2. Date
3. Initials

M.R.O. 1—82,400—

MADRAS RECORD OFFIC

Government of Madras.

Public Works DEPARTMENT.

Cons 1-4-57

G.O. No. 57 Press Mis.

5-6

Dated 1- 4- 1857

Not to be folded or roughly handled

For Consn reference.
15/9/43.

Fort Saint George, Public Works Consultation of 7th April 1857.

No. 5. Read the following letter from Colonel C. E. FABER, Chief Engineer; to H. FORBES, Esq., Acting Secretary to Government, dated 3rd March 1857, No. 10619.

SIR,

On the 17th December last, Captain Rawlins in charge of the defensive works of the seaboard, submitted the Report called for on the 11th Idem, on the action of the several series of groins recently constructed for the protection of the coast, and also on the effects upon those works produced by the severe gales which had been experienced on the 20th November and 9th December.

2. The intervention of the usual Christmas recess, and the stress of Office work caused by the preparation of the Annual Budget, delayed the issue of practical instructions to meet the exigencies of the occasion, until the 16th of the following month. The Superintending Engineer, in temporary charge of the Central Circle, after carefully inspecting the whole line of coast, drew up a Memorandum for Captain Rawlin's guidance, and this paper which formed the basis of the detailed instructions under which the Executive Officer has since acted, was forwarded to Captain Rawlins on the above date, with a letter pointing out, that "the whole subject cannot be advan- "tageously laid before Government until it can be stated with moderate precision, what outlay "from the present balance of Rupees 38,309-14-3 will be required &c."

3. On the 26th February Captain Rawlins, who in the meanwhile has been appointed to officiate in the newly created appointment of Garrison Engineer, forwarded a rough estimate of the probable expense of the operations recommended for the repair and security of the defensive works of the coast; so that the matter being now ready for the consideration and orders of Government, I do myself the honor to forward herewith.

1st. A copy of Captain Rawlin's letter No. 393, dated 17th December 1856.

2nd. A copy of Lieutenant O'Connell's letter No. 9531 of 16th January 1857, with Memo. from the Superintending Engineer in charge of Central Circle of P. W.

And 3rd. Copy of Captain Rawlin's letter No. 27 with Plan and estimate amounting to Rupees 28,350 dated 1st but not forwarded or received until the 26th Idem.

4. It is to be observed in limine, that a comparison of the stretch of sand at low tide, as exhibited in the accompanying plan, will convey a more practical view of the effect of the groins than could be communicated by any written descriptive details, however elaborate, and I would accordingly beg leave to recommend a careful consultation of the survey herewith forwarded.

5. It is to be remarked of the two gales of wind, that, whilst the longer and apparently more severe weather of the 20th and 21st November did little or no mischief to either groins or accumulation of Beach, (thus affording grounds for tolerable confidence in the protective agency of the former,) the briefer and less violent visitation of the 9th December, did much damage, and occasioned all, or nearly all the injury described in Captain Rawlin's first report. That defectively selected material has been one cause of the structural derangement of both the heads and stalks of the groins admits in my opinion of very little doubt, and however comparatively economical may be the use of water-worn and rounded stones, it seems clear from the manner in which they have been displaced and rolled over to the southward, with a liability in some places of forming serious obstructions to Massoolah boats, that only stones with sharp well defined angles, admitting of close package should be used in marine groins. It would appear also that the dimensions and consequent weight of the masses composing the heads of the groins should be considerably in excess of those at present composing the exposed parts of the works; a minimum of two tons might be advantageously enforced, and every encouragement should be held out to bring stones weighing as much as 3 tons, with well defined faces, and sharp angles, if even it should be necessary to have them expressly blasted for the purpose.

6. Upon the whole, the effect of the groins, however short it may have fallen of what might have been hoped, cannot I think when regard is had to the short period of their construction, be considered to have disappointed reasonable expectation. In the 15th para. of his first letter, Captain Rawlins indeed ascribes the preservation of the fishing hamlet in north Royapooram solely to the defence of the new groins, and he considers that the village would have been entirely washed away, if the Northern groins had not been constructed. It is

to be remarked also, that the specious plateau and broad road which form so conspicious an improvement on the former restricted space, between the Custom House and Clive's Battery, have suffered no injury from the action of the sea or surf, and would have escaped entirely unhurt, but for the channels formed by inland surface drainage. Viewing the exceeding accommodation afforded to the trade of the Port by the area that has been re-claimed by groins Nos. 14-15 and 16, it perhaps is scarcely an exaggeration to state, that the extra convenience obtained in this one locality, at one time, and for long considered hopelessly impracticable, would have been thought cheaply purchased at an expense far greater than the cost of those three most effective works. It is more common however to over-look what has been gained when in the enjoyment of the acquisition, and to direct the attention to what has *not* been accomplished, than to take a candid and comprehensive view of the whole line of coast as it was left by the recent gales, and to compare its recent condition with what it has been hitherto, after former similar visitations.

7. It certainly admits of no doubt, that some portions of Colonel DeHavillands noble Bulwark were exposed, and that the groins were insufficient for full protection in such localities, but it cannot be too frequently repeated and insisted upon, that time is an indispensable element in fully developing the results of groin agency. Another matter to be equally prominently borne in mind is, that, as the rationale of the influence of those works is an Artificial arresting of the sand kept in movement by the litteral Current along the Coast, so is it evident, that as the number of groins is multiplied, the simultaneous individual action of each is diminished. In proportion therefore as the number of groins is augmented, the ultimate accumulation from each must be defined, and results that were rapid and obvious, when there were but three or four works (and those of considerables aliency), to intercept the whole body of sand in movement along the coast, are necessarily tardy and more gradually progressive when three whole series, 24 in number, have been constructed within a space of little more than three miles.

8. It being thus, and from the very nature of things, the undoubted character of groins to fulful their object by degrees at all times, and slowly in proportion to their number, it seems to me clear, that we have now only to await the ultimate results of the works already constructed with patience, whilst the process of consolidation and of gradual elevation of present deposit is going forward. That with every gale of wind, somewhat, or even much of what has been accumulated, will be swept away temporarily, I entertain no doubt; but I am no less confident that such losses, besides being rapidly replaced, will become less and less as the trials are further apart, until finally, for all practical purposes, the spaces reclaimed by the groins may be regarded as permanent acquisitions.

9. It is easy, and perhaps not untrue, to predicate that not a vestage of the new deposits would be left, and that even the works creating them would be destroyed, if the Madras gales were to be prolonged for as many days, as commonly they do actually prevail for hours. But if it has been uniformly observed, that in point of fact, the duration of severe weather is never very great, seldom if ever exceeding two or three days at a time, I would respectfully submit, that the foregoing objections, which have been urged in my presence, are not of any real practical validity. It surely is sufficient to adapt the artificial works for the protection of the coast, to the nature of the trials which experience shews may fairly be expected; and in the combat with an imaginary adversary, indifference towards his process is not indiscreet, be it ever so great.

10. I am unable to recommend the construction of any further intermediate groins, and the result of my own reflection and of my reference to Colonel Arthur Cotton, is, that it is not only undesirable on the score of expense to erect a second bulwark wall of small section, but there is good reason for an apprehension that such a work would prove very dangerous to the goods and passengers traffic of the Port.

11. I do not even support the Executive Engineers proposition for the erection of dwarf retaining walls either for the roadway near the Fort, or for the plateau and communication on the North Beach. It may probably be advisable hereafter to construct such revetments, but at the present moment I consider that their construction would be premature.

12. The following quotation contains the opinion of the elder Cotton. "The whole "Beach is now in a satisfactory state, but we must expect that storms will for some time to

"come, take away almost all that has been deposited in some places. I would not go to any "further expense, excepting in putting a few large stones at the ends, and I certainly would "not put a second line of Bulwark, as I am convinced the groins will in time, fully answer "their purpose, and moreover I think an outer-facing extremely objectionable on account of the "boats, and for the same reason, the small round stones at the groin ends, I think very ob-"jectionable" and although these professional views are not placed on *Official* record by their distinguished author, I trust that their is no breach of the social canon in placing them before Government.

13. I beg to solicit early sanction for the several outlays and measures detailed by Captain Rawlins for the security of the Marine villa, and for the better regulation of the debouchure of the River Cooum. It is particularly desirable, that the pent up waters of that stream should not be again delivered to the South of groin No. 6, and this is only to be effected by the current being prevented from working round the stalks of the groins.

