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MIL NADU ARCHIVES

ERNMENT OF TAMIL NADU

PUBLIC WORKS. DEPARTMENT

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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

6th February 1880, No. 283 W.

General.
Establishment.

Read the following paper:—

No. 14. From Major H. M. VIBART, R.E., Acting Superintending Engineer, Third Circle, to the Chief Engineer, Public Works Department, dated Chepauk, 24th December 1879, No. 7,530.

I HAVE the honor to forward copy of a report submitted by the Executive Officer, Buckingham Canal, (drawn up after personal inspection,) on the damages sustained by the Buckingham Canal during the cyclone of 18th and 19th November 1879.

No. 1.—MEMORANDUM OF OBSERVATIONS MADE ON THE DAMAGES TO BUCKINGHAM CANAL DURING THE CYCLONE OF 18TH AND 19TH NOVEMBER 1879.

1. *Madras to Ennore Section, 1 to 12 Miles.*—No damage occurred on this portion of canal, save that the flood overtopped the embankment on 7th mile west side below the lock and swept it down for about 100 yards to ordinary ground level, the revetment below that level prevented scour further down. A large drainage from the west (from the direction of Red Hill Tank) meets the embankment at this point, and as at the time the Kortalayár was in high flood and banked up the drainage, it went over the weak embankment. The entire section from Madras to the lock needs banking. East of lock through the low grounds also the Kortalayár floods poured into canal towards Madras owing to the Cooum bar being open. The lock gates could not be closed on the above account for several days. The low grounds east of lock will be embanked across shortly. On 6th December both gauges of lock read the same 6 feet 4 inches, the water level being same both sides and gates open. The highest reading of gauge during the stormy period was 8 feet 8 inches. The gauge on Ennore lake during the storm read 4·20, the zero of this gauge is 1·5 below M.S.L. The tides at the present range on this gauge from 1·0 to 2·2. The zero of lock gauges is 6·12 below M.S. level.

2. *Ennore to Pulicat Section, 12 to 26 Miles.*—On this part of the canal, which is mostly through backwater, no damage is observable. The cut on 21st mile, connecting the Chintamoney and Pulicat backwaters, widened very much. The 15th mile and part of 16th also seems shallowed by the deposit of wash down from adjacent plains probably. The Pulicat gauge highest reading was 6·4 during the stormy period *on 18th*. The zero of gauge is 0·5 below M.S.L. Present tides range from 0·9 to 1·9 on gauge.

3. *Pulicat Lake Section, 26 to 44 Miles.*—This part of the line is through the lake, through the projections of the east shore of which four cuts were made. As in May's cyclone the effect of this cyclone on the mouths of the cut has been the same, viz., banked them up right across; the second cut particularly fared badly in this way, and up to present time a gully merely has been cut through the shoal to allow boats to pass. As to the lake side embankments of these cuts, the partial repairs done them since May's cyclone has been undone. The bank of first cut particularly has been washed down badly, and breached, shoaling up canal at the breaches, the piling with fencing run out at the mouths of this cut has much of it been carried away, thus exposing the entrances to the lake wash and silt. The west bank of second cut did not fare quite so badly. The third cut was quite damaged in May's cyclone, and being but of very short length and too exposed, it was left to itself; it is somewhat more shallowed now and has no bank at all on west side. The fourth cut west bank did not suffer either as badly as first cut. But, as already observed, in all these cases their mouths have shoaled up and canal shallowed here and there where breaches have occurred. The eastern or land side low banks, such as were made in the cases of all three cuts, have been damaged further since May's cyclone. The necessity of abandoning this lake line and running a new line within the eastern shore border has already been considered. Some boats were swamped on this line during the storm, all wood boats; and this day three boats of the same description swamped on this section, the wind being very high and the lake waters very rough.

4. *Lake to Dugarázpatnam Section, 44 to 69 Miles.*—The damage on this line is of a general nature, a general shallowing up; the result of the lake wash over west bank which though low has been washed lower and breached. The east bank also has been breached in places, but of no consequence. Much of this line has backwater on the east side of it also. The flood rose very high on this section, and but for the timely opening of the Royadooroovoo bar (which has not been known to open for a long time past) much loss of life and property would have resulted. In the Royadooroovoo toll office, which is built on the bank of canal, the water was 2 feet deep over floor, as seen by water line, this is 9 feet over canal present bed. The flood that affected this portion of the canal was brought down presumably by the Dugarázpatnam river, which is the southern arm of the Swarnamukhi; and by the Swarnamukhi flood also, which before it was relieved by the opening of the Pamanjee bar must have run southward.

The Dugarázpatnam gauge not having been fixed before the storm, the flood readings are not recorded, but will be taken from water-marks and referred to B. Ms. and noted.

The tide readings on Dugarázpatnam gauge now range from 1·5 to 3·15.

The southern entrance to the Dugarázpatnam lake, which yearly shallows up and hard to maintain during westerly winds, is now much shoaled up, and the lake depth generally seems to be short especially about the entrance to branch channel of bungalow.

Two bars opened out at Dugarázpatnam during the storm, but one is now open and not very wide.

5. *Dugarázpatnam to Swarnamukhi Section, 69 to 75 Miles.*—In this reach of canal there is general shallowing up, the result of the Swarnamukhi floods, here and there particularly there are very very shallow places, as short as 1 foot at low tide, and the head of cut at junction with Swarnamukhi has silted up to 1½ feet below low tide level for several hundred feet length of channel.

The destruction of trees is more visible from hence northwards.

6. *Swarnamukhi River Section, 75 to 77 Miles.*—The river course forms the canal line in this reach. This is the worst part of the canal now as respects short water depth. Since September, when this part of canal was last seen, the flood has worked a complete change of river bed, very very deep holes have been formed in places, while generally the bed has shallowed up leaving no water at low tide, and but for the Pamanjee bar being open and the tide rising 2·8 as observed this day, navigation will be quite stopped. The bar is running freely still. This is always a difficult reach to maintain, and yearly the same trouble is experienced; so the sooner the better if a diversion is made and the river bed abandoned. The Pamanjee bar which had been closed for years past was opened by the floods of this cyclone.

7. *Siddavaram Section, 77 to 90 Miles.*—This section from the combined effects of the Swarnamukhi floods at one end and the Kundalaroo floods at the other, has shallowed up generally throughout. At the Swarnamukhi junction a great shoal was thrown up across the entire head of channel for about a hundred yards length of channel, the mouth of channel having considerably widened also. A gully had been cut through this shoal by the Overseer to about a foot only below low tide level, so that boats could not pass except at high tide, in consequence of which I remained here and put a large body of coolies on to deepen cut, several boats being detained both sides. Here and there in this reach the canal has been further shallowed by breaches in banks and drainage discharge, but the breaches are of no importance. In the sandy deep cuttings particularly, the short depth of water is mostly felt.

The Kundalaroo gauge during the storm read 8·9. The high tide of last full moon read 7·0 and low tide 4·4. The present tide readings range from 6·8 to 4·5. The zero of gauge is 4·5 below M.S.L.

The Gauge Goomastah reports that for three days the Swarnamukhi floods passed into the Kundalaroo by way of canal during and after the storm, the Kundalaroo not having been in much of flood.

8. *Kundalaroo River Section, 90 to 91 Miles*, is deep throughout. At the entrance of the canal on south border the river is shoaling up very fast, and since September a new shoal has formed about mouth of canal on east side, where there was always deep water before; deepening has to be constantly done at the south entrance to keep the channel head open.

9. *General Remarks.*—The toll office shed at Royadooroovoo was much damaged and walls fell. The platforms about the mile and furlong stones, which were damaged much by May's cyclone and were restored, have been washed away very extensively and many more of these stones have been thrown down quite. The canal avenues have suffered again, but not so badly as in May's cyclone.

