was prepared by Mr G. A. Carless, A.M.I.C.E. The scheme was estimated to cost Rs 81,000.

25. In this scheme it is proposed (1) to use about 2,580 feet of the existing conduits & to cement plaster them, (2) to lay 1,770 feet of 15" pipes to a service reservoir which was to be formed in the bed of a partially dug famine tank near the famine Jail, this tank was to be open (3) thence to lay cast iron pipes throughout the town & (4) the provision of (a) tanks for the deposition of silt and, (b) filter beds. No sum appears to be included in the estimate of Rs 81,000 for the latter works.

26. It may be taken that with settling tanks & filter beds the cost of the works would not be less than Rs 1,50,000

27. The scheme is admittedly defective. (1) Some portions of the town would not be supplied at all, (2) in other portions the dipping wells which are so objectionable must remain; (3) pipes of large diameter would be necessary below the service reservoir owing to the small head available; (4) the Council would still have to pay for the water it drew from the canal though probably a less sum than Rs 3,500.

28. I suppose that the latter amount could be reduced to Rs 1,500, the annual cost of the scheme would not be less than Rs 8,750 and this for an unsatisfactory scheme.

29. Dr W. G. King when Medical assistant Sanitary officer for Kurnool propounded a scheme which entailed pumping and which was sent to the Municipality (vide G.O. dated 30th January 1888, No 75, M. dtd) with the Superintending Engineer's (III circle) remarks that

that the "scheme xxxx is not likely to commend itself to a poor Municipality" and the Municipality were recommended to improve their present supply. No reason was given for the above recommendation but I suppose it was made on the ground of expense. It yet remains to be seen however whether a pumping scheme is not the cheapest seeing at any rate that water proposed to be used can be got for nothing while at present £3,500 is paid annually for it.

30. I have already described the Geology of the northern side of the river, that of the southern side of the Sirandi is totally different. The Geological conditions already described prevail two thirds of the way across the Sirandi, when the Cuddapah Slate beds are struck and a deep bed has been secured out. Rock on the southern side has not been touched at a depth of about 30 to 40 feet. The piers of the road bridge over the Sirandi have flooring walls and masonry floor, but I have not been able to discover the exact depth at which the piers were founded.

31. Mr King's proposal was to form a filtration gallery in the southern bank of the river just below the Canal aqueduct and be intended to intercept the large sub soil flow which has its source in the Jayamvatha Hills to the South. The best drinking water obtainable in Bangalore is obtainable from the south side of the river and I have no doubt but that the site selected is the best site for a filtration gallery.

32. The water in the bed of the river is probably the same water as that which is in the strata on the banks and of the filtering gallery were placed at the side of the river we should have the benefit of the water from the upper reaches as well as the water flowing directly from the adjacent strata at site of filtration gallery.

33. The only sanitary objection to the position of this gallery is the existence of Grave yards on this bank, but as there are Coppers down the river (except six Graves which are about 100 years old), I think that this objection may be ignored and although water will filter into the river at this point directly from the land

land the great bulk of the water which will be drawn will be water flowed from the strata along the whole course of the river above this point.

34. It will be seen that Dr King's source and the Hindri source of supply are practically the same and the water which would be obtained would be practically pure.

35. Dr King proposed to utilize the canal water for pumping up water from the Hindri to the town (the canal level is some 25 feet above the Hindri River) by means of a turbine or a breast wheel.

36. We may calculate that there will be a loss of all the water used in whatever form it may be utilized and that its price will be that now charged, viz Rs 1 per 400 c.ft.

37. Kurnool, I think, should have a limited supply, that is, just sufficient and I would not, looking to the circumstances which affect the health of the town, propose to send in more than 15 gallons per head.

38. Kurnool at this rate would require 300,000 gallons daily or say per

an average of 33 cft per minute.