14. In para, 5 of his Memo. of the 16th January, Captain Johnston has recommended, that the Northern line of the Cooum shall be defined by a row of piles. With the steam apparatus now at command there is no doubt that a very effective work could be constructed of the kind projected by the Superintending Engineer, but it is for the Government to decide whether the necessities of the case will not be fully met by strengthening the Southern Bank. The stream coming through the Wallajah bridge has a Southern direction, and at the season when the section of the bar is necessary, high winds prevail from the N. N. E. and N. E. impelling the waters to the Southward, where alone mischief is to be apprehended. On these considerations, the Government may perhaps think it proper to oppose no artificial obstructions towards any additional width of the discharge towards *the north*. If extension to the southward be positively debarred by the strengthening of groin No. 6, and if the northern boundary be-likewise restricted by piles far too well driven to be undermined, sectional capacity can only be obtained by additional *depth*, and whilst this scouring process is going forward, rapid as it assuredly will be, I should fear lest the waters of the Cooum, being bunded back, the premises of Messrs. Frank, Messrs. Taylor and others, having property adjacent to the river, and below its flood level, would be inundated. If however the Executive Engineer Captain Rawlins can satisfy himself, that the outfall of the river will be sufficiently capacious for the two streams that unite near the Marine villa, when the northern boundary is defined, without heading back the waters into Messrs. Frank's premises, which his levels will ascertain, it will contribute to the early establishment of the proper regimen of the river and benifit the Canal navigation, to put down the piles projected by Captain Johnston. But it ought not to be overlooked that if the depression of the bed of the Cooum mouth exceed that of the river Corteliar at the bar at Ennore, this latter, which his so invaluable for the Cochrane's Canal supply, may be expected to close before, instead of after the river Cooum, and thus the navigation, notwithstanding the construction of the Shadiencoopum Lock will be on a worse footing than used to be the case, when the Ennore river remained open for some weeks after the self closure of the Cooum.

15. No new grants of money being required, but only a re-distribution of existing cash balances, I hope that the early authorization of Government will not be witheld, and I should propose to instruct Captain Rawlins to place himself in communication either with the Superintendent E. C. Canal or in his absence, the Assistant Executive Engineer Mr. Konig, so as to consult the interests of the Canal navigation in the measures to be ultimately adopted for the management of the works at the mouth of the Cooum.

16. It may not be undeserving of mention, in conclusion, that since the opening of the new road between the Fort and the Sea, a line of much more continuous communication, and of much greater general convenience and utility than before, has been interrupted by the prolonged discharge of the river Cooum, so that whatever reasons formerly existed in favor of a permanent road along the south Beach are clearly greatly strengthened now; and it perhaps is questionable whether any measure of local improvement and convenience, greater than a bridge over the outfall of the Cooum, could be devised.

No. 6. ORDER THEREON, No. 597; dated 1st April 1857.

1. The papers submitted with the foregoing letter, relate to the effects produced by the storms of November and December last on the groins along the beach, and to the measures suggested for their repair and for the further protection of the coast.

2. The state of the several groins after the storms, is reported upon in Captain Rawlins' letter of the 17th December 1856; and the works proposed for execution in connection with them, are detailed in that Officer's letter of the 17th February last, and are as follow:

Repairing and lengthening the rear or land side of groins 1 to 4 at the Marine villa, at a cost of Rupees 81-4.

Repairing and raising groins 5 & 6, both of which have sunk considerably in consequence of the impingment of the current from the Cooum, at a cost of Rupees 2,777-8.

Throwing up an embankment from the road close to the Marine villa railings, so as to prevent the Cooum, during high freshes, forcing a channel for itself through the low ground between the villa and its present bank; also for repairing the small sluices leading from the Government park, and providing swinging shutters for the escape of drainage water from the villa, and the exclusion therefrom of the river water; the cost of these works being estimated at Rupees 541-14.

3. As the foregoing repairs and improvements are evidently necessary, and are recommended by the Chief Engineer, the Right Honorable the Governor in Council authorizes their immediate execution, at a total cost of Rupees (3,400) three thousand and four hundred; the amount being disbursed from the sums already sanctioned for the groins and other works connected with the beach.

	Rs.	A.	P.
Repairing groins 1 to 4	81	4	0
Do Do 5 & 6	2,777	8	0
Embanking the Cooum and repairing sluices on the Marine villa side of the river	541	4	0
	3,400	0	0

4. In para. 5 of his Memo. of the 16th January last, Captain Johnston recommends that the Northern bank of the Cooum should be defined by a row of piles. But for the reasons fully stated by the Chief Engineer in para. 14 of his letter, the Government concur with him that it is unadvisable to oppose any obstructions to the free discharge of the water towards the North. When the river opens its bar, the great object to be attained is to let it make for itself a wide mouth as soon as possible, and any work that tends to narrow the opening is likely, in the opinion of Government, to produce the evils apprehended by Colonel Faber.

* Memo. para. 8.

5. Captain Johnston also recommends* the extension of Arbuthnot's jetty groin, on the ground that it is a most desirable measure if regarded only as an experiment. The cost of its extension fifty yards seawards, is estimated by Captain Rawlins at 16,600 Rupees. The Chief Engineer has expressed no opinion on the subject, and the Government are not disposed to sanction a further expenditure of so large an amount on this groin.

6. Captain Rawlins proposes the construction of a dwarf wall between Arbuthnots and Clive's Battery groins, a distance of 2,187 feet, and estimates the cost at Rupees 5,000. He advocates the work on the ground that it will answer the purpose of "keeping up the plateau from crumbling and slipping down, and of preventing the fritting or cutting away of the edge by rain water and drainage;" but he at the same time admits its liability to be undermined during unusual gales, and doubts whether it would be prudent now to run the risk of its construction. The Chief Engineer does not support the project, and the Government agree with him that it would be premature at present to undertake it.

7. Captain Rawlins also submits an Estimate for constructing a bulwark stone revetment along the face of the beach, of about one-third the sectional area of that of DeHaviland's, as suggested by Captain Johnston in paras. 11 and 12 of his Memo. already quoted. He calculates that the cost of such a revetment would be Rupees 45,360, if it be constructed entirely of new stone; Rupees 11,340, if all the stone be taken from DeHaviland's bulwark; and Rupees 28,350, if half be taken therefrom, and the other half obtained

from the quarries. The Chief Engineer expresses* his decided opinion that such a bulwark is not only undesirable on the score of expense, but that there is good reason to apprehend that it would prove very dangerous to the goods and passenger traffic of the port; and he supports his opinion by quoting the views on the subject entertained by Colonel Arthur Cotton. In these views, the Government entirely concur.

* Para. 10.

8. In the concluding para. of his letter, Colonel Faber adverts to the interruption of the line of communication recently opened between the fort and the sea, by the prolonged discharge of the Cooum, and advocates the construction of a bridge over the out-fall of the river as a desirable measure of local improvement and convenience. It is possible that a bridge built on piles sunk 25 feet would answer the object in view, but the Government regard such a means of communication at this place, more as a luxury than as a necessity, and they would be prepared to sanction the construction of a bridge, only if money were readily available, which is not now the case.

9. The Government observe that the Chief Engineer has omitted to send the plan of the whole length of beach, to which he invites the special attention of Government in para. 4 of his letter. These omissions to forward documents necessary to a correct understanding of the schemes proposed are very unsatisfactory, and reflect little credit on the Department which Colonel Faber controls.

(Signed) H. FORBES,
Acting Secretary to Government.

№ 9531

(11)

From

The Assistant to the Chief Engineer

To

Captain Rawlins

1st. Assistant Civil Engineer

On Special duty.

"Public"

Groins at Madras

Sir,

I am directed to acknowledge the receipt of your letter № 393 dated 17th December 1856, and to state that the Chief Engineer concurs generally in the recommendations in which you have made for proceeding with the repairs of the groins, but he would particularize the following items, and request your early attention in carrying them out.

2. Colonel Faber desires me also to forward herewith a copy of the Inspection Report of the Superintending Engineer in charge of the Central Circle of P. W., which he considers you may peruse with great advantage.

1st № 1. 2. 3. and 4 groins to be connected with the beach in their rear.

2nd № 5 groin to be completed, its present low and small head being raised to the same level as № 6, if sufficient stones can

can be obtained from Nos 1. 2. 3. and 4. which are now unnecessarily high.

