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# MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

G.O. No. 2774 P.W.D. Press  
MS

Dated 18th November 1870.

Not to be folded or roughly handled

CTK

No. 338. Read the following Memorandum from the Acting Chief Engineer for Irrigation, to the Secretary to Government, Public Works Department, dated Fort Saint George, 31st October 1870, No. 214 :—

HAVING, in company with the Superintending Engineer, 4th Division, visited the Madras Water Works, I beg to submit, for the information of Government, a brief account of the damage which they have sustained from the recent floods in the Cortiliar and from the heavy rains, and to state what measures it appears to me should be adopted in connection with the necessary repairs, and with a view to prevent future injury.

2. At the anicut the only damage, if the removal of one coping stone be excepted, which was apparent, was the destruction of nearly the whole of the superstructure of the under-sluiques. I noticed that the northern abutment of the sluiques appeared to show that there was an absence of proper bonding in the masonry; whether this in any measure conduced to the damage here is doubtful, as it is quite possible that the injury may have been commenced by a tree striking against the tops of the shutters; care should, however, be taken in executing the repairs, that large stone carefully bonded is alone used. When the river falls the exact extent and nature of the injuries should be ascertained and reported.

3. The up-stream wings of the head-sluique have been carried away up to the angle buttresses, and there is a large breach behind these wings. The only other damage appears to be the washing out of the filling in over the sluique vents and behind the eastern or down-stream wings. The roadway of the sluique was 15 feet

\* 10 feet above crest of anicut.

above the sluique sill, and the river rose to 16 feet\* or thereabouts, as the water

washed into the channel some teakwood beams 1 foot square which were on the roadway. The flood in the Cortiliar cannot be taken to be an extreme one, and the height of the head-sluique, which has proved to be insufficient to keep out a flood reaching the level of that of last week, must therefore be considerably increased. Mr. Fraser gives the area of the drainage basin at 770 square miles, and the maximum discharge may be assumed to be 3.3 millions of cubic yards an hour, or 47,250 cubic feet a second. The discharge over the anicut would then be nearly 100 cubic feet per second per foot of length. The nearest calculation which, in the absence of information as to velocity of approach and level of water below the anicut, can be made, indicates that the water might rise 2 feet higher; and, allowing a margin of  $1\frac{1}{2}$  feet, the proper height of the roadway of the head-sluique will be  $19\frac{1}{2}$  feet above the sill of that work. Probably the afflux caused by the anicut would be about 2 feet, and the ends of the wings below the dam may accordingly be made  $17\frac{1}{2}$  feet above the sill. It will be necessary to take down and rebuild the parapets of the sluique and wings, in order to carry out the alteration of height properly.

4. To enable the head-sluique to be repaired and the breach round the up-stream wings closed, it will be necessary to throw a bund across the channel a short distance below the head-sluique; and this should be done as quickly as possible, both to prevent risk of further damage to the sluique, and to shut out flood-waters from the channel. It may be mentioned that the top of this bund should be 18 feet above the sill of the head-sluique. About the 1st December, if the north-east monsoon

rains be by that time over, a ring bund can be thrown across the breach above the line of the upper wing, and preparations can then be made for rebuilding the ends of the wings, materials being in the meantime got ready for this work. The filling in of the breach should be done with good soil; much of that washed away appears to have been extremely sandy.

5. It will not be practicable to admit river water to the channel again this season, and it becomes the more necessary therefore to arrange for executing all requisite improvements to the channel as soon as possible, in order that the early freshes of 1871 may be made the most of.

6. In paragraph 4 of my Memorandum\* No. 38, of the 19th February last, it was noticed that the first inlet on the right bank of the channel appeared likely to admit river water as well as local drainage, and this would seem to have occurred during the recent freshes. It will be necessary to prevent a repetition of this occurrence by either raising the crest above flood level, and this would probably make the inlet practically useless, by diverting the drainage, or by shutting out floods from the drainage basin by an embankment. Levels will be needed to determine the proper arrangement. Something is being now done to raise the crest, but it will not do to work in the dark.

