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(2) Date of repair 29.10.86.

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PUBLIC WORKS. **DEPARTMENT**

G.O. No. 718.W.
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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

11th March 1879, No. 718 W.

Buildings and Roads.
Civil Works.

Read the following papers:—

No. 128. From W. PARKES, Esq., M.I.C.E., Engineer-in-Chief, Madras Harbour Works, to the Secretary to Government, Public Works Department, dated Madras, 15th February 1879, No. 4 W.

A plan and section on one sheet.

In accordance with the memorandum of the Chief Engineer, dated 12th November 1878, to the effect that Government had decided to defer the general question of the drainage of the foreshore of the Harbour till my arrival at Madras, I have now the honor to inform you that I have given the subject my best consideration, and have had the advantage of two interviews with His Grace the Governor and several consultations with Mr. Jones, the Municipal Engineer, as well as the assistance of Mr. Thorowgood and Mr. Beardmore.

2. I think there can be no doubt that it will be ultimately necessary to intercept from the Harbour all possible vents for storm water, but there is certainly much force in the suggestion that in the present undecided state of the question of the general drainage of the Black Town, and of the ultimate arrangement of that portion of the foreshore which faces the Harbour, it is hardly possible to foresee what particular mode of carrying out that interception will be most convenient. During the short interval that will elapse before these questions are decided, the storm waters may without much evil be permitted to escape as at present, and the works of interception be adapted only for the daily flow of house drainage.

3. The discharge to be dealt with is that of a population of about 20,000.

4. There are altogether thirteen sewers carried under the Beach Road between Messrs. Parry and Co.'s and Clive's Battery, but of these, only four bring down house sewage, the others being merely surface drains from the premises immediately facing the beach, and if they receive sewage at all, it may be more easily diverted to some of the open Black Town drains at the back, and thus conducted into the intercepting sewer, than by making connections directly with the latter.

5. The quantity of sewage which actually reaches the present mouths of the above four sewers is very much less than that which must be delivered from the houses, as by some gaugings made by Mr. Beardmore in January 1878 the daily flow amounted to little more than 2½ gallons per head of the population. An improved drainage and water-supply may be expected greatly to increase the flow and the consequent necessity of interception. Mr. Jones is of opinion that when these improvements which are urgently required are carried out, the flow may amount to 15 gallons per head per diem, of which one-half will run off in six hours, and for this I propose therefore to make provision.

6. I think that the whole of the foreshore between Fort St. George and Royapooram must be considered as unavailable for drainage outfalls. The Harbour frontage about one-half of the length is obviously so, and the remainder will be always liable to annual fluctuations of the line of beach, which will render it impossible to maintain the mouth of a drain in any fixed position. This fact will I expect soon force itself on the attention of Government as an additional reason for making a better provision for storm waters, than is afforded by the southern mouth of the great Black Town sewer.

7. We are thus led to Royapooram as the nearest site for the outfall of the intercepting drain, and fortunately it has certain advantages for the purpose. It is entirely free from changes of the shore line of the same kind as those which are taking place south of the Harbour, and the surf which is constantly beating upon it will prevent any foul deposit on the foreshore. The artificial beach of laterite which protects the face of the north surf bank of the Harbour Pier will form an excellent bed for the outlet pipe.

8. The disadvantage of the site is that it is in the neighborhood of a dense population, to whom the northern outfall of the Black Town sewer is already a nuisance, which is sometimes intolerable. I believe, however, that the nuisance is due to preventible causes, and it has been materially reduced by the addition made under Mr. Thorowgood's direction of an iron pipe from the mouth of the sewer to a point 155 feet further seaward, which carries off the sewage in a constant discharge instead of its being permitted to accumulate in the sewer, where it fermented and in turn re-absorbed its own foul gases. The sewer, however, is still a reservoir of the foul gases for which there is no proper means of escape provided, and it is to the absorption of these gases by the fresh sewage, rather than to the inherent foulness of the sewage itself, that the remaining nuisance is due.

9. I feel sure that these evils may be avoided in the outlet of the proposed intercepting sewer, so that the present nuisance shall at least not be aggravated. The gases should have as free an exit at the upper end of a sewer as the liquids have at the lower end. If this is effectually provided for, there is no reason why the outlets of the sewers should be offensive.

10. I therefore propose that the junctions of the four existing drains with the new drain should be made airtight, but recommend that the upper ends should be trapped to prevent the escape of gases at the points where they receive the contents of the open town drains, and that each "dead end" so formed should be connected with a ventilating shaft carried up to at least 15 feet above the tops of the neighboring houses.

11. The junctions with the intercepting drain must be so constructed that while they do not permit the escape of gas they will permit the escape of an excess of storm water. This may be effected by making the storm overflows in the form of traps, which will have to be kept supplied with water.

12. I propose that the four existing drains should not be directly connected with the intercepting drain, but that the junction be made to wells of brickwork 4 feet internal diameter, sunk 8 feet into the sand. These will serve as catch-pits for the grosser solid particles brought down from the town drains, which may be removed periodically. The wells will be covered with granite slabs in which the trapped arrangement for the storm overflow will be made.

13. The drain will be laid out in a straight line between its junctions with the two extreme town drains No. 10 and No. 2 on the plan, passing under the screw pile pier as close to the abutment as practicable. From the junction with No. 2 it will be carried direct under the north surf bank to the laterite foreshore where it will discharge at about mean sea level.

14. The inclination will be 1 in 700 throughout. I propose to form the lower half of the section of Portland cement concrete deposited in situ in a trench dug for the purpose, the upper half to be of brickwork, set and jointed in cement mortar. The last 50 feet will be of cast iron pipes.

15. If the capacity of the drain be made sufficient to carry only the discharge of the four drains it is intended primarily to intercept, a diameter of 12 inches would be sufficient; but I would strongly recommend that it be made sufficient to carry also the sewage now being pumped up near the fort, which by a little modification of the present pumping arrangements might be delivered into an extension of the intercepting drain at the same inclination. Thus the constant daily discharge at the fort and the nuisance caused by it would be done away with, but the storm water would be left to discharge as at present into the sea.

16. This extension of the scheme would, however, of course be carried out by the Municipality. The liability of the Harbour Works will terminate at drain No. 10.

17. In order to obtain sufficient inclination for the sewer, it will have to be laid for a portion of its length at a depth so little below the present surface of the ground that it will not be covered sufficiently to be protected from injury. It will therefore be necessary to raise the level of the ground in this part nearly to that of the adjoining Beach Road. This in itself will be an improvement, and only an anticipation of what would ultimately be required on other accounts.

18. The cost of the whole work I estimate at Rupees 13,603 if adapted for the local sewage only; or Rupees 17,811 if enlarged to receive the fort outfall, both including 10 per cent. for contingencies. This amount includes the cost of forming junctions with the present sewers as they exist, but does not include any allowance for improvement in those sewers above their outlets, or for ventilating shafts at the upper ends. These I have presumed would be borne by the Municipality.

No. 128-A. From the same Officer, dated Madras, 25th February 1879, No. 8.

IN reply to your memorandum, No. 752, of yesterday's date, I have the honor to state that in the event of the extension of the canal to the Harbour being carried out, the intercepting drain, whether conveying sewage only or storm waters also, may without difficulty be constructed below the bed of the canal as an inverted syphon culvert.

No. 128-B. From the same Officer, dated Madras, 1st March 1879, No. 9 W.

YOUR memorandum of yesterday's date requests further explanation relative to the "improvement in the present sewers above their outlets," allowance for which is stated not to be included in the estimated sums of Rupees 13,603 and Rupees 17,811.

2. My estimate includes making junctions with the present drains as they exist, but assumes that they either are or will be made at the expense of the Municipality in a suitable state for conveying the sewage to those junctions.

3. It is admitted that the covered drains ought to be trapped and ventilated at their upper ends in any case, but in order to do this effectually it may be necessary to put them in a state of complete repair throughout their whole length and perhaps to close some subsidiary openings. I have not thought it within my province, however, to make such an examination of the drains as would enable me to specify what works are necessary for this purpose. They ought to be carried out in any case, but the urgency for them will be increased by the connection with a further length of half a mile of covered drain. That connection may bring imperfections in the existing drains to notice, but it will not be the cause of them, and they should be remedied at the expense of the authority in whom the maintenance of the drains is vested and not at that of the Harbour Works.

No. 129. ORDER THEREON, 11th March 1879, No. 718 W.

IN these letters Mr. Parkes explains his proposals for dealing with the town sewage which at present finds its way into the Harbour enclosure; and, upon the understanding that those proposals have been approved by the Municipal authorities, they are sanctioned for immediate execution.

2. His Grace the Governor in Council cannot, however, accept the statement in paragraph 16 of Mr. Parkes' letter to the effect that the liability of the Harbour Works will terminate at drain No. 10. In a previous paragraph Mr. Parkes expresses the opinion that the entire foreshore as far south as Fort St. George will be liable to annual fluctuations of the line of beach, which will render it impossible to maintain the mouth of a drain in any fixed position. In this latter opinion the Government concur; and those fluctuations in the beach line, which will probably become more marked from year to year, are without doubt due solely to the action of the Harbour Works.

3. For these reasons His Grace in Council is of opinion that the proposed intercepting drain should be made of sufficient capacity to receive the sewage which has hitherto been discharged into the sea to the north of the fort, alluded to in paragraph 15 of Mr. Parkes' letter, *as well as the discharge of house sewage from the four drains mentioned in paragraph 4.*

4. The larger of the two estimates submitted by Mr. Parkes, amounting to Rupees 17,811, is accordingly accepted; but the Government are of opinion that the proposed intercepting drain should be extended to the south sufficiently to receive the fort outfall; the entire work forming a charge against the Harbour Works.