3d. A bank to be carried from the road close to the railings of the Marine Villa along the bank, as far as the levels may render necessary. the bank to be 3 feet or 3.° 6 in height where the ground is lowest to be planted with hares foot creeper, and provided with a small sluice, with a swinging shutter on the river side, so that drainage water may pass from the Marine Villa into the river, while the river is excluded from the Compound.

4th. The groins to the west of No 6 to be connected with the bank mentioned in the last para. by banks of earth 3 feet in width at top, carried at the same level in 3½ feet above the lowest part of the Marine Villa Compound.

5th. Groine No 6 to be raised to a level nine inches below the surface of that portion of the road which is close to the Northern extremity of the Marine Villa Railings.

6th. The Roadway washed away between Groins Nos 11 and 12 should be immediately repaired, and the heads of the latter and of No 13, which have been partially destroyed

(B)

destroyed, should be strengthened by the addition of new stones, raising the whole to a level of 4 feet above high spring tides;- the stones shifted to one side by the late storm should form the base of a portion of the new head, and not be moved from their present to any other place

7th. No 14 or Arbuthnots' Groin which has sunk, should have a massive head given to it.- the surface being 6 feet by 6 feet and raised 4 feet above high water- the rest of the groin to be brought to the level of low water.

8th. The Custom House groin to have its head repaired and strengthened, so that it may have the same height as it had before the storm.

9th. The same to the Clives' battery groin.

10th. Groins 17 to 22 to be repaired and completed, but not extended at present.

3 I am further directed to request, that you will furnish the Chief Engineer with approximate estimates of the cost of completing the above works, and also of extending Arbuthnots' jetty another 50 yards seawards

seawards, and of making provision for carrying the surface water of the road between the Custom House and Clives' battery into the existing drains, instead of allowing it to flow over the edge into the sea. The Chief Engineer will also be glad to have the cost of such dwarf walls, as you propose for the road side, and also for the bulwark revetment suggested by Captain Johnston.

4. As the whole subject cannot be advantageously laid before Government, until it can be stated with moderate precision, what outlay is from the present balance of Rupees /38309-14-3/ Thirty eight thousand three hundred and nine, Annas fourteen, and Pice three, will be required, I have the honor to request, that without interrupting the progress of the proposed operations on the South Groins and other indispensable work, you will prepare and submit a Rough Statement of cost at your earliest convenience.

I have the honor to be &c.

/Signed/ P. O. Connell Lieut.
Actg to the Chief Engineer

Central Office of P. W.
Fort Saint George
16th January 1857

/True Copy/
Wm Faber Colonel
Chief Engineer

Com. Gray

Enclosure in a Letter
From
The Chief Engineer
To
The Secy: to Govt
Public Work Dept

Letter 3d
Rec'd } March 1857

Rec'd 10th Do
No 1044/1057.
Copy of a Letter from
the Chief Engr
to Capt Rawlins Offg
Chief Engr on the Coast
forwarding instructions with
reference to the prosecution
of the work at the Groins
at Madras

Memorandum

As shewn in the surveys, the
low tide line, is defined by the heads of Groynes
Nos 1, 2, 3 and 4 - at high tide the sea washes
round their heels, and it is necessary therefore
that they should be thrown back with the
superfluous stones on them. their strength and
height being both, as represented by Capt Rawlins
lines, unnecessary -

2 Groynes Nos 3 should be completed
to the full length originally intended, and
also be extended back to beyond the reach of
high tide -

3 Groyne No 6 has sunk very
considerably in its whole length, occasioned
in a great measure no doubt, by the action
of the current in the river Cooum - This groyne
should be raised, and a revetment carried
from it to join the middle of the stalk of
the river Groyne, and again, from that to the
point a in the survey, which is the present
head of the projecting land - The whole line
of this revetment should be raised sufficiently
to prevent the river again finding vent to the
south of it, and endangering the Marine Villa

4 For the further protection of the Villa-
rino Villas, an embankment should be thrown
up from the point A, and extended as far
as may be found necessary, by taking a
line of levels towards the Port Image.- The
several drains should be furnished with
shutters to exclude the river water in high floods,
whilst in no degree obstructing the efflux of drain-
age water.-

5 At the mouth of the Bar, a row of
piles should be driven in the direction of the
dotted line, to define the mouth of the river
on that side

6 The beach has been a great deal
washed away between Groynes Nos 6 and 7, but
is rapidly forming again, and does not require
to be further protected.-

7 The road which has been destroy-
ed at the north East angle of the Fort be-
tween Groynes Nos 11 and 12, should be immedi-
ately repaired, and the head of the latter
which has been partially destroyed, as well
as that of No 13, should be well strengthened

8. The Jetty Groyne No 14 which
has sunk in its whole length, again re-
quires to be raised, and a massive head should
be given to it.- The Jetty itself with the excep-tion

of the outer pier has sustained no injury, and
its extension, if only as an experiment, appears
most desirable.

9 The Custom house Groyne No 15
has also sunk considerably, and the stones
from its head displaced.- this should be
properly strengthened..

10 From 17 to 22, the Groynes require
to be completed.

11 It is undesirable, owing to the in-
convenience they occasion to the boats, to in-
crease the number of Groynes, or even to ex-
tend the existing ones if it can be avoided,
and I would propose, when a sufficient ex-
tent of beach has been again formed which
is now rapidly in progress, that no money
should be expended on the Groynes beyond
what is required for completing those that
are unfinished, and strengthening those that
have been damaged- the remainder of the
fund to be devoted to constructing a bul-
wark along the face of the beach.

12 With the protection afforded by
the Groynes, the bulwark probably need not
be more than ⅓ of the section of that con-
structed by Coll Dr Heartland, for the conveniens
of landing goods, and sufficiently easy

slope

may be given to the stones, and that the
may be covered with a surface of road dust
installing

16 January 1857.

Signed/ C. G. Johnston (Capt.)
Rg. Supt. Engr.

True Copy
A. Fraser Colonel
Chief Engineer

Endorsed as Letter
from
The Chief Engineer
to
The Secy. to Govt.
C. W. D.

Dated 3d March 1857.
Rec'd
No. 1069

Copy of Memo-
No. 1467/57

No. 27

From

Captain H. W. Rawlins
1st Assistant Civil Engineer
On Special duty

To

The Chief Engineer
Department Public Works
Fort St. George

Sir

In continuation of my letter No. 373 of 17th December last, and in obedience to your instructions thereon, No. 9531. of the 16th Ultimo I have the honor to submit the rough plans and estimates called for of the works proposed to be executed in connection with the Groynes and other coast defences at Madras.—

2 At the Marine Villas it is contemplated to repair and lengthen the rear or land side of Groynes from 1 to 4 at a cost of Rs. 81-4-0, so as to prevent the sea washing round and insulating the Groynes from the permanent beach.— The stones required are to be taken from the present Groynes, which are unnecessarily high and massive.—

3 It is next intended to repair and raise Groynes No. 5 & 6 both of which have sunk considerably in consequence of the

impingment

impingment of the current from the Coumm at a cost of Rs. 2777-8-0. It is also proposed, at an estimated cost of Rs. 541-4-0. to throughe upon embankment from the road close to the Marine Villa railings upstream to a distance of 300 yards; so as to prevent the river during high freshes forcing a channel for itself through the low ground between the Villa and its present bank. Also to repair the small sluices leading from the Government Park, and to provide where necessary swinging shutters, whereby the land drainage can escape while inundation from the Coumm river is kept back.

4th The accompanying survey will shew the position of the embankment as well as the contour of the bars and the total cost of the above improvements is calculated as follows:-

For repairing Groynes 1-64	Rs.	81-4-0	
5th " 5th	"	506	2777-8-0
Embanking the Coumm and repairing the sluices on the Marine Villa side of the river			541-4-0
			3400-0-0

5 In the above, I have not included the expense of reforming the road across the bar, because I am given to understand that the same is under the Assessment Department.

The breach is 1000 feet, and will probably cost Rs. 1000 to repair when the bar is closed, which it is not quite at present.

6 The Fort road has been repaired, and is open for traffic and the heads of the Groynes have been added to and strengthened where required.

7 The Light House and Parry's Groynes are completed and at present require nothing further to be done to them.

8 I am repairing Arbuthnot's Groynes and adding stone to its sea ends, and agreeably to the 11th Para of your letter I have estimated the cost of lengthening 1-50 yards at Rs. 16,600. In connection with this subject, I beg to submit for your perusal and record, sections of repeated soundings taken by me with much care for upwards of a mile seawards. They were made at three different places, one in a line with Arbuthnot's Groyne, and the two others 50 yards to the right and left. It will be seen that the beach shelves very gradually, and that the depth of the water is 54 feet at a distance 1800 yards from the bulwark.

