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MIL NADU ARCHIVES

ERNMENT OF TAMIL NADU

Public works DEPARTMENT

G.O. No.	501 W	Press.
B.P. No.		Mis.
Dated	24-2-1987	197.

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501

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

24th February 1881, No. 501 W.

Buildings and Roads.
Civil Works.

Read the following paper:—

No. 91-A. MANGALORE HARBOUR.

This harbour was inspected and reported on by Mr. Robertson in February 1871.

2. At the time of this inspection two mouths to the harbour were in existence, one, the escape of the Gurpur river, called the Gurpur gap, the other the escape of the Netravati river, this last being the proper mouth of the harbour; the mouths were separated by the Budacodi island. The Gurpur gap was originally made in 1827 by the villagers, who cut through the sand with the object of relieving their lands from the flood water of the Gurpur river, the harbour mouth being at this time at Oolaul, some 2 to 3 miles further south, the Gurpur river had consequently this additional distance to travel before it escaped to the sea.

3. This southern mouth has steadily worked northwards till it has attained the position shewn in the plans of 1858 and 1871, while the Gurpur mouth has remained stationary or nearly so, moving, if anything, southwards.

4. From the chart of 1858 it will be seen that the two mouths then held very similar positions to those shown in Mr. Pringle's survey of 1871, the Netravati mouth, or harbour mouth proper, being however somewhat further south in the earlier plan.

5. In 1856 an attempt was made to close the Gurpur gap by building a dam above it across a shallow portion of the backwater; this it was hoped, by excluding the tidal water, would allow of the gap being closed by the sea; this attempt proved a failure, the dam being destroyed by a high tide before it had been fully completed.

6. In 1860 Colonel Pears reported that the Gurpur gap was only 75 feet wide; while in 1871 it was 779 feet at the narrowest part.

7. Mr. Robertson in his report recommends the closing of the gap and the fixing of the harbour mouth, as the first steps to be taken before proceeding to improve the harbour. This has throughout been the object of Government in the various surveys, &c., undertaken with reference to this harbour.

8. In recommending the closing of the Gurpur gap Mr. Robertson briefly describes the method he would pursue; he deprecates, however, the immediate or rather the sudden closing of the gap as likely to inundate the neighbouring lands during floods, owing to the great shoaling which has taken place in the Gurpur river, between the gap and the harbour mouth, since the gap was originally made in 1827.

9. In April 1872 the Superintending Engineer, Seventh Division, reported to Government that the sand-spit immediately opposite the "salt cotours" had been very much narrowed by the action of the Netravati river; he feared that unless protective measures were taken a breach would occur at this point during the monsoon, and accordingly proposed the construction of two groynes with rough stone pitching between them.

10. The Chief Engineer, in his memorandum No. 382 of April 1872, rejected this proposal, stating that a breach at this point would be advantageous; this being, in his opinion, the best position for the harbour mouth, as formerly when so fixed the bar was better than it has ever been since.

11. In January 1874 the Inspecting Engineer for Ports, &c., in accordance with G.O., No. 2,133, of August 1873, submitted plans and estimates to Government for closing the Gurpur gap; but at the same time reported as follows:—

- (1) that the Budacodi island lying between the two mouths had been almost washed away during the monsoon of 1873, what remained being a mere sand bank;
- (2) that the Gurpur gap had moved 800 feet south of its position in April 1873;
- (3) that from these results he inferred that the monsoon of 1874 would in all probability sweep away what remained of the island, and the mouths of the Netravati and Gurpur rivers would be united.

Under the above circumstances he proposed that no steps should be taken towards closing the gap.

12. To this proposal Government agreed in their Order, No. 347-B, of 12th February 1874; at the same time stating that surveys of the harbour showing changes should be regularly submitted before and after each monsoon.

13. Nothing further of any importance appears to have occurred till 1876. In June of that year the District Engineer telegraphed that the gap had closed during the dry season, and followed up his telegram with a full report, dated 21st July 1876.

14. On this the Chief Engineer remarks in G.O., No. 2,055, of 10th August, that "the double opening which had for so many years existed between the Mangalore backwater and the sea, whereby the waters of the Netravati river to the south, and the Gurpur river to the north, made their way into the sea by separate channels, has gradually merged into one, by a process which not having been closely watched was so imperceptible that its result has only now been reported.

"It can only have been said to have been completed when the sand-spit from the northern beach overlapped" the head of the sand island within. "It is now evident that the sand island is due to the surf deposit."

This was the condition of the harbour at the beginning of 1877.

15. A survey and sections of the harbour were taken during March and April, from these cross sections it was seen that there was great silting up of the backwater immediately in front of the "salt cotours" and also in front of the custom house, the current of the Netravati setting on to the spit opposite the "salt cotours" and keeping to a great extent along that bank.

16. A rough estimate of Rs. 600 for "constructing temporary groynes to protect the portion of sand-spit opposite the salt cotours" was sanctioned about this time, the groynes, nine in number, consisting of cocoanut piles, with leaves of the same plant worked in between them, were constructed during the monsoon.

17. It is difficult to form an opinion as to the effect of these groynes; they were constructed after the setting in of the monsoon and on the cessation of the monsoon and the subsiding of the backwater to its ordinary level, it was found that the lower portions of the groynes had rotted and worn away and offered free passage to the water, numbers of the piles had also rotted; a little silting up had taken place behind one or two of the groynes, but to no appreciable extent.

18. The sea during some heavy weather in August cut well into the spit behind or nearly behind the groynes, there being only a bank of sand some fifteen paces broad between the high-water marks of sea and backwater, the action of the sea appeared to be a scouring action from south to north along the length of the spit.

19. The southern spit during this monsoon worked somewhat further northwards.

20. From the close of the monsoon of 1877 to the commencement of that of 1878 the chief change occurred in the spit north of the harbour mouth, this spit extended gradually some distance inwards into the backwater as shown by the survey of May 1878.

21. During the last monsoon, that of 1878, the narrow portion of spit, opposite the salt cotours, was still further cut into by the sea, which in one or two places washed

over into the backwater; this is the weak point in the harbour and the Netravati river might at a time during monsoon floods cut its way out, or the sea break in.

The change in the mouth itself is to some extent a return to the old state of things.

The extended portion (mentioned above) of the northern spit has been cut through by the Gurpur river, the portion so cut off within the harbour becoming an island, consequently there are again two mouths.

The southern spit has worked still further northwards, but has at the same time narrowed very much at its head.

These changes are shown by the survey taken in October 1878.

22. It is very probable that before the ensuing monsoon the island just formed and the northern spit will again become connected by silting up of the gap between them; this would very much narrow the mouth proper.

The effect of this narrowing of the mouth would be very likely to hasten the breaking out of the Netravati opposite the salt cotours, and this might result in the closing of the existing mouth.

This would appear to be the result desired by the Chief Engineer in his memorandum No. 382 of April 1872.

It would be advisable that an early decision should be come to whether the silting up of the new Gurpur gap should be assisted, or measures taken for getting rid of the island just formed, by cutting through it.

—November 1878.

(Signed) W. DAVIDSON,
Asst. to Suptg. Engineer, Fourth Circle.

No. 15.

No. 91-B. REPORT ON MANGALORE HARBOUR.

This harbour is fully described in Mr. Robertson's Report on Indian Harbours, and in page 12 of the report will be found the surveys of 1858 and 1871. The present state is as follows.

2. The bar and the Gurpur river gap have joined and the bar is about $1\frac{1}{2}$ miles north of the custom house and three-quarters of a mile south of Sultan's Battery. The entrance is about 200 yards wide and there is 14 feet of water on the bar, a native vessel drawing 12 feet has lately come into the harbour.

3. In consequence of there being only one entrance the whole tidal reservoir and the fresh water brought down by the two rivers combined keep the harbour entrance and bar in fair order and as good as we can hope to obtain without heavy and expensive works.

4. The entrance however being $1\frac{1}{2}$ miles north of the custom house, where all goods are loaded, is inconvenient. Should the harbour be left alone the following probably will happen. The entrance will slowly work further north, but the bar will remain good.

