: 450
3-6-98.

Cov 2 1659 D/ 07

23-8-07

Returned
10/9/07
G.

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## Marine (189 ) Department.

G.O., No. 450 Mar

DATED 3rd June/98

[illegible]

R. D. 775 Mar
27-9-98

[Despatch Abstract.]

Madras Harbour: Desiring that opinion of the Advocate General taken regarding the liability of the Madras Harbour Trust Bd. for damage caused by the encroachment of the sea to the north of the ——.

Recd and 8/6/98

## BACK PAPERS.

| G.O. | No. | Department. | Date. | G.O. | No. | Department. | Date. |
|---|---|---|---|---|---|---|---|
| | 277 | Marine | 30.6.87 | | | | |
| | 278 | " | 24.4.98 | | | | |

## FURTHER PAPERS.

| G.O. | No. | Department | Date. | G.O. | No. | Department. | Date. |
|---|---|---|---|---|---|---|---|
| | 647 | Marine | 26.7.98 | | | | |

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Urgent

Regd to 3216

# Marine ~~Local & Munl.~~ (1898) Department.

CURRENT No. ~~58 M~~ ~~170~~ 357/98

V 2

From

THE PRESIDENT,
Municipal Commission,
Madras.

SECRETARY TO GOVERNMENT
2--FEB.-1898
P. W. No. 1155
LOCAL & MUNICIPAL DEPARTMENT

Dated 1st February 1898

Received ~~2-2-98~~ } 7-2-98

Registered ~~2-2-98~~

Enclosures 3 (2 plans)

Spare copies -

B P

No. 139 d/ 4-2-98

~~Order~~

Transferred to the Public works (Marine) Department.

A. L. Hannay
4/2/98
Ag under Secretary.

V.R.
3/2/98

### SUBJECT.

Enclosing 2 plans showing the encroachment of the sea since 1896 and copy of letter from the Chief Engineer Madras Railway, reports that the erosion has made serious damages and threatens the safety of the northern suburbs of the city and that the construction of a proper revetment is quite necessary for the safety of the city.

to
The Public works (Marine) Departt

9/3/98

4

## BACK PAPERS

| G.O. | No. | Department. | Date. |
|---|---|---|---|
| Ls | 28 | 31-1-98 + papers | |

## FURTHER PAPERS

| G.O. | No. | Department. | Date. |
|---|---|---|---|
| | | | |

---

P. W. / I

P. W. No. 1155

MUNICIPALITY OF MADRAS,
Public Works Department,
Madras, 1st February 1898.

580 M

From

Lieut.-Col. SIR GEORGE MOORE, Kt., C. I. E.,
*President, Municipal Commission.*

1P

To

The Secretary to Government,
Local and Municipal Department,
Fort St. George.

Sir,

7lgN

Enclosures 3

With reference to G.O.No.560 Marine dated 19th August 1896, I have the honour to forward the accompanying tracing (A) showing the encroachment of the sea since 1896. From this it will be seen what the anticipation of the Board's Engineer, that very little if any further erosion will take place, was worth.

This erosion affects the Municipality's finances and that will have to be settled by the Harbour Trust Board against which body a heavy claim is accumulating, owing to their declining to take any action to prevent further erosion.

But as serious if not a more serious state of affairs has been developed in the last month or two - In December 1897 a portion of the Boards revetment in front of the premises known as Shands Press was washed away and a portion of that building ruined -

Further south, immediately in front of the Royapuram Railway Terminus, the sea has actually encroached on the roadway and there is probability of further erosion - with all due deference to the Board's Engineer -

5

In

In this connection I append a copy of a letter from the Chief Engineer Madras Railway.

The high water line, January 1898 on the accompanying tracing (B), does not show this erosion but on inspection it will be seen that the roadway under the Harbour line has been washed away.

This tracing shows how serious the erosion has been, and that it actually threatens the safety of the northern suburbs of the City.

It will be also seen that up to date over 2 miles of roadway have been demolished by the encroachment of the sea.

Under these circumstances I must submit that the time has arrived for Government to take such measures as they may deem fit - not only in the interests of the Board - but for the safety of the City and insist upon the construction of a proper revetment or such other works as may be considered advisable.

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

C W Moore Lt.-Col.

President, Munl. Commn.

A/o

S. 3
357/98

---

Enclosure

Madras Railway Company,
Chief Engineer's office,
Madras, 7th January 1898.

No. C. 189

From

The Chief Engineer,
Madras Railway Company.

2 S.P

To

The Engineer,
Municipal Commission,
Madras.

Sir,

With reference to the recent erosion by the sea between the North Croyne of the Harbour Works and Casimode, I have the honour to enquire whether you are in communication with the Harbour Trust authorities regarding the protection of the highway along the Beach, as, if no steps are being taken towards this end, it will become necessary for this Company to consider how its property at Royapuram is to be protected. I shall therefore be glad to learn what is being done.

I have the honor to be,
Sir,
Your most obedient servant,
(Sd) James M. Ewing,
for Chief Engineer.

(True copy)

Engineer.

A/o

6

Mar Genl £ 2
~~5-80~~ 170 Nos of 1898.
357

2
Pend. Ch. 170

urgent

Marine Dept.

No. 83E d/ 8-2-98

4P

Endl.

Referred to the Chairman Harbour Trust Board for early remarks as to the action the Board proposes to take in the matter.

1 Reminder issued 17-3-98

R.B.

7-2-98

The Ch. H. T. Bd. with papers in original to be returned

S.D. 8/2/98

7

Mar. E.4
357/98

## ~~Public Works~~ Marine (1898) Department.

CURRENT No. 357

From The Chairman,
Harbour Trust Board

Order

No. 5458

*Dated* 18 } March 1898
*Received* 23 }
*Registered* 23 }
*Enclosures* — 9 (5 plans)
*Spare copies* — 3

Retd. with Enl. 775 mar/ to the Ch. H.T. Bd. 9-5-98

SUBJECT.

Encroachment of the Sea north of the Madras Harbour.

Offering Remarks on the —

P. W. 29.
1,000—7-12-97.

| BACK PAPERS. | |
|---|---|
| No. | Date. |

| FURTHER PAPERS. | |
|---|---|
| No. | Date. |

The Chairman
Harbour Trust Board

5458

Dated 18 }
Despd 22 } March
Recd 23 }

Encroachment of the sea north of the Harbour

Effecting [illegible]

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# Marine (1898) Department.

CURRENT No. 357

*Order*

*From*
*The Chairman,*
*Harbour Trust Board,*
*Madras.*

*No.* 5458.

*Dated* 18*th* *March* 1898.
*Despatched* 22nd ,, ,,
*Received* 23rd ,, ,,
*Enclosures* : (i). *Current No.* 170, *with its enclosures.*
9 (ii). *The Tracings* (3) *referred to in para.* 10.
x(5 plans) (iii). *Spare copies three.*

Retd. with G.O. 775 Mar. 9-5-98
to Ch. H. T. 9.5.98

## SUBJECT.

Replying to Endorsement No. 83E, dated 8th February 1898 (Marine Department), on letter No. 1155, dated 1st idem, from the President, Madras Municipal Commission, bringing to notice the encroachment of the sea north of the Harbour, and requesting that adequate steps be taken to protect the northern suburbs of the City, and the Municipal sewage farm, beyond the end of the extended protective revetment.

8

## BACK PAPERS.

| G. O. | No. | Department. | Date. |
|---|---|---|---|
| 165 | Eg | 18-3-98 | |
| 83 | Eg | 8-2-98 | |

## FURTHER PAPERS.

| G. O. | No. | Department. | Date. |
|---|---|---|---|
| | | | |

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MADRAS HARBOUR TRUST,
SECRETARY'S OFFICE,
MADRAS, 18th *March* 1898.

No. 5458.

FROM

J. N. ATKINSON, ESQUIRE, I. C. S.,
CHAIRMAN, HARBOUR TRUST BOARD,
*Madras.*

TO

W. B. DEWINTON, ESQUIRE,
SECRETARY TO GOVERNMENT,
*Marine Department.*

SIR,

I have the honor to acknowledge the receipt of your endorsement, dated 8th February, No. 83E, forwarding letter from the President, M. M. C., No. 1155, P. W., dated 1st idem (current number 170 herewith returned) for the remarks of the Trustees of the Harbour, as to the action they propose to take in reference to the protective revetment, north of the Harbour, and the erosion of the sewage farm.

**2.** The theory that of late years has been propounded attributes the process of erosion that is going on to the north of the protective revetment, and the accumulation of sand to south of the Harbour, alike to the littoral drift of sand up and down the coast; and it is argued that it is the Harbour itself forming as it were a huge groyne that is directly responsible for the effect observed both to south and north. But this is only a matter of theory, and the Trustees are of opinion that there is a considerable body of proof that at any rate the erosion to the north is not attributable to the Harbour.

**3.** There are survey plans issued by Government on record which show that the same process of erosion that is now so marked to the north of Madras, was going on many years before the Harbour works were commenced, not only to north, but all along the Madras foreshore. If the Harbour were itself responsible for the mischief that is being done, then on the analogy of what is found taking place at the north end of the revetment, and of what has been observed in connection with all the numerous groynes constructed from time to time, the first and most noticeable effect should be a deep bay at the shore end of the north arm; but though this spot is entirely unprotected, there is no bay, but, on the contrary, a projecting sandy foreshore used for beaching masulah boats, timber rafts, etc., The President M. M. C, and the Agent and Manager M. R. apprehend that there is risk of the roadway being washed away at this point, but the damage done to it in January last was trifling, and no more than has often happened before, and at this particular spot the Trustees believe that there has been no retreat of the H. W. line for the past 30 years.

**4.** It is very important to distinguish between the two entirely different processes by which the sea attacks the land along the Madras beach. There is a littoral drift of sand up and down the coast, the drift from south to north preponderating, and it is to this process that theory attributes the formation of bays at the north of all groynes, revetments or other similar obstacles along the water edge. But besides this, there is another process continually going on from time out of mind, *viz.*, to the direct attack of the sea on the land, tending constantly to claw away first the beach, and then the land behind. It was to stop this process that DeHavilland's wall, the groynes constructed by Government, those constructed by the H. T. B., and finally the revetment extending from the vicinity of the Harbour northwards were built; and but for these various protective works it is likely that the H. W. mark at the present day be far inland of its present position.

**5.** It cannot seriously be contended that the bay immediately to north of the revetment and the connected erosion of the Municipal sewage farm are due to the Harbour Works proper; it is arguable whether they are due to the protective revetment. But if due to the latter, it is inconsistent and unreasonable that compensation should be demanded for one comparatively unimportant piece of damage caused by that revetment, to which alone the northern parts of Madras owe their preservation, either from unceasing inroads of the sea, or from the great expense entailed in keeping it back.

**6.** Government asks what action the H. T. B. intends to take; and it will be convenient to set down briefly what has already been done. Originally protective groynes were constructed extending from the north arm of the Harbour as far as Cassimode. These groynes proved inadequate and in their place a revetment covering the same length was substituted at a cost of Rs. 2,08,931. Subsequently this revetment was further extended to its present limit, costing Rs. 3,24,261. With the amount spent on repairs of groynes and revetments, and the cost of land eroded at Cassimode which Government paid for and charged to Harbour funds, the total cost to date is Rs. 7,98,038 and in the coming year the Board intends to spend Rs. 64,000 in restoring and improving the section of the revetment. These figures show that the Board has made liberal grants towards the protection of the northern parts of Madras; and it intends to maintain the existing revetment in an efficient condition.

**7.** There remains the problem of the erosion stretching northwards from the revetment which has caused the disappearance of so much of the sewage farm. Three possible courses are open to the Trustees. The revetment may be extended to the northern boundary of the sewage farm: but the cost of construction alone will amount to Rs. 3,19,520, to which must be added a considerable annual expenditure on repairs, while the effect will only be apparently to push the erosion further north, and so leave the H. T. B. no nearer stopping the mischief, but with a heavy addition to its pecuniary liabilities. Precisely the same result would ensue on the adoption of a second possible course, *viz.*, the construction of one or more groynes, only that in this case the cost would be heavier, Rs. 4,70,848, and the groynes would, in a few months, be demolished by the sea. The third possible course is to leave matters in *statu quo*, and even if the H. T. B. be held liable to pay the value of all land eroded, this would probably be financially less of a burden than either of the two courses already mentioned.

**8.** But the Trustees submit that they cannot be held responsible for damage caused to the Municipal Sewage Farm, on any theory that the erosion is due to the construction of the Harbour, and would point out that whether that theory is right or wrong, the construction of the Harbour and revetment has effectually protected the foreshore of the City from the Fort to the Farm, and thereby saved either Government or the Municipality heavy expenditure in the construction and up-keep of such protective works as DeHavilland's sea wall, and the series of groynes which supplemented it.