39. The water would have to be raised from the river some 55 feet & for this we should require a machine to develope an average of 4 H.P. which shall at times require double this power or 8 H.P. effective will be required; the quantity of water which would be required to work such a machine (say a turbine) supposing that 25 feet of head were available would amount to about 25 feet per second. The average amount of water required would be 8,000 gallons daily which would cost Rs 240 a month or Rs 2,880 per annum, but though this might be slightly cheaper than steam, it is not so satisfactory an arrangement; it would not be available throughout the year and even ordinarily the water cannot be spared.

40. The cost of steam power would probably not exceed Rs 10 per diem Rs 300 a month or Rs 3,600 a year; this is but little more than is now paid for the water and as the water would be obtained for nothing the pumping will practically cost nothing and only

land the great bulk of the water which will be drawn will be water diverted from the creeks along the whole course of the river above this point.

34. It will be seen that Dr. King's source and the Kindri source of supply are practically the same and the water which would be obtained would be practically pure.

35. Dr. King proposed to utilize the canal water for pumping up water from the Kindri to the town (the canal level is some 25 feet above the Kindri River) by means of a turbine or an breast wheel.

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40. The cost of steam power would probably not exceed Rs 10 per diem, Rs 300 a month or Rs 3,600 a year; this is but little more than is now paid for the water, and as the water would be obtained for nothing the pumping will practically cost nothing and

only

only the works would have to be paid for.

41. The cost of the pipes in Mr. Carless' scheme is set down at Rs 73,000 and if the pipes are laid only to the extent which he proposes a greater head being practicable & hence smaller diameter of mains allowable, their cost might be reduced to somewhat under Rs 50,000.

42. The Engines would require to develope ordinarily some 3½ H.P., at times double this say 7 H.P. and allowing 75 per cent for friction, Engines of about 12 H.P. would be necessary & allowing for a reserve, say 3 Engines of 6 H.P. each; the total cost of these would amount approximately to Rs 10,800.

43. No settling tanks or filter beds would be required because we here take a pure water to begin with which is much preferable to taking an impure water laden with silt and then cleaning it.

44. The total cost of the scheme would be roughly say:

Filtration gallery	Rs 8,000
Engines &c	" 10,800
Pumping station	" 4,000
Pipes & Fountains	" 50,000
	Rs 72,800
Add 12½ % for supervision and contingencies	" 9,100
	Rs 81,900

45. The annual cost would be

For interest and Sinking Fund	Rs 5,118
For working expenses	" 3,600
	Rs 8,718

Mr Carless scheme would cost

For water	Rs 1,500
For Labor at filters & tanks	1,000
For interest & Sinking fund	" 6,250
	Rs 8,750

46. The Municipality at present pay Rs 3,500 for water plus the cost of repairs to conduits; their present supply is not gauged & is practically unlimited but neither its purity or its amplitude are matter for satisfaction. The present state of matters so long as Canal water is used cannot without filtration be improved, & filtration would be a very expensive operation

47. The Hindri water drawn from the sandy bed must be in every respect purer & the water itself will cost nothing. No analysis has yet been made of the water from the place selected for the gallery but this I have requested the Chairman to arrange for, an analyses of the water from a Norton's tube well on the south (right) Bank of the Hindri showed the water to be rather high in nitrates & chlorine but this, I think, must be due to its proximity to the graveyards which are lower down the river than the site of the filtration gallery which I propose.

48. Without any Government contribution the scheme would cost the Municipality an additional sum of (Rs 8,718 - Rs 3,500) Rs 5,200 say yearly. But if Government are as generous to Kurnool as it has been to other Municipalities (and Kurnool is certainly a place much in need of an improvement in its water supply) the Municipality would have to meet only a moiety of cost or the following annual charges.

Interest & Sinking Fund	Rs 2,559
working charges	" 3,600
	Rs 6,159
Less	" 3,500
	Rs 2,659

which might be obtained by a small water tax.

49. The scheme can be readily worked out in detail as much of the information which would be required is already available.

I have the honor to be,

Sir

Your most obedient servt

Sanitary Engineer 6 Circle

882 M

1891.