7. It is clear that the channel below the Katenkal cannot carry off the floodwaters of that drainage, for, though the left bank was high and strong, it has been extensively breached both at this point, and at two places lower down; it will be requisite to provide a surplus work in the left bank of the channel, as near to the point where the drainage enters as may be practicable. Captain Scott thinks that, just above the point named, a surplus weir may be placed. The weir should have its crest 1 foot below full supply level, and this crest should be wide enough to carry an earthen bund 2 feet high and 2 feet wide at the top. The length must be sufficient to prevent the water rising more than 2 feet above full supply level, after the earthen bund has been washed away.

8. The weir below the Boosykal junction has its crest flush with full supply level in the channel, and about  $2\frac{1}{2}$  feet went over the crest this year. It is not advisable to allow  $8\frac{1}{2}$  feet of water to run down the channel, as thereby the slopes are much injured. The crest of this weir will be better therefore placed 1 foot lower, and the water should, under ordinary circumstances, be kept at the proper level by means of an earthen bund 2 feet in height put upon the lowered crest, which will be breached and carried away should the water be unduly raised by freshes in the Boosykal.

9. Captain Scott thinks that it would be very convenient were the bridge below the old line of the Boosykal converted into a sort of sluice, whereby any great excess of water might be prevented from passing down the channel. An estimate may be prepared for the alterations necessary to adapt the bridge to this purpose.

10. The Katenkal breach had better be left open until the additional waste weir has been built up to crest level. The two breaches just above the Karany bridge may be closed as soon as labour is available.

11. It is considered that with the channel below the head-sluice bunded, with the Katenkal breach open, and with the Boosykal weir crest lowered 1 foot by the removal of the top course of stones, it will not be necessary to keep the channel below the Boosykal bunded, and the bund may then be removed and the opening in the bank connected with it may be closed to 7 feet above bed level as a temporary arrangement, leaving its entire closure until the end of the season.

12. The bund of the Cholaveram tank slipped badly for a length of 80 feet, and to a less extent for 112 feet more. The slip is a short distance to the north of the sluice for the supply of the Red Hills tank. The slip should receive immediate attention. The cuts made at the toe of the slip showed no water in the bund, and it seems probable therefore that the slip was due not to any percolation of tank water, but to the heavy rains which probably found their way down cracks into the lower part of the bund and produced extensive settlements, while, further, the new soil in settling may have been pushed outwards by the rear slope of the old bund below. The transverse cuts commenced on the 24th instant should be carried down to 1 yard below the level of the water in rear of the bund, and should be filled in to a width and depth of 1 yard with large lumps of laterite; secondly, a longitudinal trench should be cut from end to end of the slip to the same depth of 1 yard below the water level, and a dry stone wall, having a width at base of 6 feet and at top of 3 feet with a height of 6 feet, the batter of one in two being towards the rear of the bund should be constructed. The face of this wall at the original ground level should be on the line of the toe of the rear slope of the bund where undisturbed. The soil outside or below this wall should be well consolidated, that over the drains being also carefully filled in, so as to give additional support to the wall; thirdly, the earth of the slip should be consolidated as much as possible by ramming it with poles and rammers, and in doing this it should be at the same time stepped, so as to give a firm base for the new earth to be placed upon it to bring it to section; all cracks should be carefully filled in and tamped; fourthly, the bund should be raised to the height at which it stood before the slip occurred, and the rear slope brought to section: the slope will be a little flatter than before, because the top of the dry stone wall is to be 3 feet above the level of the former toe of the bund.

13. The crest of the escape was at 8 feet above old crest level, and, for a short length,\* a course of stones was removed to lower the water. This may be left as it is for the present.

\* About 45 feet.

14. The water in the Red Hills lake may be allowed gradually to rise to 6 feet above old crest level, the leaks being watched, and their condition from time to time noted down. Captain Scott is lowering the crest of the wall in lieu of bank for a length of 150 feet to the six level, and this will suffice. It will depend upon the effect upon the leaks of the additional head of 6 feet whether any greater depth should be allowed this year. Captain Scott should report in good time, so that this point may be decided.

15. The sluice in the Cholaveram tank for the supply of the Red Hills lake should be pushed forward to completion. The temporary shutters are very far

*Proceedings of the Madras Government, Public Works Department,  
18th November 1870.*

from convenient, and the regulation of the supply is consequently not as much under control as it is intended to be.