**9.** The Sewage Farm is not needed in the interests of the conservancy of the City, as the sewage might be allowed to flow into the sea from the outfall channel without detriment to the health of the population, and if the Municipal Commissioners wish to make a profit out of the sewage, the H. T. B. submits that it is for them to take whatever steps may be necessary to protect the land from erosion, but they cannot expect the public to pay for a revetment out of Harbour funds to enable an income to be realised. It must be remembered that both the Harbour Trust and the M. M. C. have been constituted in the public interest, and in such a question as the protection of a sewage farm public funds should not be diverted to the extent of several lakhs of rupees to protect land at a cost that the Municipal Commissioners would not sanction, if it had to be met from such portion of the public funds as are under their control. In that case they would see at once that the farm was not worth maintaining at such an expense to the public; and it is of little importance to the public, which body the funds may be administered by, the fact is clear that a sewage farm situate in a position which necessitates the expenditure of at least three lakhs to prevent erosion is not a work of public utility.

**10.** I enclose a tracing showing the line of the coast from the North arm of the Harbour to beyond the sewage farm with the H. W. marks of the years 1839, 1862, 1876, 1882, 1888, 1890, 1897 and 1898; and also copies of plans prepared by Captain Rawlins in 1855 and 1861. These will show that the process of erosion was going on before the Harbour was thought of.

I have the honor to be,
Sir,
Your obedient servant,
J. N. ATKINSON,
*Chairman,*
*Harbour Trust Board.*

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## Extract of Proceedings of the Trustees of the Harbour of Madras, at a Meeting held at the Offices of the Board on Friday, the 18th day of March 1898.

* * *

3. Read and discussed draft reply to endorsement No. 83E, dated 8th February 1898, from the Secretary to Government, Marine Department, referring for remarks, letter No. 1155, dated 1st idem, from the President, Madras Municipal Commission, bringing to notice the encroachment of the sea north of the Harbour, and requesting that adequate steps be taken to protect the northern suburbs of the City, and the Municipal Sewage Farm, beyond the end of the extended protective revetment.

Read Minute by a Trustee.

*Resolved*,—that the draft letter, as now amended, is approved, and will be submitted to Government with the plans showing the progress of the erosion of the foreshore from 1839 until protection was afforded to the City by the construction of the Harbour, and to the northern suburbs by the protective rubble revetment, together with tracing giving the subsequent variations of the High water mark.

* * *

(True extract).

C. PINSENT,
*Secretary,*
*Harbour Trust Board.*

---

PRINTED AT THE SCOTTISH PRESS, BY GRAVES, COOKSON & CO., MADRAS.

1

# Local & Munl. (1898) Department.

**CURRENT No.** 1016 M

UNDER SECY TO GOVT
12 MAR 98
PUBLIC W. DEPT

10 P

**From** The P. W. Department
Railway Branch.

No. 319 d/ 16-3-98

~~**Order**~~

Transferred to the Public Works (Marine) Department in Continuation of Endorsement No. 139 dated 4th February 1898.

No 833
8-2-98

**No.** 120 R.M.

**Dated** 11th March 1898.

**Received** 12-3-98

**Registered** 12-3-98

**Enclosures** 2

**Spare copies**

E. G. Roberts
Ag Assistant Secretary
15-3-98

V. R.
14/3/98

**SUBJECT.**

Transferring letter from the Agent and Manager, Madras Railway, asking to move the Government to proceed with protective works before the next Monsoon bursts.

To
The Public Works Marine Departt

11

## BACK PAPERS.

| G.O. | No. | Department. | Date. |
|---|---|---|---|
| Ent | 139/98 | | |

## FURTHER PAPERS.

| G.O. | No. | Department. | Date. |
|---|---|---|---|
| | | | |

Genl E.4
435/98

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(No. I.)
No. 10453
193

## MADRAS RAILWAY.

AGENT AND MANAGER'S OFFICE,

Madras, 5th March 1898

78

C. No. 1123
Recd. 7.3.98

RECEIVED
1898

From
The Agent and Manager.
M. R.

To
The Consulting Engineer for Railways.
Madras.

SIR,

I have the honor to send, for your perusal, copy of a letter which has been addressed to me by the Company's Chief Engineer pointing out that the sea has encroached very much of late opposite to our General Stores buildings and to ask that you will move the Government to proceed with protective works before the next monsoon bursts.

Letter for favour of report
JHP. 8/3/98

I have the honor to be,
Sir,
Your most obedt servt.

Agent & Manager.

12

Enclosure

8 S. P.

Madras Railway Company
Chief Engineer's Office,
Madras, 3rd March 1898.

No. C/296

The Agent & Manager.

Dear Sir,

I beg to invite your attention to the very heavy encroachment of the Sea which has recently taken place opposite the General Stores Buildings at Rayapuram, and the Safety of the Company's property is now seriously threatened.

The beach has in one portion been washed away close up to the edge of the road and there now remains the width only of the roadway between the Company's premises and the sea.

I shall feel much obliged if you will address the Consulting Engineer on the subject and request that very early action may be taken by the Government with a view to arrest any further encroachment in the locality referred to.

Yours, &ca.,
(sd) Henry C. West.
Chief Engineer.

(True Copy)

Agent & Manager.

13

Mar. E. 2
I 344/98
10 of Mar of 1898

ENC. No. 1 to E. P. C. No. 1123 of 1898
193 5. 3-98
FROM Am

MADRAS RAILWAY.

From The Agent and Manager.

To The Consulting Engineer for Railways.

Dated 188

Recd.

No.

2/1016 M of 1898.

Mar. E. 1/[illegible]/98
435

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R. Form No. 11.

No. 120 R. M.

LOCAL & MUNICIPAL DEPT.
1016 M

Government of Madras.

PUBLIC WORKS DEPARTMENT,

RAILWAY BRANCH.

MEMORANDUM.

98

*Dated Madras,* 11th March 1898.

Letter from the Agent and Manager, Madras Railway, No 10453/193 dated 5th March 1898, with enclosure.

Transferred to the Local and Municipal Department for favour of early disposal.

It is requested that this Department may be furnished with a copy of the orders issued thereon.

F. D. Forde
Under Secretary.

14

Mar. E.3
3/4/98
435

urgent

# Marine (1898) Department.

R, No. 165-E, d. 18-3-98

11 P

**CURRENT No.** 344

Referred to the Chairman Harbour Trust Board in continuation of Endorsement No 83 E. dated 8 February 1898, to which an early reply is requested.

*From* The Local & Munl. Dept.

**No.** 319

R.S.

Cross 17.3.98 D.W

The Ch. H. T. Bd. in original to be returned

**Dated** 16
**Received** 17
**Registered** 17
March 1898

**Enclosures** — 3

**Spare copies** -

D 18/3/98

**SUBJECT.**

Encroachment of the Sea. Transferring correspondence relating to the — opposite the Madras Rail General Store Buildings at Royapuram.

15

## BACK PAPERS.

| G.O. | No. | Department. | Date. |
|---|---|---|---|
| 88 | Ed | | 8-2-98 |
| 85 | Ed | | 31-1-98 |
| 792 | Marine | | 11-5-97 |
| 99 | | | 5-2-99 |

25 E. 16.1.97

## FURTHER PAPERS.

| G.O. | No. | Department. | Date. |
|---|---|---|---|
| 629 E | | | 5-12-96 |
| 788 Marine | | | 14-11-96 |
| 434 E | | | 4-5-96 |
| 562 | | | 6-8-96 |
| 368 E | | | 21-7-96 |
| 340 E | | | 30-6-96 |
| 220 | | | 25-4-96 |

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# Marine (1898) Department.

CURRENT No. 435

*Order*

*From*
*The Chairman,*
*Harbour Trust Board,*
*Madras.*

*No.* 35.

*Dated* 4*th* *April* 1898.
*Despatched* 6*th* „
*Received* 12 April 1898
*Enclosures :* *Current No.* 1016M, *with its Enclosures.*
*Spare copies : three.*

## SUBJECT.

Replying to memo. No. 165E, dated 18th March 1898 (Marine Department), regarding the encroachment of the sea opposite the Madras Railway General Store buildings at Royapuram.

16

## BACK PAPERS.

| G. O. | No. | Department. | Date. |
|---|---|---|---|

## FURTHER PAPERS.

| G. O. | No. | Department. | Date. |
|---|---|---|---|

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No. 35.

HARBOUR TRUST OFFICE,
MADRAS, *4th April* 1898.

FROM
J. N. ATKINSON, ESQUIRE, I. C. S.,
CHAIRMAN, HARBOUR TRUST BOARD,
*Madras.*

TO
W. B. DEWINTON, ESQUIRE,
SECRETARY TO GOVERNMENT,
*Marine Department.*

SIR,

I have the honour to return the papers that accompanied your reference No. 165E, dated 18th March, and to reply as follows.

x G.O. 357

**2**. In my letter No. 5458, dated 18th idem, I have already indicated generally the reasons why the Harbour Trust Board considers that it cannot be held responsible for damage done to the foreshore north of the Harbour. The case is stronger in so far as the slight effect on the foreshore and roadway in front of the Madras Railway terminus and stores at Royapuram is concerned.

**3**. Plan dated 1st September 1855, which accompanied my letter, shows beyond question that before the Harbour was commenced it was found necessary to protect the foreshore in front of the Railway premises by groynes, and it is believed that expenditure had to be incurred periodically on this account, though whether the Railway or Government provided the funds this Board has no information.

**4**. It was prior to the commencement of the Harbour that the Madras Railway constructed the small jetty that still exists in a dilapidated condition. This jetty the Railway has maintained up to the end of 1897, and it is probable that to it is partly due the preservation of the foreshore at this point, and that to the damage that occurred to it on December 25th and 26th, owing to the abnormal direction of the sea, the slight erosion to south of it is due.

**5**. The Harbour Trust Board has never spent anything on protection of that part of the beach which extends from the base of the north arm of the Harbour to the commencement of the protective revetment, a distance of about 300 yards; and it is obvious that the Harbour itself can have no detrimental effect on this part of the beach. There cannot be any scour setting in round the north arm, otherwise this sandy beach would have shown traces of erosion long ago, whereas it is now practically the same as at any time during the last 40 years. On the other hand, the Harbour effectually protects this part of the foreshore from the prevailing currents and seas, those from south through south-east to east. It must, therefore, be admitted that any effect that the Harbour has had on the shore in front of the Madras Railway Terminus has been for good.

**6**. The rough weather which caused the slight damage alluded to by the Agent of the Madras Railway Co., in his letter which forms an enclosure to your memo. under reply, occurred on December 25th and 26th, 1897; and the records of the Deputy Conservator's Office show that the wind and sea was during the whole time from E. N. E. and N. N. W. If anything else were needed, this would suffice to show that the Harbour Trust Board cannot possibly be responsible to make good the damage that has occurred.

**7**. The Harbour Trust Board proposes to address Government on the whole question of responsibility for the protection of the foreshore of Royapuram and Cassimode; and meanwhile submits that if the Agent of the Railway considers that steps should be taken to protect the Railway premises against a recurrence of such risk as threatened last December, the responsibility for so doing does not lie on the Harbour Trust Board.

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

J. N. Atkinson
*Chairman,*
*Harbour Trust Board.*

urgent

# Marine (1898) Department.

15

**CURRENT No.** 643

The Hon. Sir Henry Bliss K.C.I.E. – Again 26 May 98
The Hon. Mr Grose C.I.E. – Seen – vide Ch of 35 – do –
H. E. the Governor 3rd May 98

**Order**

38 P

*From*

*The Chairman,*
*Harbour Trust Board,*
*Madras.*

*No.* 714.

*Dated* 13th *May* 1898.

*Despatched* 14th "

*Received* 16th May 1898

*Enclosures* ; *Estimate, Form E. No.* 121.
6 (4 plans) " " *E. No.* 125.
× *Plan and Cross Sections.*

*Spare copies : three.*

Retd to Ch. H.T. Bd with G.O. 775 Mar 29-5-98

## SUBJECT.

PROTECTIVE REVETMENT NORTH
OF THE MADRAS HARBOUR.

---

Repudiating all responsibility on the part of the Harbour Trust Board; and submitting estimate for repairs, Rs. 64,879, for such action as Government deems necessary.