5. The ventilating shafts alluded to in paragraph 10 of Mr. Parkes' letter should be constructed by the Municipality; and the President will be requested to take the necessary measures for this purpose, in communication with the Superintendent of the Harbour Works. Any improvement which may be necessary in the existing sewers should also be carried out at the expense of the Municipality; except so far as an alteration in their levels may be rendered necessary to effect a junction with the intercepting drain, in which case the cost of such alteration should be borne by the Harbour Works.

6. It is observed that, in the event of Cochrane's Canal being extended to the Harbour, the intercepting drain can be carried below the bed of the canal; and it may be well for the Superintendent of the Harbour Works to consider the expediency of constructing the necessary syphon in the first instance.

(True Extract.)

(Signed) J. H. M. SHAW-STEWART, Colonel, R.E.,
Ag. Secy. to Govt., P.W.D.

To the Superintendent, Madras Harbour Works.
" Financial Department.
" Superintending Engineer, Third Circle.

W. H. Parkes M.I.C.E.

Exd. T. D. Ryan.
Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of [1879] Madras.

PUBLIC WORKS.

To

THE SUPERINTENDENT,
MADRAS HARBOUR WORKS.
&c., &c., &c.

Dated March 11th

Issued

Recd. *Eyt.*

G. O., *11th March* 1879, No. 718 W.

MARCH.

Nos. 128-129.

Drainage of the Foreshore between the Groynes of the Madras Harbour—Orders on correspondence from Mr. Parkes on the subject of the—.

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No. ORDER THEREON, 11th March 1879, No. 718 W.

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3. For these reasons His Grace in Council is of opinion that the proposed intercepting drain should be made of sufficient capacity to receive the sewage which has hitherto been discharged into the sea to the north of the fort, alluded to in paragraph 15 of Mr. Parkes' letter, as well as the discharge of house sewage from the four drains mentioned in paragraph 4.

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6. It is observed that, in the event of Cochrane's Canal being extended to the Harbour, the intercepting drain can be carried below the bed of the canal.

(True Extract.)

Colonel, R.E.,
Ag. Secy. to Govt., P.W.D.

To the Superintendent, Madras Harbour Works.
" Financial Department.
" Superintending Engineer, Third Circle.

Drainage of the Foreshore between the Groynes of the Madras Harbour—Orders on correspondence from Mr. Parkes on the subject of the—.

Exd. T. D. Ryan.

to/ S.V. 24-3-79

and it would be well to ask the
Superintendent of the Harbour
Works to settle the [illegible]
in consultancy the necessary
as shown in the [illegible]

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

4th February 1878, No. 558 W.

Buildings and Roads.

Civil Works.

Read the following paper:—

No. 20. Endorsement of the Chief Secretary to Government, Financial Department, dated Fort St. George, 24th January 1878, No. 125.

From L. R. BURROWS, Esq., Acting President, Municipal Commission, to the Chief Secretary to Government, dated Madras, 22nd January 1878, No. 941.

I have the honor to forward, for the information of His Grace the Governor in Council, a report from the Executive Engineer of the Municipality on the accumulation of sand which is being formed to the south of the South Pier of the Harbour Works, and to the obstruction which is caused to the working of the screw pile drain recently constructed by the Municipality. Should the extension of the foreshore continue, the discharge of the contents of the main drain will be attended with far greater nuisance to the inhabitants of the Fort than it is at present.

2. If Government approve of the suggestion made by Mr. Jones to construct a groyne to the south of the main drain mouth, I request that orders may be issued for the work being carried out at the expense of Government by the Public Works Department.

From J. A. JONES, Esq., Executive Engineer, Municipal Commission, to L. R. BURROWS, Esq., Acting President, Municipal Commission, dated Madras, 19th January 1878, No. 1,111.

Screw Pile and Main Drain.

Since middle of September 1877 the sand has been accumulating to a very large extent round the mouths of these drains.

2. In March 1877 the pumping was commenced and the method for discharge of the drain acted very satisfactorily up to 13th October 1877. Since this latter date we have had to stop pumping entirely owing to the amount of sand deposited over and around the mouth of the pipe which delivered the sewage into the sea.

3. The pipes originally had seven feet of water over them at high tide and four feet at low tide, at present the low tide mark is at a considerable distance away from the mouth of the pipes.

4. This great increase of sand is no doubt due to the construction of the South Pier of the Harbour Works, and the sand appears to wash away between the Harbour Works Pier (south) and Captain Taylor's Pier and to be deposited from Captain Taylor's Pier southwards.

5. I met Mr. Thorowgood yesterday morning, and he believes that though there may be a slight diminution of the sand shortly, still eventually there will be a large increase and the foreshore still more extended.

6. As regards the pipe, to allow of us again pumping a branch is at present being laid at a high level above the sea to the end of the present pier and the pipe will be turned over into the sea at the end of the pier. This will only allow of us pumping from half tide to half tide as the end of the present pier is now about at low water mark, and it is not expedient to pump sewage when there is no water to receive it.

7. The remedy is to extend the pier some fifty feet further seawards and continue the pipe at a high level, turning it over the end of the pier thus lengthened into the sea as before.

8. There is a very serious danger menacing the mouth of the main drain, because this also will eventually be closed by the increase of sand. Mr. Thorowgood considers that a groyne should be run out a short distance to the south of the mouth of the drain.

9. This mouth is always used in floods and storms when the pump is not able to discharge the sewage quickly enough.

10. It will take about 100 tons of rubble for this work, and Mr. Thorowgood offers to allow it to be brought over the Harbour Line if it comes from Palaveram.

11. It is absolutely necessary to prevent the blocking up of the main drain at once.

12. The cost of the work detailed would cost about Rupees 600 or Rupees 700 without extra pumping.

13. There is the probability that our endeavors to keep the drain open may be futile from this continual extension of the sand, and even if we can keep it open the sewage will run over a long length of sand and thus be a greater nuisance both to the Fort and Town than it has been before.

FORWARDED to the Public Works Department for consideration and disposal.

(Signed) D. F. CARMICHAEL,
Chief Secretary.

No. 21.

ORDER THEREON, 4th February 1878, No. 558 W.

THERE can be no doubt that the silting up of the foreshore is due to the action of the Harbour Piers. The remedy should therefore be applied at the cost of the Harbour Works. The District Engineer, Presidency, will take the work in hand at once, extending the drainage by additional pipes where necessary.

2. An estimate should be submitted in due course, but this should not be allowed to delay the progress of the work.

(True Extract.)

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

To the District Engineer, Presidency.
" President, Municipal Commission
" Examiner of Public Works Accounts.
" Superintendent, Madras Harbour Works.
" Financial Department.

Exd. E. C. Shunker.

Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of (1878) Madras

PUBLIC WORKS.

To the District Engineer,
Presidency.

Dated February 18

Subject

Read,

Encl.

G. O. 14th February 1878, No. 6[illegible] W.

FEBRUARY.

Nos. 20-21.

Mala drain mouth, Madras.—The District Engineer, Presidency, directed to construct at once a groyne to the south of the [illegible] extending the drainage by additional pipes where necessary.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

28th February 1878, No. 984 W.

Buildings and Roads.
Civil Works.

Read the following papers :—

No. 310. Endorsement of the Chief Secretary to Government, Marine Department, dated Fort St. George, 29th November 1877, No. 2,218.

No. 310-A. From Mrs. C. SADLER, to the Chief Secretary to Government, dated Royapoorum, 28th November 1877.

I HAVE the honor to forward for the merciful consideration of His Grace the Governor in Council some particulars and correspondence regarding a case of very great hardship from which I am suffering.

I am the proprietrix of a piece of land near the sea beach at Royapooram, consisting of four grounds, the greater portion of which was enclosed by a wall and from its convenient position and security was used for storing timber and other cargo, and also being a very eligible building site. Since the construction of the north groyne of the Harbour, as His Grace is well aware, the sea has attacked the whole beach to the northward, damaging the Railway property, also Mr. Coleman's, and ultimately reaching mine, which has been more than half washed away and the remainder rendered valueless. There can be no moral doubt that the Harbour Works is responsible for this action of the sea. Several groynes have been run out to protect the roads and buildings nearest the works, but they were not carried far enough to secure mine, and my prayer is that His Grace the Governor in Council will grant me compensation for my heavy loss.

The Municipal Commissioner threatens to issue warrant of distress for the tax upon this unproductive piece of ground, a tax which I have hitherto always paid under the impression that I was under the same protection as other land-holders in this city, but as will be seen by his letter he refuses to be accountable for my loss.

The Harbour Works Superintendent without denying his obvious responsibility pleads no authority for giving me compensation, although the amount is small and would be almost invisible among such large expenditure, yet it is of the greatest importance to a distressed widow with a large family, the widow of a very meritorious public servant, the late Mr. Sadler, the Pier Master, through whose unremitting exertions the Pier was restored when abandoned by the Public Works Department as impossible to be repaired.

There is no doubt the Pier has proved during the famine the salvation of the lives of thousands by the facilities it has afforded for landing grain.

The sums quoted are those actually paid for the land and its belongings, and I respectfully ask of His Grace the Governor in Council that my just claim may be entertained and the compensation granted.