5. In a few years, perhaps very soon, in consequence of a heavy flood in the Netravati river and the action of the sea on the sand-spit, this stream will burst out in a new mouth, say about $1\frac{1}{2}$ miles south of the custom house, or $2\frac{1}{2}$ miles south of its present mouth.

6. The effect of this will be that the present mouth will almost close, and the backwater between the two mouths will silt considerably unless the Gurpur river gap (now the present mouth) is closed artificially.

7. But if this is done with the Netravati river mouth $2\frac{1}{2}$ miles south of it probably the cultivation up the Gurpur river will suffer and possibly the villagers will, as they are supposed to have done in 1827, cut the mouth open.

8. The Netravati river mouth will of course slowly move northward and repeat what has happened between 1827 and 1880.

9. It would be most advantageous to the harbour and bar that there should be an entrance and that that entrance should be fixed as proposed by Mr. Robertson, but I fear there is no hope of money for this being available.

10. The best position for the entrance has to be considered I would propose about half a mile north of the custom house, this is three-quarters of a mile south of the present site, and this would considerably relieve the strain on the sand-spit on the left side of the Netravati river and at the same time the flood waters of the Gurpur river (if the gap was closed) would not be too much backed up.

Supposing funds are not available to fix the entrance, the cost of which would probably be not less than Rs. 30,000, the following is proposed in June or July when there is heavy flood in the Netravati river, to cut the sand bank at the narrowest and most convenient place near half a mile north of the custom house; and when this has been done successfully to close the present Gurpur gap, this of course would be done in, say, January, the following year after it had partially closed naturally.

COIMBATORE,
11th January 1881.

(Signed) H. R. MEAD, Major, R.E.,
Superintending Engineer, Second Circle.

No. 92.

FORWARDED to the Master Attendant for perusal and return. A decision as to what is best to be done can be better arrived at after the personal inspection which it is proposed to make. Meanwhile the Chief Engineer has asked the Superintending Engineer for a rough estimate of the cost of the work as proposed by him.

13th January 1881.

(Signed) R. H. SANKEY, Col., R.E.,
Chief Engineer, P.W.D.

No. 91-C. From J. H. TAYLOR, Esq., Lieutenant, R.N.R., Master Attendant, Madras, to the Chief Engineer, Public Works Department, dated Madras, 20th January 1881, No. 442.

I HAVE the honor to return the report on Mangalore Harbour from the Superintending Engineer, Second Circle, dated 11th instant after perusal as requested in your No. 92, dated 13th idem.

No. 91-D. Note by the Chief Engineer, Public Works Department.

THE Superintending Engineer, in his inspection report No. 15, of the 11th January 1881, brings to notice the present condition and requirements of the Mangalore Harbour, and as I have now had the opportunity of a personal examination of the state of matters on the spot in company with the Superintending Engineer, Master Attendant, and Executive Engineer obtaining such other information as has been readily available, I beg to submit, for the consideration of Government, the following observations as to the course which it would seem best to adopt in the interests of all concerned.

2. Major Mead's report above adverted to, and a statement drawn up by Mr. Davidson, Assistant Engineer (herewith forwarded), deal in such a complete manner with the past history and present condition of the port that I shall merely allude to these in the briefest terms.

3. The map shows that from the point where the Netravati (or Buntwall) river first impinges on the coast, just north of the Oolaul village, there is a long backwater extending parallel with the sea for four miles up to a small fort called "Sultan's Battery" where the Gurpur river debouches.

4. The Netravati river following the law of all south Indian rivers turns north on reaching the coast owing to the combined action of the prevailing south-west surf

and wind, and in this way, judging from the atlas of 1827, its mouth has gradually advanced from a point nearly as far south as the Oolaul village to its present point $1\frac{1}{2}$ miles north of the custom house, or, roughly speaking, at the rate of between 250 to 300 feet each year. The advance may have been at times retarded or accelerated according to circumstances, but seems to have been pretty steady throughout this period of fifty-four years.

5. The Gurpur river from some no doubt sufficient, but as yet not very fully investigated, cause (probably the presence of laterite in the sides and bed controlling its course) has so far as is known had rather the opposite tendency, and as shown by the correspondence has, since the reputed artificial opening of its mouth by the villagers in 1827, moved in rather a southern direction. The gap which the Harbour Engineer, Mr. George Robertson, wished to deal with artificially in his report of 1871 closed of itself finally in May 1876, since which time both rivers have discharged through one opening into the sea.

6. Following the ordinary law this opening will continue its advance northward, and if no unusual occurrence were to take place in the interval we might expect to find the united mouth of the two rivers opposite Sultan's Battery in about another eighteen years or less.

7. But it will be readily seen that in this lengthening of the discharge channel the slope or inclination, and consequently also the velocity of the water passing out, of the Netravati river must diminish "*pari passu*." During flood therefore there is more and more a tendency for the water in the backwater to become heaped up and to overflow the long narrow barrier, which built up by the ceaseless action of the surf now separates it from the sea.

8. The correspondence also shows that fears have so far been entertained as to warrant experiments being made in 1877 with temporary groynes thrown up on river side of the backwater, in the hopes of arresting silt and thus give greater breadth and solidity to this natural barrier.

9. The condition of this long and apparently frail spit of sand is certainly not satisfactory, as although there is nothing to show that weak as it is the river is likely to burst through in any ordinary seasons, it will be seen from the foregoing observations that even as regards these the tendency is to diminish year by year its chances of being able to hold out, and there can hardly be a doubt that were any great "*débacle*" to occur at a time when the tide was very low and the surf inactive, the river must burst through at some southern point; probably at the same place as the mouth as shown by the atlas in 1827, near the village of Oolaul.

10. It would seem that the Chief Engineer, General Walker, in his memorandum No. 382 of April 1872 was rather of opinion that a southern mouth so formed would be advantageous, but on this point there will necessarily be differences of opinion. It may possibly be conceded that the mouth being then much more in the direct line of the river discharge a greater depth would probably be maintained on the bar during flood.

11. But as against this it may be urged that in the first place the Gurpur river would have a tendency to open an independent mouth for itself near Sultan's Battery, and were such an event to occur it can scarcely be doubted that shoals would in all probability form in the present backwater, diminishing its use for patamars of any size, and possibly cutting off entirely the present custom house from immediate connection with vessels of any draft even at high tide.

12. In the next place whether such shoaling take place or not, the distance which cargo boats would have to traverse in serving vessels in the offing would be so sensibly increased, that in all probability it would be found advisable to move the custom house and connected establishments to some point south of the present salt cotaurs.

13. So far, therefore, as I am enabled to form an opinion, I do not share the above view, and am inclined to think that we should endeavour to prevent the formation of this southern *débouchure*.

14. Among the most obvious methods of securing this end are the construction of sufficiently substantial permanent groynes along the backwater side of the long

sand-spit running north from the village of Oolaul, in somewhat the same position as the temporary groynes previously constructed, or of groynes of a still more substantial character along the sea face of the spit, with the direct object of arresting the sand in movement from the south, and thus adding such breadth as may be desired to the spit.

15. From the experience gained in the construction of the Madras Harbour there can now exist no doubt as to the perfectly certain action of works of this kind carried out with the requisite solidity. Long as is the line of spit, two of three breakwaters run out perpendicular to the shore (the northernmost placed, say, 300 or 400 yards south of the present mouth) would almost with perfect certainty arrest any desired breadth of sand, and render this permanently secure.

16. But it must at once be stated that the expense of one or other of these remedies would be such as (in the present state of the trade of this port, valuable as it undoubtedly is) to prove in my opinion prohibitory.

17. I can of course only say so now in general terms, but if the Government desire this inquiry to be followed up in this sense there will be no difficulty in having reliable estimates prepared.

18. On fully going into these and other proposals it seems to me, that the principles underlying the suggestions of the Superintending Engineer in his memorandum, are correct and should be acted on.