10. The fullest instructions in writing have been issued to the Canal Superintendent to clear the line to 3 feet below low tide so as to allow of uninterrupted navigation, but this clearing is only practicable in the short reaches, not on the miles which have shallowed generally, the deepening of which will occupy months. On the lake to Dugarázpatnam section I have ordered all the breaches on west side to be closed temporarily with small banks, so as to prevent

the tide floods from the ends of section and from the Royadooroovoo bar being locked in as much as possible, and not allowed to spread into the lake as now, by which the tidal influence on canal is barely felt as the reach of this section is very long and the tidal influence at the ends very small. It will be immensely advantageous if the Royadooroovoo bar keeps open.

15th December 1879. (Signed) S. OTTMANN, Sub-Engineer,
Executive Officer, Buckingham Canal Division.

No. II.—OBSERVATIONS ON THE DAMAGES DONE TO THE BUCKINGHAM CANAL DURING THE CYCLONE OF 19TH AND 20TH NOVEMBER 1879.

Kundalaroo to Pennér Section, 91 to 114 Miles.—*On 91st mile* no damage was done, as there are no banks, virtually, but merely berms, through the swamp, and over which the flood rose and fell freely. *On 92nd mile*, through swamp also, the berms did not suffer for the same reason. The Kristnapatam basin revetment walls, loose set, have been much shaken. The cyclone flood level on this mile denotes 9 feet over canal bed which was designed 4·5 below mean sea level. *In 93rd mile* no particular damage occurred, save a further wash down of banks which suffered in May's cyclone. With a good opening on this mile, for the Kristnapatam drainage, the banks will be saved in future. This mile is through backwater, and without bank east side. This mile is shallower also now by the wash into canal of banks and berms. *The 94th mile* has two breaches west side from want of drainage outlet; canal generally shallowed by wash down, being deep sand cutting. *The 95th mile* through deep sand cutting has also shallowed generally by wash, the ramps at cattle crossings breached. On this mile the flood mark seems 10 feet. *On 96th mile*, half the mile being in deep sand cutting, has shallowed as on the other miles. The rest of mile is through backwater with low berms, which did not suffer particularly, but where the Nalatoor drainage enters, and the bank was breached and washed down in May's cyclone, the damage is greater now, and all along it the canal has shallowed; a good outlet is wanted here. On east side also an old drainage outlet breached wider; the Nalatoor bar opened in the cyclone, but has now nearly closed up; this bar is over half a mile distant from canal and very rarely opens. *On 97th mile* the flood mark is 10½ feet; there is no particular damage on this mile. *On 98th mile* the flood mark is 10½ feet at the mile stone, but 11 feet where the large Ananthapuram drainage joins, and which damaged the canal and banks seriously at junction, filling up canal for some length quite, low berms washed over, general shallowing, the result of breaches and drainage junction. *On 99th mile* no particular damage, save that the cattle crossing ramps breached; at the mile stone the flood mark seems 10 feet. *On 100th mile* there are no damages particularly. The Yadooroo Ravoo (ferry), which was before shallow, has deepened very much by scour. *On 101st mile* the cattle ramps breached, but no other damage; flood mark 10 feet. *On 102nd mile* the old May's breach of drainage towards Kodoor south bar widened considerably, but of no consequence: this bar, which rarely opens, was opened during the cyclone, and now closed except at high tide; a portion of east bank also has been washed down quite; the low berms generally on this mile permitted the flood to rise and fall freely, so there was no particular damage. *In 103rd mile* the damage is very serious by the Kodoor drainage which was obstructed having broken through, tearing down banks and berms at junction and for some distance beyond also, the towpaths, berms and portions of high banks have been all swept down; the locality has the appearance of a large basin; this damage occurred close by Kodoor toll office, the chains and apparatus of toll bar having been swept away (since recovered); the canal for two furlongs length quite silted up, the flood having been arrested by the storm wave through the bar a mile beyond; the flood mark at 103rd mile stone is 10½ feet. *On 104th mile* an old bar that had not opened for ages, and was quite bunded across by the canal bank, opened out by the storm wave evidently, first carrying away east bank, when the impounded Kodoor drainage increased the damage passing out. This bar is a furlong from canal. Canal quite shallowed up at this locality particularly, and generally all along the mile: the opening in bank on east side is a furlong length. On west side also a large breach occurred by drainage from the west not having had outlet; the bar is closing, flood tides only flow over now; a permanent opening will be wanted here; at 104th mile stone the flood mark seems to be 9½ feet. *In 105th mile* except in 8th furlong, where drainage from west overtopped and breached through, no particular damage occurred; an inlet is wanted here; the flood mark at the mile stone is 10 feet. *In 106th mile* no particular damages: flood mark 10½ feet. *In 107th mile* the flood mark is 10½ feet; banks not particularly injured, but canal much shallowed by the junction of a large old drainage; an old bar opened out in this locality and now closed, over half mile distant from canal. *In 108th mile* there is no particular damage; flood mark seems 9½ feet. The Koratur bungalow has fallen in, the rear half of it; it is built of raw brick with thatched roof; is a long way from canal, and I certainly do not advocate its restoration. *In 109th mile* a very old bar opened, but now closed; a very extensive drainage enters canal here, which caused the bar to open. The flood water mark of this drainage observed *on the west bank* is distinctly seen as 10½ feet, and which height it must have reached till bar opened or probably while the sea-wave from bar kept it out. Extensive outlets and inlets are

wanted here; the drainage channel cut outside west bank here is a sham; no other damage on this mile. *In* 110*th mile* the flood mark seems 9½ feet; there is a large breach on 8th furlong at old field drainage west side, and east side consequently eroded by the impact. *The* 111*th mile* flood mark seems 9½ feet; except at north end, where banks were made across drainage, and which have been swept down, no other damage. *The* 112*th mile* crosses a great drainage in two arms, of a furlong each, which is the Gangapatam river and backwater; both arms have bars, the southern one rarely opens, but on this occasion it did. The northern arm bar is now open, but does not continue so long; on the turn of the wind to south it will close, the fishermen say; the southern arm which was bunded across-quite, and weathered May's cyclone, had its banks completely swept away; they should not have been made at all; the north arm is the river proper. Two furlongs of this mile are through deep sand cutting, along which the canal is very shallow by wash-down banks and berms. *In the* 113*th mile* the flood mark is 9 feet; (there being natural outlet, not allowing drainage to pack up in this locality.) In 6th furlong the cattle ramps both sides breached; banks badly eroded behind also. On 2nd furlong also breach both sides, and canal much shallowed. A third arm of Gangapatam backwater crosses here, 2nd furlong, but was banked across; it is these banks that breached, mentioned above, and opened old bar now nearly closed; this crossing must be maintained open; the canal generally is shallow along 1st furlong, being through deep sand cutting. The 113th mile indicates 9 feet flood only, the Pennér being near; no particular damage, banks eroded behind. *The* 114*th mile*, 2½ *furlong*, is Pennér south border.