TRANSFERRED to the Public Works Department for disposal.

(Signed) D. F. CARMICHAEL,
Chief Secretary.

No. 310-B. Endorsement of the Chief Secretary to Government, Marine Department, dated Fort St. George, 9th February 1878, No. 223.

From A. MACKENZIE, Esq., Chairman, Chamber of Commerce, to the Chief Secretary to Government, dated Madras, 7th February 1878.

The part of the foreshore enclosed by the two arms of the Harbour being in front of many banks and mercantile offices, its condition is a matter of interest to the members of the Chamber, and on this ground I am desired to do myself the honor of moving the Government to give the insanitary condition of the locality their attention.

2. It will be known to the Government that there has been a large accumulation of sand between the two groynes, extending far beyond the extremity of the pipes from which the town's sewage used to be discharged direct into the sea. But no measures have been taken to divert the flow of sewage, and the pipes now discharge their contents on to the sand, which being saturated with the filth emits under a hot sun disgusting and dangerous effluvia. The idea of extending the pipes to the present limit of the sea, and allowing the sewage to be there discharged into the water has doubtless not commended itself to the Government, since it is a matter of great importance that the water within the Harbour walls should be kept as free as possible from pollution. But the Chamber, and probably the public, would be glad to learn that measures will be immediately taken for intercepting the sewage, and for arranging for its discharge at some point or points north or south of the Harbour. The expense of this diversion must be incurred some day, and it is thought by the Chamber that as the ultimate execution of the work is only a question of time it should not be delayed any longer.

Transferred to the Public Works Department in continuation of endorsement No. 125, dated 24th January 1878.

(Signed) D. F. CARMICHAEL,
Chief Secretary.

No. 310-C.

NOTE.

The Chief Engineer has ascertained from the Superintendent of the Madras Harbour Works that of the several drains that discharge into the Harbour between the Piers only one, viz., the most southerly, has any flow of consequence, the whole of the remainder together not discharging more than one-tenth of this flow. From this he believes that under existing circumstances it is not necessary to incur the great expense of constructing an intercepting sewer along the whole length of the base of the Harbour, but would simply divert the principal drain noticed by taking it in pipes through the surf bank of the south pier which would comparatively speaking cost but little. The small discharge from the remaining drains will not, he thinks, cause any appreciable inconvenience to the Harbour, and therefore he recommends their not being interfered with at present. He further remarks that in Mr. Clarke's proposed system of draining Madras it is arranged that all the drains in question shall discharge into sewers landwards leading to the pumping wells.

2. In regard to the measures ordered to be undertaken to secure property in the vicinity of the beach north of the Harbour Works, he notes that further erosion may be arrested by the construction of a group of six or eight more groynes north of the existing group; and later in the year if found necessary that short groynes be inserted between each of the existing groynes. He has carefully inspected the beach and from the papers in his office on the subject records his conviction that the erosion cannot be solely attributed to the construction of the Harbour piers as years ago such took place and had to be arrested by the existing groynes. However on the same principle that then induced the Government to sanction them it appears desirable that the additional group be constructed.

3. To admit of lengthening the principal pipes discharging the Black Town main drain immediately north of and close to Fort St. George into the sea, the Chief Engineer recommends that the temporary pier lately built by the Master Attendant, now of no use, be dismantled and its materials used for taking the drain pipes further out to sea.

(Signed) E. A. FOORD, Colonel, R.E.,
Chief Engineer and Secy. to Govt., P.W.D.

16th February 1878.

No. 311. Order thereon, 28th February 1878, No. 984 W.

Concurring with the Chief Engineer's remarks, the Governor in Council directs that estimates be without loss of time prepared for a fresh group of six groynes to be placed north of the existing groynes on the north side of the Harbour Works, and to be composed of the same materials as those of the existing groynes.

2. The Superintendent, Madras Harbour Works, will also estimate for diverting the principal drain referred to by the Chief Engineer through the surf bank of the southern Harbour groyne in the manner proposed in the second paragraph of his memorandum above recorded.

3. The Government also approve the Chief Engineer's suggestion regarding the utilization of Captain Taylor's temporary pier, the materials of which will be jointly valued by the Master Attendant and the District Engineer, Presidency, and the sum realized credited to Port Funds; and the District Engineer, Presidency, will arrange for extending the pipes of the Black Town drain immediately north of Fort St. George. In connection with this point the Government observe that while the temporary evil will be averted by this device the drain mouth will also have to be kept clear in case of rainfall.

4. Separate orders will be passed regarding the claims for compensation on receipt of the Chief Engineer's further report.

(True Extract.)

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

To the Superintendent, Madras Harbour Works.
" District Engineer, Presidency.
" Marine Department.
" Examiner of Public Works Accounts.
" Financial Department.
" Chief Engineer, Public Works Department.

Exd. S. T. Austin.
Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of (1878) Madras.

PUBLIC WORKS.

To

The SUPERINTENDENT,
MADRAS HARBOUR WORKS,
&c., &c., &c.

Dated February 28th.

Issued

Recd.

Exd.

G. O., 28th February 1878, No. 984 W.

FEBRUARY.

Nos. 810-811.

**Madras Harbour Works.*—Estimates to be prepared and submitted for a fresh group of six groynes to be placed north of the existing groynes on the north side of the ——, also an estimate for diverting the principal drain referred to by the Chief Engineer, and Captain Taylor's temporary pier to be utilised for extending the pipes of the Black Town drain north of Fort St. George.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

10th April 1878, No. 1,766 W.

Buildings and Roads.
Civil Works.

Read the following paper:—

No. 93. Endorsement of the Chief Secretary to Government, Financial Department, dated Fort St. George, 15th March 1878, No. 462.

From L. R. BURROWS, Esq., Acting President of the Municipal Commission, to the Chief Secretary to Government, dated Madras, 14th March 1878, E.No. 1,409.

I HAVE the honor to observe as follows, for the information of His Grace the Governor, with reference to G.O., No. 984 W, of 28th February 1878, and more particularly with regard to the first paragraph of the Chief Engineer's Note:—

1. That if Mr. Clarke's scheme for the drainage system be carried out all the sewage will be brought landward, and that in that case the diversion of the southmost sewer through the south pier of the Harbour Works will be unnecessary.
2. That if Mr. Clarke's scheme is not carried out (as it has been condemned by the Commissioners, and will only be carried out by the pressure of Government, it is improbable that it will be so) an intercepting sewer along the beach will be necessary.
3. That, therefore, in either case it will be waste of money to carry the sewer through the surf bank as proposed.

TRANSFERRED to the Public Works Department.

(Signed) D. F. CARMICHAEL,
Chief Secretary.

No. 94. ORDER THEREON, 10th April 1878, No. 1,766 W.

THE Government direct that the diversion of the principal drain through the surf bank of the Southern Harbour Groyne be at once carried out in accordance with the orders already issued.

(True Extract.)

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

To the Superintendent, Madras Harbour Works.
" District Engineer, Presidency.
" Examiner of Public Works Accounts.
" Financial Department.

Exd. T. D. Ryan.
Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of (1878) Madras.

PUBLIC WORKS.

To

The SUPERINTENDENT,
MADRAS HARBOUR WORKS,
&c., &c., &c.

Dated April 10th.

Issued

Recd. *Encl.*

G. O., 10th April 1878, No. 1,766 W.

MAY.

Nos. 93-94.

Madras Harbour Works.—The diversion of the principal drain through the surf bank of the Southern Harbour Groyne of the —, ordered.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

8th May 1878, No. 2,088 W.

Buildings and Roads.

Civil Works.

Read the following papers:—

No. 84. From A. MACKENZIE, Esq., Chairman, Chamber of Commerce, to the Secretary to Government, Public Works Department, dated Madras, 12th April 1878.

I HAVE the honor to acknowledge receipt of the Proceedings of Government, Public Works Department, 28th February, from which the Chamber have learnt that the Government have directed the Superintendent of the Harbour Works to prepare an estimate for diverting the principal drain between the two piers through the surf bank of the southern harbour groyne, and that no steps are to be taken for the present to intercept the outfall of sewage from the smaller drains.

2. It is observed that His Grace the Governor in Council has been informed that there is no flow of consequence from these smaller drains; but the Chamber would respectfully remark that this is not the case during rainy weather, when the drains in the town are flushed and the accumulations of months are washed through the pipes to their outlet. It seems to the Chamber that the discharge of any sewage in the space enclosed by the harbour groynes may fairly be deprecated on sanitary grounds, and that danger to the public health, as well as a very appreciable inconvenience to the harbour, may be expected to result from the neglect of means that readily suggest themselves for preventing the pollution of the foreshore and the still water of the harbour.

3. The diversion of the chief drain through the surf bank of the southern groyne will doubtless, at comparatively small cost, shift the nuisance and danger complained of a few yards seawards, but the southern angle formed by the surf bank with the shore will (especially during the south-west monsoon, when still water will be found there) become little better than a cess-pool, and the beach for some little distance may become most objectionable in consequence. The Chamber venture to think that, as public health is concerned, it would be more economical in the long run to employ efficient means for grappling with the difficulty which has arisen from the Harbour Works. The re-arrangement of the drainage of the foreshore is a costly necessity arising from, and fairly debitable to, the harbour scheme.

No. 84-A. From L. R. BURROWS, Esq., Acting President, Municipal Commission, Madras, to the Secretary to Government, Public Works Department, dated 30th April 1878, E. No. 315.