× Forwarded under separate cover

This paper just received is circulated with the file already in circulation – I have nothing further to add to my previous note on the subject, except that the Board's position in disclaiming all responsibility is quite untenable

H Bliss
17.5.98

39 P

The position now is that the H. T. B. says it won't carry out the works which seem to be needed for the protection of the properties situated on the shore to the N. of the harbour. Govt. has no power, so far as I know, to compel them to do so. Nor has any one else, save by means of a civil suit. The Govt. has not, so far as I know, any locus standi in virtue of which it could sue the H. T. B. either to compel it to carry out this or that work or to obtain damages from it on account of its neglect or refusal to carry out such work. The only persons who can so sue are persons whose own property which

H. Ms. 17.5.98 R. 20.5.98

28

H. Ms. again 26.5.98 R. 27.5.98
H. E. 28.5.98 R. 28.5.98

16

## BACK PAPERS.

| G. O. | No. | Department. | Date. |
|---|---|---|---|
| " | 207 | Marine | 19.3.98 |
| " | 601 W | ~~Rev.~~ | 8-3-82 |
| " | 3186 | W | 24.12.87 |

Act II of 1886

40P

is threatened with injury or has actually been injured by reason of the action or default of the H.T.B. Such persons are the Muni. Commrs & the owners of Chandri Press & other properties along the shore to the N. of the harbour. It seems to me that they must be left to their legal remedies, all that the Govt. can do being to state its opinion as to the liability of the H.T.B. & to place the evidence in its possession at the disposal of such persons as may need it for the enforcement of their legal rights

B.S.
18/5/98

41P

I was not prepared for this sudden change of attitude on the part of my Hon. Colleague. I am generally for peace, but here I would not acquiesce in the position taken up by the H.T.B. until I could feel sure that they have the law on their side. I propose that the Law Advisers be asked to give their opinion on the following points:—

(1) Whether the expenditure of H. Trust money on works to protect the property of others from erosion due to the Harbour (of course assuming this to be capable of proof), is not admissible under the Act No. II of 1886.

(2) Whether if so, Govt. could not, under Secs. 67 and 68 compel such expenditure. And,

(3) whether, if such expenditure under the Act is not admissible or compellable, the H.T.B. are not liable, under general law, for Damages caused by their Works.

A.S.H.
25.5.98

## FURTHER PAPERS.

| G. O. | No. | Department. | Date. |
|---|---|---|---|

(S.P.)

I agree that the Adv. Genl's opinion shd be taken

D. 27/5/98

The Note on the linked file had better lie over for the present

A.S.H.

43P

I was not conscious of, and did not intend, any change of attitude. I remained of the same opinion as before that the H.T.B. was bound to carry out the works necessary for the protection of the coast to the N. of the N. groin; but I said that I did not see how Govt. cd. compel it to do so. I still don't see how it can. But by all means let the Adv. Genl's opinion be taken. If he thinks Govt. can compel the H.T.B. to act, so much the better.

44P

B.S.
27/5/98

The Adv. Genl. must see all the papers & the Sec. shd. let him know d.o. that he will be glad to help him, if required, as to the facts of the case in regard to the extent of the H.T.B's jurisdiction & so on

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Marine C No. 643/98

No. 714.

HARBOUR TRUST OFFICE,
Madras, 13th *May*, 1898.

13P

From

J. N. ATKINSON, Esq., I. C. S.,
Chairman, Harbour Trust Board,
*Madras.*

To

W. B. deWINTON, Esq.,
Secretary to Government,
*Marine Department.*

Sir,

C No. 357

& C Nos 135
" 457

In my letters No. 5458, dated 18th March, and Nos. 35 and 171, dated 4th and 13th April, I have brought to the notice of Government that the Harbour Trust Board is of opinion that it should no longer be held responsible for the protection of the foreshore of Madras to north of the Harbour; and in the second of these letters I stated that this Board would address Government at length on the whole question. Since then I have been endeavouring to collect information on the past history of the subject: but, as this Board was only constituted in 1886, and it has, therefore, no records of earlier date, and since it would take long to obtain a complete file of all material documents from the Government offices, the Board has determined, considering the urgency of the matter, to address Government at once, I have, therefore, the honour now to lay before Government a statement of the case for the Harbour Trust Board, trusting to the courtesy of Government to have all records bearing on the subject collated in its own offices.

**2.** My lettters above quoted have indicated how for years before the Harbour was commenced the process of erosion of the Madras foreshore was steadily going on: and how large were the sums of money spent by Government to protect the Fort and Town. It is not necessary to multiply proof of what is indisputable, but I may say that I am aware of the existence of records in the Madras Deputy Collector's Office proving that erosion was in progress in the very earliest years of the century.

**3.** The Harbour Works were commenced in 1876, and it is believed that, for some few years prior to that, there had been an intermission or at least a slackening of the efforts to protect the foreshore from the sea. But a few years after the commencement of the Harbour Works, attention was again attracted to the erosion that was going on along the Royapuram shore. By this time sand had accreted to a considerable extent to south of the Harbour. The accretion can hardly have been due to anything other than the Harbour; but the Harbour Trust Board is of opinion that, without distinct proof after adequate investigation, it would be rash to assume that the contrary process of erosion to north of the Harbour was due wholly or partly to that structure.

Naturally!

**4.** It is well known that all round the Peninsula, and more particularly on the Coromandel Coast, the processes of accretion and erosion are always in progress, and that, not with any regularity but with such surprising alternations and variations of kind and degree, that it is impossible to formulate any theory to account for them. These processes must, it may reasonably be supposed, be governed to some extent by the nature of the currents running up and down the Coast, and of these currents and the laws governing them practically nothing is known.

**5.** When in or about 1880 Royapuram appeared to be endangered by the attack of the sea, the theory was at once advanced that the originating cause of the danger lay in the Harbour Works. The Harbour Trust Board believes that this theory was accepted without any critical examination of its correctness, or consideration of the consequences that would flow therefrom. Government itself was constructing the Harbour, and Government was in the last resort the guardian of the lives and property of the inhabitants of Madras, and it seems not improbable that in deciding to undertake the expense of protecting the sea face of Royapuram, the Government of the day was influenced as much by a recognition of the fact that no individual or public body could carry out the necessary protective works as efficiently as itself, as by a deliberate and considered admission of responsibility.

18

**6** The precedent having once been set, was followed unquestioningly. Government itself continuing to extend the protective revetment so long as the Harbour Works remained in its direct control, and the Harbour Trust Board accepting the obligation as binding on it. In 1881 an extension was given to the principle of responsibility, Harbour funds being for the first time debited with the cost of protecting property not from actual erosion, but from the real or fancied risk of it, and in pursuance of this new departure, at one time or another 24 acres of landed estate have been acquired, not because it had been washed away or damaged, but merely because its security was supposed to be endangered. Out of this extent about 10 acres remain intact to this day, so groundless were the fears then entertained. And here it is well to draw attention to the remark in para. 2 of the Report of the Committee appointed under G. O., 24th December 1881, No. 3186W. "It is to be noted first of all, that long before the Harbour "Works were commenced, there had been continual erosion and loss of land by the encroachment of the "sea, and some of the claimants for compensation had, by 1876, when the Harbour Works were com"menced, lost a considerable part of the land which they imagined or say they imagined, was in their "possession." *Vide* G. O., 8th March 1882, No. 601W.

How "groundless", if the other 14 acres have been washed away? [illegible]

para 2 page 1, G.O. [illegible]

**7.** Before leaving this part of the subject, it may be well to say that, so far as the Harbour Trust Board is aware, there is absolutely no evidence, other than the "*post hoc ergo propter hoc*" argument that the erosion observed at Royapuram in 1880 was either wholly or partly caused by the Harbour Works, and even that old fallacy could not be applied in this case, since the erosion had been observable before the Harbour was commenced. So far as there was any hypothesis at all, it is believed to have been somewhat to the effect that the current when passing from south to north in front of the Harbour formed an eddy round that structure, and was thus diverted on to the beach to the north in such force as to produce the disastrous results observed. But it is out of the question to suppose that an ocean current could be diverted by an insignificant structure like the Madras Harbour, and what eddy there is, is quite powerless to produce the results observed.

**8.** The Board has now initiated experiments and is taking evidence to test the direction of the currents north of the Harbour, and finds that, so far as these experiments have gone, the evidence is that there is no current from the eastern face of the Harbour towards Royapuram or Cassimode, but that the general trend is in a direction parallel to the shore, so that the current passing the Harbour mouth does not impinge on the beach anywhere at all.

5458 ? [illegible] 357

**9.** In my letter No. 3458, dated 18th March, I mentioned that the Board had already spent or been debited with a total sum of Rs. 7,98,038 on the construction and repair of protective works: and in addition a sum of Rs. 18,593 has been expended in the purchase of land that had either been washed away, or was supposed to be threatened with erosion. This very heavy expenditure has been thrown on the trade of the port, not from any proved liability, but on account of a mere theory never substantiated and hardly even formulated. And now the height of absurdity is reached when the Municipal Commission and the Madras Railway endeavour to saddle the Board with responsibility for the effects of a slight storm—on December 25th—when both wind and sea came from the N. E. and when the damage which occurred is entirely attributable to those two forces, as was similar damage observed elsewhere on the coast on the same date. It is intolerable that the trade of the port should continue to be called on to protect the property of others from the acts of Providence.

**10.** In the above paras, I have indicated the grounds on which the Harbour Trust Board considers that Harbour Funds should never from the first have been burdened with the cost of protecting Royapuram and Cassimode from the sea. But the mistake was made, and it is perhaps too late now to amend it. The present position of affairs is that, there is a long protective revetment, which requires immediate repair, and future maintenance; and that beyond the northern end of the revetment the sea is continuing its encroachments. The immediate question is who is responsible for the repairs to, and maintenance of, the revetment; and who is responsible to protect the land to north from the sea? The Harbour Trust Board repudiates responsibility in either case.

X

**11.** The Board was on the point of taking Counsel's opinion on the question of responsibility for upkeep of the protective revetment, when fortunately it received notice of a suit from the owner of a godown, on account of damage thereto in the storm of December 25th last. The issues in this case cannot be here discussed, but it is not unlikely that the case will be decided on a side issue and not on the general question of responsibility; and I venture therefore to offer a few remarks on this general question.

**12.** The liability of the Board to construct the protective revetment may have been held to be established by one or both of only two suggested hypothesis. One of these is that referred to in para, 7 above, and as there stated, the Board maintains that there never was any proof of this hypothesis and that what evidence there is tends to disprove it.

**13.** The other and more recent hypothesis is to the effect that the erosion is due to the obstruction offered by the Harbour to the normal littoral drift of sand, the northward drift to north of the Harbour continuing uninterruptedly, while no sand can come from the south to supply the place of what has gone. The attractiveness and plausibility of this hypothesis is due simply to the patent fact that large quantities of sand have banked up against the south arm, while none is visible to the north of the Harbour so far as the protective revetment extends. But the theory is open to criticism in a dozen directions. Thus it assumes that the sandy foreshore or beach that is visible where no revetment exists is fed and maintained solely by sand carried in suspension along the sea margin. But there is absolutely no ground of which the Harbour Trust Board is aware for holding that sand is not also brought in in considerable quantities from the deeper water beyond the surf line, and the further spaces of the deep sea; and the Board believes that Sir A. Rendel has given his opinion in favour of this contention. That there is a movement of sand in deep water is certain, and can be proved indisputably, as, for instance, by the constant discolouration of the water in depth, up to 9 fathoms to S. E., E. and N. E. of the Harbour in all but the calmest weather. This discolouration must be due to sand, and the action of tides, currents and wind must bring the sand to the shore.

Is this so? [illegible]

The movement of sand does not extend beyond the 6 fathom line [illegible] para 10 [illegible] in No 536 [illegible] 6 Aug 98 [illegible] Trust [illegible]

**14** To lay any stress on the fact that there is, generally speaking, no sandy foreshore along the toe of the protective revetment, whereas there is such a forsehore both to north and south of it would be absolutely fallacious. When there are neither groynes nor revetment there is always a sandy foreshore; when there are groynes whether with or without revetment, there is accummulation of sand in the neighbourhood of the groyne: when there was a revetment only, there was sometimes a narrow sandy foreshore, sometimes none at all, the sea washing the foot of the revetment, precisely as it does now opposite Royapuram and Cassimode. In a plan called "A new and improved plan of Madras and its "suburbs, executed in the years 1837, 33 and 39, with all the additions and improvements up to the "end of the year 1842, by Thomas Hill, Surveyor," the Madras shore is shown protected only by a revetment without groynes, and at that time the sea line is shown at the toe of the revetment the whole way from the south end of Fort St. George to the site of Clive's battery, and it may with propriety be inferred that if that revetment had been continued to this day, without the addition of groynes, and without any Harbour having been constructed, the same phenomenon would have been observable. What then becomes of the theory that the absence of a sandy foreshore along the toe of the present protective revetment is due to the obstruction offered by the Harbour to the northward littoral drift of sand?