The

9 The Custom House and Clive's Battery Groynes have been repaired and all the remaining ones are in excellent order. The Rayapooram Ones from 17 to to 22. are extended to their full length, and further work at them has been stopped for the present agreeably to para 10 of your letter.

10 It will cost Rs. 5000 to construct a dwarf wall between the Arbuthnot and Clive's Battery Groynes, a distance of 2187 feet. I think it should be 6 feet deep and six inches above the road, and that it will answer the purposes of keeping up the plateau from crumbling and slipping down and of preventing the flitting or rolling away of the edges by rain, wave and drainage. The only danger is its liability to be undermined during unusual gales like those experienced in November and December last.

11 This is undoubtedly a great Objection, but one which will diminish gradually by time as the action of the Groynes more fully developes the uniform extension of the beach; when the proposed wall will I think be secure from the destructive influence of any storms. During fine weather such a wall will give a neat appearance and finish to the road, and will be a convenience to the traffic embarked and debarked on the beach; but whether it is prudent or not now to run the risk of its construction; or whether it will be better to leave the beach for the present in its unfinished state until it has permanently formed, I must respectfully beg leave to submit to your more experienced consideration.

12 I estimate that the cost of a bulwark stone revetment of about 1/3 the sectional area of De Havilands, as proposed by Captain Johnstone, would cost Rs. 45360, if it was constructed entirely of new stone — Rs. 11340. if all the stone was taken from De Havilands bulwark; or Rs. 28350. if half was taken therefrom, and the other half newly quarried stone.

Such a revetment would doubtless be a great security to the beach, but I fear that either of the above three plans would prove too expensive to be undertaken; particularly as it is possible, and indeed I hope not improbably, but that such a stone revetment in the course of time may become unnecessary, by the extention of a good permanent beach beyond it, in the same way as De Havilands bulwark is now superseded, by the Groynes.

13 On the other hand if a broad sandy beach did not ultimately form to seaward; the

loss

Memorandum of Sums sanctioned upon revised and Original Estimates since the 1st May 1856 for the Groynes and other works connected with the Beach. Madras.

Particulars of Works	Date of revised Sanction	Amount	Amount expended from 1st May 1856 to 31st January 1857	Balance Remaining for completion of works	Remarks
Light House Groynes	618 2d May 1856	3000 " "	779 5 6	2220 10 6	
Strengthening Groynes Nos 14-15-16	Do Do Do	12010 " "	5122 6 9	6887 9 3	
Road within Clives Battery	Do Do Do	23820 " "	16748 8 3	7071 7 9	×
Fort two Groynes	816 29th May Do	4000 " "	1783 6 3	2216 9 9	
Fort Road	Do Do Do	3780 " "	3180 9 "	599 7 "	
Rayapooram Groynes	1181 15 July Do	21000 " "	13774 14 8	7225 1 4	
Total Company's Rupees		67610 " "	41389 2 5	26220 13 7	

(2)

Fort St. George
1st February 1857

H. W. Rawlins Captain
1st Assistant Civil Engineer
On special duty

Memorandum of Sums sanctioned upon revised and original Estimates since the 1st May 1856 for the Groynes and other works connected with the Madras Beach.

(Despatched Feby 1857)

No 27.

From

Captain H. W. Rawlins
1st Assistant Civil Engineer
On Special Duty

To

The Chief Engineer
Department Public Works
Fort Saint George.

Sir,

In continuation of my letter No 393 of 17th December last, and in obedience to your instructions thereon, No 9531, of the 16th Ultimo, I have the honor to submit the rough plans and estimates called for of the works proposed to be executed in connection with the Groynes and other coast defences at Madras.

2. At the Marine Villa it is contemplated to repair and lengthen the rear or land side of Groynes from 1 to 4 at a cost of Rupees 81-4-0 so as to prevent the sea washing round and insulating the Groynes from the permanent beach. The stones required are to be taken from the present Groynes, which are unnecessarily high and massive.

3. It is next intended to repair and raise

Carried Over — 2913

Rec'd 3 Annexures 8 Sketches

No 27 Captain H. W. Rawlins 1st Asst Engr on Special Duty

Subject Submitting rough plans and estimates connected with the proposed coast defences at Madras.

Write 2 Annexures & 3 Plans

Received 29th January 1861
Registered 29th January 1861

raise Groynes Nos 5 & 6 both of which have sunk considerably inconsequence of the impingment of the current from the Coorum at a cost of Rupees 2777-8-. It is also proposed, at an estimated cost of Rupees 541-4-. to throw up an embankment from the road close to the Marine Villa pail. ings up stream to a distance of 300 yards, so as to prevent the river during high freshes forcing a channel for itself through the low ground between the Villa and its present bank. Also to repair the small sluices leading from the Government Park, and to provide where necessary swinging shutters, whereby the land drainage can escape while inundation from the Coorum river is kept back.

4. The accompanying survey will shew the position of the embankment as well as the contour of the bar and the total cost of the above improvements is calculated as follows.

For repairing Groynes 1 to 4 Rs 81-4-.

Do Do 5 & 6 .. 2777-8-.

Embanking the Coorum and repairing the sluices on the Marine Villa side of the river } 541-4-.

3400-.-.

5. In the above, I have not included the

(15)

the expense of reforming the road across the bar, because I am given to understand that the same is under the Assessment Depart. -ment. The breach is 1000 feet, and will pro. -bably cost Rupees 1000 to repair when the bar is closed, which it is not quite at present.

6. The Fort road has been repaired, and is open for traffic and the heads of the Groynes have been added to and strengthened where required.

7. The Light House and Parry's Groynes are completed and at present require nothing fur. -ther to be done to them.

8. I am repairing Arbuthnot's Groynes and adding stone to its sea end, and agreeably to the 11th Para of your Letter I have estimated the cost of lengthening it 50 yards at Rupees 16,600. In connection with this subject, I beg to submit for your perusal and record, sections of repeated soundings taken by me with much care for upwards of a mile seawards. They were made at three different places, one in a line with Arbuthnot's Groyne, and the two others 50 yards to the right and left. It will be seen that the beach shelves very gradually, and that the depth of the water is 54 feet at

at a distance 1800 yards from the balcarit.

9. The Custom House and Cline's Battery Groynes have been repaired and all the remaining ones are in excellent order. The Royapooram Ones from 17 to 22, are extended to their full length, and further work at them has been stopped for the present agreeably to para 10 of your letter.

10. It will cost Rs 5000 to construct a dwarf wall between the Arbuthnots' and Clines' Battery Groynes, a distance of 2187 feet. I think the wall should be 6 feet deep and six inches above the road, and that it will answer the purpose of keeping up the plateau from crumbling and slipping down; and of preventing the fritting or cutting away of the edge by rain water and drainage. The only danger is its liability to be undermined during unusual gales like those experienced in November and December last.

11. This is undoubtly a great objection, but one which will diminish gradually by time as the action of the Groynes more fully developes the uniform extension of the beach; when the proposed wall will I think be secure from the destructive influence of any storms. During fine weather such a wall will give a neat appearance and finish to the road, and will be a convenience to the traffic embarked and debarked on the beach, but whether it is prudent or not now to run the risk of its construction; or whether it will be better to leave the beach for the present in its unfinished state until it has permanently formed, I must respectfully beg leave to submit to your more experienced consideration.

12. I estimate that the cost of a bulwark stone revetment of about ⅓ the sectional area of DeHavilands, as proposed by Captain Johnston, would cost Rupees 45360, if it was constructed entirely of new stone- Rupees 11340, if all the stone was taken from DeHavilands' bulwark, or Rupees 28350, if half was taken therefrom, and the other half newly quarried stone.

Such a revetment would doubtless be a great security to the beach, but I fear that either of the above three plans would prove too expensive to be undertaken; particularly as it is possible, and indeed I hope not improbably, but that such a stone revetment

revetment in the course of time may become unnecessary by the extension of a good permanent beach beyond it, in the same way as De Haviland's bulwark is now superseded, by the Groynes.

13. On the other hand if a broad sandy beach did not ultimately form to seaward, the loose stones composing the bulwark could not be kept compact and close together within the influence of the tides; and would probably endanger the breaching of the boats, and render the approach to the shore a source of greater anxiety than it is at present.