2. *Pennér River Section*, $\frac{114}{2\frac{1}{2}}$ *to* $\frac{116}{6\frac{1}{2}}$ *Miles.*—The Pennér gauge read 9·3 during the cyclone. The tides since have been ranging from 7·2 to 3·4. In the southern arm the sand-spit in midstream is extending still eastward, which sends the line of navigation nearer bar. It has extended since March last over a 100 yards from my own observations. The central arm is a mere over-flood water-way. Though generally deep heretofore it has much silted up since November cyclone along north border, causing a great obstruction at the mouth of the island cut; in short there is no water over it at low tide, and the silt is so fine and semi-fluid that men cannot venture out of boat; the poling rods go down 8 to 11 feet in it, with very slight pressure. Stuff like this only a dredge could manage it will be observed. The island cut between central and northern arms has not silted very much more than in May's cyclone, but its borders have been eroded very much; there is about a foot of water, perhaps less at low tide; the southern mouth, besides the river approach to it before mentioned, is high and dry over low tide, for about a furlong. The northern arm is not as deep now as after last cyclone; the southern shore has shallowed very much, thus obstructing north mouth of island cut to some extent. The river bed, as in all these cases, alters year after year; but as I before advocated, the central arm should be closed up by training the river so as to keep the north and south arms permanently deep and bars well open; the central arm bar which opened in the cyclone has already closed up securely for the season.

3. *Pennér Pydaroo Section*, 117 *to* 124 *Miles.*—*In* 117*th mile* no particular damage; the flood mark on mile seems 10½ feet, though the gauge on southern arm Pennér indicated only 9·3 at the same time, and in the canal south of Pennér 9 feet. *In* 118*th mile* no damages particularly, flood marks 10½ feet; generally shallowed from influence of river floods at one end and Ramatheertham drainage at the other. *On* 119*th mile* flood mark 10½ feet; on 1st furlong large breach east side from drainage having no outlet, and no other damages. Canal shallowed generally for same reason as above. *On the* 120*th mile* the Ramatheertham backwater crosses for about four furlongs length; this backwater was originally bunded up, leaving two little openings for outlets and inlets. In last May's cyclone the bunds were swept away and bar opened; the banks were not reformed, but merely low, flat berms with very flat slopes outwards and two openings given for drainage on west side, the May's opening left unobstructed on east side. In the recent cyclone the flood rose and fell without injuring the low berms; the bar opened, and has since closed, the high tides only flowing over. The outlet to sea needs to be created a permanency; along the reach of this backwater the canal has shallowed very much. *The* 121*st mile* has 11 feet of flood line indicated on it. Deep sand cutting, generally shallowed by wash and influence of floods both ways. *The* 122*nd mile* is also shallowed by the same influences; is through deep cutting, banks somewhat injured. *The* 123*rd mile* runs along border of backwater with low berms generally, which have not suffered very much more since May's cyclone, the flood having risen and fallen freely; the high banks where they occur are somewhat eroded. *On the* 124*th mile*, 6*th furlong*, the Pydaroo crosses the canal, just at cross-ing has a very ugly bend, at right angle almost, which is far from convenient for its navigation. The portion from 1 to 5 furlongs is along border of backwater, not much injured since May's cyclone, by reason of the berms having then been washed down low; the canal is shallow along here also.

4. *Pydaroo River Section.*—The opening proper is a furlong, but the high flood waterway is several furlongs. The bar is now open, keeps open for a great part of the year; on the west of canal the country is a vast swamp, where the floods have time to spread. The gauge read 11·0 during the cyclone, withal. The tides range from 7·9 to 5·9. The swamp above referred to is one vast bed of oyster.

5. *Pydaroo, Chippalairoo Section*, 124 *to* $\frac{132}{4}$ *Miles.*—*The* 125*th mile* indicates 11 feet flood. This mile is along the border of same swamp as in 124th. The west bank, which was washed down to a low berm in May's cyclone, has hardly suffered, save somewhat more washed. *The* 126*th mile* is also along the border of same swamp, and its west bank or berm has the same features as on preceding mile, only washed down somewhat more. *The* 127*th mile* has a 10 feet flood mark. The Eskapally river is crossed on 6th furlong, but the flood waterway is indicated by the high ground borders at the 2½ and 6 furlongs; the low west berms have not suffered more since May's cyclone; the river-way openings has widened merely; the last two furlongs are in cutting, with banks badly eroded. The Eskapally bar is very extensively open in a north-east direction. *The* 128*th mile* has been much injured. It has a flood mark of 10½ feet. On 1st furlong both banks have been entirely swept away adjacent to bar opening (this was an old drainage crossing bunded across); the west bank on 5th and 4th furlongs also swept down, and east bank also breached opposite, the breaches are adjacent to bar, about two furlongs off; what is left of both banks on this mile are mere shells, being eroded quite behind. The 6th to 8th furlongs are scarcely injured; in deep cutting; the canal is generally shallow on the mile from the breaches, and more so at Eskapally ferry on 8th furlong. *On* 129*th mile* also the east bank is badly eroded behind from outside action and breached in several places; on 7th and 8th fur-longs west bank also eroded and breached; flood mark seems 11 feet. *The* 130*th mile* breached to sea, east side, at old bar that opened in cyclone and since closed. Banks generally eroded behind, and in places washed down, with some minor breaches. *The* 131*st mile* has flood marks of 11 feet. Banks generally eroded both sides, and washed down in places. *The* 132*nd mile* has a flood mark of between 10½ and 11 feet. Banks generally injured somewhat inside, but more outside. On 1st furlong breach E. side; on 8th furlong E. berm swept down mostly; the banks on this mile are more or less low berms. *The* 133*rd mile*, the Chippalairoo south border, is at end of 5th furlong, the east bank, for the 5th furlong has more or less suffered by the action of Chippalairoo south bar, breached and swept down in places; the mouth of the canal at Chippalairoo south border is a great shoal, with a gully cut through merely to let boats pass, but there is no water at low tide; the mouth on east side has been eroded and carried away, widening the mouth therefore considerably; canal much shallowed in this mile.

6. *Chippalairoo River Section*, $\frac{132}{5}$ *to* $\frac{133}{4}$ *Miles.*—This is just such another reach as the Swarnamukhi, and quite as hard to maintain a deep channel along its bed owing to the ever shifting sands. The river on its south border swept away a furlong length of canal banks which run into high flood waterway; it also opened its old southern bar, which for years had been closed; the deep channel along bed which was staked out after monsoon floods has so materially altered by cyclone floods that it became necessary to order their removal, and the new deep channel alignment restaked; the bed on the whole is shallower than in September last, and the deep channel very tortuous. The gauge reading of Chippalairoo during cyclone was 9·80 on 18th, 10·50 on 19th and 20th, 9·50 on 21st, so that the duration of the flood period was very long hereabouts. The tide readings now range from 7·8 to 5·4. The canal here needs to be led away westward entirely, leaving river bed to itself. Bar freely open.

7. *Chippalairoo to Mannaroo*, $\frac{133}{4}$ *to* $\frac{160}{3}$ *Miles.*—*In* 134*th mile* the flood mark is 10½ feet (as on gauge). The 5th and 6th furlongs have been badly eroded behind, and parts washed down; on 7th furlong breached both sides and ran to a bar now closed; the banks on this fur-long are more or less much damaged. On 8th furlong high banks, outside erosions and east bank badly washed down. This mile is exposed seaward to a very low seaboard. This mile has shallowed somewhat. *The* 135*th mile* is also exposed on the sea side in the same way. Sea bank much eroded, also land bank, by the spill of Chippalairoo high flood; a breach on east bank, and on 2nd to 4th furlongs banks much washed down; flood mark 11 feet. *The* 136*th mile* flood mark is also 11 feet; banks very badly eroded behind; breach on 1st furlong west side, and banks here and there washed down. *The* 137*th mile* has the same 11 feet flood mark; banks eroded behind. *The* 138*th mile* has also a 11 feet flood line, no particular damages inside, but eroded outside. *In* 139*th mile* also the flood mark is 11 feet. East bank breached; banks eroded behind, generally washed over. Tummalapenta is on this mile. *In* 140*th mile* flood mark not visible distinctly, low berms and banks; no material injury, save erosions behind, and breach east side. *On* 141*st mile* the flood mark is 11 feet; low berms as in above mile, and damaged as in above not materially. *From* 142*nd mile* the canal leaves the low swamp country and enters deep cutting from 7 furlongs. The first seven furlongs are in swamp with low berm banks eroded behind. On 8th furlong breach east side from drainage which must be left open. *From* 143rd *to* 145th *miles*, through deep sand cutting, there has been no damage, but canal shallow from wash; at 145th mile stone the flood mark seemed 12½ feet. *On* 146th *mile* the flood mark looks 13 feet; deep, sand cutting and canal shallow. *On* 147th *mile* the flood mark shows 12½ and 12. On 1st furlong is a great breach west side, from drainage, obstructed for miles both sides with-out an opening, the country about being wet land with tanks adjacent. On 3rd furlong also bank overtopped and breached west side. On 5th furlong west bank overtopped and washed down some-what. Flood mark on drainage channel banks (*outside* west bank) is clearly seen as 14 feet. On 6th furlong also west bank overtopped and washed down somewhat. On 7th furlong breaches