& Harg L

**15.** The pith of the matter is this, that in no way can responsibility be fixed on the Harbour Trust Board, except by advancing theories, which are pure theories unsupported by evidence and open to criticism on every side. The one obvious and unassailable fact is that erosion of the Madras beach has been going on from time out of mind; and the Harbour Trust Board therefore considers that it cannot be held responsible to prevent or make good this erosion.

**16.** In G. O. No. 367 M., dated 19th March 1898, it was held in the case of a certain encroachment by the sea at Tellicherry that it was the duty of owners of property to protect each his own property, but for convenience sake and to ensure efficient protection, Government decided to carry out the necessary works itself, collecting an equitable share of the cost from those concerned. The Harbour Trust Board requests that Government will apply the same principles in the case of Royapuram and Cassimode.

**17.** The Board's Engineer prepared an estimate amounting to Rs. 64,879 for repair of the revetment, and this was considered at the Board's meeting on 29th April, but it was decided that the Board could no longer acquiesce in the very heavy charge that the present state of affairs entails upon the trade of Madras: and I have the honour therefore to forward these estimates with the connected plans, sections and specifications for such action as Government deems necessary. I also forward a copy of the Harbour Trust Board's resolution, and would add that, in the opinion of the Board, it is urgently necessary that the revetment be repaired at the earliest possible date.

No. The [illegible] preamble [illegible] [illegible]

**18.** Apart from all other grounds for questioning the propriety of charging the Harbour Trust Board with the cost of this protective revetment, it is clear that under the Madras Harbour Trust Act 1885 (Act II of 1886), the Board cannot legally devote any part of its revenues to this purpose. The preamble of that Act states that it is enacted "to make provision for the regulation, conservancy and improvement of the Harbour of Madras." In section 2 (3) "Harbour" is defined as meaning "the "artificial Harbour at Madras consisting of the enclosing groynes and the enclosed space, and the corres- "ponding foreshore east of the beach road, and all buildings, structures, or appliances provided by the "Governor in Council or the Trust Board for the purposes of the Harbour and of the vessels using it together "with the moorings therein laid down by the Governor in Council or the Trustees." By no latitude of construction can this definition be held to include the protective revetment. Section 60 empowers the Board to "execute such works as they determine to be necessary or expedient for the purposes of the said Harbour," and section 61 enumerates six classes of works that may be so executed. The 6th of these classes is as follows:—"(6) the construction of such breakwaters and other works without the limits of "the Harbour as shall be expedient for the protection of the said Harbour, and all such other works and "appliances as may be, in the opinion of the Board, expedient for carrying out the purposes of this Act." The protective revetment is certainly not wanted for the protection of the Harbour, and the purpose of the Act having been declared to be "the regulation conservancy and improvement of the Harbour," the Trustees are of opinion that that revetment is certainly not expedient for carrying out the purposes of the Act. There is no other provision in the Act under which the protective revetment could legally have been constructed by the Trustees, and they consider therefore that they cannot now legally spend any part of the funds entrusted to them on extension, repair or maintenance of the revetment.

I have the honour to be,
Sir,
Your obedient servant,

J. H. Atkinson
*Chairman,*
*Harbour Trust Board.*

15-8-9

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## Extract of Proceedings of the Trustees of the Harbour of Madras, at a Meeting held at the Offices of the Board, on Friday the 29th day of April 1898.

* * *

**12.** Read letter from the Board's Engineer, No. 81, dated 23rd April, submitting an estimate in D. P. W. form, as directed, for repairs to the protective revetment.

Resolved, that this estimate, amounting to Rs. 64,879, will be submitted to Government, with a request that the works therein provided for, or such other works as Government considers necessary, may be carried out by Government, or by whomsoever Government considers responsible. This Board repudiates all responsibility; but is of opinion that the work is of an urgent nature.

* * *

(True extract.)

C. PINSENT,
*Secretary, Harbour Trust Board.*

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## Extract of Proceedings of the Trustees of the Harbour of Madras, at a Meeting held at the Offices of the Board, on Friday the 13th day of May 1898.

* * * *

**2.** Read draft letter to the Secretary to Government, Marine Department, submitting, for reasons given, that the Harbour Trust Board should not be held responsible for the protection of the foreshore of Madras to north of the Harbour.

Read minutes by Trustees. Approved as amended.

* * *

(True extract.)

C. PINSENT,
*Secretary, Harbour Trust Board.*

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(E. No. 121.)
6,000—21-1-97.

Removed from Con: 643 of 98 = 60450 [illegible]
3-6-98

To be employed for all earth-work (Tank and Channel) estimates when sectional measurements are used and when the quantities are not taken out direct.

### Estimate Form.

Calculation Sheet of Cross Sectional Areas and Contents of Earth-work.

To accompany the Detailed Estimate No.
of 189 -9, for* Repairing the revetment North of the Harbour

* Here enter the name and description of work in full.

Mar Genl
6th 8/98

## ESTIMATE FORM—Calculation Sheet.

| Number of Section. | Area of present Section. above De: Hav: M. S. Level | Area of proposed Section. above De: Hav: M.S. Level. | Difference. | Mean Area. | Length. | Cubical Contents. | Remarks. |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Rough stone revetment | | | | | | | |
| 1 | 248·27 | 352·50 | 104·23 | | | | |
| 2 | 329·19 | 407·00 | 77·81 | 91·02 | 200 | 18204·00 | |
| 3 | 536·42 | 618·75 | 82·33 | 80·07 | 150 | 12010·50 | |
| 4 | 476·42 | 540·37 | 63·95 | 73·14 | 50 | 3657·00 | |
| 5 | 457·92 | 513·62 | 55·70 | 59·82 | 100 | 5982·00 | |
| 6 | 178·60 | 492·25 | 313·65 | 184·67 | 300 | 55,401·00 | |
| 7 | 231·21 | 340·25 | 109·04 | 211·34 | 150 | 31,701·00 | |
| 8 | 254·90 | 287·12 | 32·22 | 70·63 | 50 | 3,531·50 | |
| 9 | 279·39 | 336·81 | 57·42 | 44·82 | 300 | 13446·00 | |
| 10 | 295·51 | 322·87 | 27·36 | 42·39 | 290 | 12,293·10 | |
| 11 | 258·72 | 310·75 | 52·03 | 39·69 | 310 | 12,303·90 | |
| 12 | 239·26 | 353·50 | 114·24 | 83·13 | 300 | 24,939·00 | |
| 13 | 176·97 | 396·16 | 219·19 | 166·71 | 155 | 25,840·05 | |
| 14 | 289·97 | 377·54 | 87·57 | 153·38 | 245 | 37,578·10 | |
| 15 | 287·96 | 384·38 | 96·42 | 91·99 | 300 | 27,597·00 | |
| 16 | 289·65 | 401·50 | 111·85 | 104·13 | 400 | 41,652·00 | |
| 17 | 161·81 | 731·50 | 569·69 | 340·77 | 300 | 102,231·00 | |
| 18 | 706·86 | 19,102·75 | 18,395·89 | " | " | 18,395·89 | End of Old revetment |
| 19 | 149·16 | 187·25 | 38·09 | | | | Commencement of New revetment |
| 20 | 212·09 | 248·15 | 36·06 | 37·07 | 300 | 11,121·00 | |
| 21 | 273·60 | 358·28 | 84·68 | 60·37 | 300 | 18,111·00 | |
| 22 | 216·33 | 249·76 | 33·43 | 59·05 | 300 | 17,715·00 | |
| 23 | 238·64 | 380·28 | 141·64 | 87·53 | 300 | 26,259·00 | |
| 24 | 208·73 | 339·70 | 130·97 | 136·30 | 300 | 40,890·00 | |
| 25 | 254·67 | 379·77 | 125·10 | 128·03 | 300 | 38,409·00 | |
| 26 | 145·64 | 246·50 | 100·86 | 112·98 | 300 | 33,894·00 | |
| 27 | 98·84 | 151·25 | 52·41 | 76·63 | 300 | 22,989·00 | |
| 28 | 114·33 | 201·50 | 87·17 | 69·79 | 300 | 20,937·00 | |
| | | | Carried over. | | | 677,088·04 | |

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## ESTIMATE FORM—Calculation Sheet.

| Number of Section. | Area of present Section. | Area of proposed Section. | Difference. | Mean Area. | Length. | Cubical Contents. | Remarks. |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | | | | Brought forward | | 677,088·04 | |
| 29 | 309·37 | 320·87 | 11·50 | 49·33 | 300 | 14,799·00 | |
| 30 | 707·50 | 731·50 | 24·00 | 17·75 | 300 | 5,325·00 | |
| 31 | 462·68 | 749·00 | 286·32 | 155·16 | 25 | 3,879·00 | |
| 32 | 3,387·57 | 19,102·75 | 15,716·18 | | | 15,716·18 | End of new revetment |
| | | | | Total C. ft. | | 716,807·22 | |

STATION Madras

Dated April 1898.

19·4·98

A. de Pogson

Engineer. Executive Engineer,

~~Division.~~

1473

10,000—17-8-97.

(E. No. 123.)

To be employed where there are many parts or sub-divisions of a work.

CIRCLE.— Madras
DIVISION.— Harbour Trust
TALUK.— Board.
DISTRICT.—

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ESTIMATE FORM. — ABSTRACT — GENERAL (FOR MANY PARTS OF A WORK).

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Financial Head— Capital account Major Works
Budget Head— Protective Works.
Departmental Head—
Main Head—
Sub-Head—
Project of which the work forms part—
Section—
Name of Work— Repairing revetment north of the Harbour.

Amount of Estimate—
To be carried out by—

Mar Eng / 643/98-

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REFERENCES.

## ESTIMATE FORM.—ABSTRACT—GENERAL (FOR MANY PARTS OF A WORK).

| Description of Work. | Rates. | | Repairing revetment north of the Harbour | | | | | | | | | | | | | | | | Total. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Unit. | Amount. | Quantity. | Cost. | Quantity. | Cost. | Quantity. | Cost. | Quantity. | Cost. | Quantity. | Cost. | Quantity. | Cost. | Quantity. | Cost. | Quantity. | Cost. | Quantity. | Cost. |
| | | RS. | | RS. | | RS. | | RS. | | RS. | | RS. | | RS. | | RS. | | RS. | | RS. |
| Rough stone deposited in revetment .. | 100 Cft ✓ | 7-0-9 | ✓ Cft 716,807 | 50,572 ✓ | „ | „ | „ | „ | „ | „ | „ | „ | „ | „ | „ | „ | „ | „ | Cft. 716,807 ✓ | 50,512 ✓ |
| Laying metre gauge line along revetment | 100 Lft. | 125-5-0 | Lft 9000 | 11,278 ✓ | „ | „ | „ | „ | „ | „ | „ | „ | „ | „ | „ | „ | „ | „ | Lft. 9,000 | 11,278 ✓ |
| | | | | | | | | | | | | | | | | | | | | 61,790 ✓ |
| Contingencies @ 5% | | | | | | | | | | | | | | | | | | | | 3,089 ✓ |
| | | | | | | | | | | | | | | | | | | | Total Rupees. | 64,879 ✓ |

Station, Madras
Dated April 1898.

Note.—(1) All rates are to be given in Rupees, Annas and Pies.
(2) Quantities are to be entered as so many units; thus the unit for Brick-work being 100 cubic feet, 9,250 cubic feet of Brick-work would be entered as 92·5 units.

A.W.
19.4.98

A. de Pogson
Engineer, Harbour Trust Board
~~Executive Engineer.~~

Erosion to the north of the Madras Harbour. 1

P. W. DEPARTMENT. 1

**READ the following :—**

Letter from the Chief Engineer, Madras Railway Company, No. C. 189, dated 7th January 1898.

Letter from the President, Madras Municipal Commission, No. 1155, dated 1st February 1898.

Endorsement thereon in the Local & Municipal Department, No. 139, dated 4th February 1898.

Letter from the Chairman, H. T. Board, Madras, No. 5458, 1/18th March 1898.

Letter from the Chairman, H. T. Board, No. 35, dated 4th April 1898.

16 P

## FOR ORDERS.

~~The Hon'ble Sir Henry Bliss K.C.I.E.~~

The Hon'ble Mr Grose C.S.I. ✓

H. E. the Govr. Prd. ✓

The papers read above relate to the encroachment of the sea to the north of the revetment on the north side of the Madras Harbour.