WITH the view of supplying the information required in your memorandum, No. 1,884, dated 24th instant, I have the honor to forward a plan* of the area drained into the sea between the new Harbour Works groynes. The blue lines represent

* Per Sample Post.

the open street drains. The red lines 1, 2, 3, and 4 are underground drains. These drains carry drainage from houses as well as storm water. The other thin red lines are drains for storm water only. The number of inhabitants living within this drainage area is estimated as being below 20,000. The area is about one-third of the 3rd Municipal Division, the population of which, according to the last census, was 50,957.

No. 85. ORDER THEREON, 8th May 1878, No. 2,088 W.

THE harbour piers having advanced to a point when drainage must be stopped from flowing into the harbour or saturating the accumulated sand, the diversion of the outlet through the south pier should have been completed before this. Action should be taken at once in the matter by the Superintendent of the Madras Harbour Works, who will also devise means of diverting *all* flow of sewage from the harbour.

2. Early report will be made as to what has already been done and when what is requisite will be accomplished.

(True Extract.)

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

To the District Engineer, Presidency.
,, Superintendent, Madras Harbour Works, with Plan.
,, Chamber of Commerce.
,, Financial Department.

Exd. T. D. Ryan.
Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of (1878) Madras.

PUBLIC WORKS.

To

The DISTRICT ENGINEER,
PRESIDENCY,
&c., &c., &c.

Dated May 8th.

Issued

Recd. *Encl.*

G. O., 8th May 1878, No. 2,088 W.

MAY.

Nos. 84-85.

Madras Harbour Works.—The Superintendent of the — to devise means for diverting *all* flow of sewage from the —, and calling for early report of what will be necessary to effect this.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

12th June 1878, No. 2,472 W.

Buildings and Roads.
Civil Works.

Read the following paper :—

No. 103. From F. N. THOROWGOOD, Esq., Superintendent, Madras Harbour Works, to the Secretary to Government, Public Works Department, Buildings and Roads Branch, dated Madras, 1st June 1878, No. 10 W.

I HAVE the honor to submit the following report of these works for the month of May 1878.

2. NORTH PIER.—In the monthly report for April 1878, Mr. Beardmore stated that the work of setting blocks had been suspended for a time on account of the newness of the blocks on hand. I regret to state that delay from the same cause existed in the early part of May, and when all was ready for a resumption of work the weather prevented any diving operations from being carried on.

3. On the 31st May the divers having prepared the bed for one course, eight blocks were satisfactorily laid, bringing the length of concrete block work now to a distance of 704¼ feet from the point marked B.

4. The past delay in the progress of the works is extremely annoying, but I think I may with confidence predict that in future nothing but unfavorable weather shall prevent the work from advancing, although I fear that during the south-west monsoon the progress will not be so rapid as during the north-east.

5. I am now in correspondence with Mr. Parkes on the subject of the age of concrete blocks, as he is of opinion that they might be set in the work rather sooner than has hitherto been the case. But I must state that the reason for keeping them longer than five weeks before laying them has been simply a matter of caution.

6. At present everything is ready for a rapid advance of the work, and with the extended block grounds and new stone crushers (from England) it is hardly possible that another stoppage for want of blocks will occur. The block ground now is capable of holding as many blocks at one time as was reckoned upon by Mr. Parkes when he framed his estimate of the time for completing the harbour, and before the present stock is cleared out I shall have heard from him finally as to whether he still considers that blocks of one month old may safely be set in the lower courses of the piers.

7. RUBBLE BASE.—When the weather has permitted, the work of tipping rubble base from boats has been carried on as formerly, and 1,452 tons of laterite have been disposed of in this manner. This work is still going on, but I hope it will shortly be superseded by the steam hoppers on their return from Cocanada. There is now a considerable length of rubble base in advance of the work, so that no delay need be anticipated on that account. No deposit of sand has yet been discovered by the divers.

8. BLOCK-MAKING.—On the 11th May the block grounds were filled quite full (the total number of blocks on stock being 1,035); the work of making blocks was

therefore suspended. Between May 1st and 11th, 92 blocks were made, of which 8 were prepared by hand labor, and 84 by the usual steam machinery.

9. QUARRIES.—The supply of stone from the quarries has been sufficient for the works, but has not been pushed to any great extent. From Ambathoor 950 tons of laterite stone and ballast have been received, most of which has been deposited in the rubble base together with stone from the "false" start.

10. From the quarries on the South Indian Railway 5,546 tons of stone of various sorts has been delivered. This has been used for block-making and for rubble base, foreshore, &c.

11. SOUTH PIER.—The state of the weather has been such as to prevent any blocks from being set at the south pier during May, but everything is in readiness for taking advantage of the first day of smooth water, the blocks for the next course being in waiting at the south pier; 1,593 tons of stone have been deposited in the base and foreshores.

12. DRAINS.—The work of diverting the drain near the south pier is being proceeded with briskly, and 12-inch pipes have been procured from the Municipality for carrying the diversion through the surf bank. This will serve to keep the area between the piers free from any great accumulation of sewage until a complete intercepting sewer can be constructed.

13. STORES.—During the month of May the steamers *Deccan*, *Columbian*, *Almora*, and *Mirzapore* brought stores from England, the principal being diving dresses and apparatus, 20 stone-crusher jaws, a cement-testing machine, and some steel wire rope.

14. The prospect of having shortly to work the two hopper barges and to keep them supplied with fuel led me to lay in a large stock of coal which will last nearly one year. The last large supply was obtained through the Public Works Stores at Rupees 27 per ton, and the present stock (600 tons) was delivered on the works for Rupees 25 per ton by coal merchants. The coal is of very good quality, but is not suitable for smiths' work as I had hoped it would be from the analysis submitted to me. On the 23rd May a portion of this coal took fire from spontaneous combustion, but by working vigorously night and day the fire was kept under, and a very little coal was damaged.

15. GENERAL MORGAN'S CEMENT.—The cement made by General Morgan has been used freely in block-making, and the concrete made with it appears up to the present time to be equal to that made with the same proportion of English Portland cement. I would, therefore, propose that another 2,000 tons be procured for these works at 10 per cent. lower cost than the English cement. It will be necessary to procure more cement from England, and I intend to submit an indent for a further supply, but not for the whole estimated quantity required. The cost of the English cement including all charges for landing, storing, &c., and allowing for what is damaged in the act of landing by boats, amounts to about Rupees 46 to Rupees 47 per ton, the lowest price being Rupees 45-13-0 per ton in 1875-76. If 10 per cent. be taken off these prices the rate would be Rupees 42 or 43 per ton. On this subject, however, I wish to address Government separately as it is a matter of much importance.

16. EXPENDITURE.—The amount expended on the works up to date exclusive of some charges for "materials at site" which are not yet wholly adjusted is Rupees 18,05,579.

17. PLANS AND SECTIONS.—Accompanying this report I have the honor to submit a plan of the harbour showing the alteration in the high water contour line, and two sections in advance of the north and south piers.

18. GENERAL.—I regret to state that my staff is suffering greatly from sickness, and that both the Accountant and Storekeeper are consequently absent from duty. Mr. J. Chicken, the Foreman Mechanic from England, is also unable to be on the works, and is in the hands of the Surgeon of the district suffering severely from fever.

No. 104. ORDER THEREON, 12th June 1878, No. 2,472 W.

HIS GRACE the Governor in Council notices with satisfaction the cessation of sand deposit, as well as the progress made in block-making.

2. The Superintendent will submit a further report at an early date on the proposed intercepting sewer. Its cost and the probable time of completion should be stated.

(True Extract.)

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

To the Superintendent, Madras Harbour Works.
" Marine Department.

Exd. C. Howarth.
Syare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of {1878} Madras.

PUBLIC WORKS.

To

The SUPERINTENDENT,
MADRAS HARBOUR WORKS,
&c., &c., &c.

Dated June 12th.

Issued

Recd. *Encl.*

G. O., *12th June* 1878, *No.* 2,472 W.

JUNE

Nos. 103-104.

Madras Harbour Works.—Passing order on the Progress Report of the — for May 1878.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

22nd July 1878, No. 2,963 W.

Buildings and Roads.
Civil Works.

Read the following paper :—

No. 227. From A. MACKENZIE, Esq., Chairman of the Chamber of Commerce, to the Secretary to Government, Public Works Department, dated Madras, 5th July 1878.

THE Chamber are indebted to the Government for the attention that has been given in Proceedings, Public Works Department, 8th May, No. 2,088 W, to their representation of the 12th April of the necessity of rearranging the drainage of the foreshore. They are, however, disappointed to find that, as yet, only one of the eleven sewers which have their outlets between the two groynes has been taken in hand and diverted through the southern surf bank. It seems to the Chamber that, as none of the sewers referred to can be permitted to discharge themselves into the Harbour when that work is completed, it is expedient to at once intercept the whole of them by a drain running parallel to the beach road. This intercepting drain might have two outlets, one south of the southern groyne, at the point where the steam pump is now working, and the other at a similar distance north of the northern groyne, at a point where a corresponding pumping station may be established. The outfall from the two ends would then be sufficiently far from the Harbour groynes to prevent any of the sewage being washed into the Harbour, or accumulated in the outer elbow, or angle, formed by those groynes with the beach. Near the shore end of the screw pile pier, at a point about midway from the extremities of the intercepting sewer, picottahs might be erected for raising sea water and discharging it into the drain in order to flush it daily.