at bridge, on old coast road which now forms west bank of canal here. On 8th furlong the east bank has been washed over somewhat. *The* 148*th mile* shows a flood mark of 12 feet; except on 6th furlong where west bank has badly breached and swept down, and on 7th furlong where same bank is badly eroded behind, the rest of mile has not materially suffered, the banks were washed over generally by outside drainage; drainage inlet required on west side on this mile which has shallowed. *The* 149*th mile* also shows 12 feet of flood mark; the first three furlongs have erosions behind. On 4th furlong the Ramapatam river so-called crosses, which originally had merely gullies as outlet and inlet, but in May's cyclone these openings were materially enlarged. In November cyclone they have still more enlarged, and need to be provided for permanently, as this drainage runs to the bar adjacent, which opens yearly, which is indication enough it is not to be trifled with; the 5th to 8th furlongs banks are badly eroded, especially east bank as the river runs parallel to it behind; generally the banks on this mile have suffered —this mile has shallowed. *In* 150*th mile* the flood mark ranges from 12 to 12½ feet; the 1st furlong east bank, which is exposed to the bar, has been swept down quite and breached; the west bank also somewhat damaged. The 2nd furlong east bank suffered in the same way, and there is a great breach and bank swept down. On the rest of mile, in deep cutting, no particular damage has been done, though west bank was overtopped and washed down somewhat. The Sub-Division Officer's temporary bungalow in this mile was flooded and seriously damaged, and had to be abandoned by Mr. French's family, who were occupying it at the time; the storeshed all came down; the toll office had its roof blown off; this mile has shallowed somewhat. *The* 151*st mile* shows 12½ feet flood; 1st furlong west bank overtopped and breached; 2nd furlong west bank breached; 3rd and 4th furlongs overtopped and damaged, east bank eroded; 5th furlong eroded both sides; 6th furlong east bank much damaged and west bank eroded behind. On 7th furlong the Elekarroo crosses, and has swept away both banks for a full furlong. This drainage was originally embanked with a small inlet opening. The cyclone of May made large openings both sides. November's cyclone increased the opening, and no doubt extensive outlets are required to the bar here, which is very close, the waves during high tide washing across the crossing which is very deep; there are two bars still open, but will soon shut up to all appearances. On 8th furlong banks have breached, and east bank being exposed to the bar has been badly washed behind also; this mile has shallowed. *The* 152*nd mile* indicates 12½ feet flood. On 1st furlong west bank breached several places, and east bank also badly injured from the Elekarroo floods and exposure to bar. On 2nd furlong also there is a breach on west bank. There should be no banks in these furlongs, but low berms only. On 5th to 8th furlongs also banks overtopped and somewhat damaged. *The* 153*rd to* 160*th mile* the canal runs in very deep sand cutting; and much shallowed from wash off banks and berms and erosions of borders; flood mark 12 feet; on 1st furlong of 159th there is a breach on west bank. *On* 161*st mile* the Mannairoo crosses; the 1st furlong west side has been badly breached by the river, which runs parallel behind, and canal much filled up; the 2nd furlong also from the river flood has been badly eroded behind, the banks of three furlongs have been quite swept away, being across high flood waterway; properly there should be no banks on these three furlongs.

8. *Munnair River Section,* $\frac{160}{3}$ *Mile.*—This river which was very shallow in this year has now deepened extensively, and has swept down much of its north or left border, carrying away much of head of canal on that side. The gauge having been swept away by the floods there is no record in its register of rise of flood, but the flood marks are seen all along both sides and herein recorded. The gauge has since been recovered. The tides range from 3·0 to 5·8. This river crossing is very awkward, to which is to be attributed its very serious effect on the canal, both sides for several miles, which it silts up to almost low tide level yearly; there is a good open bar throughout the year.

9. *Munnair to Palairoo Section,* $\frac{160}{4}$ *to* $\frac{169}{1}$ *Miles.*—The entire length of this section has a very low exposed seaboard and canal close to sea; the storm wave from the sea is clearly indicated by the effects on sea (east) bank of canal and washing down of sand hills along the shore; the canal is a complete wreck in this reach and several old bars have opened out, the drainages leading to which having been obstructed by banks. *On* 161*st mile* the 4th furlong east bank at river junction has been quite swept away, and canal mouth eroded and enlarged on that side; a great sand bank also formed across the mouth; west bank eroded behind; on 5th furlong both banks eroded behind, the same is the case on 6th furlong, and on 7th furlong. The 8th furlong has badly breached both sides, and more or less swept down; the flood mark seems 11½ feet. *The* 162*nd mile* has 11½ feet of flood mark; the 1st furlong west bank more or less washed down, east bank badly breached and damaged; the 2nd furlong banks badly damaged and eroded both sides; the 3rd furlong banks also are badly damaged and breached; the 4th furlong banks have been swept down and breached, the 5th furlong west bank more or less swept down, and east bank badly eroded behind, the 6th furlong west bank quite destroyed, the east badly eroded. The 7th furlong banks have been destroyed and breached, and run to bar adjacent; what is left of banks are mere shells; the 8th furlong banks are badly eroded. This mile has a very low seaboard, and may be said to be a continuous bar of the Munnairoo. *The* 163*rd mile* indicates 12 feet flood; the storeshed and overseer's shed on this

mile at Oolapalem have been quite swept away, and road from village to canal breached; the flood went over banks quite all along, on 1st and 2nd furlongs banks behind quite shelled, bar adjacent running from the Munnairoo; 3rd to 5th furlongs continuously breached both sides; continuous bar adjacent now nearly closed, sand hills swept away, canal has no water at low tide by reason of the filling caused by breaches. The high tide waves wash across canal through breaches; the 6th to 8th furlongs are through deep cutting and high banks; no damage to them inside, but quite eroded outside, the east bank particularly by the sea waves. *The* 164*th mile* shows 12 feet flood mark; this mile is through deep sand cutting, east bank eroded behind, canal shallowed. *The* 165*th mile* shows also 12 feet flood, through deep sand cutting shallowed much; on 5th furlong great breaches both sides, with open bar close by and waves at high tide washing across; canal quite filled up here; permanent outlets and inlets are required here, where in May's cyclone breaches occurred, but now materially enlarged, the banks on rest of mile are eroded on sea side only. *On* 166*th Mile.*—On 1st to 6th furlongs, through deep sand cutting, only outside erosions east side. On 7th furlong both banks for half furlong swept away, being across high flood waterway of drainage; the 8th furlong is a continuous breach, with an open bar and waves washing across; this part breached in May's cyclone, and now has extensively enlarged. This is the Palairoo spill water and must be banked out, and only an inlet will then do here; canal quite silted up along here. *The* 167*th mile* indicates 12 feet flood mark. The 1st furlong is a continuous breach with 8th furlong of adjoining mile. The 2nd furlong for half length is breached continuously with the above furlong. The 3rd furlong is badly eroded, the 4th and 5th furlongs eroded also slightly, but more outside eastward. The 6th furlong has a large breach to eastward with open bar, west bank badly eroded behind; the 7th furlong badly eroded, the 8th furlong badly breached and eroded. *The* 168*th mile* shows 12 feet flood mark; 1st furlong, both banks eroded and are mere remnants; 2nd and 3rd furlongs west bank nearly all swept down; east bank also so gone to some extent, and what is left badly eroded; the 4th furlong banks damaged and eroded; the 5th furlong breached and eroded; also 6th furlong, 7th furlong east bank swept down, west bank eroded; 8th furlong both banks eroded behind. *On the* 169*th mile* the Palairoo crosses on 2nd furlong, the 1st furlong banks destroyed and eroded, being across high flood waterway. The entire reach from Munnairoo to Palairoo has shallowed up very much, particularly at Munnairoo end for 3 miles, and at the breaches canal quite filled up to low tide level.