14. I append a statement shewing the amount sanctioned and expended upon the Groyne works up to 1st. February instant.

The balance remaining is Rupees 26220; of which Rupees 6800 are exclusively set a-part for the extension and completion of the Drains between Arbuthnot's and Clive's Battery Groynes; which drains will be commenced so soon as the description of Store revetment or wall for the road shall be determined.

I have the honor to be &c.

/Signed/ H. W. Rawlins Capt.
1st Assistant Civil Engineer
On Special Duty.

Madras
1st February 1857.

/True Copy/

A. Taber Colonel
Chief Engineer.

for

Comptr Stores

Carried Cost — 2913

Memorandum of sums sanctioned upon revised and original Estimates since the 1st May 1856 for the Groynes and other works connected with the Beach of Madras.

Particulars of Work	Date of Sanction	Amount	Amount expended from 1st May 1856 to 31st January 1857	Balance remaining for completion of work	Remarks
Light House Groynes. —	18. 2d May/56	3000	779 5 6	2220 10 6	
Strengthening Groynes No 14. 15. & 16	Do — Do — Do	12010	5122 6 9	6887 9 3	
Road within Olives Bailey	Do Do Do	23820	16748 8 3	7071 7 9	
Fort two Groynes	8/29 May Do	4000	1783 6 3	2216 9 9	
Fort Road	Do — Do Do	3780	3180 9 .	599 7 .	
Royapooram Groynes.	11/8 15 July/56	21000	13774 4 8	7225 1 4	
Total Company's Rupees		67610 . .	41389 2 5	26220 13 7.	

Fort Saint George 15 Feb 1857

(True Copy)
A. H. Foulis Colonel.
Chief Engineer.

(Signed) H. H. Racolin Capt.
1st Asst A.G. Eng'rs on special duty

Copied Govt 29/3

Compd Shan

Enclosure in a letter
from
The Chief Engineer
&c &c
The Secretary to Govt
Public Works Dept

Dated 12th
Rec'd } March 1857

Rec'd 16th

P.P. 445/57
Copy of a letter from
Captain Rawlins 4th Regt
Civil Engr Andamans
&c &c &c
containing sundry
estimates connected with
the Groynes and other
works on the Beach
Port Blair.

(7) [New Works]

Public [roads]

Abstract of Estimate No of 185 /5

Road No.

District Madras

Works proposed to be executed in Connection with the Groynes thrown out for the protection of the Beach -

Quantities	Description of Work	Rate Rs	As	P.	Amount Rupees	Amount for each part Rupees
C. Yds	Marine Villa Groynes & Coconut Bar- No 1 to 4 Groynes:					
325	Tons Rough Stones deducting for interstices	"	4	"	81	
	No 5 to 6 Groynes					
1111	Tons of Rough Stones deducting interstices	2	8	"	2777	
	Embankment No 1					
1166	Cy Yds of Earthwork for raising embankment from the road close to the Marine Villa railings along the bank up stream to a distance of 300 yards so as to prevent the encroachment of the river endangering the stability of the Villa	7 Cy Yds	"	"	8	49
	Planting the same with Wares foot creepers	"	"	"		6
					Carried Over	2913

Quantities	Description of Work	Rate			Amount	Amount each part
C. Yds.		Rs	As	Ps	Rupees	Rupees
	Brought Over				2913	
616	Cy^s of Earth work for 5 cut Coconut groynes with the above embankment ——— 7 Cy^s	"	"	8	26	
106	Rgt^r of Earth work for Revetting same with Strong slakes and fascines on both sides Rgt^r 2	"	"	"	212	
	To lengthening a drain 20 feet Plastering the same	"	"	"	10	
	1 Teak Swing Shutter Complete Fitting same to enable the drainage from the Reserve Tank Compound to flow into the river is extended from immediately the Compound	"	"	"	7	
	Slight Repairs to Gutters small drains between the above & the Govt House Bridge Each	5	"	"	15	
	Sundries & Contingencies				157	
						3100
	Cost of Extending Arbuthnot groyne another 60 yards Seawards					
300	Cy^s of 10 Pile of Calawood 15 feet apart wrought ——— Cy^s	2	4	"	675	
	Carried Over				175	

Quantities	Description of Work	Rate			Amount	Amount for each part
	Brought Over				675	
	Fitting on Screws with bolts & Nuts Complete	2	"	"	20	
375	Cft^s of Teak wood wrought & put up Cft^s	2	4	"	844	
300	Rgt^r of Iron bar laid down at 10 ℔ per Rgt^r including nails ——— ℔	"	3	"	187	
	10 Screws for piles ——— Each	62	"	"	620	
	Fitting scaffolding for 10 screw piles including labour ——— Each	30	"	"	300	
	Labour for screwing in piles with Cap Iron Head ———	30	"	"	300	
3000	Cy^s @ 2 Tons per Cy^s large rough Stone, quarried & deposited Tons 6000 ——— Ton	2	"	"	12000	
	Additional for head 500 Tons ———	2	"	"	1000	
	Sundries Contingencies ———				654	
						16600
	To Construct a dwarf wall from Arbuthnots to Clives Battery Groyne ———					
32805	Cft^s of Brick in Chunam ——— Cft^s	"	1	9½	3673	
1095	Sqft^s of Plastering to D^o ———	2	"	"	218	
1860	Cy^s of Excavating foundations & filling in same ——— Cy^s	"	1	"	304	
	12 Nosses of Masonry Complete with plastering similar to the ones at the wall by Marine Villa to allow drainage water to run off ——— Each	30	"	"	360	
	Carried Over				4555	

Quantities	Description of works	Rate	Amount	Amount for each part
	Brought Over		4555	
100	Tons of Rough laterite Stones to be placed at bottom of Slope to prevent Sand falling away and undermining ——— per Ton	2 - -	200	
	Sundries & Contingencies ———		245	
				5000
	Cabl.ga Bulwarks as proposed by Captain Johnstone in his Memo Dated 16th January 1857.			
11340	Cubic Yds @ 2 tons 3 Cwt 22680 tons which Section is about ⅓ of that of Coll De Havilands bulwarks if new Stone be quarried & deposited will Cost ———	2 - -	45360	
	If all the Stones be taken from the De Havilands Bulwarks including the Cost of repointing the joints and metalling about ———	" 8 "	11340	
11340	Cubic Yds @ 2 Tons 3 Cwt 22680 tons which Section is about ⅓ of that of Coll De Havilands Bulwarks ———			

(21)

Quantities	Description of works	Rate	Amount	Amount for each part
	Brought Over			
	If ½ be taken from De Havilands Bulwarks ½ new Stone quarried it will Cost ———			
22680/2	Tons old Stones ——— Ton	" 8 "	5670	
22680/2	Tons new Stones ——— "	2 " "	22680	
				28350

Central Office of P.W.
Fort Saint George
3rd March 1857.

A Stuart Capt
Acting Supt Engineer N.

Enclosure

In a letter

From,

The Chief Engineer

D.P.W.

To,

The Secretary to Govt

D.P.W.

Dated 3rd & March 1857

Recd.

P.D. 247/57

No. 1619

Abstract Estimate for Certain works proposed to be executed in connection with the Groynes now under construction for the protection of the Beach at Madras.

No. 393

From

Captain H. W. Rawlins

1st Assistant Civil Engineer

On Special duty

To

The Chief Engineer

Department Public Works

Fort Saint George

Sir,

In obedience to the orders received from you on the 11th instant, I have the honor to submit a survey of the beach taken at low tide yesterday, marked in blue in the accompanying plan, and to report upon the state of all the Groynes &c. as they now appear after the very rough weather experienced during the past month.

The Marine Villa Groynes

2. The Groynes from Nos. 1 to 5. appear to be perfectly uninjured, although the sand has in a great measure being cut away. At low tide, the line of water mark is nearly parallel with the heads of Groynes Nos. 1. 2. 3. & 4; but at high tide, the surf washes up to and around the heels of nearly all

all of them. During the late gales, the surf was within 30 feet of the new retaining wall opposite No. 4 Groyne which is the weakest point. The last 80 feet of No. 5 Groyne appears never to have been completed, and I recommend that it should be attended to at once, the stones for the same being taken from Groynes No. 1 to 4 in proportion; as they are in my opinion, not only too substantial but unnecessarily high. No. 6 Groyne is uninjured towards its head, but the shore end of it has sunk considerably for about 100 lineal feet inconsequence of the impingment of the current from the Boorum.