19. It is quite true that a certain amount of risk will still be run by leaving the sand-spit unstrengthened by any artificial means, and exposed to the possible action in case of an excessive flood coming down the Netravati river, but as above explained any removal of the mouth to a more southerly position now occupied will by so much tend to diminish the height of the flood level and increase its security.

20. After a careful examination of the sand-spit I have selected a point about one-fourth of a mile south of the custom house or more accurately 460 feet south of bench mark No. 4) where, the breadth of the spit being reduced to 250 feet, there are fair chances of our being able to open a new mouth for the river, in case of a heavy flood coming down the river say in the middle of June, and other circumstances favoring.

21. It is needless to go into the details of the preparations to be made with this object further than to say that, the cost of excavating the necessary trench across the spit may be from Rs. 1,000 to Rs. 1,500, an amount which can be easily appropriated from the Provincial Budget of 1881-82, unless, as may appear desirable to Government, the outlay be met from funds at the disposal of the Marine Department.

22. Should the operation prove successful there will apparently be no necessity for doing anything to the existing mouth, which will then be $1\frac{1}{2}$ miles to the north, and which in all probability will close of itself to a great extent and possibly altogether. Should the Gurpur river still seek its way south, the two rivers will issue by one *discharge* as at present, and their joint action as the result of these proposals may be expected to have the effects—

- 1st,—the Netravati river will be restrained from breaking through the sand-spit south;
- 2nd,—all vessels and boats using the port will be saved at least $1\frac{1}{2}$ miles in reaching the custom house;
- 3rd,—the river mouth being removed back $1\frac{1}{2}$ miles from its present position will take some twenty-seven years to work northwards to where it is now;
- 4th,—if the Gurpur river still discharges itself to the south, the backwater will be kept quite as clear if not clearer of shoals than it is at present; and of anything the depth of water on the bar should be improved from the greater velocity engendered during floods; but in order to facilitate all operations in future it is very advisable that the port officer should carefully watch and maintain a continuous record of the changes in the backwater throughout each monsoon.

23. Funds should be provided for the work as early as possible in April if the Government approve; Rs. 2,000 is probably the utmost that will be needed.

24. To save time this paper has been shown to the Master Attendant who will submit his remarks separately.

MANGALORE,
1st February 1881.

(Signed) R. H. SANKEY, Colonel, R.E.,
Chief Engineer, P.W.D.

No. 91-E.

Memorandum by the Master Attendant.

I ENTIRELY agree with the Chief Engineer in his remarks upon Mangalore Harbour, and I fully recognize the expediency of endeavouring to open a new mouth for the Netravati river in a position suited to the trade and shipping interests of the port. It seems certain that the river will ere long choose a plan for itself, probably going back to the extreme southern corner of the sand-spit, in which case much inconvenience to all concerned would ensue. As a very large proportion of the sea-borne trade of Mangalore is conducted within the harbour, a large allotment of the funds required for the contemplated work may fairly be debitable to Port Funds, the case being one they are intended to meet. I would recommend that two-thirds of the estimate be charged to the available balance of Port Funds to credit of Mangalore.

3rd February 1881.

(Signed) J. H. TAYLOR, Lt., R.N.R.,
Master Attendant, Madras.

No. 91-F.

ORDER THEREON, 24th February 1881, No. 501 W.

'The papers read above on the subject of the Mangalore Harbour will be recorded. The port has recently been inspected by the Chief Engineer, accompanied by the Master Attendant, Madras, the Superintending Engineer and the Executive Engineer of the division. The proposals made by Colonel Sankey and concurred in by Captain Taylor to open in the first heavy flood of next monsoon a new mouth for the Netravati river at the narrow part of the sand-spit west of the backwater at a point 460 feet south of the B.M. opposite the custom house seem calculated to serve as far as possible the trade and shipping interests of the port, and as the cost is inconsiderable they will be put in hand as early as circumstances admit, under the supervision of the officers of the Public Works Department, from a grant to be made from Port Funds.

2. It is considered that the sand bank stretching north from Oolaul will be safer with the reduced strain which the new opening thus proposed will secure, and risk of the Netravati forcing an opening for itself near Oolaul will at the same time be sensibly diminished.

3. Should the operation of opening a new mouth for the Netravati river prove as it may be hoped, successful, the Government sees no necessity for attempting to close artificially the present mouth.

4. A sum of Rs. 2,000 will be placed at the disposal of the Public Works Department from Port Funds by the Financial Department early in April, arrangements meanwhile being made for the commencement of the work on a regular estimate which the Superintending Engineer will submit for sanction with the least practicable delay.

(True Extract.)

(Signed) R. H. SANKEY, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Superintending Engineer, Second Circle.
" Examiner of Public Works Accounts.
" Marine Department.
" Financial Department.

Ed. E. C. Shanker.
Spars Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Gobt. of (1881) Madras.
PUBLIC WORKS.

To

THE SUPERINTENDING ENGINEER,
SECOND CIRCLE,
&c., &c., &c.

Dated February, 24th.

Issued

Encl.

Encl.

G. O., 24th February 1881, No. 591 W.

FEBRUARY.

Nos. 91-A-91-F.

Mangalore Harbour.—The proposals for the opening of a new mouth for the Netravathi river approved, and the Financial Department requested to place Rs. 2,000 at the disposal of the Public Works Department for the work.

5
591
CAW

Submit the
correspondence to
the Master Attendant
In an expression
of his opinion re-
farding charges
amounts proposals

I also wish
to know whether
any note has
been kept ^{by the Engineer Dept.} and if
so with what result
on the effects of the
work already
commenced
under the provisions

^{1/2}
D. W. C. 12/2

This may at
once be circulated
as securing the
plan of Benbow
and change made
it into any other
being be carried
off by the printer

1/2/81. P.H.

Dr W

I send herewith
Capt. Taylor's & my
remarks about Man-
galore in connection
to the H. Co. and the
Governor

It will be as well
I think to have all
the papers printed
for subsequent printing
with the S.O. &c.

Heads report Mr
Davidson's with my
own & Capt. Taylor's
inconsistency

Mr. Pringle has it.
Seems carried off the
plans of the end of
Bangalore by mistake
so it will be necessary
to correct them
and also to get a
copy of Mr. Robertson's
report as I cannot
keep mine till

Chas
Taylor
Q

the end of my
tour

W.H.

3/2/51

Note by the Chief
Engineer

The Superintendent
Engineer in his inspection
report - No 15 of the 11th
January 1881 brings to
notice the present
condition and ruin
of the Mangalore
Harbour, and as I
have since had the
opportunity of a personal
examination of the
state of matters on
the spot in company
with the Super? Engineer
Master Attendant and
Executive Engineer,
obtaining such other
information as has
been readily available.
I would now submit
for the consideration
of Government the plan

observations as to
the course which it
will now seem best
to adopt in the interests
of all concerned

Major Smith's report
above adverted to
and a statement
drawn up by Mr. Seward
- Sen Assist. Engineer
deal (vermin & minerals)
deal in such a complete
manner with the facts
history & present condition
of the port that I
shall merely allude
to them in the briefest
terms

The map shows that
from the point where
the Netravathi (or
Buntwal) river first
impinges on the coast,
just north of the
Island village there
is a long backwater

extending parallel
with the sea for four
miles up to a small
fort called "Sultans
Battary" where the river
now debouches

The Netravathi river
following the law of all
South Indian rivers
turns north on reaching
the coast - owing to the
combined action of the
prevailing South west
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in this way, judging
from the Atlas of 1827,
its mouth was gradually
advanced for a point
nearly as far South as
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its present point $1\frac{1}{2}$
miles north of the
Custom house, or roughly
speaking at the rate
of between 250 to 300
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advance may have
been at times retarded
or accelerated owing

to circumstances

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this period of 54 years

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but as yet not very fully
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ficial opening of its mouth
by the villagers in 1827,
moved in
rather a southern
direction

~~the~~ - The fact which
the Harbour Engineer Mr. George Robertson
wished to ^{deal with} ~~show~~ artificially
in his report of 1871,
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time both rivers have
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opening into the sea