10. *Palairoo-Moosee River Section,* $\frac{168}{1}$ *to* $\frac{169}{2\frac{1}{4}}$ *Miles.*—The Palairoo crosses on 2nd furlong of 169th mile, and the Moosee on 1st to 3rd furlongs of 170th mile; the flood mark is 12½ feet distinct; the gauge tide readings range from 7·2 to 3·9. The Palairoo bed, which was very shallow previously, has become very deep. The Moosee keeps as usual very deep. Both rivers have open bars, which were continuous during cyclone, but now separate. From $\frac{168}{3}$ to $\frac{169}{\frac{1}{2}}$ is in a cut between the two rivers. This cut has quite silted up and very badly breached, at which breaches the canal bed is 15 inches over low tide. There used always to be a deep channel round the point eastward behind the bars, and this channel when I was going up was all right, and boats navigated along it owing to obstruction in the cut above described, but on my return I found the channel nowhere, the high north-east winds having caused the sea to encroach inwards, and the channel has thus been blocked; the cut is therefore only practicable at high tide; this cut gives trouble yearly from the combined action of the rivers either end, it filled up in May's cyclone and was deepened and is now much worse than before.

11. *Moosee, Gundalcamma Sections,* $\frac{169}{2\frac{1}{4}}$ *to* $\frac{186}{7}$ *Miles.*—This section also, like the Munnairoo-Palairoo Section, is a wreck from 178th mile to the end; the seaboard is low and exposed and is one continuous bar, and very extensive drainages cross, which unfortunately were banked across. The canal has consequently shallowed up much in these reaches and at the breaches quite filled up. *On* 170*th mile* the 3rd furlong banks are so badly eroded behind that mere shells of them are left, these banks are across the high flood waterway of Moosee so can never be maintained and should be levelled down. The 4th and 5th furlongs for the same reason are badly breached and eroded, 6th to 8th furlongs are badly eroded inside and outside; these also are across the high flood waterway of Moosee, the slopes also are swept away and canal widened consequently; flood mark 12½ feet. *The* 171*st mile* has 13 feet flood line seen. In deep cutting, high banks, borders eroded, west bank outside eroded; the 1st furlong east bank badly eroded outside also. *The* 172*nd mile* indicates 13 feet flood; in deep sand cutting (7 yards), shallowed borders washed down in places. *The* 173*rd mile* indicates 14 feet; in deep cutting, high banks, borders slightly washed down, with breaches at ramps; bad erosions behind west bank, the result of Moosee flood. *The* 174th *mile shows* also 14 feet; in deep cutting, borders washed down, ramps breached, west bank eroded as on preceding mile. *The* 176th *mile* shows also 14 feet; deep cutting, banks somewhat overtopped west side from outside, west bank eroded by Moosee spill water, ramps badly breached and canal filled up. *The* 176th *mile* also shows 14 feet; west bank eroded behind as in preceding mile; banks overtopped, ramps breached, and canal filled up. *The* 177th *mile* mark of flood is 13 feet, not distinct; west bank eroded behind for same reason as in above miles, banks overtopped and washed into canal, bank slopes and borders eroded. *The* 178th *mile* shows 14 feet flood mark. The 1st furlong ramp breached both sides

and filled canal, bank overtopped and washed in, west bank eroded. The 2nd to 6th furlongs are through the Thondaroo creek, its west bank has been eroded by Moosee spill floods, and the cross bank at north end badly breached and destroyed. The 7th and 8th furlongs through deep cutting are not particularly injured.

The Moosee flood spills over the entire country on its left bank from 3 to 4 miles width, discharged by the Thondaroo creek into the Kottapatam swamp; the canal cut through this drainage valley, and its high banks on west side offered some obstructions, but the entire bunding up of the Thondaroo was injudicious, as objected by me all along, for this vast outlet was substituted by a petty channel on outside, which would never have done the duty; the obstruction therefore raised the flood level in canal to 14 feet in this reach, the only way I can account for this very high flood line hereabouts. This rise of flood outside swamped the adjacent villages, and it is said damaged the Allore tanks also close by, on borders of flood line. The road to Ongole was also breached badly by the unusual rise of flood, though the road generally suffers more or less in the same way in ordinary floods.

The 179th mile shows also 14 feet flood, which went over the approaches of temporary bridge at Kottapatam carrying them away; but withal the bridge stood firm, so I cancelled the order for dismantling it and ordered approaches to be made up again. The 1st to 3rd furlongs are in deep cutting, only west bank somewhat eroded behind, owing to exposure to swamp. The Overseer's and store sheds at Kottapatam were all knocked down and swept away, the 4th to 8th furlongs, banks overtopped more or less, and west bank badly eroded exposed to swamp. The flood mark above bridge is 14 and below it 13, the result no doubt of the obstruction, the high embankment the road offered till it breached away quite. *On 180th to 183rd mile* the canal is through swamp and banks quite exposed, the west bank more exposed has been quite eroded behind, washed over and damaged, and canal shallowed; the east bank having been originally made a low berm more or less, did not suffer much more since last May's cyclone. *The 184th mile* shows 12 feet flood; on this mile that vast drainage the Mudigondy crosses which has an open bar at all times. This drainage ordinarily spreads over several miles which have been banked across and drainage forced into the opening of stream proper, the consequence of which has been that the banks on this mile have more or less been swept away and deposited in canal, shallowing it much. The seaboard is very very low along here, without any sand-hills. *The 185th mile* flood mark seems 11 feet; this mile, like the preceding, runs across Mudigonda drainage, and its banks more or less swept down and otherwise damaged; low seaboard as in above miles with continuous bars. *The 186th mile* has the same features as the preceding two miles, and as badly injured; low seaboard, continuous bars, flood mark 11 feet, erosions of remnant of banks before and behind also. *The 187th mile* shows 12 feet flood; on 1st furlong great breaches with a bar opened out; furlongs 2nd to 5th borders swept away and canal materially widened, the result of Gundlacumma floods, banks somewhat injured and eroded behind. On 6th furlong east side breached, banks eroded inside and outside, canal borders eroded to toe of banks; on 7th furlong the banks made across Gundlacumma high flood waterway have been swept away and canal head much shallowed. The river crosses on 7th furlong.

12. *Gundlacumma River Section, $\frac{186}{7}$ Miles.*—The river right border seems more shallowed than before; the left border remains deep, and is gradually eroding away further left at southern side; a great shoal has been thrown up at mouth of canal obliquely, leaving however deep channel beyond; on north border the river erosion widened channel mouth materially on east side and threw up a great shoal at mouth, leaving a narrow channel on one side only. The gauge having been swept away no register was made of flood, but the flood mark clearly indicates 12 feet.