3. The opening of the bar this year was attended with unusual difficulty owing to rough weather and the violence of the surf; and it was not until the water reached 5'-11" on the standard that the river formed a vent at all. At first the water disemboqued itself on both sides of No. 6 Groyne, but after a time the embouchure on the south side closed of itself, and the stream flowed through the north channel only.

4. The road is breached for a distance of 300 yards nearly, and about 30 feet

feet of the Government park rails have been carried away. The promontory or spit of land to the North of the Marine Villa, as shewn in the plan, is in danger of isolation, and I would recommend that some further protective measures be adopted to regulate the set of the stream around this awkward curve of the Boorum, so as to prevent the possibility of the river during high freshes forcing a channel for itself through the low ground between the Marine Villa and the present bank. Had the Boorum risen a foot higher before the bar opened in its usual place, I believe that such a channel would have been formed, imminently endangering the Marine Villa, as the set of the two streams nearly at right angles to each other at that point, would naturally resolve itself in that direction.

5. I will do myself the honor at an early period of submitting a detailed survey of this part of the Boorum for your consideration. I think it is a pity that the five small Groynes in the Boorum were ever removed as they certainly appear to have added

added to the security of that portion of the river bank, I also venture to suggest that the river should be embanked throughout that portion of its course which is low, and liable to overflow, thereby causing considera-ble damage to public and private property in Madras.

6. Fort Groynes.

From No. 6 Groyne of the Marine Villa series to No. 7 of the Fort one, a distance of 2010 feet, the beach has been a good deal eroded, but this is not material as the road is well inland. The Heads of the primary Groynes Nos. 8. 10. 12. & 13 have been some-what knocked about and the stones spread out, par-ticularly Nos. 12 & 13, which require more ma-terial to be added to them. The secondary Groynes Nos. 7. 9. 11. & 13½ are in good order.

At the North East angle of the Fort, where the beach last year was washed away, a similar occurrence has now also taken place, (notwithstanding that an additional intermediate Groyne, No. 11½, has been lately constructed there,) owing to which, the roadway at this point has been

been encroached upon for a distance of 1000 feet; and this will have to be immediately repaired. The remaining portion of the road-way around the Fort has not been in the least damaged. The sand however drifts on to the road a good deal; and the Sea-pink which was planted as a remedial measure, has not thriven so well as Sanc-ticipated. I think a small retaining wall might safely be constructed from Groyne No. 7 to Groyne No. 11 for about Rupees 2 per running yard and that this wall might be eventually extended to D'Havilands Bul-wark, when the accumulation on the northern side of the Series has equalled that on the southern.

8. Though several years may elapse before the action of the Groynes will be fully developed, still I think that it must even-tually tend to the extension of the whole Beach from South to North, as the ac-cumulation of sand has been gradually in-forming from the Southern end of each Series; and although the prevalence of bad wea-ther tends to the displacement of certain portion of the accumulation it is but removed

to a lower level, to be added to during suc-
-cessive seasons.

9. The effect of the Groynes seems to accumulate or raise up the beach, equally as much as to extend it; and during gales it is but the upper portion that is displaced and redeposited lower down in extension of the base. In this way alone I can account for the fact, that immediately after both gales, low water mark extended further Seawards than it did previously, and that during subsequent fine weather the beach has been fast reaccumulating to its original height.

10.

North Beach Groynes.

From Groynes 13½ to 14. a great deal of the sand has been cut away, leaving D'Havilands Bulwark exposed for about 500 yards, and it is for the Chief Engineer's consideration whether too small intermediate Groynes would be advisable or not.

11. The sea end of No. 14 Groyne has sunk considerably; so much so, that for a distance of a hundred feet no stones are visible at low water, and they appear to have spread out on the south side. The last pile has also been shaken and forced out of its perpendicular. The platform must be repaired and the sea end of the Groyne raised to three feet above the high water mark. No. 15 Groyne has sunk a little, but the stones at the head have been turned, and spread out southwards. It requires some slight repairs. No. 16 has suffered little or no injury. The plateau opposite the Custom House has stood remarkably well though furrowed here and there by rain water channels.

12. The proposed new road between Groynes Nos. 15 & 16. has been cut away an average breadth of 8 feet for a distance of 250 yards; and this has been caused not so much by the action of the surf as by the surface drainage of that portion of the town. The reformation of this road is nearly completed and the sand again fast accumulating. I think however, that a retaining foundation wall, will be necessary, not so much to prevent the encroachment of the sea as to keep the side of the road from slipping down.

13. The two Groynes opposite the Railway Terminus Nos. 17 & 18 were never quite completed, as you desired me in Ex-

Pro:

No: 1372, 29th February last, to defer depositing any more material at those Groynes until further experience and observation determined the necessity or otherwise of lengthening them. I now propose to strengthen these two Groynes, by raising the sunken parts to their original height, after which they can be extended if desirable.

14. The Terminus roadway has been a good deal cut away and will require repair. The construction of a revetment or Sea wall along this portion of the Beach has been recommended by Major Worster, and it would undoubtedly be an improvement; but I am not at present prepared to say that I think it absolutely necessary, particularly if the Railway authorities carry out their intention of making a groyne midway between Nos 17 & 18 to protect their Shears, and Landing apparatus.

15. The Groynes at Royapooram are in course of construction and have not been in any way damaged, nor has the sea encroached any further. I consider it Providential, that these Groynes were so far advanced, when the Gales occurred, as otherwise I firmly believe that the Fishermens Village would have been entirely washed away, and perhaps the Town itself seriously endangered.

16. I beg to annex a Memo of the several sums sanctioned upon revised and original Estimates since the 1st May 1856 for the Groynes and other works connected with the Beach, and I respectfully solicit the favor of these works being surveyed and inspected by your Department with a view to my receiving further instructions for their prosecution.

I have the honor to be &c

Madras
17th Decr 1856.

(Signed) E. W. Rawlins Capt
1st Assistant Civil Engineer
On Special Duty.

(True Copy)
A. Fraser Colonel
Chief Engineer

Capt Rawlins

Memorandum of Sums Sanctioned upon revised and original Estimates since the 1st May 1856 for the Groynes and other works connected with the Madras Beach.

Particulars of Works	Date of revised Sanction	Amount	Amount expended from 1st May to 30th November	Balance remaining for completion of works	Remarks
	tons				
Light House Groyne	618 - 2 May/56	3000 - " - "	636 - 4 - 9	2,363 - 11 - 3	
Strengthening Groynes Nos 14 & 15	Do	12,010 - " - "	248 - 14 - 3	11,761 - 1 - 9	
Road within Clives Battery	Do	23,820 - " - "	13,308 - 9 - 1	10,511 - 6 - 11	In this sum is included the
Fort two intermediate small Groyne	816 - 29th May/56	4,000 - " - "	1,348 - 9 - 3	2,651 - 6 - 9	rebuilding of the Cistern and the
For the Fort Road	Do	3,780 - " - "	2,545 - 8 - 3	1,234 - 7 - 9	construction of the small drains
Royapooram Groynes	1181 - 15th July/56	21,000 - " - "	11,212 - 4 - 2	9,787 - 11 - 10	from the Battery to the Custom House.
		67,610 - " - "	29,3000 - 1 - 9	38,309 - 14 - 3	

(Signed) H. W. Rawlins. Captain
1st Asst Civil Engineer on
special duty

Madras
17th December 1856

(True Copy)
A Fraser Colonel
Chief Engineer

Capt Grey

Enclosure in a letter
from the Chief Engineer
to the Secy: to Govt
Public Works Dept.

Dated 3rd March 1859
Rec'd 7th "

P.W.D. 44/59

By Lieut Colonel Pitt
Captain Cautley Asst
Civil Engrs on Special duty
relating to the state of
the Groynes and Beach
after the two gales ex-
perienced in Nov.r 1858.

Rough Estimate of the probable cost of certain works proposed to be executed in connection with the Groynes thrown out for the protection of the Beach Madras.