The Chamber venture to impress upon Government the importance of dealing in a comprehensive manner with the drainage question that has arisen from the Harbour Works, since it appears to them that, as the beach enclosed between the two groynes is now protected from the influence of the littoral currents, there is far less opportunity than formerly for the sea, by an occasional overflow, to cleanse the sand from sewage pollution. Some of the ten drains that have their outlets in the space referred to are probably more useful for the escape of storm water than of actual sewage; but during heavy rain there is not much difference in the character of the discharge from any of the sewers. Owing to the imperfect system of drainage in the town, and the infrequency of flooding rain, the sewage accumulates for months, and must emit, during hot weather, gases that are inimical to public health. At length rain falls in abundance, and the putrid accumulations are washed down, and at last are discharged either into the sea when the tide is unusually high, or on to the sand where it forms a permanent lake of the most poisonous matter. Thus the beach, in the busiest part of the port, is already more or less saturated with sewage, and the shipping operations are conducted by crowds of coolies, boatmen, &c., while exposed to the danger of inhaling the effluvia from the filthy pools at the mouths of the drains. Not only are the persons engaged in the several mercantile offices and banks exposed to the danger arising from the evaporation from the beach, but the health of the

Judges, officers and clients of the High Court, as well as of the officers and persons doing business at the Custom House, Stamp Office, Commissariat Office, &c., is seriously endangered by the same cause. Under these circumstances the Chamber are of opinion that no time should be lost in affording public health better protection against a risk which has been aggravated by the Harbour Works.

No. 228. ORDER THEREON, 22nd July 1878, No. 2,963 W.

THE Chamber's letter will be communicated to the Superintendent of the Madras Harbour Works who will, in communication with the President of Madras Municipality, draw up a scheme for intercepting all the drainage referred to. The cost of the project, together with the cost of subsequent maintenance, should be given. The project should be accompanied by such remarks as the President of the Municipality may have to offer.

(True Extract.)

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

To the Superintendent, Madras Harbour Works.
„ President, Madras Municipality.
„ Chairman, Chamber of Commerce.
„ District Engineer, Presidency.
„ Financial Department.

Exd. T. D. Ryan.

Spare Copies

BUILDINGS AND ROADS,
CIVIL WORKS.

Govt. of (1878) Madras.

PUBLIC WORKS.

To

THE SUPERINTENDENT, MADRAS
HARBOUR WORKS,
&c., &c., &c.

Dated July 22nd.

Issued

Recd. Encl.

G. O., 22nd July 1878, No. 2,963 W.

JULY.
Nos. 227-228.

Drainage of the Foreshore between the Groynes of the Madras Harbour.—Public orders on the letter of the Chamber of Commerce regarding the rearranging of the —.

Coty

No. 31 W

From

THE SUPERINTENDENT,
MADRAS HARBOUR WORKS.

To

Colonel G. A. Foord R. E.
Secretary to Government, P. W. Dept.
Buildings & Roads,

Fort St. George, Madras, 14th September 1878.

SIR,

In compliance with G. O. No. 2963 W, dated July 22nd, I held a consultation with the President and the Executive Engineer of the Municipal Commission on August 2nd, when we discussed the subject of constructing a sewer to intercept all drainage which at present flows into the space between the North and South piers of the Harbour, and I have now the honour to submit a scheme with plans, sections, estimates &c. for such a sewer.—

General description 2. The accompanying drawing marked No. 1 on a scale of 200 feet to 1 inch shows the position of the proposed intercepting sewer in a broad red line, commencing at drain No. 13 to the South of the South Pier and extending along the Beach Road until after intercepting the flow from all the intermediate drains it joins the large 10 feet sewer at Royapooram where it discharges itself into the sea to the North of the North Pier. The fall or inclination of this intercepting sewer will be 6 feet in one mile, and it will be of such dimensions as to carry off all sewage from the drains discharging into it as well as such quantities of storm water as would be due to a rainfall of half an inch per hour. It is true that a very heavy tropical rain will occur at times greatly in excess of this estimated amount, and on such occasions the sewer will be for a time surcharged, but as half an inch per hour is much more than usually falls during an ordinarily heavy rain, I consider it not necessary to make the sewer of larger dimensions than those now submitted.—

3. The sewer is divided into sections of sizes increasing as the drains intercepted increase in number and the area to be drained

becomes

becomes larger. These sections and areas are hereafter more fully described in detail.

Amount of Fall.

4. The fall of 6 feet per mile although very slight will be sufficient to allow the sewage and storm water to run easily through the sewer and discharge into the sea at the level of the outfall of the present Royapooram sewer without the aid of any pumping machinery whatever.—

Sources of information.

5. The areas to be drained, the rainfall to be allowed for and the amount of fall for the main sewer are based upon information and plans obtained from the Executive Engineer of the Municipal Commission. The sections of the different portions of the sewer, the quantities that such sections are calculated to carry the position, levels and general arrangement of the intercepting sewer and the estimate of cost are arrived at independently of the design and estimate of that engineer.

Detailed Description
First Length.

6. Commencing from the South or higher end of the proposed intercepting sewer at drain No. 13, and extending northward to drain No. 10, the first length of 1330 feet

is intended to carry off the drainage from an area of 280000 square feet. This area is shewn on drawing No. 2 by the space enclosing the large figure 1 in green. The section of this first length of the sewer need only be that of an ordinary barrel drain 1' 6" in diameter made of brick in cement (as shewn at Fig: 1 drawing No. 1).– The quantity that such a sewer can readily carry off when running full at an inclination of 6 feet to one mile is 220 cubic feet per minute, while the amount of water due to half an inch of rainfall per hour over the area to be drained gives a discharge of only 194 cubic feet per minute.

Second length

7. From drain No. 10 to drain No. 7, a length of 735 lineal feet, the section of the intercepting sewer is made egg-shaped (as shewn at Fig: 2. drawing No. 1) and is able to discharge with ease 1514 cubic feet per minute. The additional area to be drained by this length is shewn on drawing No. 2 by the space enclosing the large figure 2 in green, and the total area drained by the intercepting sewer

up

up to drain No. 10 is 2,104,000 square feet, which with a rainfall of ½ inch per hour would give a discharge of 1458 cubic feet per minute.–

Third & other lengths.

8. In a similar manner the sewer is of an increased size and capacity from drain No. 7 to drain No. 4 a length of 1325 lineal feet, and again from drain No. 4 to drain No. 2, a length of 410 lineal feet, until it reaches its maximum section from drain No. 2 to the outfall at the Royapooram 10 feet sewer at present existing.–

Capacity of sewer

9. The total area whose drainage the sewer is intended to intercept amounts to 4,255,400 square feet and is shewn in drawing No. 2 by the space surrounded by a broad green line marked with the green figures 1, 2, 3, 4, 5. The discharge due to half an inch of rainfall per hour over this area amounts to 2950 cubic feet per minute, and a sewer of such section as the last length of the one now proposed is capable of discharging with ease 3562 cubic feet per minute. It will be seen therefore that the size of the intercepting sewer

is inte

is ample, as all the sectioned areas, with the exception of the 1' 6" barrel drain, are calculated on the supposition that there is left a clear space of 9 inches between the crown of the sewer and the surface of the liquid inside.–

10. The lengths, sectional areas, and amounts of discharge will be more clearly understood by reference to the accompanying list + estimate.

Construction

11. The sewer would be made throughout of brickwork in cement, and would be backed with cement concrete of a strength of about 1 part of cement to 11 of sand and broken stone. The rates at which the Estimate is calculated are supposed to cover the cost of superintendence, and although only applied to the actual work of building the sewer it is thought that they will cover the expense of making the connection with the drains to be intercepted which may turn out to be a more troublesome task than I at present anticipate.–

Ventilators & man holes

12. It will be necessary to construct three manholes for access to the sewer, and three ventilating shafts at the points shewn on the longitudinal section on drawing No. 1.–

Estimate.

13. The total estimate for the construction of the whole work with 10% added for contingencies amounts to Rs57911. 0 . 0 and it is not probable that this sum would be exceeded.

General remarks

14. The present scheme is drawn up only with the view of intercepting the drainage that would otherwise fall into the Harbour, but it will be easy to extend the sewer Northward if desirable so as to catch the drainage of Royapooram, in which case it is probable that a pumping engine would be necessary at the outfall.–

15. I would remark that I learn from Mr. Parkes that he is anxious to go thoroughly into this question of intercepting the drainage within Harbour limits, and I have no doubt that he will be prepared to do so when he next visits Madras.–

16. At the present time (and so long as the surf beats heavily along the beach), the great evil within Harbour limits is the effluvium

from existing pools of stagnant rain and sea water in the sand. Unless these pools are filled up, the nuisance will continue whether there be an intercepting sewer or not, but a general impression appears to be prevalent that all bad effluvia from the beach are attributable to the absence of a sewer to intercept the drainage between the North and South piers of the Harbour under construction. —

P.W. 10444/7
2

I have the honor to be
Sir,
Your most Obedient Servant,
F.W. Harrowgood.
Superintendent
Madras Harbour Works

Madras Harbour Works

Proposed Beach Road Sewer.

Table of Areas Discharges and Sizes for Sewers with the Estimated Cost.