Following the ordinary
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two rivers opposite
Suttons Battery in
about another 18
years or less

But it will be readily
seen that in this con-
-gathering of the discharge
channel the slope
or inclination, and
consequently also the
velocity of the water
passing out of the
river must be deemed
"vari passu". During
flood therefore there
is more and more
a tendency for the water
in the back water to
become heaped up
and to overflow the
barriers which, built
up by the ceaseless

of the Gulf and separates
it from the Sea

The correspondence
also shows that plans
have so far been enter-
tained as to construct
Embankments being made
in 1877 with temporary
dykes thrown up
on this side of the
backwater, in the
hopes of arresting silt
and thus render
more solid this natural
barrier

The condition of this
land and apparently
fragile Spit of Land
is certainly not satis-
-factory, as although
there is nothing to show
that weak as it is
the river is likely to
burst through in any
ordinary seasons, it
will be seen from the
foregoing observations
that even as regards

time the tendency
is to diminish year
by year its chances of
being able to hold out
and there can hardly
be a doubt that some
very great "debacle"
to occur, at a time
when the tide was
very low, and the Gulf
inactive, the river
must burst through
at some Southern
point — probably at
the same place as the
mouth can be seen by
the Atlas ~~above~~ in 1827

General Walker

It would seem that
the Chief Engineer in
his memo No 302 of
April 1872 was rather
of opinion that a
Southern mouth so
formed would be
advantageous, but at
this point there is
necessarily a difference
of opinion — It was
possibly in 1827

that the mouth
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in the bar during
flood.

But as against this
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in the first place the
Purpur river would
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mouth by itself near
Dultan's Battery, and
were such an event to
occur it can scarcely
be doubted that
boats would in all
probability form in
the present habitation
diminishing its use
in matters of any
size, and possibly
cutting off entirely
the present custom
house in immediate
connection with vessels

of any draft even
at high tide.

In the next place
whether such shaking
take place or not
the distance which
cargo boats would have
to traverse in leaving
vessels in the offing
would be so sensibly
increased, that in
all probability it will
be found advisable
to move the Custom
house and connected
Establishments to
some point south
of the present Salt
Stores.

So far therefore as
I am enabled to
form an opinion I
do not share the above
view, and am inclined
to think that we
should endeavor
to prevent the removal
of this Customhouse.

Conclusion
Among the most
obvious methods
of securing this end
are the construction
of sufficiently sub-
stantial permanent
groynes along the
backwater side of
the long sand spit
running north from the
village of Ocala in
summarily the same
positions as the tem-
porary groynes formerly
constructed — or of
groynes of a still
more substantial
character along the
sea face of the spit
with the direct object
of arresting the sand
in movement from the
south & thus adding
such breadth as
may be deemed to
be of use.

From the experience
gained in the construction

of the dead-end harbor
there can ^{very} ^{well} ^{be} said
no doubt as to the
perfectly certain action
of works of this kind
carried out with the
necessary solidity —
Long as the line of
spit in two of these
breakwaters run out
perpendicular to the
shore (the northern-
most placed say
300 or 400 yards south
of the present wharf)
would almost with
perfect certainty secure
any desired breadth
of sand, and render
this permanently se-
cure.

But it must at
once be stated that
the expense for one
or others of these re-
medies would be less
as in the present state
of the trade of this
port, valuable as it

undoubtedly is) ~~can~~
to prove in any opinion
prohibitory

I can of course only
say so and in general
terms but if the Board
decide this evening to
be followed up in this
sense there will be no
difficulty in having
reliable estimates
prepared.

On fully going into
these and other pro-
posals it seems to me
that the principles
underlying the ~~proposals~~
of the Superintendent
regarding in his mind
are correct and should
be acted on

It is quite true that
a certain amount of risk
will still be run by
leaving the South Spit
unstrengthened by any
artificial means, and
exposed to the possible

action in case of an
excessive flood coming
down the river, but
as above explained
any removal of the
mouth to a more
southerly position will
be compensated by so
much ~~and~~ to diminish
the height of the flood
level, and increase
its security

After a careful ex-
amination of the Sand
Spit I have selected
a point about $\frac{1}{4}$ of a
mile south of the
Custom House or wharf
(approximately 460 feet south
of Bench mark 104)
where the breadth of
the Spit being reduced
to 250 feet - there are
fair chances of our
being able to open a
new mouth in the
river in case of a
heavy flood coming

down the river
day in the middle
of June, and other
circumstances proving

It is needless to go
into the details of
the preparations to be
made with this object.
Nothing more to say
that the cost of creating
the necessary trench
across the spit may
be from Rs 1000 to
Rs 1500, an amount
which can be easily
appropriated from
the Provincial Budget
of 1881-82, unless
as may appear
desirable to divert
the outlay to work
the funds at the
disposal of the Marine
Department.

Should the operation
prove successful
there will apparently

be the result of
these proposals

be no necessity in
doing anything to the
existing mouth which
will then be $1\frac{1}{2}$ miles
to the north, and which
in all probability will
close of itself to
a great extent, and
possibly altogether.

Should the purpose
river still seek its
way south the two
rivers will issue by one
dibouchure as at
present, and this
point action may be
expected to have the
effect

1st the Natarwati
river will be pre-
vented from breaking
through the Sand
Spit south

2nd All vessels and
boats using the
port will be saved
at least $1\frac{1}{2}$ miles
in reaching the
Custom House

3rd The river mouth

being ^{removed} back $\frac{1}{2}$
miles from its present
position will take
some 27 years to
work northwards
to where it is now.

4. If the Professor view
still passes south
the backwater will
be kept quite as clear
if not clearer of
Shoals than it is at
present; and of any-
thing the depth of
water on the bar
should be improved
for the greater velocity
ensured during
floods; but in order

Funds should be
provided for the work
as early as possible
in April if the Government

Approve - Rs 2000 is for.

To save time this
paper has been shown to
the Charter Attendant who
quite submits his remarks
respecting

to facilitate all
operations in future
it is very advisable
that the Port Office
should carefully
watch and maintain
a continuous record
of the changes in the
backwater throughout
each monsoon

Secretary
al
12 Feb 1881

15/50
Memo by the Marine Assistant
Feb 3rd 1881.

I submit you with the
Chief Engineer in his remarks
on the Mangalore Harbour
and I fully recognize the expediency
of endeavoring to open a new
route for the Muziris all India
in a position suited to the
trade & shipping interests of
the Port. It seems certain that
the river will be long chosen a
line for itself probably being back
to the estuary rather than coming of
the head of it in which case much
inconvenience & oil consumed would arise
As a by consequence of the long
trade of Mangalore is conducted within
the harbour a large allotment of the
funds required for the harbour will
not may find be applicable to
Port funds the case being one they
are intended to meet. I would
recommend that two thirds of the
estimate be charged to the
available balance of Port funds
to end at Mangalore

W. Taylor
Marine Assistant

Mangalore Harbour ¹⁷/₅₂₁

This Harbour was inspected and reported on by Mr. Robertson in February 1871.

At the time of this inspection two mouths to the Harbour were in existence - one, the escape of the Gorgur River, called the Gorgur Gap - the other the escape of the Netravati river, this last being the proper mouth of the Harbour. The mouths were separated by the Badarodi Island.

The Gorgur Gap was originally made in 1827 by the villagers, who cut through the sand with the object of relieving their lands from the flood waters of the Gorgur river. The Harbour's mouth being at this time at Calani, some 2 or 3 miles further south, the Gorgur River had consequently this additional distance to travel before it escaped to the sea.

This southern mouth has steadily worked northwards till it has attained the position shown in the plans of 58 and 71. While the Gorgur mouth has remained stationary, or nearly so, moving if anything, southwards.

From the chart of 1850 it will be seen that the two mouths then held very similar positions to those shown in Mr. Pingle's survey of 1871. The Netravati mouth or Harbour mouth proper, being, however, somewhat further

further south in the earlier plane.