13. *Gundlacumma to Rumperoo Section, $\frac{186}{7}$ to $\frac{197}{3\frac{1}{2}}$ Miles.*—This section also for several miles has a low exposed seaboard with several old bars, all which now opened by the drainages which were obstructed breaking through the banks. The 188th mile shows 11 to 11½ flood; 1st furlong, erosions both sides, canal widened, and banks also eroded; 2nd to 7th furlongs, no particular damages save erosions of banks and borders; the 8th furlong is one enormous breach with an open bar, this opening should be a permanency, it breached in May's cyclone and has breached still more now. *The 189th mile* has 12 feet flood mark, 1st furlong erosions only; 2nd furlong badly breached at old obstructed drainage; 3rd furlong badly breached also and eroded, bar adjacent; the rest of mile not particularly damaged save erosions to banks, berms, &c. *The 190th mile* shows 12 feet flood; except 4th and 1st furlongs badly breached, the other damages are erosions merely of no consequence, bar adjacent. *The 191st mile* shows also 12 feet flood. On first five furlongs no particular damages; 6th furlong for half its length west side swept away, and east bank badly eroded; 7th furlong, great breach east side to bar; this opening should be kept as a large drainage has to be disposed of here; on rest of mile the low berms escaped. *The 192nd mile* indicates 12 feet flood. The low berms on this mile escaped, the higher banks have been eroded, inside and outside in places somewhat eroded. On 7th and 8th furlongs west bank washed down quite and east bank badly eroded. *The 193rd mile* shows also 12 feet flood; the 2nd and 3rd furlongs breached, on other furlongs banks washed over inward shallowing canal, and some

erosions on outside. *The 194th mile*, sundry breaches in several furlongs; banks also washed over depositing into canal and eroded behind. *On 195th mile* the flood mark is 12½ feet. On first six furlongs no serious damages, sundry breaches and erosions, and washed over in places; 7th furlong east bank breached, 8th furlong both banks swept away for 100 yards, north end being across flood waterway of Pedda Ganjam creek. This locality breached before, but has extended now, showing particular waterway required for outlet and inlet. *The 196th mile* has also 12 feet of flood mark. The 1st furlong is a continuous breach with last furlong of preceding mile and is bed of creek; on 2nd furlong west bank somewhat injured, east bank swept away; 3rd and 4th furlongs, bad erosions both sides more on east being exposed to swamp, and east bank also otherwise destroyed on 3rd furlong; on 5th furlong both banks breached and more or less swept away, swamp both sides; 6th to 8th furlongs, no great damage inside, outside erosions. The 197th mile, 1st furlong, not particularly injured. The Ramperoo is joined at 3½ furlongs; 2 to 3½ furlongs' banks which were obstructed across Ramperoo flood waterway have more or less been swept away and deposited in canal which is much shallowed. This reach should have no more than low berms, over which the flood can rise and fall freely. The toll shed at Pedda Ganjam was destroyed and being rebuilt. The Ramperoo bar is permanent; always open.

14. *General Observations.* (1.)—In addition to damages to banks, &c., above recorded, I have to state that several furlong stones have been displaced and thrown down, including many that were reset since May's cyclone.

(2.) The canal tow-paths, berms, and slopes of banks have been extensively sown over with prickly-pear, which I have ordered to clear away before it takes root.

(3.) All the old bars where drainages went to sea of old and had been closed for years opened out on the occasion of this cyclone. I observed that several of these bars which were open when I passed up had all but closed up when I was returning, and it is said will all close as soon as the wind changes southward, leaving only the permanent river bars open. In those places where the canal is very close to the bars, I found difficulty in passing the reaches of canal exposed to the bars by reason of the waves washing across, driving the boat out of canal into the swamps.

(4.) That a storm wave was blown up the seaboard all along the line from the Munnair northwards to Pedda Ganjam is very evident, 1st from the erosions of the sea bank and wash *inward* of breaches; 2nd from the rise of inland drainage to unusual height, and 3rd from the testimony of all the villagers along the coast line, who state that the water was absolutely sea water at first, after which the land floods came down. It is also reported by villagers more inward, but along the swamped western borders, that but for the storm wave the land floods should never have risen upon their villages; and that the canal banks and closing of natural drainages are proving disastrous all along the seaboard villages. There should be no question about this.

(5.) The May's cyclone breaches were left unclosed at the several natural outlets; the November's cyclone has materially enlarged these breaches, indicating more waterway being needed for the drainage. The outside flood on west or land bank has been very high, due no doubt to the general breaching of tanks, and this is particularly observable along the Kundakur and Ongole Taluks limits, where the tank breaches are, I understand, very very extensive.

(6.) It has been practically demonstrated both in last May's and November's cyclone that till such time as regulating flood and drainage works and locks to shut out floods are constructed, it is best to have the canal unbanked at the confluences of all the extensive drainages. The low berms wherever made, have weathered out with very little damage indeed through both cyclones. The only fault in them is that the rear slopes are too steep, and that if made 3 or 5 to 1 will stand any flood, rising and falling freely over them.

(7.) The canal has materially shallowed on the whole, the result of the drainage being impounded by the storm wave, or otherwise a general scour might have resulted. The extensive breaches *inward* by land flood on one side and sea flood on the other have thrown the banks into the canal, and all these localities are badly filled up. The reaches most effected by general shallowing are that from Ramperoo to Gundlacumma, northern portion; that from Gundlacumma to Moosee, northern portion; that of the Moosee-Palairoo section as a whole blocked very seriously; that of the Palairoo-Munnairoo section as a whole seriously; that of the Munnairoo-Chippalairoo section northern and southern portions seriously effected by the rivers, and central portions on deep sand cuttings; that of the Chippalairoo river section as a whole; that of the Chippalairoo-Ramatheerthum section more or less, especially southern portion effected by the backwater and river floods That of the Ramatheertham-Pennér section as a whole; that of the Pennér section through island as a whole and very badly blocked. That of the Pennér and Kundalairoo section in places only, and northern portion effected by the river.

I have no intention of closing any breach till such time as it is determined whether the canal is to be an open or closed one for present purposes.

The obstructions to navigation are being now first removed, after which the general deepening in most reaches will be undertaken so far as present grants will permit, and for the rest a special estimate will be submitted for which soundings will be taken as soon as obstructions are cleared for present emergency.

(8.) The highest level of November cyclone is on Moosee-Gundlacumma section as will be seen, the flood having risen to 14 feet owing to high floods of Moosee and Gundalcumma at ends and the impounded waters of the Mudigondy drainage centrally, which must have been greatly obstructed, till the banks gave up. The Kottapatam-Ongole road high embankment must have also helped to raise the outside flood level.

MADRAS,
25th December 1879.

(Signed) S. OTTMANN, Sub-Engineer,
In charge of Buckingham Canal Division.

No. 15. ORDER THEREON, 6th February 1880, No. 283 W.

ORDERED to be recorded.

(True Extract.)

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

Exd. S. T. Austin.
Spare Copies

GENERAL ESTABLISHMENT.

Govt. of {1880} Madras.

PUBLIC WORKS.

To

Dated February 6th.

Issued

Read. Encl.

G. O., 6th February 1880, No. 283 W.

FEBRUARY.

Nos. 14-15.

Buckingham Canal.—The Executive Officer's report on the damages sustained by the — during the cyclone of 18th and 19th November 1879, recorded.

No. 7530.

3rd Circle, Superintending Engineer's Office,

Chepauk, 24th Decr 1879.

81

From

The Superintending Engineer,

3rd Circle,

783

To

The Chief Engineer

Public Works Department

Sir,

Enclosure
1 Copy Report

I have the honor to forward copy of a Report submitted by the Executive Officer — Buckingham — Canal — (drawn up after personal inspection) on the damages sustained by the Buckingham Canal during the Cyclone of 18th & 19th Nov 1879.