2. The Harbour Trust Board has hitherto accepted the responsibility and borne the cost of protecting the foreshore, and has, up to date, spent a sum of Rs. 7,98,038 on this work, and intends in the coming year to spend a further sum of Rs. 65,000 in restoring and improving the existing revetment. It expresses its intention of maintaining the existing work in an efficient condition, but now questions the theory that the erosion of the foreshore is due to the existance of the harbour groynes, and considers that if the threatened municipal sewage farm is to be protected, the cost should be met not from Harbour, but from Municipal, funds. It is contended that the sewage farm is not actually needed,

2d

It has always hitherto been held that the construction of the harbour groynes was the cause of the damage which has been caused by the sea north of the harbour; and the arguments of the H. T. B. do not lead me to think that this opinion was erroneous. It is true that there were erosions before the harbour works were begun, but they were not constant or serious or confined to one particular spot, as is now the case. As regards the erosion of [illegible] Press, the conclusion of the C. E. at the end of his para 9, that the Harbour was not responsible for this, seems to me inconsistent with the latter part of his para 11, in which he ~~[illegible]~~ points out the probability of serious damage

43—800-27-4-94.

U/25/4/98 / 21

H.E. 19/4/98 [illegible] 20/4/98 [illegible] 98 R 16.4.98 [illegible] 16.4.98 [illegible] needed in the interests of the conservancy of the city, and that it is quite possible to make other arrangements for the disposal of the sewage. A sewage farm which necessitates the expenditure of at least 3 lakhs of Rupees for its preservation cannot, it is said, be regarded as a work of public utility.

3. In support of the statement that the present erosion is due to causes other than the harbour groynes, the Chairman submits plans showing high water marks at various periods between the years 1839 and 1898; also copies of plans prepared by Captn. Rawlins in 1855 and 1861.

4. The capital cost of extending the revetment to the northern boundary of the sewage farm is estimated to ~~cost~~ be Rs. 3,19,520, while the only result would be to push the erosion further north. It would, it is considered by the Harbour Trust, be cheaper to leave matters in *statu quo* and pay compensation, *i.e.* if the Harbour Trust Board is held liable.

5. The above represents the views of the Harbour Trust Board on this subject, but it is submitted that these views cannot be accepted as correct. The Board maintains that the Harbour is not responsible for the erosion which is taking place to the north thereof because

(1) erosion was in progress long before the Harbour existed

(2) if the Harbour was at fault there would be a deep bay immediately to the north of it, whereas there is a projecting sandy foreshore, which has not retreated for 30 years.

(3) there are 2 distinct processes by which the sea attacks the land

(a) Littoral drift when arrested by obstacles along the shoreline

(b) Direct attack of the sea.

6. With regard to (1) it is, no doubt, perfectly true that erosion took place as described, not only to the north, but also to the south of and on the site of the Harbour; but it is equally certain that the presence of the Harbour has enormously increased that erosion to the northward and for the same reason that any obstacle on the shoreline produces erosion to leeward.

7. This action is due to the fact that the obstacle deflects the littoral current and wave action from their normal course and produces a circular eddy to leeward thereof. The greater the length of the obstacle, and the more nearly its angle with the shore approaches a right angle, [illegible] more extensive is the eddy and consequent erosion caused. This is the explanation of the fact brought

forward

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being caused by a heavy sea setting in from the N.E. into what he calls the pocket which is formed by the junction of the North harbour groyne with the shore. Last Decr. the sea setting in from the N.E. affected the foreshore near Shand's Press. The next time there is a heavy sea from this direction it may take effect nearer the N. groyne & may even, the C.E. thinks, cut round the shore end of that groyne into the harbour. The responsibility of preventing this seems to me to lie with the H.T.B., which should therefore be moved to construct the proposed sea wall from the end of the N. groyne up to the beginning of the existing sea wall near Shand's Press. It is useless, it seems to me, for the H.T.B. to say that the harbour groynes are not the prime cause of the mischief to the N. of the harbour, because a comparatively small length of the beach immediately to the N. of the N. groyne has hitherto remained unaffected, for the C.E. satisfactorily shows why the erosion ~~would~~ has not been caused close to the N. groyne but further up the coast, and it is easy to see that the effect of the eddy set up by the existence of the harbour might even be to cause an accretion immediately under the shelter of the harbour groyne, while, causing the sea to cut ~~cutting~~ away the shore further off. Nor, in my opinion, can the H.T.B. point to the fact that no damage has been caused in this particular ~~par~~ spot for many years, for it is common knowledge that the cyclone which wrecked the harbour came in from due east & so would not specially ~~&~~ have attacked this particular spot, while there has been no serious cyclonic disturbance since then, either to test the works or to affect the shoreline. I think therefore that the H.T.B. should be held alone responsible for all works required to resist the erosion of the sea to the N. of the harbour.

Whether the H.T.B. should be required to extend the existing sea wall further to the N. is a different matter. It would, I consider, be a waste of money to do so if the Municipality would consent to give up the sewage farm or to move it elsewhere. Whether it should do either is a matter on which the Sanity Comr. must be heard. He may have reasons which do not occur ~~to me~~ for objecting to the sewage being turned direct into the sea, and it may not be possible to find a suitable site for a sewage farm elsewhere. It may also be more expensive to form a new sewage farm than to protect the existing one. Enquiries should, I think, be made upon these points.

In any case, the H.T.B. should in my opinion pay for what is necessary. It is too late in the day, after what they have hitherto done without contesting their liability, for them to set up the plea that the harbour is not the cause of the erosion.

29P

15/4/98

19/4/98

I agree with Hon. Members as to the responsibility of the Harbour Trust Board for the main revt. mainly along the coast and for the protection of the sewage farm. I also concur in the action wh. they propose should be taken with respect to the

sewage

forward by the Board in support of its argument that there is no bay to the immediate north of the Harbour, as there is to the north of most, if not all, other obstacles on the coast. The length of harbour wall is so great - so much greater than any other obstacle on the coast, natural or artificial, - that it protects the shore immediately to the north, and sends the eddying, and consequent erosive, action further onward. The bays immediately to the north of the two ends of the protective revetment are caused, undoubtedly, by those ends, but the influence of these obstacles only extends for a short distance, and the remaining erosion which is taking place along the sewage farm is due principally to the presence of the harbour as above described.

8. With regard to the different processes which cause erosion of the foreshore, they are, I think, correctly stated by the Harbour Board, to be as follows:-

(a) Littoral drift when arrested by obstacles along the shoreline.

(b) Direct attack of the sea.

Both are most difficult of explanation, and the present knowledge of the subject, even of those who have studied it most carefully, is not sufficient to admit of any definite decision being formed. I have lately been reading a long paper on the subject of littoral drift which was read before the Institution of Civil Engineers in 1896, and evoked much discussion and correspondence, and I have been studying on the spot the erosion which has taken place of the foreshore at Tellicherry, which must be due to the direct action of the sea. The general conclusion arrived at concerning the former was that the travel of sand &c, along the shore depends on the direction of the prevalent winds blowing towards the shore, and that when that travel is arrested artificially, as in the case of the Madras Harbour, sand is deposited on the windward side of the obstacle, and erosion takes place to leeward, partly because the supply of sand is cut off, partly because of the eddying action caused by the obstacle. In proof of this theory it may be stated that sand is deposited to the north of the harbour during the N.E. Monsoon and there are numerous instances of it on the shores of the British Isles and adjacent continent. The sand is not all taken from the foreshore and deposited furtheron; much of it comes from the deep bed of the sea.

9. The direct action of the sea is still more difficult to explain. I examined the log kept by the Port Officer

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sewage farm.

I do not feel quite so sure of the liability of the H.T.B. to protect the portion of the shore immediately north of the harbour, called by Mr. De Winton, the "pocket". According to Mr. De Winton, the action of the harbour is naturally protective. If this be correct, it would seem a little hard to make the H.T.B. pay for any works which may be needed at this spot. But, before deciding on this point, I think further enquiry is necessary into the question whether or not the Harbour-works are the cause of the particular damage which seems to have been occasioned here at this spot.

A.J.H.
25.4.98

Officer at Tellicherry and I found that, if the information there entered is correct, the direction and force of the wind, the direction of the current and the condition of the surf were practically identical in the days preceding, during and subsequent to, the erosion. The only unknown factor was the strngth of the current, and I have taken steps to have this measured in future. I could arrive at no definite conclusion from the figures before me, but it is certain that the sea may erodethe shore at any time during the prevalence of high winds and surf. It was the heavy weather in December last which caused the destruction of Shands Press and the erosion of the roadway in front of Royapuram railway terminus, complained of by the President of the Madras Municipality in his No. 1155 of 1st February 1898. The Harbour was not responsible for this.

10. I think, therefore, that the proper view to take of this vexed matter is that the harbour is principally, but not entirely, responsible for the erosion which is taking place to the northward, and the Harbour Trust Board may rightly be debited with not less than 2/3rds of the cost of protecting the foreshore from erosion. The remaining third should be met from Municipal or Provincial

funds.

funds.

11. With regard to the protective measures necessary, the Board while disclaiming all responsibility, says that it has already spent Rs. 7,98,038 in protective work, that it proposes to spend Rs. 64,000 in the present year, in restoring and improving the section of the revetment, and that it intends to maintain the latter in an efficient condition. These proposals will, I think, satisfy all requirements as far as the existing revetment is concerned, provided that larger stone, measuring not less than 2 cubic feet, is used for feeding it, and that some attempt is made to pack it at a uniform slope. It would also be well to protect the toe of the revetment with bags of Portland Cement concrete. But I think something more is required to protect the roadway between the Harbour and Shands Press. This length of foreshore has been to some extent protected by the Harbour so far, but it seems to me certain that a heavy cyclone from the N.E. coming straight into this pocket, with full concentrated force, would work great havoc to the roadway and adjacent buildings, and very possibly breach right round into the Harbour. It is the universal practice, I believe, to connect harbour walls with the adjacent shore

by

by what are called rootwalls-and [illegible] this, I think, is what is needed here. I would therefore construct a sea wall from the northern arm of the harbour to the point where the road leaves the beach near Shands Press and there join it to the existing revetment. Its toe should also be protected either by bags of Portland Cement concrete or by wave-breaker blocks. If the latter course was adopted I believe the risk of damage from cyclones would be very small.

12. The question of the protection of the sewage farm has now to be considered. For previous discussion and decision on this matter please see papers flagged N et seq. The Harbour Board denies all responsibility for this erosion (Para 8), but for reasons given above it is submitted that this view cannot be accepted. The prophecy of the Harbour Board Engineer that no further erosion would take place has been, as might have been expected, unfulfilled, and it is certain that the sewage farm can only be maintained in its present position by protective work of some kind. The question therefore resolves itself into

(1) Shall the farm be maintained,

(2) Who is to pay for its maintenance.

With regard to (1) the Chairman, Harbour Trust Board proposes to allow the sewage to fall into the sea. But this course

is

S.P.

Flag. N.

S.P.

I shouldn't like this

HS

is, I submit, untenable. It is almost criminal to waste such splendid stuff, and I do not think Mr. Atkinson can have seen the excellent results of the existing sewage farms. The President, Municipal Commission, says that no other suitable site exists for a sewage farm, but that a possible site can be found south of the Cotton Canal and that the cost of transferring the sewage farm to this point would be Rs. 1,78,640. vide G.O. 560 Marine, dated 19th August 1896. He however deprecates the transfer from a sanitary point of view, and because of the nature of the soil and the lie of the land. I think that further search should be made for a suitable site. A possible one seems to be the sand accretion on the beach to the south of the harbour, beyond the proposed dock site. A sewage farm if properly conducted and cared for, and uncombined with dust heaps, is inoffensive, and I doubt if the residents on the 1st line beach would know of its existence. If no other site is obtainable, I think the present farm should be protected by a revetment. This would cost, as estimated by the Harbour Trust Board Rs. 3,19,520, and its effect would no doubt be only to push the erosion further north, but as our object is gained if we protect the

sewage

25 P 10

sewage farm this consideration need not influence our decision. The cost of constructing and maintaining this revetment should I think be borne by the Municipality and the Harbour Trust Board in equal shares, because

(1) The harbour is the principal cause of the erosion.

(2) The sewage farm is very profitable to the Municipality, and a very necessary adjunct to its sewage system.

(3) The cost of transferring the farm to the Cotton Canal, if the sea is allowed to encroach on the existing farm at will, would be greater than the Municipality's share above proposed, of cost of protecting the existing site.

H Bliss 16.4.98

M.

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11

~~Public Works~~ Marine DEPARTMENT.

C. No. 357 + 435

HIS EXCELLENCY THE GOVERNOR. 23 May 1898

The Hon Sir Henry Bliss K.C.I.E.
~~THE HON'BLE SIR HENRY BLISS, K.C.I.E.~~
The Hon Mr Grose C.I.E.
~~THE HON'BLE MR. GROSE, C.I.E.~~

SUBJECT: Erosion to the north of the Madras Harbour

23-5-98

FOR ORDERS.