(8)

Measurement						Price									
Length	Breadth	Depth	Superficies	Cubic feet		Rupees	Annas	Price	Rate	Rupees	Annas	Price	Rupees	Annas	Price
					Barrier Villa Groynes & Bar										
					Coom Bar										
					No. 1. Groyne										
					To repairing Groyne, by lengthening and raising the near land side so as to prevent the Sea washing round and isolating it from the permanent beach											
					The material to be taken from the superfluous stones as the Groyne at present is unnecessarily high										
					No. 2. Groyne										
30	6	4	"	1920	Do: Do: Do:										
					No. 3. Groyne										
55	5	3	"	825	Do: Do: Do:										
					No. 4. Groyne										
50	5	3	"	750	Do: Do: Do:										
50	5	3	"	750	Cubic feet = 325 tons rough stones deducting for interstices		"	4	"	Ton	81	4	"		
		Total		4245											
					No. 5. Groyne										
					To repairing and raising the head of No. 5. Groyne, which has sunk										
					Barrier (Over)										

	Price			Nos	Feet	Inches	Parts	Feet	Inches	Parts
	Rupees	annas	Pie							
Brought Over										
Considerably, with new large stone quarried and deposited										
Additional for head										
No 6. Groyne										
To deepening and raising the sea End, which has sunk Considerably with new large stone Cubic feet = 1111. tons of rough stone deducting interstices	2	8	-	1 Train	2777	8	-			
Embankment &c.										
To raising an earth embankment from the road close to the Guarrin Villa railings along along the bank up stream to a distance of 300 yards so as to prevent the encroachment of the river endangering the stability of the Villa										
Cubic yards			8	Cyd	48	4	4			
Planting the same with the Bares Root cuttings					6	-	-			
To join Coonn Groynes with the above embankment										
Cubic yards			8	Cyd	26	10	8			
Ditto same with strong stakes										

Measurement				
Length	Breadth	Depth	Solid Feet	Cubic Feet
30	1	1	"	300
300	12"	6"	"	150
150	6"	4"	"	150
300	6"	6"	"	75
		Total		375
300	Running feet.			
50	yards 12	5	"	3000

	Price			Nos	Feet	Inches	Parts	Feet	Inches	Parts
	Rupees	annas	Pie							
Brought Over										
from the Guarrine Villa compound to flow into the river, while the river is excluded from inundating the compound										
Slight repairs to 9. other small drains, between the above & the Government House Bridge				5	-	-	Ea			
Sundries & contingencies										
Cost of Extending Arbuthnot's Groyne another 30 yards Seawards										
10 Piles of Teak wood 15 feet a part, in rough				2	4	-	Cft			
Fixing 20 screws with bolts & complete				2	-	-	Ea			
Jobbs										
Platform boards										
Teak wood for railway				2	1	-	Cft			
Wrought and put up										
Drew bar laid down @ 10 lbs per running yard including nails				-	3	-	lbs			
10 Screws, for piles				62	-	-	Ea			
Fixing scaffolding for 10 Screw piles including labour				30	-	-	-			
Labour for screwing in piles with capstan Head				30	-	-	-			
Cubic yards @ 2 tons per cubic yard large rough stone, quarried and deposited Tons 6000				2	-	-	Ton			
Additional for head 500 Tons				2	-	-	-			
Sundries and contingencies										

Price										
Rupees	annas	Pie	Rules	Rupees	annas	Pie	Rupees	annas	Pie	

Psyche Redoubt 24th Feby 1857.
Lt Col

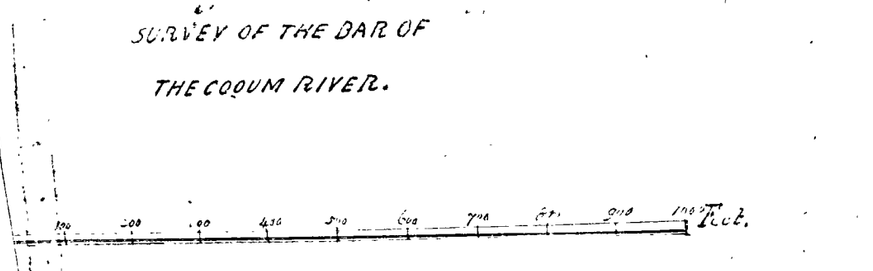
	Price Rupees	Annas	Pice	Rate	Rupees	Annas	Pice	Rupees	Annas	Pice
To construct a divan wall from Arbuthnot's to Clive's Battery Groyne										
Brick in chunam wall	"	1	9½	Cft.	3673	7	7			
Plastering tops of same 109 Square	2	"	"	Sqr.	218	"	"			
Excavating foundations and filling in same 4860 C.yds	"	1	"	C.yd.	303	12	"	✓		
12 Slopes of masonry complete with plastering similar to the ones at the wall by Marine Villa to allow drainage water to run off	30	"	"	Ea.	360	"	"	✓		
Rough laterite stones to be placed at bottom of slope to prevent sand cutting away and undermining	2	"	"	Ton	300	"	"			
Sundries and contingencies					244	12	5	5000	0	0
Cost of a Bulwork as proposed by Captain Johnstone in his Memo dated 16th January 1857										
=11340 Cubic yards (2 tons 3 cwt. =22680 tons which section is about ⅓ of that of Coll. DeHavilands bulwork If new stone be quarried and deposited will cost	2	"	"	Ton	45360	"	"			
If all the stones be taken from the DeHavilands Bulwork including the cost of reforming the road and metalling about	"	8	"	"	11340	"	"			
Do										
Do										
Do										

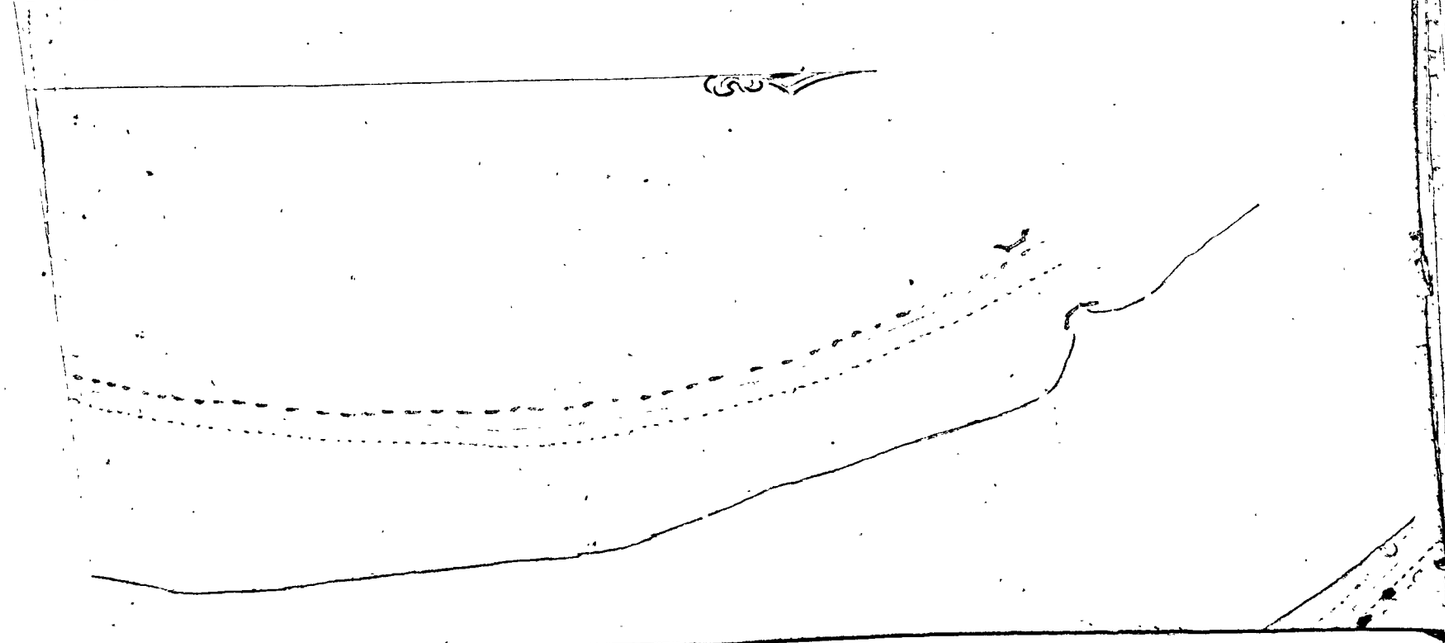
Sections of the Beach at Madras taken by repeated soundings.

S.W. 447/57

SURVEY OF THE BAR OF

THE COOUM RIVER.