I have the honor to be
Sir
Your most obedient
Servant

Major, R.E.,
Superintending Engineer, 3rd Circle.

1879.

From
The Supt Engr 3d C.

283

No. 7530.

Recd of 6th Jan/80 No 283 W

dated 24th
Recd 26 } Decr/79.

Encl as.

Damage sustained by the Buckingham Canal—
Forwards copy of report regarding the — during the Cyclone of 18th & 19th Novr/79.

W
26/12.

Book No. 14

No. 1 Memorandum of Observations made on the damages to Buckingham Canal during the Cyclone of 18th and 19th November/79.

I. Madras to Ennore Section 11 to 12 miles.

1. No damage occurred on this portion of Canal, save that the flood overtopped the Embankment on 7th Mile west side below the Lock and swept it down for about two yards to ordinary ground level, the revetment below that level prevented scour further down. A large drainage from the west (from the direction of Red Hill Tank) meets the Embankment at this point, and as at the time the Cyclone was in high flood and backed up the drainage, it went over the weak Embankment. The entire Section from Madras to the Lock needs heightening. East of Lock through the low grounds also, the Cyclone floods poured into Canal towards Madras owing to the Ennore Bar being

O/ver

open. The Lock gates could not be closed on the above account for several days. The low grounds east of Lock will be embanked across shortly. On 6th December both gauges of Lock, read the same 6'-4", the water level being same both sides and gates open. During the Stormy period was 8'-8" The highest reading of gauge on Lunmore Lake during the Storm read 4.20, the zero of this gauge is 1.5 below M. S. L. The tides at the present range on this gauge from 1.0 to 2.2. The Zero of Lock gauges is 6.12 below M. S. Level.

II Lunmore to Pulicat Section 12 to 26 Miles

On this part of the canal, which is mostly through Backwater, no damage is observable. The cut on 21st Mile, connecting the Chintamoney and Pulicat backwaters widened very much. The 15th Mile and part of 16 also seems shallowed by the deposit of mash down from adjacent Paddy plains probably. The Pulicat gauge highest reading was 6.4 during the Stormy period on 12th. The Zero of gauge is 0.5 below M. S. L. Present tides range from 0.9 to 1.9 on gauge.

HWM 6.1 MSL

HWM 2 MSL

III Pulicat Lake Section 26 to 44 Miles.

This part of the line is through the Lake, through the projections of the East shore of which four cuts were made. As in May's Cyclone the effect of this Cyclone on the mouths of the cut, has been the same viz banked through up right across the second cut particularly fared badly in this way, and up to present time a gully merely has been cut through the Shoal to allow boats to pass. As to the Lake side embankments of these cuts, the partial repairs done there since May's Cyclone has been undone. The bank of 1st cut particularly has been washed down badly and breached shoaling up Canal at the breaches the piling with fencing now out at the mouths of this cut has much of it been carried away thus exposing the embankments to the Lake waves

and

and silt. The west bank of 2nd Cut did not fare quite so badly. The 3rd Cut was quite damaged in May's Cyclone and being but of very short length and too exposed, it was left to itself; it is somewhat more shallowed now and has no bank at all on west side. The 4th Cut west bank did not suffer either as badly as 1st Cut. But as already observed in all these cases, their mouths have shoaled up and Canal shallowed here and there where breaches have occurred. The Eastern or land side low banks such as were made in the cases of all three cuts, have been damaged further since May's Cyclone. The necessity of abandoning this lake line and running a new line within the Eastern shore border, has already been considered. Some boats were swamped on this line during the storm, all wood boats; and this day 3 boats of the same description

description swamped on this section the wind being very high and the lake waters very rough.

IV. Lake to Doogarajapatam Section 44 16/19 Miles.

The damage on this line is of a general nature a general shallowing up; the result of the Lake wash over west bank which though low; has been washed lower and breached. The east bank also has been breached in places but of no consequence. Much of this line has backwater on the east side of it also. The flood rose very high on this section and but for the timely opening of the Royadooroovoo Bar (which has not been known to open for a long time past) much loss of life and property would have resulted. In the Royadooroovoo Toll office which is built on the bank of Canal, the water was 2 feet deep over floor, as seen by water line this is 9 feet over Canal present bed. The flood that affected this portion of the

the Canal was brought down presumably by the Doogarajapatam River, which is the Southern arm of the Doornamoo Key and by the Doornamoo Key flood also which before it was relieved by the opening of the Pamanjee Bar must have run Southward.

The Doogarajapatam Gauge not having been fixed before the Storm the flood readings are not recorded but will be taken from Watermarks and referred to Bm and noted.

The Tide readings on Doogarajapatam Gauge now range from 1·9 to 3·15.

The Southern Entrance to the Doogarajapatam Lake which yearly shallows up and had to be maintained during westerly winds is now much shoaled up and the Lake depths generally seems to be short especially about the Entrance to branch Channel of Bungalow.

Two bears opened out at Doogarajapatam during the Storm but one is now open and not very wide.

V. Doogarajapatam and the Doornamoo Key Section

Leg to 75 Miles.

In this reach of Canal there is general shallowing up the result of the Doornamoo Key floods, here and there particularly there are very very shallow places as short as 1 foot at low Tide and the head of cut at junction with Doornamoo Key has silted up to 1½ feet below low Tide level for several hundred feet length of channel.

The destruction of Trees is more visible from hence Northwards.

VI Doornamoo Key river Section 75 to 77 Miles.

The river Course forms the Canal line in this Reach. This is the worst part of the Canal now as respects short water depth. Since Sept^r when this part of Canal was last dred, the flood has worked a complete change of river bed very very deep holes have been formed in places while generally the bed has shallowed up leaving no water at low Tide and but for the Pamanjee Bar being open and the Tide rising 2·8 as observed this day, navigation will be quite stopped.

The

The Bar is running freely still. This is always a difficult reach to maintain and yearly the same trouble is experienced so the sooner the better if a diversion is made and the River bed abandoned. The Pannanjee Bar which had been closed for years past was opened by the floods of this Cyclone.

VII Siddavaram Section. 77 to 90 miles

This section from the Combined effects of the Soornamookey floods at one end and the Kundalaroo floods at the other has shallowed up generally throughout at the Soornamookey Junction a great shoal was thrown up across the entire head of channel for about a hundred yards length of channel the mouth of channel having considerably widened also. A gully had been cut through this shoal by the Overseer to about a foot only below low Tide level so that boats could not pass except at high Tide in Consequence of which I remained here and put

put a large body of Coolies on to deepen cut several boats being detained both sides. Here and there in this reach the Canal has been further shallowed by breaches in banks and drainage discharge but the breaches are of no importance. In the sandy deep cuttings particularly the short depth of water is mostly felt.

The Kundalaroo gauge during the Storm read 8.9. The high Tide of last full moon read 7.0 and low Tide 4.4. The present Tide readings range from 6.8 to 4.5. The Zero of Gauge is 4.5 below M. S. L.

The Gauge Goomastah reports that for 3 days the Soornamookey floods passed into the Kundalaroo by way of Canal during and after the Storm, the Kundalaroo not having been in much of flood.

VIII. Kundalaroo River Section 90 to 91 Mile.

Is deep throughout. At the entrance of the Canal on South border the river is shoaling up very fast and since September a new shoal has formed about mouth of Canal

on

on East side, where there was always deep water before; Deepening has to be Constantly done, at the South Entrance to keep the Channel head open.