	Lt ft.	Area Drained Sqre feet.	Total area drained by each length of Sewer	Discharge at ½ inch rainfall per hour in cub ft per min:	Size of proposed Sewer	Actual discharge due to Sewer filled within 9 inches of the crown at 6 ft. per mile fall in cub ft per minute	Cost Rupees.
First length from mouth of Drain 15 to mouth of Drain 10	1330	280,000	280,000	194	1′ 6″ barrel	220 (running full)	5,902
Second length from Drain 10 to Drain 7	735	1,824,000	2,104,000	1,458	4′ 8″ × 3′ 0″	1,514	7,471
Third length from Drain 7 to 4	1,325	1,048,600	3,152,600	2,185	5′ 3″ × 3′ 6″	2,250	17,666
Fourth length from Drain 4 to 2	410	540,000	3,692,600	2,560	5′ 8″ × 3′ 8″	2,607	5,905
Fifth length from Drain 2 to Outfall at Rayapooram 10 ft Sewer.	940	562,800	4,255,400	2,950	6′ 0″ × 4′ 0″	3562	13,842
							50,786
Three manholes at Rs 200/- each							600
Three Ventilating Shafts at Rs 20/- each:							60
Add for pumping to keep foundations clear if required							1,200
							52,646
Add 10% for Contingencies							5,265
							57,911

F.W. Harrowgood. Superintendent M.H. Works

In C
2494

Buildings & Roads

From The Superintendent
Madras Harbour Works

P.W. 1044/78

No. 31 W
Dated 14th September 1878

No of Enclosures 3

Drainage of Beach Road
Submits Plan & Estimate for
Rs 57911 — for sanction —

23

Madras Municipality,

E. No. 1141

EXECUTIVE ENGINEER'S DEPARTMENT,
Madras, 18th September 1878.

From
L. R. BURROWS, Esq.,
Acting President Municipal Commission.

To
F. N. Thorowgood Esqre
Superintendent, Madras Harbour Works

Sir,

As requested in your letter dated the 14th Instant No. 291 M. I have the honor to return your report on the proposed sewer along the Beach Road and the drawings and plans which accompanied it. I also enclose a Memorandum by the Municipal Executive Engineer which I request you will forward to Government with your report. I would merely remark that the proposed sewer seems well adapted for the end in view. I fear, however, that it will be liable to silting in heavy downpours especially if these happen contemporaneously with high tides, when the discharge of the drain will be impeded. I would therefore suggest a greater number of man-holes or other conveniences for cleaning it out.

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

L. R. Burrows
Acting President Mpl.

P.W. 10444/78
4

Memorandum on Specification Plans & Estimates for New Sewer along North Beach Road

The sewer is designed to carry off $\frac{1}{2}$" rain fall from 4255400 feet but this amount is less than is included within the broad green line on Drawing No. 2 (see para 9 of Mr. Thorowgood's letter) as the drainage of the most northerly division (unnumbered) is not allowed for, and it at present falls directly into the main drain. It would however be of advantage (as the greater part of this division is insufficiently drained and as its natural fall is towards the sea) if the section of the sewer were slightly enlarged so that it might be sufficient to carry the drainage of this part also.

The new sewer instead of joining the Royapuram Sewer at right angles should have a curved junction.

The sewer being proposed to be of brick should be cemented on the inside throughout

It would be better to have man holes at each junction with sewer numbered 2. 4. 7 & 10 instead of three only allowed, and these man holes should be constructed with ventilators attached to them.

One flushing Reservoir would be required as the velocity when only small quantities of sewage are running in the sewer will be extremely little and a considerable quantity of sewage will be deposited.

If a sea wall is to be constructed between the Harbour arms the sewer should be constructed inside that when the cost would be little or nothing as it would be merely a "void" running along the length of the wall the only cost would then be for Ventilation Man Holes & Junctions.

The allowance for pumping seems to me inadequate as there is likely to be a large quantity of water so near Mean Sea Level.

Executive Engineer
Munl Commrs

PW 10444/78

28

26

No. 35 W.

From

The SUPERINTENDENT,
MADRAS HARBOUR WORKS,

To

Colonel E. A. Foord, R. E.
Secretary to Government, Public Works Dept.
Buildings & Roads.
Fort St. George
MADRAS, 18th September 1878.

SIR,

I have the honor to submit herewith my report (No. 31 W dated the 14th instant) with drawings and estimate for the construction of an intercepting sewer within Harbour Limits.

2. It was submitted to the President of the Municipal Commission on the 16th instant and herewith I enclose his letter and the notes of the Executive Engineer on the subject.—

3. I would remark that with reference to the Executive Engineer's note on the junction of the intercepting sewer with the Royapuram sewer, that is a detail which can easily be altered.—

I have the honor to be,
Sir
Your most Obedient Servant
F. N. Thorowgood.
Superintendent
M. H. Works

G. O. No. 2963 W of 22-7-78 Orig
" " 2472 W " 12-6-78
" " 2088 W " 8-5- "
" " 1766 W " 10-4- "
" " 984 W " 28-2- "
" " 558 W " 4- " "
" " 3326 " 22 Nov/75

P.W. 1878

No. 10444

Buildings & Roads

From The Superintendent
Madras Harbour Works

No. 35 W.
Dated 18th September 1878
Recd. 19 "
No. of Enclosures 6

P. 2

Drainage of Beach Roads
Submits report with remarks
of Municipality thereon. —

Papers 16-10-78
To Coly 19-9-78 Retd 4-10-78
Cir 19/9 Retd 16-10-78
Reced 4-10-78

PUBLIC WORKS DEPARTMENT.

Letter from the Supt. Madras Harbour
Works No. 35 W dated 18th Septr. 1878.

FOR ORDERS. with the remark that
it would be well to let
the matter lie over till
Mr Parkes' arrival.

E A Wood Col. R.E.
Chief Engr. & Secy. to Govt.
P. W. D.

I don't think we can
properly postpone action
till Mr Parkes comes.
It is uncertain. There
is an existing nuisance
consequent on the construction
of the Harbour groynes &
the accumulation of sand
between them — [illegible] [illegible] —
Sept. 1878.
We must do what is necessary
to abate it without delay —

FOR ORDERS.

Hon. Mr. Huddleston
His Grace the Governor
Hon. Sir W. Robinson
Hon. D. F. Carmichael

Agree with Mr Huddleston as to the urgency — but it would be most useful to have our Harbour Engr — chief at one with us & as the time of Mr Parkes' arrival is at hand & a month or two is no matter much we might telegraph & ask when he (Mr P.) may be expected out this year —

I think the plan good but would ask whether the new drain may not be made more extensively useful for drainage purposes if [illegible] be used as outlet of the main (10 ft) drain at the back of the drainage area. I would have a greater fall & [illegible] but I scarcely dare to express an opinion
20/9 [illegible]

Cir 21/9 Rec'd 4.10.78

P.W. Dept

Note by the Chief Engr P.W.D.

With reference to His Grace the Governor's remarks, as Mr Clarke's proposed Drainage scheme appears to be abandoned by the Municipality of Madras, the plan now proposed seems to meet all that is required and provides for the discharge of 12 Inches of rain fall per diem if such an abnormal fall should occur. The Chief Engineer approves of the general design of the sewer which if sanctioned can be put in hand at once

Ascertain by Telegm. when Mr Parkes will be here. [illegible] by the Superintendent of the Madras Harbour Works. At the same time if Mr. Parkes is to be here in December as the North East monsoon will in all probability remove all immediate the inconvenience which might arise by postponing immediate action in the matter, the Chief Engineer believes it advisable to await Mr Parkes own views on the question.

E A [illegible] Col R.E.

[illegible]

4th ~~Sept~~ Octr/78

Hon H. [illegible]
[illegible]
[illegible]
[illegible]

To Madras
Supdt: Harbour Works

14th Oct. 1878.

With reference Harbour intercepting sewer. Parkes expected Madras. When. Wire reply.

S/ W. Farewell Col
Under Secy to Govt
P.W.D.

Ask San Commr Govr
views as to
deferring work —

B.C. 17/10

M.A. 17/10

32

TRAFFIC CODE FORM CI.

ss. p

15

INDIAN TELEGRAPH.

Local 30

To (Station) Ootacamund
From Station Madras

Words. 17

Time tendered for transmission. Madras time.
Day. 15. H. 12. M. 33

Official Instructions.—

To (Person) Madras Works.
From (Person)* Thorowgood

Parkes mentions January
as date of
visit but has
not fixed for
certain.

* Thorowgood

Recd. from ________ (L. L.)
At ____ H. ____ M., on the ________
By ________
Date OOTACAMOND 15-10-78

Sent to ________ (L. L.)
At ____ H. ____ M., on the ________
By ________
Telegra

(P. 1) – Govt. Tel. Press, – No. 636, – 10-10-77, 1000000.

W. 1878 Dept

Hon W. Huddleston

His Grace the Gover

Hon Sir W. Robinson

Hon D. F. Carmich

Special Col. No. 119

Circulated for information with previous papers.

15/10

Rec. 15th October /78
2.45

Issd. to [illegible]

C.S. No. 4753 d/21st Octr/78

Oct 21. 1878

No. 4753 d/ 21st Octr. 1878.

Memorandum.

The undersigned is directed to ascertain the views of the Sanitary Commr. as to the expediency of deferring, till January next, when Mr. Parkes is expected out - the question of the drainage of the foreshore between the groynes of the Madras Harbour Works - referred to in the undermentioned orders.

G.O. No. 558 W d/ 14th. Feby. 1878.
" " 984 W " 28th " "
" " 1766 W " 10th April "
" " 2088 W " 8th May "
" " 2472 W " 12th June "
" " 2963 W " 22nd July "

An early reply is requested.

(Sigd.) E. A. Foord Col. R.E.
Secy. to Govt. P.W.D.