3 + P

S: P.

With reference to the latter part of His Excellency's remarks dated 25.4.98 in the accompanying Note for orders, I beg to point out that it is the North wall of the Harbour which forms the 'pocket' complained of. If it was not there, the action of the sea impinging on this particular portion of the coast line would be normal & regular, & there would be no greater likelihood of erosion there than elsewhere. But with the wall, artificial conditions have been set up, & a heavy sea coming

Yes. But is there an erosion in or near this pocket? It is a little difficult to localize it (the erosion) on the maps. They show it not so much in the pocket as at Shaw's Press, more than a quarter of a mile away.

A.H.
29.4.98

I will see Mr. De Winton about this at noon on Monday 2 May.

A.H. 29.4.98

I saw Mr. De Winton on this subject yesterday: He told me that up to now no erosion had

26

P. W. 43.
500—27-1-98.

R 3/5/98 H.E. 27-4-98 R 29.4.98 Hmwd 6.5.98 R 10/5/98 in from the North East would be arrested in its onward progress by the Harbour wall, reflex action would be set up, and the piled-up waves would descend on the shore with greater force than would be the case under natural conditions. The harbour protects this small length of coast line from easterly & northerly winds & seas, A but, if my view is correct, it increases the destructive powers of a sea coming in from the North East, which is a common quarter for cyclones. The damage done in Decr last may have been due to this very action, & not to the direct action of the sea as suggested in my previous note. But that is a point which it is almost impossible to decide B with any accuracy. A groyne wall connecting a harbour with the shore is, I believe,

had taken place at the 'pocket', but he added that a severe cyclone might do damage there, and that consequently it is desirable to protect the spot by a revetment or some other form of sea-wall.

On re-consideration of the question of responsibility for erosion to the North of the Harbour, it seems that the Harbour works are to a great extent, but not wholly, the cause of it. The H.T.B. should therefore pay a larger share of the cost of protection, but not the whole of it. The proportion of two-thirds to be borne by the H.T.B. and one-third by the Govt. or the Municipality, seems to me fair.

The sewage-farm is, Mr. De Winton says, a most valuable property to the Municipality. Before it is decided to move it or to do away with it, the Municipality as well as the Sanitary Commissioner, should be consulted. If it be decided to keep it where it is, the Municipality should pay one-third of the cost of its protection.

A.H.
3.5.98

3P8

A. ~~[illegible]~~ The H.T.B. has never, all these years, contested its liability for the whole damage – I do not

..........................Department.

C. No..................

SUBJECT.

HIS EXCELLENCY THE GOVERNOR.

THE HON'BLE SIR HENRY BLISS, K.C.I.E.

THE HON'BLE MR. GROSE, C.I.E.

35P

33 P

FOR ORDERS.

think it should be allowed to do so now. It should, in my opinion, pay the whole cost of whatever protective works are needed –

B. I regret I cannot concur in this view – I will not go so far as to say that, if the harbour had never been constructed, no ~~damage~~ ~~or~~ erosion whatever wd. have occurred to the shore opposite to the sewage farm. But I see no reason at all to suppose that, if erosion had occurred, it would have been serious, or would have extended to the sewage farm – That the erosion which has actually occurred is solely due to the construction of the harbour, I feel no doubt – It seems to me to have occurred just where, with refce to the projection of the harbour beyond the old line of the shore, it might have been expected to occur; & I therefore think that the H.T.B. should pay the cost of revetting the shore or of forming a new sewage farm, as the case may be, or of whatever else may be required to repair damages & prevent further damage – The H.T.B. has by its past action committed itself to this position, & in my opinion

considered to be an indispensable adjunct of all artificial harbours, to protect the very vulnerable point of attack between harbour & shore, & it is this protection which I propose that the Harbour Trust Board should be directed to build.

2. The questions about the sewage farm will be referred to the L & M Dept for disposal

26·4·98

P. W. 43.
500—27-1-98.

14

the Govt could compel it by action in the Courts to do whatever is found to be necessary.

RS 7/5/98  JG 10/5/98

Recirculate to His Excellency

36 P

W 11.5.98

I would suggest that, before passing final orders, the H.T.B. should have an opportunity of criticising Mr. de Winton's note. They should, I think, in fairness, see that portion of the Note which treats of the scientific aspect of the matter, – as Mr. de Winton sees it.

R.S.T. 14.5.98

37 P

I venture to think, in view of the H.T.B.'s letter No. 714 of May 13, 1898 (~~the~~ my note on which in the linked file please see), that we had better not place Mr. de W.'s note at the disposal of the H.T.B. Litigation sooner or later seems pretty certain. ~~and it will be~~ If it occurs Mr. de Winton will certainly be called as a witness by one side or the other, and it will be better that he should not be hampered by the publication now of views which he may possibly see cause in the meantime to modify.

RS 18/5/98  JG 18/5/98

The Hon. Sir Henry Bliss K.C.I.E.

The Hon. Mr. Grose C.I.E.

17.5.98

E. again 11.5.98 R 16.5.98 H Ms 17.5.98 R 20.5.98

only for the whole damage – I doubt

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Marine DEPARTMENT.

B From orders 8

Papers to be read in Proceedings :—

Again G.O., dated 189 , No.
Again G.O., dated 189 , No.
Current No. 170 of 1898, dated 7th Feb. 1898, from the L & M Dept.
" " 357 " 1898, " 23rd March " " the Ch. H. T. Bd.
" " 344 " 1898, " 17th March " " the L & M Dept.
" " 435 1898 12th April 1898 the CH. H. T. Bd.
" " 643 " 16th May 1898 - do -

**ORDER.** 450 Mar d/3rd June 1898 45 P

These papers relate to the encroachment of the sea to the north of the Madras Harbour. The Harbour Trust Board has hitherto accepted the responsibility and borne the cost of protecting the foreshore; and has, up to date, spent a sum of Rs. 7,98,038 on this work. It now, however, repudiates its liability on the grounds set forth in its letters read above.

2. The Government desires to be furnished with the opinion of the Advocate General on the following points:-

(1) Whether the expenditure of the Harbour Trust money on works to protect the property of others from erosion due to the Harbour (of course assuming this to be capable of proof) is not admissible under the Act (No. II of 1886).

(2) Whether if so, Government could

29

[P. W. 4. 500—24-3-98.]

could not, under sections 67 and 68 compel such expenditure. And,

(3) Whether, if such expenditure under the Act is not admissible or compellable, the Harbour Trust Board are not liable, under general law, for damage caused by their works.

M 30.6.98

8/6/98

To the Govt. Solicitor, with papers quoted above to be returned.

& complete file with G/O 5

Adv Genl

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Marine Department.

D/O. 877/6/98

To

The Hon. the Advocate General.

Dear Sir,

I am, by order of Government, making an official reference to you through the Government Solicitor for an expression of your opinion on the liability of the Madras Harbour Trust Board for damage caused by the encroachment of the sea to the north of the harbour, and now write to say that, should you require any further information as to the facts of the case or in regard to the extent of the Board's jurisdiction, &c., I shall be glad to furnish it.

~~Yours faithfully~~

The limits of the Port referred to in Schedule A of the Act will be found described in G.O.× 276 of 1.6.86 (Flag ★

My own view of the causes of the erosive action which is taking place will be found in my Note hereunder dated 14.4.98 Flag

× Marine Notification published at page 525 of Fort St. George Gazette of 4 June 86

B

It will be seen from G.O. No 694 W of 17 March 1882. ~~[illegible]~~ (flagged C) near the bottom of the file that Mr Parkes, the Engineer in chief who designed & constructed the harbour had no doubt that the erosion was principally caused by the Harbour walls, & this is the view which has been hitherto accepted & acted upon both by the H.T.B & Govt.

20.5.98

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A

[ 40/500 ]

Immediate

Marine DEPARTMENT.

Papers to be read in proceedings :—

Again G.O., dated 189 , No.

Again G.O., dated 189 , No.

Current No. 170 of 1898, dated 7th Febry. '98, from the L & M Deptt.
,, ,, 357 ,, 1898, ,, 23rd March 1898, ,, the Ch. H. T. Board.
,, ,, 344 ,, 1898, ,, 17th March 1898, ,, the L & M Deptt.
,, ,, 435 ,, 1898, ,, 12th April 1898, ,, the Ch. H. T. Board.

~~The Hon Sir Henry Bliss, K.C.I.E.~~ (2)
~~The Hon. Mr Grose C.I.E.~~ (3)

## ORDER.

(1) (To
The Local & Municipal Deptt.,
for counter-initials.)

The papers read above relate to the encroachment of the sea to the north of ~~the revetment on the north side of~~ the Madras Harbour.

2. The Harbour Trust Board has hitherto accepted the responsibility and borne the cost of protecting the foreshore, and has, up to date, spent a sum of Rs. 7,98,038 on this work, and intends in the coming year to spend a further sum of Rs. 65,000 in restoring and improving the existing revetment. It expresses its intention of maintaining the existing work in an efficient condition, but now questions the theory that the erosion of the foreshore is due to the existence of the Harbour groynes, and considers that if the threatened Municipal Sew-

age

J.W.C. 5.5.98

age farm lying to the north of the existing revetment is to be protected, the cost should be met not from Harbour, but from Municipal, Funds. It is contended that the sewage farm is not actually needed in the interests of the conservancy of the city, and that it is quite possible to make other arrangements for the disposal of the sewage. A sewage farm which necessitates the expenditure of at least 3 lakhs of Rupees for its preservation cannot, it is said, be regarded as a work of public utility.

3. In support of the statement that the present erosion is due to causes other than the harbour groynes, the Chairman submits plans showing high water marks at various periods between the years 1839 and 1898; also copies of plans prepared by Captain Rawlins in 1855 and 1861.

4. The capital cost of extending the revetment to the northern boundary of the sewage farm is estimated to be Rs. 3,19,520, while the only result would, it is stated, be to push the erosion further north. It would, it is considered by the Harbour Trust, be cheaper to leave matters in statu

quo and pay compensation, i.e. if the Harbour Trust Board is held liable.

5. The above statement represents the views of the Harbour Trust Board on this subject, but these views cannot be accepted as wholly correct. The Board maintains that the Harbour is not responsible for the erosion which is taking place to the north thereof because

(1) erosion was in progress long before the Harbour existed,

(2) if the Harbour was at fault, there would be a deep bay immediately to the north of it, whereas there is a projecting sandy foreshore, which has not retreated for 30 years.

(3) there are 2 distinct processes by which the sea attacks the land

(a) littoral drift when arrested by obstacles along the shoreline.

(b) direct attack of the sea.

6. With regard to (1) it is no doubt true that erosion took place as described, not only to the north, but also to the south of, and on the

Royapuram Railway terminus

site of the Harbour; but it is equally certain that the presence of the harbour has enormously increased that erosion to the northward and for the same reason that any obstacle on the shoreline produces erosion to leeward.

7. This action is due to the fact that the obstacle deflects the littoral current and wave action from their normal course and produces a circular eddy to leeward thereof. The greater the length of the obstacle and the more nearly its angle with the shore approaches a right angle, the more extensive is the eddy and consequent erosion caused. This is the explanation of the fact, brought forward by the Board in support of its argument, that there is no bay to the immediate north of the Harbour, as there is to the north of most, if not all, other obstacles on the coast. The length of harbour wall is so great — so much greater than any other obstacle on the coast, natural or artificial — that it protects the shore immediately to the north, and sends the eddying, and consequent erosive, action further onward. The bays immediately to the north of the two ends of the protective revetment are caused undoubtedly by those ends, but the influence of these obstacles only extends for a short distance, and the remaining erosion which is taking place along the sewage farm is due principally to the presence of the harbour as above described.

8. With regard to the different processes which cause erosion of the foreshore, they are, it is ~~unquestioned~~ believed, correctly stated by the Harbour Board to be as follows:-

(a) Littoral drift when arrested by obstacles along the shoreline.

(b) Direct attack of the sea.