In 1855 an attempt was made to close the Gopur Gap by building a dam above it, across a shallow portion of the backwater; this, it was hoped, by excluding the tidal water, would allow of the gap being closed by the sea. The attempt proved a failure, the dam being destroyed by a high tide before it had been fully completed.

In 1860 Herbert Pears reported that the
gorpue gap was only 75' wide; while in 1871
it was 79' at the narrowest part.

Mr Robertson in his report recommends the closing of the gap and the fixing of the harbour mouth, as the first steps to be taken before proceeding to improve the Harbour. This has throughout been the object of Govt. in the various surveys &c undertaken with reference to this Harbour.

In recommending the closing of the
Goosper Gap Mr Robertson briefly describes
the method he would pursue. He deprecates,
however, the immediate or, rather, the
sudden closing of the gap as likely to flood
the neighbouring lands during floods, owing
to the great shoaling, which has taken
place in the Goosper River, between the
Lake and the Harbour mouth, since the Gap
was originally made in 1827.

In April 1872 the Supt Engineer of Division reported to Govt that the sand spit immediate opposite the "Salt Katare" had been very much narrowed by the action of the Netravati River, he feared that unless protective measures were taken a breach would occur at this point during the monsoon, and accordingly proposed the construction of 2 groynes, with rough stone pitching between them.

The Chief Engineer, in his Memo 382 of April 1872, rejected this proposal, stating that a breach at this point would be a disadvantage, this being in his opinion the best position for the 12-hour mortar, as formerly, when so fired the war was better than it has ever been since.

In January 1874 the Inspecting Engineer for Ports &c in accordance with G.O. 2138 of August 73. submitted plans & estimate to Govt for closing the Goppur gaps but at the same time reported as follows:-

- (1) That the Badaoda Island lying between the two mouths had been almost washed away during the monsoon of 1873, what remained being a mere sandbank.
- (2) That the Gopur had moved some 500 ft south of its position in April 1873.
- (3) That from these results he inferred that the monsoon of 1874 would in all probability

sweep away what remained of the island, and the mouths of the Netravati and Gopur Rivers would be united.

Under the above circumstances he proposed that no steps should be taken towards closing the Gap.

To this proposal Government agreed. In their order 347 E of 12 February 74, at the same time stating that surveys of the Harbour showing changes should be regularly submitted before and after each monsoon.

Nothing further of any importance appears to have occurred till 1876. In June of that year, the District Engineer telegraphed that the Gap had closed during the dry season, and followed up his telegram with a mail report dated 21st July 1876.

On this the Chief Engineer remarks in G.O. 2055 of 10th August, "till the 'double opening' which had for so many years existed between the Mangalore Back-water and the sea, whereby the waters of the Netravati River to the south, and the Gopur River to the north, made their way into the sea by separate channels, had gradually merged into one, by a process which not having been closely watched was so imperceptible that its result has only now been reported."

"It can only have said to have

been completed when the sand spit from the Northern Breach overlapped the Head of the sand Island within."

"It is now evident that the sand island is due to surf deposit."

This was the condition of the Harbour at the beginning of 1877.

A survey and sections in the Harbour were taken during March and April, from these cross sections it was seen that there was great silting up of the Back water immediately in front of the "Salt Kotawars" and also in front of the Custom House. The current of the Netravati setting on to the spit opposite the "Salt Kotawars" and keeping to a great extent along that bank.

A rough estimate of Rs 600 for constructing temporary groynes to protect the portion of sand spit opposite the salt Kotawars was sanctioned about this time. The groynes nine in number, consisting of coconut piles, with leaves of the same plant worked in between them, were constructed during the monsoon.

It is difficult to form any opinion as to the effect of these groynes. They were constructed after the setting in of the monsoon and on the cessation of the monsoon and the

the subsiding of the Backwater to its ordinary level, it was found that the lower portions of the groynes had rotted and worn away, offered free passage to the water. Numbers of the piles had also rotted. A little silting up had taken place behind one or two of the groynes, but to an appreciable extent.

The sea, during some heavy weather in August, cut well into the spit behind or nearly behind the groynes. There being only a bank of sand some 15 paces broad between the high water mark of sea and backwater, the action of the sea appeared to be as coming action from South to North along the length of the spit.

The southern spit during this monsoon worked somewhat further northwards.

From the close of the monsoon of '77 to the commencement of that of '78, the chief change occurred in the spit north of the Harbour mouth. This spit extended gradually some distance inwards into the Backwater, as shown by the survey of May '78.

During the last monsoon, that of '78, the narrow portion of spit opposite the entrance to the Harbour, was still further cut into by the sea, which in one or two places washed

washed over into the backwater. This is the weak point in the Harbour and the Netra-vati river right, at any time during monsoon floods, cuts its way out, or the sea breaks

The change in the mouth itself is to some extent a return to the old state of things.

The extended position (mentioned above) of the northern spit has been cut through by the Netra-vati River. The portion so cut off within the Harbour, becoming an island. Consequently there are again two spits.

The southern spit has worked still further northwards, but has at the same time narrowed very much at its head. These changes are shown by the survey taken in October 1878.

It is very probable that before the ensuing monsoon the island just formed and the northern spit will again become connected by silting up of the gap between them, this would very much narrow the mouth proper.

The effect of this narrowing of the mouth, would be very likely to hasten the breaking out of the Netra-vati opposite

opposite the Salt Works, and this might result in the closing of the existing mouth.

This would appear to be the result desired by the Chief Engineer in his Memo 382 of April 1872.

It would be advisable that an early decision should be come to whether the silting up of the new Harbor Gap should be resisted, or measures taken for getting rid of the island just formed, by cutting through it.

Mangrove Harbour

Group 15/16

12/10/17

10207 C 3
10207 C 14

Mangrove Harbour

(1)

This Harbour was discovered and explored on by
Mr. Robertson in Feb 72. It was found
at the time of the inspection two mouths to the Harbour
were discovered - one, the Snake of the Puer
River, was called the Puer fish - the other the
Snake of the Kestavati river, this last being
the proper mouth of the Harbour. The mouths
were separated by the Paldacodi Island.
The Puer fish was originally made in 1627
by the villagers, who cut through the sand,
with the object of relieving their land
from the flood waters of the Puer river.
The Harbour mouth being at this time at
Oulaul, some 2 to 3 miles further south, the
Puer River had ^{consequently} this additional distance
to travel before it escaped to the sea -
This southern mouth has steadily worked
northwards till it has attained the position
shown in the plans of 58 and 71. While the
Puer mouth has remained stationary or
nearly so, moving, if anything, southwards.

From the chart of 1850 it will be seen that the two mouths then held very similar positions to those shown in Pyle's survey of 1871 - the Ketravati mouth is about 100 ft. higher, however, somewhat further south in the earlier plan -

In 1856 an attempt was made to close the furberlah by building a dam above it, across a shallow portion of the Backwaters, this it was hoped, by excluding the tidal water, would allow of the lake being closed by the sea - the attempt proved a failure, the dam being destroyed by a high tide before it had been fully completed.

In 1860 Mr Pears reported that the furberlah was only 75' wide, while in 1871 it was 779' at the narrowest part. Mr Robertson in his report recommends the closing of the lake and the fixing of the Harbour mouth as the first steps to be taken

23/507 123
before proceeding to improve the Harbour. This has throughout been the object of Govt. and other various surveys & undertaken with reference to the Harbour -

In recommending the closing of the furberlah Mr Robertson briefly describes the method he would propose - he deprecates, however, the immediate or rather the sudden closing of the lake as likely to flood the neighbouring lands during floods, owing to the great shoaling which has taken place in the furber River, between the lake and the Harbour mouth, since the lake was originally made in 1827 -

In April 1872 the Public Works Division reported to Govt. that the Sands put immediately opposite the "Salt holours" had been very much narrowed by the action of the Ketravati River, he feared that unless protective measures were taken, a breach would occur at this point during the monsoon, and accordingly proposed the construction of a dyke, with rough stone pitching between them.