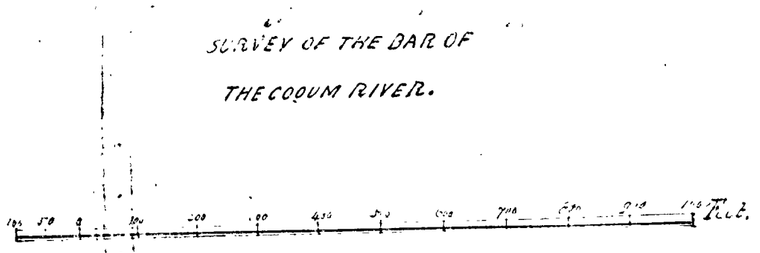


Sheet 2nd Shewed by Heavy

Sections of the Beach at Madras taken by repeated soundings.

P.W. 447/57

SURVEY OF THE BAR OF THE COOUM RIVER.



H. W. Rawlins
1st Asst Civil Engineer

Survey of the Bar
of the Coosaw River

P.R.O.

P.R.O. 447/57

Rec. 1869.

Plan of the Entrance from
the Ocean into Coosaw River
to Port Royal

Scale of Miles

Explanation of the Marks
Soundings at Low Water
Spring Tides

Depth of Water on the Bar
at Low Water Spring Tides

and recommended
by Colonel Parker &
the adoption of Colonel
Parker's ideas, rather
than Captain Johnston's, for reducing
the ninth part of the
Corps by a row of
files. Were the
rifles drawn up
here, I believe that
the front of each
be

attached to the left
it make for deep
a wide, a growth or
coin on battalion &
any such that could
to warn the drawing
would be an end.
would the Eng-
with but the proper
of a bridge should be
again considered?
I have talked when
with Colonel Reed
about it, and if

Three papers - Shaw has
accompanied by a memo.
showing the various points
carpenters employed by
Col. Fahn - Capt Schuchi
Capt Rawlins -

The repairs upon
mouth in the neighbor
hood of the prairie outlet
are evidently temporary.

I do not find the
plans of the whole height

connection with the

of back - which is referred
to by Col Baker -

The Company refuses to
the Sacketts grants - except
where has already made
his progress -

I cannot help thinking
some addl one are
required between the Fort
& Arkansas grant -

[illegible] Report where Lake
crops had been - Shew
no opinion, remarks
any plan - but Stuart
considers the workers
in saving - it interferes
with the Sacketts -
thinks it hardly advisable
to [illegible]

Lt

Sworn in - Sworn
[illegible]

[illegible] connexion with them, and
[illegible]

of the groins & the suggested works for the protection of the Burrows Point Beach - but I would not attempt or recommend any above which may be made from the stones - I doubt the practicability of extending arbitrarily from the Pier it would admit of the plan shown & the carried further out & to form a direct communication with the main land

but I should object to lengthening the pier plan of the main on the Southern beach. I should have for free out-

Ke Shedka -
The pier is very much in ruins & under the working of this Gutter Pl

No 597

Extract from the Minutes of Consultation
Under date the 7th ~~March~~ April 1857.

Read the following
letter from the Chief Engineer.

Here enter 3rd March 1857 No 1019

The papers submitted with the foregoing letter, relate to the effects produced by the storms of November and December last on the groins along the beach, and to the measures suggested for their repair and for the further protection of the coast.

2 The state of the several groins after the storms, is reported upon in Captain Rawlins letter of the 17th December 1856; and the works proposed to be executed in connection with them, are detailed

detailed in that officers letter of the 17th February last, and are as follows:

Repairing and lengthening the rear or land side of groins 1 to 4 at the Marine Villa at a cost of Rupees 81-4--

Repairing and raising groins 5 & 6, both of which have sunk considerably in consequence of the impingment of the current from the Coonn, at a cost of Rupees 2777-8--

Throwing up an embankment from the road close to the Marine Villa railings, so as to prevent the Coonn, during high freshes, forcing a channel for itself through the low ground between the Villa and its present bank, also for repairing the small sluices leading from the Government Park, and providing swinging shutters for the escape of drainage water from the Villa, and the exclusion therefrom of the river water, the cost of these works being estimated at Rupees 541-14--

As

	@	£	♁
Repairing groins 1 to 4		81	4 --
Do 5 & 6		2777	8 --
Embanking the Coonn and repairing sluices on the Marine Villa side of the river		541	4 --
		3400	-- --

3. As the foregoing repairs and improvements are evidently necessary, and are recommended by the Chief-Engineer, the Right Honorable the Governor in Council authorizes their immediate execution at a total cost of Rupees (3400) three thousand four hundred, the amount being disbursed from the sums already sanctioned for the groins and other works connected with the beach.

4. In para 5 of his minute of the 16th January last, Captain Johnston recommends that the northern bank of the Coonn should be defined by a row of piles. But for the reasons fully stated by the Chief-Engineer in para 11 of his letter, the

Govt

at the same time admits its liability to be undermined during unusual gales, and doubts whether it would be prudent now to run the risks of its construction. The Chief Engineer does not support the project, and the Government agree with him that it would be premature at present to undertake it.

7. Captain Rawlins also submits an Estimate for constructing a bulwark stone revetment along the face of the beach, of about one third the sectional area of that of De Havilands, as suggested by Captain Johnston in paras 11 & 12 of his memo already quoted. He calculates that the cost of such a revetment would be Rupees 45,360, if it be constructed entirely of new stone; Rupees 11,340, if all the stone be taken from De Havilands bulwork, and Rupees 28,350, if half be taken therefrom, and the other half obtained from the quarries. The Chief Engineer expresses† his decided opinion that such a bulwork is not only undesirable on the score of expense, but that there is good reason to apprehend that it would prove very dangerous to the goods and passengers traffic of the Port; and he supports this opinion by quoting the views on the subject entertained by Colonel Arthur Cotton. In these views the Government entirely concur.

8. In the concluding para

† para 10.

Government concur with him that it is undesirable to oppose any obstructions to the free discharge of the water towards the north. When the river opens its bar, the great object to be attained is to let it make for itself a wide mouth as soon as possible, and any work that tends to narrow the opening is likely in the opinion of Government to produce the evils apprehended by Colonel Yule.

5. Captain Johnston also recommends the extension of Arbuthnots jetty groin, on the ground that it is a most desirable measure if regarded only as an experiment. The cost of its extension fifty yards seawards, is estimated by

+ Minute, para 8

by Captain Rawlins at 16,000 Rupees. The Chief Engineer has expressed no opinion on the subject, and the Government are not disposed to sanction a further expenditure of so large an amount on this groin.

6. Captain Rawlins proposes the construction of a dwarf wall between the Arbuthnots, and Chinese Battery groins, a distance of 2187 feet, and estimates the cost at Rupees 5000. He advocates the work on the ground that it will answer the purpose of "keeping up the platform from crumbling and slipping down, and of preventing the filling or cutting away of the edge by rain water and drainage"; but he

of

para of his letter, Colonel Faber
adverts to the interruption of
the line of communication
recently opened between the
Fort and the Sea, by the con-
prolonged discharge of the
Canon, and advocates the
construction of a bridge over
the outfall of the river as a
desirable measure of local
improvement and convenience.
~~His Government~~ It is ~~hostile~~ possible that
a bridge built on piles about
25 feet would answer the
object in view, but would
~~neither be a difficult nor~~
~~expensive work~~ but
they regard such a means
of communication at this
place, more as a luxury
than as a ~~of~~ necessity
and they would therefore
be prepared to sanction
the construction of a
bridge,

(41) 5

bridge, only if money ~~is~~ were
readily available, which is not
~~the case~~.

The Government
observe that the Chief Com-
Engineer has omitted to
send the plans of the whole
length of beach, to which
he invites the special atten-
tion of Government in
para 4 of his letter. These
omissions to forward docu-
ments necessary to a correct
understanding of the schemes
proposed are very unsatisfactory
and reflect little credit on
the Department which Colonel
Faber controls

J Copies to the Chief Engr
Cons 2 April

Rec. Gen: 6th Inst. from Sir Rd Hughes
— a 30th June — 22.28
— a 13th July — 97.98

Pub: Works 1857 Copy
Dft to Comr. 7th April

No 597

Extract Mins: of Hone:
Dated 4th April 1857

From the Chief Engr. Genl. 2nd Inst.
Ord: 2413 in Hone 15th Dec:

Relative to the effects produced by the Storms of November and December last, on the groins along the beach and on the measures suggested for their repair, and for the further protection of the Coast.

No 576

Recd Thanks Rd 4th