16. Captain Scott should proceed with the emergent work, namely, the bunding of the channel below the head-sluice, the lowering of the Boosykal weir, the restoration of the Cholavaram bund at the slip, as also the closing of the two minor breaches in the upper channel at once, in anticipation of the sanction of the repair estimate. When these works have been attended to, the estimate for the additional weir should be prepared as soon as possible.

17. It is quite certain that had the Anicut Superintendent remained at his post, and taken the precaution of bunding the two ends of the wing walls of the head-sluice between the parapets, no damage to that work, and no breach would have occurred. As the water rose he got frightened, and appears to have gone away to some village, and it is necessary that he should be punished, in order that he and all employed upon the works may understand that they must remain so long as anything can be done to save the works, of which they are in charge, from injury. The Superintendent has been a long time in the Department, and it is understood that he bears a good character, and on these grounds alone is his retention in his present post allowable. His pay should be reduced from 25 to 15 Rupees a month for six months, and I hope that this will be a sufficient warning.

18. The Superintending Engineer should apply for sanction for four lascars for the head-sluice before the channel is again opened for the admission of river water. These men should be employed on sundry repairs and conservancy when not engaged in working the sluices, etc., and they should all be huttet close to the works, of which they may be in charge. It will be necessary also to have, from June to December inclusive in each year, four additional lascars to watch the banks, clear away or replace the bunds on the weirs, and do whatever other work may be needed under the orders of the Anicut Superintendent.

19. At the time of my visit the Red Hills tank water was  $2\frac{1}{2}$  feet above the old crest level of the calingulah. Captain Scott had completed about 1,000 lineal feet of the deep puddling, and several lengths of walling at the rear toe of the bund. Some of the work appears to have been effective, but the head of water was insufficient to show how far leakage has been stopped, and I have asked Captain Scott, therefore, to keep a regular record of the several leaks, so that the effect of the work recently done, as well as of work to be executed next season, may be ascertained, and that there may be consequently the best possible information to act upon.

No. 339. ORDER THEREON, 18th November 1870, No. 2,774.

IRRIGATION, No. 25.

THE Government are concerned to learn that the Madras Water Works have sustained some damage from the recent floods in the Cortiliar and from the heavy rains. The injuries to the anicut across the Cortiliar are, so far as ascertained, inconsiderable. Those to the

*Proceedings of the Madras Government, Public Works Department,  
18th November 1870.*

head-sluice, and to the head of the channel, were caused by the insufficient height of the former work, which though, at the time, 15 feet\* above the bed of the river, was submerged by the fresh to a depth of one foot. The arrangements suggested by the Acting Chief Engineer for Irrigation to prevent future damage at this point are approved.

2. The supply channel from the river has been breached in several places by the large quantity of water brought into it by the Katenkal and other land drainages. It is evident that a surplus work near the junction of the Katenkal with the channel is necessary to prevent a recurrence of the damage sustained this year.

3. The Chief Engineer's Memorandum will be communicated to the Superintending Engineer, 4th Division, with a view to estimates being prepared for the necessary repairs and additional works. The repairs will be charged to the grant for Repairs Agricultural, and may be proceeded with at once under Colonel Wilkie-son's orders. The estimates for the additional works should be sent to the Chief Engineer as soon as possible.

4. The Superintending Engineer will take care that sanction for the establishment required for the sluice, and for the conservancy of the channel, is applied for in due course, and in the prescribed form.

(True Extract.)

(Signed) J. MULLINS, Major, R.E.,  
Joint-Secretary to Government.

To the Superintending Engineer, 4th Division.  
" Controller of Public Works Accounts.  
" Chief Engineer for Irrigation.

G.O. of 1870

PUBLIC WORKS.

To

THE SUPERINTENDING ENGINEER,

4TH DIVISION.

&c. &c. &c.

Dated November 18th.

Recd.

Encl.

G. O., 18th November 1870, No. 2,774.

NOVEMBER

Nos. 338-339

Madras Water Works.—Passing order on the Memorandum from the Chief Engineer for Irrigation on the damages sustained by the Madras Water Works from the recent floods in the Cortiliar and heavy rains.

N. 214.

Memorandum

Having, in company with the Superintending Engineer 4<sup>th</sup> Division, visited the Madras Water Works, I beg to submit, for the information of Government, a brief account of the damage which they have sustained from the recent floods in the Cortiliar, and from the heavy rains, and to state what measures it appears to me should be adopted in connection with the necessary repairs, and with a view to prevent future injury.