Both are most difficult of explanation, and the present knowledge of the subject, even of those who have studied it most carefully, is not sufficient to admit of any definite decision being formed. But it is practically certain that by arresting the littoral drift the harbour is the main agent of the erosion complained of; and also that, in its immediate neighbourhood, it intensifies, by reflex action, the direct attack of the sea, & is partly responsible for the damage done, during last December, to Hamilton Cres. & the roadway in front of the Royapuram Railway terminus

9. His Excellency the Governor in Council is therefore of opinion, after careful consideration of all the circumstances

circumstances, that the proper view to take of this matter is that the harbour is principally, but not entirely, responsible for the erosion which is taking place to the northward, and the Harbour Trust Board may rightly be debited with not less than two-thirds of the cost of protecting the foreshore from erosion; the remaining third being met from Municipal or Provincial funds. The sewage farm is ~~believed to be~~ a most valuable property to the Municipality and if it is decided to retain it, a proportionate amount of the cost of preserving it from extinction should be contributed from Municipal funds. Meanwhile the views of the Municipality and the Sanitary Commissioner as to its retention or removal to another site will be obtained in the Local and Municipal Department. ^

It is thought that all ^ available sites have not been carefully considered, and further investigation should be made in this direction

10. With regard to the protective measures necessary, the Board, while disclaiming all responsibility, says that it has already spent Rs7,98,038 in protective work, that it proposes to spend Rs. 64,000 in the present

year in restoring and improving the section of the revetment, and that it intends to maintain the latter in an efficient condition. These proposals will probably satisfy all requirements, as far as the existing revetment is concerned, provided that larger stone, measuring not less than 2 cubic feet, is used for feeding it, and that some attempt is made to pack it at a uniform slope. It would also be well to protect the toe of the revetment with bags of Portland Cement concrete.

11. But something more is required to protect the roadway between the Harbour and Shands Press. This length of foreshore has been to some extent protected by the Harbour so far, but it seems certain that a heavy cyclone from the N.E. coming straight into this pocket, with full concentrated force, would work great havoc to the roadway and adjacent buildings, and very possibly breach right round into the Harbour. It is the universal practice, it is believed, to connect harbour walls with the adjacent shore by

what are called rootwalls, and His Excellency in Council is advised that this is what is needed here. A sea-wall should therefore be constructed from the northern arm of the harbour to the point where the road leaves the beach near Shands Press and there be joined to the existing revetment. Its toe should also be protected either by bags of Portland Cement concrete or by wave-breaker blocks. If the latter course was adopted the risk of damage from cyclones would, the Government is advised, be very small.

R.S.

5-5-98

The portion marked with red pencil in para. 9 does not appear to me to represent correctly the resultant of the orders given. See Hon. Sir H. Bliss' note of 15. April & Hon. Mr. Grose's of 19. April.

H.T.
6-5-98.

To

The Chairman, Harbour Trust Bd. with plans.
,, Examiner, P.W. Accounts.
,, Local & Municipal Deptt.

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Erosion to the north of the Madras Harbour

Marine DEPARTMENT.

READ the following :—

Letter from the Chief Engineer, Madras Railway Company, No. C. 189, dated 7th January 1898.

Letter from the President, Madras Municipal Commission, No. 1155, dated 1st February 1898.

Endorsement thereon in the Local & Municipal Department, No. 139, dated 4th February 1898.

Letter from the Chairman, H. T. Board, Madras, No. 5458, d/18th March 1898.

**FOR ORDERS.**

The Hon. Sir Henry Bliss K.C.I.E.
The Hon. Mr. Grose C.I.E.
H.E. the Governor.

C. no 357
14/4

The papers read above relate to the encroachment of the sea to the north of the revetment on the north side of the Madras Harbour.

2. The Harbour Trust Board has hitherto accepted the responsibility and borne the cost of protecting the foreshore, and has, up to date, spent a sum of Rs. 7,98,038 on this work, and intends in the coming year to spend a further sum of Rs. 65,000 in restoring and improving the existing revetment. It expresses its intention of maintaining the existing work in an efficient condition, but now questions the theory that the erosion of the foreshore is due to the existence of the harbour groynes, and considers that if the threatened municipal sewage farm is to be protected, the cost should be met not from Harbour, but from Municipal, funds. It is contended that the sewage farm is not actually needed in

in the interests of the conservancy of the city, ~~as~~ and that it is quite -- possible to make other arrangements for the disposal of the sewage. A sewage farm which necessitates the expenditure of at least 3 lakhs of Rupees for its preservation can not, it is said, be regarded as a work of public utility.

**FOR ORDERS.**

3. In support of the statement that the present erosion is due to causes other than the harbour groynes, the Chairman submits plans showing high water marks at various periods between the years 1839 and 1898; also copies of plans prepared by Capt. Rawlins in 1855 and 1861.

4. The capital cost of extending the revetment to the northern --- boundary of the sewage farm is estimated to cost Rs. 3, 19, 520, while the only result would be to push the erosion further north. It would, it is considered by the Harbour Trust, be cheaper to leave matters in statu quo and pay compensation, i.e. if the Harbour Trust Board is held liable.

M.

5. The above represents the views of the Harbour Trust Board on this subject - but it is submitted that these views cannot be accepted as correct. The Board maintains that the Harbour is not responsible for the erosion which is taking place to the north thereof because

(1) Erosion has been in progress long before the Harbour was started

(2) if ~~it was~~ the Harbour was at fault there would be a deep bay immediately to the north of it, whereas there is a projecting sandy foreshore, which has not retreated in 20 years.

(3) There are 2 distinct processes by which the sea attacks the land

(a) Littoral drift ~~which produces~~ when arrested ~~erosion in rear~~ by obstacles along the shore line

(b) Direct attack of the sea.

6. With regard to (1) it is, no doubt, perfectly true that erosion took place as described, but [illegible] to the

North, but also to the south of & in the site of the harbour. But it is equally certain that the presence of the Harbour has enormously increased that erosion to the Northwards ~~of the Harbour~~, & in the same sense that any obstacle on the shore line produces erosion to leeward ~~to lee of it~~. ~~i.e. on the side opposed to the prevailing wind & current. In the fact that~~

7. ~~with regard to (2) there is no~~. This action is due to the fact that the obstacle deflects the littoral current & wave action from ~~its~~ their normal course, & produces a circular ~~an~~ eddy to leeward ~~to lee~~ of itself. The greater the length of the obstacle, & the more nearly its angle with the shore approaches a right angle, the more extensive is the eddy & consequent erosion caused. This is the explanation of the fact brought forward by

Rt;

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the Board in support of its argument, that there is no ~~deep~~ bay to the immediate North of the Harbour. ~~The length of the Harbour walls is no great~~ as there is to the North most of all other obstacles on the coast. The length of the harbour walls is in fact so much greater than any other obstacle on the coast natural or ~~art~~ artificial, that it protects the shore immediately to the North & sends the eddying & consequent erosive action further ~~North~~ onward. The bays immediately to the North of the two ends of the protective revetment are caused, undoubtedly, by these ends ~~latter~~; but the influence of these obstacles only extends for a short distance, & the remaining erosion which is taking place along the Lenage farms is due principally to the ~~[illegible]~~ presence of the harbour as above described.

8. With regard to the different processes which cause erosion of the foreshore, they are I think correctly stated by the Harbour Board here as follows.

(a) Littoral drift when arrested by obstacles along the shoreline

(b) Direct attack of the sea.

Both are alike ~~much~~ most difficult of explanation, & the present knowledge of the subject even of those who have studied it most carefully is not sufficient to admit of any definite ~~expression~~ of decisions being formed.

I have lately been reading a long ~~ad~~ paper on the subject of littoral drift which was read before the Institution of Civil Engineers in 1896, & evoked much discussion & correspondence, & I have been studying on the spot the erosion which has taken place of the foreshore at Tellicherry, which must be due to the direct action of the sea.

The general conclusions arrived at concerning the former was that ~~it depends~~ the travel of sand &c along the shore depends on the direction of the prevalent winds blowing towards the shore, & that when that travel is arrested artificially, as in the case of the Madras harbour, sand is deposited on the windward side of the obstacle, & erosion takes place to leeward, partly because the supply of sand is cut off, partly because of the eddying action caused by the obstacle. In proof of this theory it may be stated that sand is deposited to the North of the harbour during the N.E. monsoon - and ~~but~~ there are numerous instances of it on the shores of the ~~English~~ British Isles & adjacent continent. The sand

9. is not all taken from the ~~sh~~ foreshore & deposited further on

much of it comes from the depths of the sea.

9. The direct action of the sea is still more difficult to explain. I examined the log kept by the Port Officer at Tellicherry, and found that, if the information there entered is correct, the direction and force of the wind, the direction of the current and the condition of the surf were practically identical on the days preceding, during and subsequent to the erosions; the only unknown factor was the strength of the current, and I have taken steps to have this measured in future. I could arrive at no definite conclusions from the figures before me, but it is certain that the sea may erode the shore at any time during the prevalence of high winds and surf. It was the heavy weather in December last which caused the destruction of sand piers and the erosion of the road way in front of Royapuram Railway Terminus, complained of by the

President of the Madras Municipality in his No 1155 of 1 Feb 1890. The harbour was not responsible for this.

10. I think therefore, that the proper view to take of this vexed matter is that the harbour is primarily, but not entirely, responsible for the erosion which is taking place to the northward, and the Harbour Trust Board may rightly be debited with not less than $\frac{2}{3}$rds of the cost of protecting that part of the shore from erosion. The remaining third should be met from municipal or provincial funds.

11. With regard to the protective measures necessary, the Board while disclaiming all responsibility, says that it has already spent Rs 7,90,036 in protective works, that it proposes to spend Rs 64,000 in the present year, in restoring and improving the section of the revetment, and that it intends to maintain the

latter in an efficient condition.
These proposals will I think satisfy
so far as the existing revetment is concerned
all requirements, provided that
larger stone, measuring not less than
2 cubic feet, is used for feeding
~~the revetment~~ it, and that some attempt
is made to pack it at a
uniform slope. It would also
be well to protect the toe of the revetment
with bags of P. cement concrete.
But I think something more is
required to protect the roadway
between the harbour & Islands
Beers. This length of foreshore
has been to some extent protected
by the Harbour, so far, but it seems
to me certain that a heavy cyclone
from the N-S coming straight into
this pocket ~~[illegible]~~, with full
concentrated force, would work
great havoc to the roadway &
adjacent buildings, & very probably
breach right round into the
harbour. It is the universal
practice, I believe, to connect

harbour walls with the adjacent
shore by what are called root
-walls - & this I think is what
is needed here. I would therefore
recommend a sea wall from the
Northern arm of the harbour to
the point where the road leaves
the beach near Islands bee
& there join it to the existing
revetment. Its toe should also
be protected either by bags of
cement concrete, or by mass-
cement concrete blocks. If the latter course is
adopted I believe the ~~[illegible]~~ risk of
damage from cyclones would be
very small.

12. The question of the protection
of the Sewage farm has to
be considered. For recent
discussions & decisions on this
please see papers flagged
The Harbour Board denies
responsibility for this erosion

or ~~pri~~ lots. reasons given above

it is submitted that this view

cannot be accepted, ~~that the~~

~~Harbour is the principal cause~~

~~of the erosion. It is certain~~

~~that the sewage farm cannot be~~

~~man~~ the prophecy of the Harbour

Board Engineers that no further erosion

would take place has been, as

might have been expected, ~~fully~~

~~fully~~ unfulfilled, & it is certain

that the sewage farm cannot be

maintained in its present position

by protective work of some kind.

The question therefore resolves itself

into

(1) Shall the farm be maintained

(2) who is to pay for its maintenance

In regard to (1) the Chairman Harbour

Bd. proposes to allow the sewage course

& fall into the sea. But this course

I submit, untenable. It is

a criminal waste such

splendid stuff, & I do not think

Mr Atkinson can have been

the results of the

farms. The President M.C.

says that no other suitable site

exists for a sewage farm, but that

a possible site can be found south of the

Cotton Canal, & that the cost of

~~transferring~~ ~~extending~~ the sewage farm to

this point would be Rs 1,76,640

vide G.O. 160 Marine 19 Aug 96 —

He however, deprecates the transfer

from a sanitary point of view, owing

to the nature of the soil & the

lie of the land.

Flag A

I think that further search should

be made for a suitable site & the

a possible one seems to be the recent

sand accretion on the beach

to the south of the harbour, between

the proposed dock site & the

farm, if properly conducted &

cared for, a sewage farm is inoffensive

But besides, the conditions in

I doubt if the beach would be suitable

of another site is obtain

I think the present farms should
be protected by a revetment. This
would cost, as estimated by the
H.T.B. Rs 3,19,520, & its effect would
no doubt be up to push the erosion
further North, but as no effect is
feared if we protect the sewage farm
this consideration need not affect
influence our decisions.

The cost of ~~this~~ constructing a main
facing this revetment should
I think be borne by the Municipality
& the H.T.B. in equal shares.

Because
(1) The harbour is the principal cause
of the erosion
(2) The sewage farm is very profitable
to the Municipality, & a very ne-
(3) ~~The cost of the~~
cessary adjunct to its sewage system.
(4) The cost of transferring the
farm to the Cotton Canal, if the
sea is allowed to encroach on the
existing farm at will, would
[be] greater than the Municipality's
share above proposed of cost of protecting
the existing site

12.4.98

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Ch. No.