To,
The Sanitary Commr.
with copies of papers to be retd.
Desp.d 21-10-78

No. 1443

Office of Sanitary Commissioner,
Madras, 25th October 1878.

From
The Sanitary Commissioner, for Madras,

To The Secretary to Government
Public Works Department

Sir,

With reference to your Memorandum No 4753 d/21st October 1878, I have the honor to report for the information of His Grace the Governor in Council, that I inspected the fore shore of the Madras beach this day, accompanied by Mr. Burrows, President of the Municipal Commission, and Mr. Thorogood, Engineer of the Harbor Works.

2. I am of opinion that the works necessary for the interception of sewage discharging on the sea beach, will have to be considered in reference to the general scheme of drainage, and that as the N.E. Monsoon is daily expected, the subject

as regards the drains discharging into the Harbor may be allowed to stand over until Mr. Parkes's arrival in January 187[illegible]. The nuisance in this part of the beach is not worse than it generally is, and at present there is a strong current running in and out of the Harbor space.

3. I may add that the accumulation of sand in front of the mouth of the main drain near the N.E. angle of the Fort prevents the use of the steam pump, and that the usual cold weather nuisance from the accumulation of sewage in the drain may be expected with the setting in of the N.E. winds. The arrangements for the discharge of sewage from the other branches of the main drain, to the north of the Harbor, are also very defective, the mouth of the pipe being clogged with sand, and sewage kept stagnating in the drain for hours at a time

4. As

4. As regards the drains emptying opposite the buildings on the beach, the nuisance arising from the stagnant pools of storm waters and sewage may be temporarily remedied by levelling the sand and filling up the hollows and keeping a channel open down to the surf, but the whole of the drainage now running into the sea should be intercepted, and diverted to some spot north of the town, where it might be lifted and utilized in cultivation, or discharged into the Sea

5. I beg to return the Enclosures of your Memo herewith –

I have the honor to be
Sir
Your most obedient Servant
W.R. Cornish. F.R.C.S
Sanitary Commissioner
for Madras

P.H. 1878

{ Cho 2963 W 8/ 22-7-78
" " 2472 W " 12-6 "
" " 2088 W " 8-5 "
" " 1766 W " 10-4 "
" " 984 W " 28-2 "
" " 558 W " 4 "
C.E. 4753 21-10-78

12137

From
The Sanitary Commissioner
for Madras

To
The Secretary to Govt.
Public Works Departt.

Dated 25 October 1878

No. 1443
Endorsement

Reporting for the information of His Grace the Governor in Council that he inspected the foreshore of the Madras Beach accompanied by Messrs. Burrows & Thorowgood and offering his views as to the expediency of deferring, till Mr. Parkes' arrival, the question of the drainage of the

Recd 4-11-78
To coty 29-10-78
Cir 31-10-78 · Retd 4-11-78

41

PUBLIC WORKS DEPARTMENT.

36

Letter from the Sanitary Commissioner for Madras No. 1443 dated 25th Octr. 1878.

FOR ORDERS.

Circulated for orders with reference to remarks of Members of Government.

E A Ord Col: R.E.
Secy. to Govt. P.W.D.

31st Octr. 1878

[illegible]

R.S.
4-11

R.S.
Ex. to E.A.S.

FOR ORDERS.

Hon W. Hudleston
Hon D. F. Carmichael

[illegible] the Governor

Parkes arrival, the question of the drainage of the

Recd 4-11-78
Cir 31/10/78. Ptd 4-11-78
[illegible] 11.78

No. 5119 of 12 Nov/78-

Letter from Harbour Suptt., No. 31 W
of 14 Sept/78-

do - do 35 W of 18 - do - do -

The Govt have decided to defer, till January next, when Mr. Parkes is expected out, the general question of the drainage of the foreshore between the groynes of the Madras Harbour Works, but as regards the drains emptying opposite the buildings on the beach, the nuisance arising from the stagnant pools of storm waters may be temporarily remedied by levelling the sand, filling up the hollows, and keeping a channel open down to the surf.

The Suptt. of the Harbour Works

will see that this attended to.

(Sd) R. A. F.
C. E.

To, The Supdt. Madras Harbour Works.

Memo: No. 752 d/ 24 Feb/79.

With reference to Mr. Parkes letter No. 4 W dated the 15th instant, the undersigned has been directed to observe that an extension of the Canal to the Harbour, so as to allow of boats passing from the Canal to the shipping lying in the Harbour, has been suggested.

This extension of the Canal will probably be strongly urged upon the favourable consideration of Govt.; and Mr. Parkes is requested to state, for the information of Govt., what measures he would propose to adopt with a view to insure the efficient working of the intercepting drain, in the event of the suggested extension of the Canal being carried out.

24/2.

W.

In Pro. 9 11-3-79 No 7184

No. 4 W

From William Parkes Esq. Memb. Inst C.E.
The ~~SUPERINTENDENT~~, Engineer-in-Chief
MADRAS HARBOUR WORKS,

To

Colonel E. A. Foord R.E.
Secretary to Government P.W.D.
Fort St. George

MADRAS, 15th February 1879

SIR,

In accordance with the Memorandum of the Chief Engineer dated 12th November 1878 to the effect that Government had decided to defer the general question of the drainage of the foreshore of the Harbour till my arrival at Madras, I have now the honour to inform you that I have given the subject my best consideration, and have had the advantage of two interviews with His Grace the Governor, and several consultations with Mr. Jones the Municipal Engineer as well as the assistance of Mr. Thorowgood and Mr Beardmore.

2 I think there can be no doubt that it will be ultimately necessary to intercept from the harbour all possible vents for storm water, but there is certainly much force in the suggestion, that in the present undecided state of the question of the general drainage of the Black town, and of the ultimate arrangement of that portion of the foreshore which faces the Harbour, it is hardly possible to foresee what particular mode of carrying out that interception will be most convenient. During the short interval that will elapse before these questions are decided, the storm waters may without much evil be permitted to escape as at present, and the works of interception be adapted only for the daily flow of house drainage.

The

3 The discharge to be dealt with is that of a population of about 20,000.

4 There are altogether 13 Sewers carried under the Beach road between Meſsrs. Parry and Compy. and Clive's Battery, but of these, only four bring down house Sewage, the others being merely surface drains from the premises immediately facing the Beach, and if they receive Sewage at all, it may be more easily diverted to some of the open Black town drains at the back, and thus conducted into the intercepting Sewer, than by making connections directly with the latter.

5 The quantity of Sewage which actually reaches the present mouths of the above four Sewers is very much less than that which must be delivered from the houses, as by some guagings

made by Mr Beardmore in January 1878 the daily flow amounted to little more than 2½ gallons per head of the population. An improved drainage and water supply may be expected greatly to increase the flow and the consequent necessity of interception. Mr Jones is of opinion that when these improvements which are urgently required are carried out, the flow may amount to 15 gallons per head per diem of which one half will run off in 6 hours, and for this I propose therefore to make provision

6/ I think that the whole of the foreshore between Fort St. George and Royapooram must be considered as unavailable for drainage outfalls. The Harbour frontage about one half of the length, is obviously so, and the remainder will be always liable to

annual

Yes consequent on harbour works

annual fluctuations of the line of beach, which will render it impossible to maintain the mouth of a drain in any fixed position. This fact will I expect soon force itself on the attention of Government as an additional reason for making a better provision for storm waters, than is afforded by the Southern mouth of the great Blacktown Sewer.

7 We are thus led to Royapooram as the nearest site for the outfall of the intercepting drain, and fortunately it has certain advantages for the purpose. It is entirely free from changes of the shore line of the same kind as those which are taking place South of the Harbour, and the Surf which is constantly beating upon it will prevent any foul deposit on the foreshore. The artificial beach of

laterite which protects the face of the North Surf Bank of the Harbour Pier, will form an excellent bed for the outlet pipe.

8 The disadvantage of the site, is, that it is in the neighbourhood of a dense population, to whom the Northern outfall of the Black town Sewer, is already a nuisance, which is sometimes intolerable. I believe however that the nuisance is due to preventible causes, and it has been materially reduced by the addition made under Mr. Thorowgood's direction of an iron pipe from the mouth of the Sewer to a point 155 feet further seaward, which carries off the Sewage in a constant discharge instead of its being permitted to accumulate in the Sewer, where it fermented and in turn reabsorbed its own foul gases. The Sewer however

is

airtight, but recommend that the upper ends should be trapped to prevent the escape of gases at the points where they receive the contents of the open town drains, and that each "dead end" so formed, should be connected with a ventilating shaft carried up to at least 15 feet above the tops of the neighbouring houses.

11 The junctions with the intercepting drain must be so constructed that while they do not permit the escape of gas they will permit the escape of an excess of storm water. This may be effected by making the storm overflows in the form of traps, which will have to be kept supplied with water

12 I propose that the four existing drains should not be directly connected with the intercepting drain, but that

the junction be made to wells of brickwork 4 feet internal diameter, sunk 8 feet into the sand. These will serve as catch pits for the groſser solid particles brought down from the town drains, which may be removed periodically. The wells will be covered with granite slabs in which the trapped arrangement for the storm overflow will be made.

13 The drain will be laid out in a straight line between its junctions with the two extreme town drains No. 10 and No. 2 on the plan, paſsing under the Screw pile pier as close to the abutment as practicable. From the junction with No. 2, it will be carried direct under the North Surf Bank to the laterite foreshore where it will discharge at about Mean Sea Level.