24
The Chief Engineer, in his memo 382 of April 72. rejected their proposal, stating that a beach at this point would be advantageous. This being in his opinion the best position for the Harbour mouth, as formerly when so fixed the bar was better than it has so been since.

In January 1874 The Inspector for Ports & Harbours submitted in accordance with G.O. 2138 of Aug 73. submitted plans estimate to put in closing the former gap; but at the same time reported as follows:-

- (1) That the Bada cody Island lies between the two mouths had been almost washed away during the monsoon of 1873, what remained being a mere sandbank.
- (2) That the former gap had moved 80 ft South of its position in April 1873.
- (3) That from these results he inferred that the monsoon of 74 would in all probability sweep away what remained of the island, and the mouths of the

25/5 15
(2)
Ketravati and former River would be united. Under the above circumstances he proposed that no steps should be taken towards closing the gap.

In their proposal Government agreed to their order 347 B of 12 Feb 74, at the same time stating that surveys of the Harbour showing changes, should be regularly submitted before and after each monsoon. Nothing further appears for assistance appears to have occurred till 1876. In June of that year, the District Engineer reported by telegraphed that the gap had closed during the dry season, and followed up his telegram with a full report - dated 20 Feb 76. - on this the Chief Engineer remarks in his memo. G.O. 2055 of 10th Aug. That "the double opening which had put

5th
many years existed between the Mangrove
back water and the sea, which the
water of the Netravati River to the South, &
the Purnea River to the North, made the
way into the sea by separate channels,
has gradually merged into one by a process
which has hardly been closely watched,
was so imperceptible that its result
has only now been reported.

"It can only have been said to have
been completed when the sand spit
from the Northern Beach overlapped
the Head of the Sand Island with
its now evident that the sand spit
is due to the deposit."

This was the condition of the Harbour at
the beginning of 1877.

A survey and sections of the Harbour
were taken during March and April,

25/3/77 6
from these cross sections it was seen that
there was great sill up of the back water
immediately in front of the "Salt Stacks" and
also in front of the "Custom House". The cause
of the Netravati being so ~~coming~~ on to the
Spit opposite the "Salt Stacks" and leading
to a great extent along that Bank.

Although the estimate of Rs 600 for constructing temporary
fences to protect the portion of sand spit opposite
the "Salt Stacks" was sanctioned about this
time - the fences nine in number, consisting
of coconut piles with leaves of the same
plant worked in between them were constructed
before the monsoon.

It is difficult to judge of the ~~value~~ ^{value} of the fences
as to the effect of these fences - they were
constructed after the setting in of the monsoon
and on the cessation of the monsoon and
the subsiding of the back water to its ordinary
level, it was found that the low portions
of the fences ^{had} ~~were~~ rotted & worn away, &

free passage
offered assistance to the water members of
the hills had also entered - a little silt, which
had taken place behind one or two of the frogs -
but to no appreciable extent -

The sea during some heavy weather in August, cut
well into the spit and behind one of the
the frogs - there being a bank of sand some
15 paces broad between the high water marks
of sea and backwater; the action
of the sea appeared to be a scum action
from south to north along the length of the
spit -

The southern spit during this season worked a
somewhat further northwards -

From the close of the season of 77 to the com-
mencement of that of 78. the chief change
occurred in the spit to the north of the
Harbor mouth - this spit extended gradually
some distance inwards into the Backwater,
as shown by the survey of May 78.

26/50

(3)

During the last season, that of 78. the
narrow portion of spit, opposite the Salt
Kotans was still further cut into by the
sea, which in one or two places washed
over into the backwater - this is the weak
point in the Harbour and the Hel-
vati river is left, at any time during season
floods, with its way out to the sea
broken in the mouth itself, & to
some extent a return to the old state

After this
the extended portion (mentioned above)
of the northern spit has been cut through
by the Helvati River, the portion within the
Harbor ~~is~~ ^{is} ~~now~~ ^{now} being an island.
Consequently there are again two mouths.
The southern spit has worked still
further northwards, but has at the same
time narrowed very much at its
head -

These changes are shown by the survey taken in
Oct. 72.

It is very probable that before the survey season
the island will be formed and the northern spit
will again become connected by silt up of
the gap between them. This would very much
narrow the mouth of the river.

The effect of this narrowing of the mouth, would
be very likely to hasten the breaking out of the
retreating of the Salt Water, and
this might result in the closing of the
existing mouth.

This would appear to be the result desired
by the Chief Engineer in his memo 342 of
April 72.

It would be advisable that an early decision
should be come to whether the silt up
of the new former spit should be
assisted, or the island measures
taken in getting rid of the island
performed, by cutting through it.
1178 J. O. Davidson

What is the Chief Engineer's order.

Mangalore Harbor

This file to accompany
S. P. when on tour
to Mangalore -

Mangalore Harbor

No. 15

28/5/1871 P. 11
Report on Mangalore Harbour.

This harbour is fully described in Mr Robertson's Report on Indian harbours and in page 12 of the report will be found the surveys of 1858 and 1871. The present state is as follows.

The Bar and the Gurpoor river gap have joined and the Bar is about $1\frac{1}{4}$ miles North of the Custom house and $\frac{3}{4}$ of a mile South of Sultan's Battery. The entrance is about 200 yards wide and there is 14 ft. of water on the Bar a native vessel drawing 12 ft. has lately come into the harbour.

In consequence of there being

being only one entrance the whole tidal reservoir and the fresh water brought down by the 2 rivers combined keep the harbour entrance and Bar in fair order and as good as one can hope to obtain without heavy and expensive works.

The entrance however being $1\frac{1}{4}$ miles North of the Custom house where all goods are loaded is inconvenient.

Should the harbour be left alone the following probably will happen.

The entrance will slowly wear further North but the Bar will remain good.

In a few years perhaps very soon in consequence of a heavy flood in the Buntwall River and the action of the sea on the sand spit, the

the Buntwall River will burst out in a new mouth say about $1\frac{1}{4}$ miles South of the Custom house or $2\frac{1}{2}$ miles South of its ^{present} mouth.

The effect of this will be that the present mouth will almost close and the backwater between the 2 mouths will silt considerably unless the Goorpar River gap (now the present mouth) is closed artificially.

But if this is done with the Buntwall River mouth $2\frac{1}{2}$ miles South of it probably the Cultivation up the Goorpar River will suffer and possibly the villagers will as they are supposed to have done in 1827 cut the mouth open.

The Buntwall River mouth will

the present mouth will close
the new mouth will open
the Goorpar River gap will be closed

will of course slowly move North-
ward and repeat what has happened
between 1827 and 1880.

It would be most advantageous
to the harbour and Bar that there
should be an entrance and that
that entrance should be fixed as
proposed by Mr Robertson but I
fear there is no hope of money for
this being available.

There cannot
be a second
entrance. The
2 Rivers will
not flow or
navigate
without the
entrance.

The best position for the entrance
has to be considered. I would pro-
pose about $\frac{1}{2}$ a mile North of the
Custom house this is $\frac{3}{4}$ of a mile
South of the present site and this
would considerably relieve the strain
on the Sand Spit on the left side
of the Buntwall River and at the
Same

same time the flood waters of the
Gorpoor River (if the gap was closed)
would not be too much backed up.

Supposing funds are not available
to fix the entrance the cost of which
would probably be not less than Rs. 20,000.
the following is proposed in June
or July when there is heavy flood
in the Buntwall River to cut the
Sand bank at the narrowest and
most convenient place near $\frac{1}{2}$ a
mile North of the Custom house
and when this has been done
successfully to close the present
Gorpoor gap. This of course would
be done in May/January
the following year after it

J. H. C. 1881
From
The Surveying
Second Circle.

Dated 11th
Sept: 12th } January 1881
Jan: 13th

No. 15

Mangalore Harbour.