From

The Sanitary Engineer

to Government,

To

The Chief Secretary

to Government

Local & Municipal Dept

No. 272

Dated 10th

Despd. 11th April 1891.

Recd. 11 APR 91

Enc. —

Subject.

Kurnool water supply

Submits his report as to improvements in connection with ——.

A/14/4

13

LOCAL AND MUNICIPAL DEPARTMENT.

Current No. 882 M

From

The Sanitary Engineer.

FOR ORDERS.

As Mr Jones' scheme seems to be hopeful, he might be asked to work it out in detail as soon as possible. The Government will no doubt contribute half the initial outlay; but having in view the extreme poverty of the town and the large sums it has been annually paying to Government for so long time for the water now supplied, it is for consideration whether the Government may not

go a stepe further and promise the Council three-fourths of the cost of the project, as in the case of the Coonoor Drainage Scheme. The watertax at the maximum rate of 4 per cent will yield about Rs 19000

2. Mr Jones gives no estimate of the cost of making the tunnels referred to by him in §§. 14. This is not part of the water works but rather a drainage scheme + if the geological formation of the town is such as described it seems to be very necessary that something should be done in this direction also. The closure of the conduits may be dealt with when the new water-supply scheme is in working order + the prohibition of such cultivation as that referred to in § 12 for orders. Submitted that Mr Jones be asked to furnish detailed scheme & estimates, with analyses of the water proposed to be supplied, that the Council be informed that Govt is prepared to advance either one half or three quarters of the cost, & that estimates for the drainage tunnels be also prepared. The Council having paid for the use of the canal water Rs 3,500 per annum since 1886, & their finances being at a low ebb in spite of careful management, some extra concession if it is submitted may be granted such as advancing three-fourths of the initial expenses for the works & allowing the contribution to be discontinued as soon as the work is actually put in hand without waiting for its completion.

H.B.

I agree to increasing 3/4 of the cost of the works which should be borne without delay about Rs 14000 The Council will pay 6 percent interest on this sum during 20 years & the principal in 20 annual instalments of Rs 1400 each. The Council will thus pay Rs 2240 per annum for 20 years. The Council will also pay Rs 1400 per annum for 20 years for the principal. The Council will thus pay Rs 3640 per annum for 20 years. The Council will also pay Rs 1400 per annum for 20 years for the principal. The Council will thus pay Rs 3640 per annum for 20 years.

I agree - but I should like to know what no. of gallons a head is considered sufficient for these Indian towns. In England I believe engineers always estimate for 20 or 25 gallons & in towns where there are mills 30 gallons. This scheme proposes to substitute 15 for a present daily average of 32. Will this much reduced supply be sufficient?

27/4/91

Note for H.B. Mr Jones

Please see § 12 of G.O. 9.90 dated 7th March 1890 [illegible]

order 9712-5-91 No 709 Pt Secs

The Sanitary Engineer is requested to work out in detail his scheme for the improvement of the water-supply of Kurnool on the lines indicated in the letter read above. The water should be carefully analysed & full particulars furnished as to the sufficiency of the supply. Should the scheme prove below feasible, Govt will be prepared to make a grant from Provincial funds of three-fourths of the cost & bland the remainder at 4½% to be repayable in 20 years 2. The remarks of the Sanitary Engineer regarding the drainage of the town & the means of improving it should be considered at an early date by the Municipal Council.

(from order)

H.B.

22-5-91

H Hind

To the Sanitary Engineer to the Govt, Municipal Council, Kurnool

Please see G.O. dated 7th March 1890 [illegible]

Kurrachee Water Supply

FOR ORDERS.

[7]

17-8-01 ✓ [illegible]
16-5-07 ✓
4-12-08 ✓
24-10-13 BH ✓

Miscellaneous.

LOCAL AND MUNICIPAL DEPT.
G.O., DATED 12-5-91
No. 709M

When given for copying

[Despatch Abstract.]

Water Supply

Requesting the Sanitary Engr. with remarks to work out in detail his scheme for the improvement of the — of Kurnool.