14 The inclination will be 1 in 700 throughout. I propose to form the lower half of the Section of Portland Cement

concrete, deposited in Situ in a trench dug for the purpose, the upper half to be of brickwork, set and jointed in Cement mortar. The last 50 feet will be of cast iron pipes.

15 If the capacity of the drain be made sufficient to carry only the discharge of the four drains it is intended primarily to intercept, a diameter of 12 inches would be sufficient; but I would strongly recommend that it be made sufficient to carry also the sewage now being pumped up near the Fort, which by a little modification of the present pumping arrangements might be delivered into an Extension of the intercepting drain at the same inclination. Thus the constant daily discharge at the Fort and the nuisance caused by it, would be done away with, but the storm water would be left to discharge as at present into the Sea.

This

16 This extension of the Scheme would however of course be carried out by the Municipality. The liability of the Harbour Works will terminate at Drain No. 10.

I am with them about this
Mr Rs. 200 · The [illegible]
Harbour works leave off at [illegible]
The scheme up to far back
the outlet!

17 In order to obtain sufficient inclination for the sewer, it will have to be laid for a portion of its length at a depth so little below the present surface of the ground that it will not be covered sufficiently to be protected from injury. It will therefore be necessary to raise the level of the ground in this part nearly to that of the adjoining beach road. This in itself will be an improvement, and only an anticipation of what would ultimately be required on other accounts.

18 The Cost of the whole work I estimate at Rupees 13,603 if adapted for the local sewage only; or Rs 17,811 if enlarged to receive the Fort outfall,

both including 10 per cent for Contingencies. This amount includes the cost of forming junctions with the present Sewers, as they exist, but does not include any allowance for improvement in those Sewers above their outlets, or for ventilating shafts at the upper ends. These I have presumed would be borne by the Municipality.—

This is in agreement
with the Harbour [illegible]
must be borne by [illegible]

I have the honour to be,
Sir,
Your most obedient Servant,

W Parkes

Engineer-in-Chief.

— No 4W

From

W. Parkes Esq. M.I.C.E.
Engineer-in Chief
Madras Harbour Works

To

Col. E. A. Foord R.E.
Secretary to Govt P.W.D.
Fort St George

Dated 15th } February 1879
Recd }

E. I Rhen

Pro. 9 11-3-79 No. 718 W

Report on interception
of Sewage from Harbour

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61 P13 52

No 8

From

W. Parkes, Esq: M. Inst: C.E.
Engineer in Chief
Madras Harbour Works.

To

Colonel J. H. M. Shaw-Stewart, R.E.
Acting Secretary to Government,
Public Works Department,
(Buildings & Roads).–
Fort Saint George

Madras, 25th February 1879.

Sir,

In reply to your Memorandum No 752 of yesterday's date, I have the honor to state that in the event of the extension of the Canal to the Harbour being carried out the intercepting drain whether conveying sewage only or storm waters also may without difficulty be constructed below the bed of the Canal as an inverted syphon culvert.–

I have the honor to be,
Sir
Your most Obedt Servant,
W Parkes. M. Inst. C.E.
Engineer in Chief
Madras Harbour Works

Buildings & Roads

From the Engineer in Chief
Madras Harbour Works

No. 8
Dated 25th February 1879

Council

Pro. of 11-3-79 No. 718B

States that an intercepting main may be constructed below the bed of the canal

---

No. 9W

From
W. Parkes Esqr. M. Inst. C. E.
Engineer in Chief
Madras Harbour Works

To,
Colonel J. H. M. Shaw-Stewart R. E.
Acting Secretary to Government
Public Works Department
Buildings & Roads
Fort Saint George

Madras 1st March 1879

Sir,

Your memorandum of yesterday's date requests further explanation relative to the "improvements in the present sewers above their outlets" allowance for which is stated not to be included in the estimated sums of Rs 13,603 and Rs 17,811.

2 My estimate includes making junctions with the present drains as they exist, but assumes that they either are or will be made at the expense of the municipality in a suitable state for conveying the sewage to those junctions.

3. It is admitted that the covered drains ought to be trapped and ventilated at their upper ends in any case, but in order to do this effectually it may be necessary to put them in a state of complete repair throughout their whole length and perhaps to close some subsidiary openings – I have not thought it within my province however to make such an examination of the drains as would enable me to specify what works are necessary for this purpose – They ought to be carried out in any case, but the urgency for them will be increased by the connection with a further length of half a mile of covered drain – That connection may bring imperfections in the existing drains to notice, but it will not be the cause of them, and they should be remedied at the expense of the authority in whom the maintenance of the drains is vested and not at that of the Harbour

Presd 11-3-77

I have the honor to be
Sir
Your most Obdt Servt
W Parkes M. Inst C.E.
Engineer in Chief
Timaru Harbour Works

64

No 1879 Dept.
No 1843

Buildings & Roads

From
W. Parkes Esq.
Engineer-in-chief
Madras Harbour Works

No. 9 W
Dated 1st March 1879

GO 4-2-78 No 558 W
" 28-2-78 - 984 W
" 10-4-78 - 1766 W
" 8-5-78 - 2088 W
" 12-6-78 - 2472 W
" 22-7-78 - 2963 W
C.E. 21-10-78 - 4753
" 12-11-78 - 5119
" 24-2-79 - 752
" 28-[illegible]-79 - 777

Pro 11-3-79 No 718 W

States that his estimate assumed the improvement in the present sewers will be made by the municipality

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66 56

Letter from Mr Parkes. Engineer in Chief, Madras Harbour Works, dated 15 Feb/79, No 4 W

FOR ORDERS.

[illegible]

19/2 Col R.E.

Offg Secy to Govt. PWD

I conclude that whatever is necessary to prevent the drains from discharging into the Harbour shd be done at once & I presume ~~that~~ what Messrs Parkes & Jones approve may be accepted if not partly going to the general drainage of Black Town. The question of the intercepting sewer has to direct the discharge of the drain

FOR ORDERS.

Work of the Intercepting very desirable — but wd. be a tedious work — One point occurs to me wh. seems to require notice viz: how will the intercepting drain work — in the event of the suggested extension of the Canal to the Harbour so as to allow of boats passing from the canal to the shipping lying in it being carried out? If as it is proposed to urge this extension very strongly on Govt. it seems to me a very desirable measure — but the canal wd. intercept the intercepting drain. Wd. a syphon arrangt. be admissible?

E.B.

G.O. No 718 W — 11-3-77

B of C — Subject of some notes on plans

& also ~~the~~ main sewer — I think P. should have it back on these points

H. 2/3

E.B.

No 718 W

Proceedings of the Madras Govt.—

Under date the 11th March 77

Read the following:—

From Mr Parkes Engr.-in-Chief M. H. W.	(H. E. No 4. W. d/ 15 Feb: 77)
do do do	(H. E. No 8 d/ 25 —)
do do do	(H. E. No 9 W. d/ 1 Mar. —)

In these letters Mr Parkes explains his proposals for dealing with the town sewage which at present finds its way into the Harbour enclosure; and, upon the understanding that those proposals have been approved by the Municipal Authorities, they are sanctioned for immediate execution.

2. His Grace the Governor in Council cannot however accept the statement in para 16 of Mr Parkes letter to the effect that the liability of the Harbour Works will terminate at drain No. 10. In a previous para Mr Parkes expresses the opinion that the entire foreshore as far South as Fort St George will be liable to annual ~ fluctuations of the line of beach, which will render it impossible to maintain the mouth of a drain in any fixed position. In this latter opinion the Government concur; and these fluctuations in the beach line, which will probably become more marked from year to year, are without doubt due solely to the action of the Harbour Works.

3. For these reasons His Grace in Council is of opinion that

the proposed intercepting drain should be made of sufficient capacity to receive the sewage which has hitherto been discharged into the sea to the North of the Fort, alluded to in para. 15 of Mr Parkes' letter, as well as the discharge of house sewage from the four drains mentioned in paragraph 4.

4. The larger of the two estimates submitted by Mr Parkes, amounting to Rs: 17,811, is accordingly accepted; but the Government are of opinion that the proposed intercepting drain should be extended to the South sufficiently to receive the Fort outfall; the entire work forming a charge against the Harbour Works.

5. The ventilating shafts alluded to in para: 10 of Mr Parkes' letter should be constructed by the Municipality; and the President will be requested to

take the necessary measures for this purpose, in communication with the Supt of the Harbour Works. Any improvement which may be necessary in the existing sewers should also be carried out at the expense of the municipality; except so far ~~unless~~ an alteration in their levels may be rendered necessary to effect a junction with the intercepting drain, in which case the cost of such alteration should be borne by the Harbour Works.

6. It is observed that, in the event of Cochrane's Canal being extended to the Harbour, the intercepting drain can be carried below the bed of the canal.

It may be noted for
the Supt of Harbour Works
the
[illegible] of the [illegible]
of forming the [illegible]
Supt [illegible] the [illegible]
[illegible]

Supt. H. Works
Financial Dept
S.E. Third Circle
Mr W. Parkes. M.I.C.E.

Ex: E.A.S.

Desp 29-3-77

17 11
22-10-07

Govt. of [illegible] Madras.
PUBLIC WORKS.

12-3

To

Dated

Issued

Encl.

Recd.

G. O. 11 Mar 1879. No. 718 W

Nos. 128-129

Drainage of the foresho
between the Engines of th
Madras Harbour Wo
in Correspondence from
Mr Parkes on the subj
of the —

[illegible]

128-129