Ch. 35

I suppose the question
re sewage farm
must go to the L. & M.
Dept. for disposal?

26.4.98

W

This is a matter for
the Local and Municipal
Dept. which can be
brought into the order
when this is drafted.

R.S.
26 Ap 98

C. No 435

W

Proposed to circulate to Hon: Members, H.E.'s note d/14-5-98. It is not certain that they will agree to the proposal as your note argues in favour of a division of the cost – to which they are opposed.

C.S.
16 May 98

Ex

17.5.98

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C. No 436

C. Circ

H.E.'s orders now are opposed to the Member's decision. Kept with the paper to be recirculated before definite orders are issued?

5.5.98

W

It was intended to recirculate the papers after the draft had been counter-initialed in the Local and Municipal Depts. The circulation to Hon: Members is now marked. It does not seem necessary to recirculate to H.E. unless Hon: Members object to the draft.

C.S.
5 May 98

No

5.5.98

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# Marine (1898) Department.

D/O **CURRENT No.** 9

*Order*

*From*

Col. Sir George Moore
President, Municipal Commission
Madras

*No.* -

*Dated* 17.5.98

*Received* 4-6-98.

*Enclosures* one

*Spare copies* -

SUBJECT.

Black Town Sewage Farm

Forwarding a copy of the Committee's report on the — dated 3rd March 1898

M. 4.
500—14-6-97.

BACK PAPERS.

| No. | Date. |
|---|---|

FURTHER PAPERS.

| No. | Date. |
|---|---|

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## Report of the Committee appointed by the Commissioners at their Meeting held on 3rd March 1896, to consider G. O., No. 2140 M, Local and Municipal, dated 21st December 1895, passing orders on the Drainage and Water supply schemes of the City of Madras.

### Members.

Lt.-Col. G. M. J. Moore, C. I. E., *President.*
M. R. Ry. R. N. Pragasa Mudaliar, Avargal.
Surgeon Lt.-Col. J. Maitland.
The Hon'ble P. Rungiah Naidu Garu.
M. R. Ry. V. Varadappa Naidu Garu.
„ P. Theagaroya Chetty Garu.
H. Ormerod, Esq.

The Committee held five meetings, of which one was at Manally.

The Committee, before expressing an opinion upon the system of House connections advocated by Mr. Loane, that is connecting the front of the houses with the sewer instead of the backyards as proposed by Mr. Cousins, considered it desirable to have a practical test. Accordingly it was determined to lay a 9" sewer down Parish Venkatachella Iyer Street, Black Town, discharging into No. I sewer, and connect the houses with it.

2. 11 house connections were made and the sewer laid in September 1896 at a cost of Rs. 2,910.

3. They also deemed it advisable to have a plan and levels taken of the proposed site for the Sewage Farm at Manally on the west of the Cochrane Canal, and an estimate of the cost of preparing the land.

4. It was found that the land available was approximately 270 Cawnies, but 130 only were dealt with, and the estimate, taking the value of the land at Rs. 600 per Cawny, amounted to Rs, 3,91,934.

5. The Committee inspected this site and were satisfied that it was not a suitable one for several reasons, the principal one being that there was no outfall for surplus sewage which would have to be discharged into the Canal. Taking into consideration the fact that as much land as could be required was available to extend the existing Black Town Farm towards the North, the soil of which has proved to be eminently adapted to Sewage farming, and that the cost of extending the main from Manally to the present Outfall channel would be about Rs. 1,55,000 and that the cost of 130 Cawnies in that locality would not be more than Rs 1,56,000, making a total of Rs. 3,11,000 against Rs. 3,91,934 for the Manally Sewage Farm, and in the view of the opinion expressed by the Committee appointed by Government in 1890 to the following effect—"They consider the existence of this Farm to be in no way objectionable, and as land for its extension is available to a practically unlimited extent, *no better final outfall could be obtained*"—the Committee recommend that the final outfall should be at the present Black Town Farm.

6. The Committee advocate the High Level Iron Main from Triplicane to Black Town Farm with Pumping stations at Kistnampett, Chintadripettah, Langs Gardens, Choolay and Tondiarpett. That the sewers should be laid with provision for house connections where found suitable—the connections referred to above

in Parish Vencatachella Iyer street having proved very satisfactory-that existing side drains may be connected with the sewers, that side drains should be constructed where house connections are unsuitable.

7. The Committee have not so far dealt with Mylapore but they recommend that the grant of 3½ lakhs given by Government should be devoted to this purpose and that Mylapore should be taken in hand *at once* and drained on the house connection system, the sewage being turned on to a temporary Sewage Farm on Barber's Bridge Rubbish Depôt, to be eventually led into the Outfall main at Triplicane.

8. The accompanying abstract shows that excluding Mylapore the total cost of construction would be Rs. 28,81,100.

9. Mr. Loane's original estimate including Mylapore, carrying the Outfall main to Manally, amounted to Rs. 27,25,000.

10. It will, however, be seen that this abstract provides Rs. 2,49,000 for extension of Sewage Farms to an extent of 208 acres, and also for an increased length of Outfall calculated above to cost Rs. 1,55,000, making a total of Rs. 4,04,000, which if added to the Rs. 27,25,000 gives a total of Rs. 31,29,000 or almost the same as the present figure.

11. It is, however, proposed to alter the line of the Outfall main by not taking it to Manally, but crossing the Canal at Basin Bridge, down Basin Bridge Road and Old Jail Street along Monegar Choultry Road, across to Suria Narayana Chetty Street, thence straight north to the northern limit of the Farm. This will do away with the present open Outfall channel and a portion of the existing 24" main.

12. It will be seen that out of the 3½ lakhs given by Government, the drainage of Mylapore is only estimated to cost Rs. 3,00,000.

13. The Committee recommend that the remaining Rs. 50,000 be utilized as follows:—

14. That the drain along Ice House Road, which from where it turns off to the south, round the Hindu Burial and Burning ground, is nothing but an ordinary ditch drain, should at once be converted into a pipe sewer in anticipation of its forming one of the components of the Triplicane section. This is estimated to cost about Rs. 35,000.

15. That the present open masonry and ditch drain along Sydenham's Road be also converted into a pipe sewer leading into D'Mellows Road Farm in anticipation of its forming one of the components of the Choolay Section—thus abolishing the long complained of nuisance in the People's Park—this is estimated to cost about Rs. 15,000.

16. With reference to para 6 of the report, the Committee would recommend that the High Level Iron Main be the first work undertaken and that a sum of 12 lakhs be allotted in the first instance.

(Signed) G. M. J. MOORE,
( „ ) P. THEAGARAYA CHETTY.
( „ ) R. N. PRAGASA MUDALIAR.
( „ ) P. RUNGIAH NAIDU.
( „ ) V. VARADAPPA NAIDU.
( „ ) H. ORMEROD.
( „ ) J. MAITLAND.

MUNICIPAL OFFICE,
MADRAS,
*6th November* 1896.

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ABSTRACT REFERRED TO

To
THE PRESIDENT,
M. M. C.

SIR,

With reference to the proposals made by the Drainage Committee, the cost of execution and maintenance of the works may be sub-divided as under. The cost of pumping has been included, but it has been found that the rental of the Farm pays for the pumping when sufficient area is provided and the sewage not allowed to run to waste.

| — | Maintenance per annum. | Construction. |
|---|---|---|
| | Rs. | Rs. |
| *Mylapore.* | | |
| Drainage and house connections ... ... ... ... ... | | 3,00,000 |
| Cost of Pumping to Barber's Bridge Farm ... ... ... ... | 5,000 | |
| Conservancy for flushing ... ... ... ... ... | 5,350 | |
| | 10,350 | 3,00,000 |
| *Chintadripett and North Triplicane.* | | |
| Outfall main from Black Town to Chintadripett ... ... ... | | 7,16,500 |
| Sewers ... ... ... ... ... ... ... ... | | 2,68,000 |
| House connections 5,000 ... ... ... ... ... | | 1,00,000 |
| Pumping machinery 2/45 I. H. P. Engines and Boilers ... ... | | 20,000 |
| Engine house, well and Drivers' quarters ... ... ... ... | | 17,000 |
| Extension of Farm 70 acres at Rs. 1,200 ... ... ... ... | | 84,000 |
| Cost of pumping Rs. 31,000—Rs. 6,000* ... ... ... ... | 25,000 | |
| Conservancy for flushing &c. ... ... ... ... ... | 7,500 | |
| | 32,500 | 12,05,500 |
| *Meersapett and South Triplicane.* | | |
| Sewers ... ... ... ... ... ... ... | | 2,10,000 |
| House connections 3,500 ... ... ... ... ... | | 70,000 |
| Pumping machinery 2/40 I. H. P. Engines and Boilers ... ... | | 16,000 |
| Engine house, well and Drivers' quarters ... ... ... ... | | 17,000 |
| Extension of outfall ... ... ... ... ... ... | | 81,000 |
| Extension of Farm 40 acres at Rs, 1,200 ... ... ... ... | | 48,000 |

* Existing charges.

| —— | Maintenance per annum. | Construction. |
|---|---|---|
| | Rs. | Rs. |
| Maintenance pumping Rs. 30,000—Rs. 10,000* ... ... ... | 20,000 | |
| Conservancy ... ... ... ... ... ... ... | 5,250 | |
| | 25,250 | 4,42,000 |
| *Egmore and Komaleeswarenpett.* | | |
| Sewers ... ... ... ... ... ... ... | | 1,50,000 |
| House connections 2,000. ... ... ... ... ... | | 40,000 |
| Pumping machinery 2/18 I. H. P. Engines and Boilers ... ... | | 8,000 |
| Engine house, well and Drivers' quarters ... ... ... ... | | 12,000 |
| Branch to outfall ... ... ... ... ... ... | | 13,000 |
| Extension of Farm 20 acres at Rs. 1,200 ... ... ... ... | | 24,000 |
| Maintenance pumping ... ... ... ... ... ... | 10,000 | |
| Conservancy ... ... ... ... ... ... ... | 3.000 | |
| | 13,000 | 2,47,000 |
| *Choolay.* | | |
| Sewers. ... ... ... ... ... ... ... | | 3,50,000 |
| House connections 6,000. ... ... ... ... ... | | 1,20,600 |
| Pumping machinery 2/42 1. H. P, Engines and Boilers. ... ... | | 17,000 |
| Engine house, well and Drivers' quarters. ... ... ... ... | | 17,000 |
| Extension of Farm 38 acres at Rs. 1,200. ... ... ... ... | | 45,600 |
| Pumping maintenance Rs. 30,000—Rs. 10,000 * ... ... ... | 20,000 | |
| Conservancy. ... ... ... ... ... ... ... | 9,000 | |
| | 29,000 | 5,49,600 |
| *Tondiarpett and Royapuram.* | | |
| Sewers. ... ... ... ... ... ... ... | | 2,70,000 |
| House connections 5,000. ... ... ... ... ... | | 1,00,000 |
| Pumping machinery 2/15 I. H. P. Engines and Boilers. ... ... | | 7,000 |
| Engine house, well and Drivers' quarters. ... ... ... ... | | 12,000 |
| Extension of Farm 40 acres at Rs. 1,200. ... ... ... ... | | 48,000 |
| Pumping maintenance. ... ... ... ... ... ... | 10,000 | |
| Conservancy. ... ... ... ... ... ... ... | 7,500 | |
| | 17,500 | 4,37,000 |

* Existing charges.

## ABSTRACT.

| —— | Pumping. | Conservancy. | Construction. |
|---|---|---|---|
| | Rs. | Rs. | Rs. |
| Mylapore ... ... ... ... ... | 5,000 | 5,350 | 3,00,000 |
| Chintadripett ... ... ... ... ... | 25,000 | 7,500 | 12,05,500 |
| Meersapett ... ... ... ... ... | 20,000 | 5,250 | 4,42,000 |
| Egmore and Komaleeswarenpett ... ... ... | 10,000 | 3,000 | 2,47,000 |
| Choolay ... ... ... ... ... | 20,000 | 9,000 | 5,49,600 |
| Tondiarpett ... ... ... ... ... | 10,000 | 7,500 | 4,37,000 |
| TOTAL... | 90,000 | 37,600 | 31,81,100 |

PUBLIC WORKS DEPARTMENT,
MUNICIPAL OFFICE,
*Madras, 29th October* 1896.

(Sd.) R. E. ELLIS,
*Engineer, M. M. C.*

The provision for house connections is made with reference to para 6, should it be considered desirable to construct them.

Please reunite this
with the Hardrow
Erosion file

3 6 58

H.C.
Papers to be
added to the
file
4 June 58