Report by Major
H. R. Mearns & Co. Survey
Engineers on the —

No 92

From the Surveying 2nd Circle No. 15
dated 11th January 1881

Forwarded to the
Master Attendants for
perusal and return. A
decision as to what is
best to be done can be
better arrived at after
the personal inspection
which it is proposed to
make. Meanwhile the
Chief Eng. has asked
the Surveying for a rough
estimate of the cost
of the work as proposed
by him. / Sd/ R. H. P.

13th Jan/81.
Capt. - 13/1/81

Chief Eng.

Administrative Department.

MADEAS,

Marine Office.

No. 1442.

20th January 1881.

From

THE MASTER ATTENDANT,

ADMINISTRATIVE DEPARTMENT,

MADEAS,

To

The Chief Engineer Public Works
Department

SIR,

I have the honor to return the report
on Mangalore Harbour from the Superintend-
ing Engineer Mr. Girdle dated 11th instant after
perusal as requested in your No. 92 dated
13th idem.

I have the honor to be
Sir

Your most obedient Servant

W. L. S. S.

Master Attendant
Administrative Department

68.92/13 January 1881

7/51 p. 1

Sp. Note by the Chief Engineer

The Superintendent
Engineer in his inspection
report of the 11th
January 1881 has in-
timated the present con-
dition and requirements
of the Harbours, and on
I have had the
opportunity of a personal
examination of the state
of matters in the
harbour, in company with the
Superintendent, Master
Attendant, and Executive
Engineer, obtaining such
other information as
has been readily available.

J. W. Cox 100

8/1

From

The Master Attendant,

Administrative Department,

Marine,

To

The

Port

20

Jan

1881

Received

No. 447

William Cox

on 20th Jan

1881

Wm. Cox
Master

I would now submit for the consideration of each the following observations as to the course which it would now seem best to adopt in the interests of all concerned.

1. Major Meade's report above adverted to and a statement drawn up by Mr. Davidson, Lieut. Engineer, (here with forward) deal in such a complete manner with the past history and present condition of the fort that I shall merely allude to these in the briefest terms.

2. The map shows that from the point where the

the Atlatlan (or Banderilla) river first impinges on the coast, just north of the Bolal village there is a long narrow strip extending parallel with the sea for four miles up to a small fort called "Sultan's Battery" where the Surpar river debouches.

3. The distance between the river following the line of all South Indian rivers flows north and reaching the coast owing to the combined action of the prevailing south-west surf and wind, and in this way, judging from the atlas of 1827, it

1724
mouth has gradually
advanced from a point
nearly as far south as
the Lalau village to
its present point $\frac{1}{2}$
miles north of the Lush
Kauo, or roughly speaking
at the rate of between
200 to 300 feet each year.
The advance may have
been at times retarded
or accelerated according
to circumstances but seems
to have been ^{pretty} steady
throughout the period
of 56 years.

5 The Karpa River
from some no doubt
sufficient but as yet
not very fully investigated
cause (probably the
presence of latents in
the

1725
the sides and bed controlling
its course) has so far
as is known had rather
the opposite tendency,
and as shown by the
correspondence has since
the reputed artificial
opening of its mouth
by the villagers in 1827,
moved in rather a
southern direction. The
gap which the Harbour
Engineer Mr. George Robertson
wished to deal with
artificially in his report
of 1871, closed of itself
finally in May 1876, since
which time both rivers
have discharged through
one opening into the sea.
6 Following the ordinary
low the opening with

continue its advances
northward and if no
unusual occurrences
were to take place in
the interval we might
expect to find the united
mouth of the two rivers
opposite Sullivan's Battery
in about another 18
years or less.

7. But it will be readily
seen that in the lengthening
of the discharge channel
the slope or inclination,
and consequently also the
velocity of the water passing
out of the ^{Nitrawati} ~~river~~ must
diminish "pace passo".

During flood therefore
there is more and more
a tendency for the water
in the low Kwato to
heave up and to
overflow the barrier which

? Nitrawati

37/5 1827

built up by the ceaseless
action of the surf now
separates it from the sea.

8. The correspondence also
shows that fears have so
far been entertained as to
warrant experiments being
made in 1847 with tem-
-porary groynes thrown
up on river side of the
low Kwato, in the hopes
of arresting silt and
thus render more solid
this natural barrier.

9. The condition of this
long and apparently frail
spit of sand is certainly
not satisfactory although
there is nothing to show
that weak as it is the
river is likely to burst
through in any ordinary
seasons, it will however

from the foregoing observations -
 - that even as regards
 there the tendency is to
 diminish year by year its
 chance of being able
 to hold out, and there
 can hardly be a doubt
 that were any great
 "deltas" to occur at a
 time when the tide was
 very low, and the surf-
 inactive, the river must
 burst through at some
 southern point - proba-
 bly at the same place
 as the mouth as shown
 by the atlas in 1827.

10 It would seem that
 the Chief Engineer General
 Walker in his Memoirs
 382 of April 1872 was
 rather of opinion that
 a southern mouth so

formed

from the present for
 a period of 7 years some
 27 years ago. & deter-
 mine Walker's opinion. The
 opening at that time was
 almost immediately opposite
 the Austin House

MM

to be a breach of the
 river in 1872. The
 river was in position to
 burst through at some
 southern point. Walker
 said that it was
 probable that it would
 burst through at some
 southern point. (Walker
 1872)

formed would be advan-
 - tageous, but on this point
 there will necessarily be
 differences of opinion. It
 may possibly be conceded
 that the mouth being ^{then} ~~now~~
 more in the direct line
 of the river discharge a
 greater depth would
 probably be maintained
 as the bar during flood.
 11. But as against this
 it may be urged that in
 the first place the Ganges
 river would have a
 tendency to open an
 independent mouth for
 itself near Sultan's Battery,
 and were such an event
 to occur it can scarcely
 be doubted that ships
 would in all probability

185
 basin in the present back
 water diminishing its use
 for piers of any size,
 and possibly cutting
 off entirely the present
 Custom House for im-
 mediate connection
 with vessels of any draft
 even at high tide.

10. In the next place
whether such a change
to the place or not the
distances which cargo
boats would have to
traverse in serving
vessels in the office
would be so sensibly
increased, that in all
probability it would
be found advisable
to move the Custom House
and connected establishments

The shore in the
day time (when the surf
is rising & when waves
break off the main point
five or six hundred feet
from shore) there
beach water or sand.

Letter April 21

The collection is very
fine and of the highest
grade. It is the finest
southern part of the
and is found by the
Mississippi river.

to some point south of
the present Salt-Catano

13. So far therefore as
I am enabled to form an
opinion I do not share
the above view, and am
inclined to think that
we should endeavor
to prevent the formation
of the southern debacle

14. Among the most obvious methods of securing this end are the construction of sufficiently substantial permanent groynes along the backwater side of the long sand spit running north from the village of Solaul in somewhat the same position as the temporary

142
groynes previously constructed -
or if groynes of a still
more substantial charac-
ter along the sea-face of
the spit with the direct
object of arresting the
sand in movement
from the south and thus
adding such breadth as
may be desired to the spit.

15. From the experience
gained in the construc-
tion of the harbor piers
there can now exist
no doubt as to the
perfectly certain action
of works of this kind
carried out with the
 requisite solidity -

Long as is the line
of spit - two of
three

143
three breakwaters run out
perpendicular to the shore
(the northernmost placed
say 300 or 400 yards south
of the present mouth)
would almost with
perfect certainty ~~secure~~^{arrest}
any desired breadth of
sand and render the
permanently secure.

16. But it must at
once be stated that the
expense of one or other
of these remedies would
be such as (in the present
state of the trade of this
port, valuable as it
undoubtedly is) to
prove in my opinion
prohibitory.

17. I can of course only
say as now in general

terms but if the Govt.
desire this enquiry to be
followed up in this case
there will be no difficulty
in having reliable esti-
-mates prepared.

18. On fully going into
these and other proposals
it seems to me that the
principles underlying
the suggestions of the
Superintendent in his
memo are correct and
should be acted on.