At the ancient the only damage, if the removal of one coping stone be excepted, which was apparent, was the destruction of nearly the whole of the superstructure of the undersluices. I noticed that the northern abutment of the sluices appeared to show that there was an absence of proper bonding in the masonry: whether this in any measure coincided to the damage there is doubt, as it is quite possible that the injury may have been continued by

by a tree striking against the tops of the shutters; care should however be taken in executing the repairs, that large stone carefully bonded is alone used. When the river falls the exact extent and nature of the injuries should be ascertained and reported.

3. The upstream wings of the head sluice have been carried away up to the angle buttresses, and there is a large breach behind these wings. The only other damage appears to be the washing out of the filling in over the sluice vents and behind the eastern or downstream wings. The roadway of the sluice was 15 feet above the sluice sill, and the river rose to 16 feet or thereabouts, as the water washed into the channel some teakwood beams 1 foot square which were on the roadway. The flood in the fortification cannot be taken to be an extreme one, and the height of the head sluice, which has proved to be insufficient to keep out a flood reaching the level of that of last week, must therefore be considerably increased. Mr. Fraser gives the area of the drainage basin at

2 3  
770 square miles, and the maximum discharge may be assumed to be 6.3 million of cubic yards an hour, or 47,250 cubic feet a second. The discharge over the ancient would thus be nearly 100 cubic feet per second per foot of length. The nearest calculation which, in the absence of information as to velocity of approach and level of water below the ancient, can be made, indicates that the water might rise 2 feet higher; & allowing a margin of  $1\frac{1}{2}$  feet, the proper height of the roadway of the head sluice will be  $19\frac{1}{2}$  feet above the sill of that work. Probably the afflux caused by the ancient would be about 2 feet, and the ends of the wings below the dam may accordingly be made  $17\frac{1}{2}$  feet above the sill. It will be necessary to take down and rebuild the parapets of the sluice and wings, in order to carry out the alteration of height properly.

4. To enable the head sluice to be repaired and the breach round the upstream wings closed, it will be necessary to throw a bund across

across the channel at short distance below the head sluice, and this should be done as quickly as possible, both to prevent risk of further damage to the sluice, and to shut out flood waters from the channel. It may be mentioned that the top of this bund should be 10 feet above the sill of the head sluice. About the 1<sup>st</sup> December, if the N. E. monsoon rains be by that time over, a ring bund can be thrown across the breach above the line of the upper wing, and preparations can then be made for rebuilding the ends of the wings, materials being in the meantime got ready for this work. The filling in of the breach should be done with good soil; much of that washed away appears to have been extremely sandy.

It will not be practicable to admit river water to the channel again this season, and it becomes the more necessary therefore to arrange for executing all requisite improvements to the channel as soon as possible, in order that the early freshes of 1871 may be made the most of.

CW

\* Letter Superintendent Engineer

On para 4 of my Memorandum No 38 of the 19 February last, it was noticed that the first inlet on the right bank of the channel appeared likely to admit river water as well as local drainage, and this would seem to have occurred during the recent freshes. It will be necessary to prevent a repetition of this occurrence by either raising the crest above flood level, and this would probably make the inlet practically useless, by diverting the drainage, or by shutting out floods from the drainage basin by an embankment. Levels will be needed to determine the proper arrangement. Something is being now done to raise the crest, but it will not do to work in the dark.

It is clear that the channel below the Katerhab cannot carry off the flood waters of that drainage, for though the left bank was high and strong, it has been extensively breached both at this point and at two places lower down; it will be requisite to provide a surplus work in the left bank of the channel, as near to the point where the drainage enters as may be practicable. Captain Scott

Scott thinks that, just above the point named, a surplus weir may be placed. The weir should have its crest 1 foot below full supply level, and this crest should be wide enough to carry an earthen bund 2 feet high and 2 feet wide at the top. The height must be sufficient to prevent the water rising more than 2 feet above full supply level, after the earthen bund has been washed away.

A section of the ground along the line of the outfall to the sea of the Katarhal will be required.