19. It is quite true that
a certain amount of risk
will still be run by
leaving the sand spit
unstrengthened by any
artificial means and

exposed to the possible
action in case of an
excessive flood coming
down the river, but as
already explained any
removal of the mouth
to a more southerly
position now occupied
will by so much tend
to diminish the height
of the flood level, and
increase its security.

20. After a careful
examination of the
sand spit I have
selected a point about
 $\frac{1}{4}$ of a mile south of
the Custom House or
more accurately 400 feet
south of bench mark (10)
where the breadth of the
spit being reduced to

250 ft. there are fair
chances of our being
able to open a new
mouth for the river,
in case of a heavy
flood coming down
the river say in the
middle of June, and
other circumstances favoring
it. It is needless to go into
the details of the propo-
sitions to be made
with this object further
than to say that the
cost of excavating the
necessary trench across
the spit may be from
£1000 to £1500, an
amount which can
be easily appropriated
from the Provincial
Budget of 1881-82, unless
as may appear desirable
to

to look ^{52/3} the outlay be
met from funds at
the disposal of the
Marine Department.
22. Should the operation
prove successful there
will apparently be no
necessity for doing any-
thing to the existing
mouth, which will then
be 1 1/2 miles to the north,
and which in all proba-
bility will close of
itself to a great extent,
and possibly altogether.
Should the Curpur
river still run its way
south the two rivers will
issue by one de barachère
as at present, and their
joint action as the result

2 of these proposals may
 be expected to have the
 effect of
 1st the Ketchikan river
 will be prevented from
 breaking through the sand
 spit south.
 2d All vessels and boats
 using the port will be
 saved at least 1/2 mile
 in reaching the Custom
 House.
 3d The river mouth being
 removed back 1 1/2 miles
 from its present position
 will take some 27 years
 to work northward to
 where it is now.
 4th if the Copper River
 discharges itself to the
 still ~~from~~ south the
 backwater will be kept
 quite as clear if not
 clearer of shoals than

21 3/5 1891
 it is at present; and of
 anything the depth of
 water in the bar should
 be improved from the
 greater velocity engendered
 during floods; but in
 order to facilitate all
 operations in future
 it is very advisable
 that the Port Officer
 should carefully watch
 and maintain a con-
 tinuous record of the
 changes in the backwater
 throughout each
 season.

23 Funds should be
 provided for the work
 as early as possible
 in April if the Govt
 approve. \$2000 is
 probably the utmost

that will be needed.

24. To some times this paper
has been shown to the
Master Attendant who
will submit his remarks
separately.

Col. R. H. Langley, Col. R. H.
Chief Engineer

Mangalore
1st July 1881

24/9
Memo. by the Master Attendant
February 23 1881.

I am in agreement with
the Chief Engineer in his
remarks upon the proposed
harbour and I fully re-
cognize the expediency
of endeavouring to open
a new mouth for the
Beaulieu river in a
position suitable to the
trade and shipping
interests of the port.
It seems certain that
the river will occasionally
change its plan for itself
probably going back
to the extreme southern
corner of the sand spit
in which case much

incurred to all
concerned would ensure
as a very large proportion
of the sea-borne trade of
Bengal is conducted
within the harbor or
large shelter of the
quays provided for the
contingent work may
fairly be debited to
Port Funds the same
being over they are
instructed to make
provision that the
share of the same
be charged to the
available balance of
Port Funds to credit
of Bengal.

Respectfully,
Master Attendant

C. 12.2. 1822

now at the narrow point
in the land bank west
of the Backwater & some
40 feet wide of the
B. M. opposite the Custom
House. It is perfectly
my track here like that
of the water & even arrived
in approving - then that
Col. Mead advocates. viz
to make an opening north
of the Cust. Ho: in front
of the present opening.
As the land bank is stretching
north from the old strand
the present train it will
form more easily than the
old train & the new
opening will be more
rich of convenience from
the necessity of giving an opening
for the old train like the
new one. This I doubt whether
it is convenient or be so
great as must at present be
conceded from the distance
being so far north of the
C. 12.2. 1822.

FOR ORDERS.
The Board of Directors
C. Mead. The Board of Directors
wishing to be informed that the Board may be
any expenditure or specially charging the Board of Directors. accordingly
Col. Mead. I am extremely obliged to you for the opening which you have
and which will be a great benefit to the Board of Directors. I think if we
close it (it is very difficult to do so) and the Board of Directors
by flood. We shall have a great benefit to the Board of Directors. I think if we
an opening as they are now. I think if we have an opening as they are now.
good. The Board of Directors. I think if we have an opening as they are now.
C. 12.2. 1822.

Report on Mangalore Harbour by Mr. Davidson
 dated 11th June 1881.

Report on Mangalore Harbour by Mr. Davidson
 dated 11th June 1881.

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 dated 11th June 1881.

FOR ORDERS

Major

Major

Major

Major

Major

Major

Major

Major

Major

Major

Major

Major

Major

Major

Major

Major

Major

No. 5018.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Under date the 21st Feb/81.

Read the following.

Report on Mangalore Harbour
 by Mr. Davidson dated 11th June 1881.

H.E. 10 of Nov. 1879.

Report on Mangalore Harbour
 by Major Friend.

H.E. 10 of 11th Jan/81.

Note by the Chief Engr. P.W.D. dated 11th Feb/81.

H.E. 10 of 11th Jan/81.

Note by the Master Attendant dated 11th Feb/81.

H.E. 10 of 11th Jan/81.

The papers read above on the subject of the Mangalore Harbour will be recorded. The Port has recently been inspected by the Chief Engineer, accompanied by the Master Attendant Madras, the Superintending Engineer and the Resident Engineer.

R.S.

of the Division. The proposals made by Colonel Lanley and concurred in by Capt.

Saylor seems calculated
to secure, as far as possible
the trade and
shipping interests of
the Port, and as this
fact is inconsiderable

they will account be
put in hand, under
the supervision of the
Officers of the P. W. Dept.
from a grant the made
from Post funds.

~~2. The Chief Engineer
proposes to form an
artificial opening for
the Hilaratti river
at the narrow point~~

to open in the first
heavy flood of next
monsoon a new
mouth for the Petrarate
river at the narrow
neck of the sand spit
west of the backwater
at a point 460 feet
south of the B.M. opposite
the Custom House

as early as Circumstances
admit.

~~in the sand bank
west of the Buckwalter
and some 40 feet south
of the B.M. opposite the
Custom House.~~

2 It is considered that
as the canal bank is
stretching, not the frame
of the ~~structure~~ ^{structure}
~~structure~~ will be agree
with the reduced strain
which the new ^{thus proposed} opening
will receive, and the

rich of ~~xxxxxxxxxxxx~~
~~xxxxxx~~ the situation
 forcing an opening for
 itself near Bolal will
 at the same time be sensibly
~~xxxxxxxxxxxx~~
 diminished

10. A sum of \$2000
will be placed at the
disposal of the P.W. Dept.
Guam Post Funds by

3

Should the operation
of opening a new mouth
in the Metacombic river
prove as it may be hoped
successful the Government
sees no necessity for
attempting to close
artificially the present
mouth

11. A sum of \$2000
will be placed at the
disposal of the P.W. Dept.
from Post Funds by

the Financial Dept. Recd. 23/2
early in April, arrangements
=ments meanwhile
being made for the com-
=mencement of the work
on a regular schedule
which the Superintending
Engineer will submit
for sanction with the least practicable
delay

Att

23/2/81

Ch. Secy. ✓
Ex. Secy. ✓
Finance Dept. ✓
Eng. Dept. ✓

Recd
5-3-81

the
 land
 = mean
 being
 = mean
 as a
 which
 being
 for

15-575 MB

400

GOVT. OF (1881) INDIA.
 PUBLIC WORKS.

To
 By
 For
 Recd. Encl.

G.O. 2474/1881 DEL. NO. 501/15

Nov 7 1881

Muzaffargarh

The proposals for
 the opening of a new
 mouth of the Ravi
 into the river of Punjab
 & the canal at the
 the end of the canal
 to place the 2000 at the
 disposal of the Muz.
 for the work.

[Signature]