The weir below the Boosyhal junction has its crest flush with full supply level in the channel, and about  $2\frac{1}{2}$  feet over the crest this year. It is not advisable to allow  $2\frac{1}{2}$  feet of water to run down the channel, as thereby the slopes are much injured. The crest of this weir will be better therefore placed 1 foot lower, and the water should under ordinary circumstances, be kept at the proper level by means of an earthen bund 2 feet in height put up in the lowered crest, which will be breached and carried away should the water be unduly raised by freshes in the Boosyhal.

7. Captain Scott thinks that it would be

10. be very convenient were the Bridge below the old line of the Boosyhal converted into a sort of sluice whereby any great excess of water might be prevented from passing down the channel. An estimate may be prepared for the alterations necessary to adapt the bridge to this purpose.

11. The Katarhal branch had better be left open until the additional waste weir has been built up to crest level. The two branches just above the dammy bridge may be closed, as soon as labour is available.

It is considered that with the chain net below the head sluice closed, with the Katarhal branch open, and with the Boosyhal weir crest lowered 1 foot by the removal of the top course of stones, it will not be necessary to keep the channel below the Boosyhal bund, and the bund may then be removed and the opening in the bank connected with it, may be closed to 1 foot above bed level, as a temporary arrangement, leaving its entire closure until the end of the season.

12. The bund of the Chotavain Saris

slipped.

slipped badly for a length of 80 feet, and to a less extent for 112 feet more. The slip is a short distance to the north of the sluice for the supply of the Red Hills Tanks. The slip should receive immediate attention. The cuts made at the toe of the slip showed no water in the bund, and it seems probable therefore that the slip was due not to any percolation of tank water, but to the heavy rains, which probably found their way down cracks into the lower part of the bund and produced extensive settlements, while, further, the new soil in ~~the~~ may have been pushed outwards by the rear slope of the old bund below. The transverse cuts commenced on the 24<sup>th</sup> Instant should be carried down to 1 yard below the level of the water in rear of the bund, and should be filled in to a width and depth of 1 yard with large lumps of laterite, and a longitudinal trench should be cut from end to end of the slip to the same depth of 1 yard below the water level, and a dry stone wall, having a width at base of 6 feet and at top of 3 feet with a height of 6 feet, the batter

of 1 in 2 being towards the rear of the bund, should be constructed. The face of this wall at the original ground level should be on the line of the toe of the rear slope of the bund where undisturbed. The soil outside or below this wall should be well consolidated, that over the drains being also carefully filled in, so as to give additional support to the wall; 3<sup>rd</sup> The earth of the slip should be consolidated as much as possible by ramming it with poles and runners, and in doing this it should be at the same time stepped, so as to give a firm base for the new earth to be placed upon it to bring it to section; all cracks should be carefully filled in and tamped; 4<sup>th</sup> The bund should be raised to the height at which it stood before the slip occurred, and the rear slope brought to section: The slope will be a little flatter than before, because the top of the dry stone wall is to be 3 feet above the level of the former toe of the bund. 13. The crest of the escape was at 8 feet above old crest level and, for a short length, a course of stones was removed to lower the water. This

about 10 feet

This may be left as it is for the present.

14. The water in the Red Hills Lake may be allowed gradually to rise to 6 feet above old crest level, the leaks being watched, and their condition from time to time noted down. Captain Scott is lowering the crest of the wall in lieu of bank for a length of 150 feet to the 6 level, and this will suffice. It will depend upon the effect upon the leaks of the additional head of 6 feet whether any greater depth should be allowed this year. Captain Scott should report in good time, so that this point may be decided.

15. The sluice in the Chholaoram Sauts for the supply of the Red Hills Lake should be pushed forward to completion. The temporary shutters are very far from convenient, and the regulation of the supply is consequently not as much under control as it is intended to be.

16. Captain Scott should proceed with the emergent work, viz: the bunding of the channel below the head sluice, the lowering of the Boosykal

Boosykal weir, the restoration of the Chholaoram bund at the slip, as also the closing of the 2 minor breaches in the upper channel, at once, in anticipation of the sanction of the repair estimate when these works have been attended to, the estimate for the additional weir should be prepared as soon as possible.

17. It is quite certain that had the ancient superintendent remained at his post, and taken the precaution of bunding the two ends of the wing walls of the head sluice between the parapets, no damage to that work, and no breach would have occurred. As the water rose he got frightened, and appears to have gone away to some village, and it is necessary that he should be punished, in order that he and all employed upon the works may understand that they must remain so long as any thing can be done to save the works, of which they are in charge, from injury. The Superintendent has been a long time in the Department, and it is understood that he bears a good character, and on these grounds alone is

is his retention in his present post allowable.  
His pay should be reduced from 25 to 15 Rupees  
a month for 6 months, & I hope that this  
will be a sufficient warning.

18... The Superintending Engineer should  
apply for sanction for 4 lascars for the head sluice  
before the channel is again opened for the admis-  
sion of river water. These men should be em-  
ployed on sundry repairs and conservancy when  
not engaged in working the sluices &c, and  
they should all be huddled close to the works,  
of which they may be in charge. It will be  
necessary also to have, from June to December  
inclusive in each year, 4 additional lascars  
to watch the bunds, clear away or replace the  
bunds on the weirs, and do whatever other work  
may be needed under the orders of the ancient  
superintendent.

19... At the time of my visit the Red  
Hills tank water was  $2\frac{1}{2}$  feet above the old  
crest level of the calingulab. Captain Scott  
had completed about 1000 lineal feet of the  
deep muddling, and several lengths of walling  
at

at the rear too of the bund. Some of the work  
appears to have been effective, but the head of water  
was insufficient to show how far leakage has  
been stopped, and I have asked Captain Scott  
therefore to keep a regular record of the several  
leaks, so that the effect of the work recently  
done as well as of work to be executed next  
season may be ascertained, and that there may  
be consequently the best possible information  
to act upon.

Fort St George  
31<sup>st</sup> October 1870  
Sa  
Volundhins  
Major R.S.  
Acting Chief Engineer for Irrigation.  
The Secretary to Govt. P.W. Dept.

The Asst Chief Engineer  
for Irrigation } (H. E. No. 214 of 31 Oct 1970)

Wm. B. Wood  
Engineer & Surveyor  
St. Paul, Minn.  
July 11, 1880  
No. 4420  
John A. King Engineer  
for irrigation

To the Secretary to Govt

P.W.

Date 31 October 1878

23<sup>12</sup> 24<sup>12</sup>

Specimen

2/2/14

submitted for the  
information of Govt an  
account of the damage  
which the badral malar  
washed have sustained  
from the recent floods  
in the Tortilliar front

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1877-1878

e.g. from 1870 Da. 12<sup>th</sup>

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of the former work, which  
though, at the time, 15 feet  
above the bed of the river,  
was submerged by the flood  
to a depth of 1 foot. The  
arrangements suggested  
by the Acting Chief Engineer  
for irrigation to prevent  
future damage at this  
point are approved.

\* 4 feet above estimated  
flood level.

2. The supply channel  
from the river has been  
breached in several places  
by the large quantity of  
water brought into it  
by the Katanhal and  
other land drainages. It  
is evident that a surplus  
work, near the junction  
of the Katanhal with  
the channel, is necessary  
to prevent a recurrence  
of

of the damage sustained  
this year.

3. The Chief Engineer's  
Memorandum will be  
communicated to the  
Supr Engineer & Division,  
with a view to estimates  
being prepared for the  
necessary repairs and  
additional works. The  
repairs will be charged  
to the grant for repairs  
Agricultural, and may  
be proceeded with at  
once under Col. Wilton's  
orders. The estimates for  
the additional works  
should be sent to the  
Chief Engineer as soon  
as possible.

4. The Supr Engineer  
will.

will take care that  
 sanction for the establish-  
 -ment required for the  
 sluice, and for the conser-  
 -vancy of the channel,  
 is applied for in due course,  
 and in the prescribed form.

W. 4/11/70

W

12/11/70  
 W. 4/11/70

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To  
 9 The S. Engr. 1<sup>st</sup> Div.  
 5 Cont. S. Engr.  
 3 Chief Engr. for  
 Irrigation.

11/7/7 BTL

Further Puchy 80/7

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1/2 662

Govt. of 1870: Madras.

PUBLIC WORKS.

To the Superintending Engineer

A. S. (Division)

*[Signature]*

Dated

Recd.

G. O. 18: 1000. 2774

Nos. 3387 339

Madras Water Works. Being  
as in the Memo from  
the Chief Eng for Irrigation  
on the damages sustained  
by the Madras Water Works  
from the recent floods in  
the Corbillion & heavy rains.