IX <u>General remarks</u>. The Toll office shed at Royadoroovoo was much damaged and walls fell. The Jilah forms about the mile and furlong stones which were damaged much by May's Cyclone and were restored have been washed away very extensively and many more of these stones have been thrown down quite. The Canal avenues have suffered again but not so badly as in May's Cyclone.

X The fullest instructions in writing have been issued to the Canal Superintendent to clear the line to 3 feet below low tide so as to allow of uninterrupted navigation but this clearing is only practicable in the short reaches not in the miles which have shallowed generally, the deepening of

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of which will occupy Months. On the Lake to Doogarajapatam Section. I have ordered all the breaches on west side to be, closed temporarily with small banks so as to prevent the Tide floods from the ends of Section and from the Royadoroovoo Bar being locked in as much as possible and not allowed to spread into the Lake as now, by which the Tidal influence on Canal is hardly felt as the reach of this Section is very long and the Tidal influence at the ends very small. It will be immensely advantageous if the Royadoroovoo Bar keeps open.

(Signed) S. Ottmann
Sub Engineer D.P.W.
15-12-79
Ex officer B. Canal Divn
(True Copy)

[illegible] Major R.E.

24/12/79

Ag Supg Engineer 3d Circle.

No 2 Observations on the damages done to the Buckingham canal during the cyclone of 19 and 20th November 1879.

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1 Kundalaroo to Pennaiur Section 91 to 114 miles.

On 91 mile no damage was done, as there are no banks, virtually, but merely berms, through the swamp, and over which the flood rose and fell freely. On 92 mile, through swamp also, the berms did not suffer for the same reason; — The Krishnapatam basin pevetment walls, loose set, have been much shaken. — The cyclone flood level on this mile denotes 9 feet, over canal bed which was designed 4·5 below Mean Sea Level. On 93 mile, no particular damage occurred, save a further wash down of banks which suffered in May's cyclone. With a good opening on this mile, for the Krishnapatam Drainage, the banks will be saved in future. — This mile is through Backwater, and without bank east side; — This mile is shallower also now, by the wash into canal of banks and berms. — The 94 mile has 2 breaches west side, from want of drainage outlet; canal generally shallowed

by wash down being deep sand cutting: — The 95 mile through deep sand cutting has also shallowed generally by wash; the ramps at cattle crossings breached. — On this mile, the flood mark seems 10 feet. — On 96 mile, half the mile, being in deep sand cutting, has shallowed as on the other miles: The rest of mile is through backwater with low berms, which did not suffer particularly, but where the Nalatoor drainage enters, and the bank was breached and washed down in May's cyclone; — the damage is greater now, and all along it the canal has shallowed; a good outlet is wanted here: On east side also, an old drainage outlet breached wider: the Nalatoor Bar opened in the cyclone, but has now nearly closed up: this bar is over half a mile distant from canal, and very rarely opens. — On 97 mile the flood mark is 10½ ft: there is no particular damage on this mile. — On 98 mile the flood mark is 10½ feet; — at the mile stone, but 11 feet where the large Arantkapuram drainage joins, and which damaged the canal and banks seriously at junction, filling up canal for some length quite: low berms washed over: general shallowing, the result of breaches and drainage junction.

On 99 mile, no particular damage, save that the cattle crossing ramps breached: at the mile stone the flood mark seems 10 feet.

On 100 mile, there are no damages particularly. The Yadoroo Paro (Jerry) which was before shallow, has deepened very much by scour. —

On 101 mile, the cattle ramps breached, but no other damage: flood mark 10 feet. —

On 102 mile, the old May's breach of drainage towards Kodoor South bar, widened considerably, but of no consequence: — this Bar which rarely opens, was opened during the cyclone, and now closed except at high Tide: a portion of East bank also has been washed down quite: — the low berms generally on this mile permitted the flood to rise and fall freely, so there was no particular damage. — On 103 mile, the damage is very serious, — by the Kodoor drainage which was obstructed having broken through — tearing down banks and berms at junction and for some distance beyond also, the towpath, berms and portions of high banks have been all swept down, the locality has the appearance of a large basin: this damage

occurred close by Kodoor Toll Office, the chains and apparatus of Toll bar having been swept away since recovered by the canal for 2 furlongs length quite silted up; the flood having been arrested by the storm wave through the bar a mile beyond; the flood mark at 103 mile stone is 10½ feet.— On 104 mile, an old bar that had not opened for ages and was quite bunded across by the canal bank, opened out by the storm wave evidently first carrying away east bank, when the impounded Kodoor drainage increased the damage passing out: This bar is a furlong from canal: canal quite shallowed up at this locality particularly and generally all along the mile: the opening in bank on East side is a furlong length: On west side also a large breach occurred by drainage from the west not having had outlets.— the bar is closing, flood tides only flow over now.— a permanent opening will be wanted here: at 104 mile stone, the flood mark seems to be 9½ feet.— In 105 mile, except in 8th furlong where drainage

from west overtopped and breached through, no particular damage occurred: an inlet is wanted here: the flood mark at the mile stone is 10 feet.— In 106 mile no particular damage:— flood mark 10½ feet. In 107 mile, the flood mark is 10½ feet:— bank not particularly injured but canal much shallowed, by the junction of a large old drainage: an old bar opened out in this locality and now closed,— over half mile distant from canal.— In 108 mile, There is no particular damage: flood mark seems 9½ feet:— The Korater Bungalow has fallen in the rear half of it;— it is built of pan brick with thatched roof: is a long way from canal and I certainly do not advocate its restoration. In 109 mile a very old bar opened, but now closed:— a very extensive drainage enters canal here, which caused the bar to open:— The flood water mark of this drainage outside the west bank is distinctly seen as 10½ feet and which height it must have reached till bar opened or probably while the seawave from bar kept it out: Extensive outlets and inlets are wanted here: the drainage channel cut outside

west bank here, is a dam: no other damage on this mile. — On 110 mile, the flood mark seems 9½ feet, there is a large breach on 8th furlong at old field drainage west side, and East side consequently eroded by the impact. — The 111 mile, flood mark seems 9½ feet; except at North end where banks were made across drainage, and which have been swept down, no other damage. — The 112 mile crosses a great drainage, in two arms, of a furlong each, which is the Gangapatam River and backwater, both arms have bars, the southern one rarely opens, but on this occasion it did. — The northern arm bar is now open, but does not continue so long: on the turn of the wind to south it will close, the fishermen say, the southern arm which was bunded across quite recently Nov's cyclone had its banks completely swept away. — They should not have been made at all: — the north arm is the river proper. Two furlongs of this mile, are through deep sand cutting, along which the canal is very shallow, by wash down banks and berms.

On the 113 mile, the flood mark is 9 feet / there being natural outlet, not allowing drainage to pack up, in this locality /. — On 6 furlong the cattle pamps both sides breached, banks badly eroded behind also. On 2nd furlong also breach both sides, and canal much shallowed: — At third arm of Gangapatam backwater crosses here, 2 furlong, but was banked across, — it is these banks that breached mentioned above, and opened old bar, now nearly closed, this crossing must be maintained open: the canal generally is shallow along 1½ furlong being through deep sand cutting. — The 113½ mile indicates 9 feet flood, only, the Pennair being near: no particular damage, banks eroded behind. — The 114 mile 2¼ furlong is Pennair South border. —

II Pennair River Section. 114/½ to 116/6½ Miles.

The Pennair gauge read 9.3 during the cyclone. The Tides seem have been raging from 7.2 to 3.4. — On the southern arm the sand spit in mid stream is extending still eastward, which sends the line of navigation nearer bar — it has extended since March last over 100 yards from my own observations: — The central arm, is a mere over flood waterway, — though generally deep heretofore, it has much silted up since November cyclone along north border, causing a great obstruction

at the mouth of the Island cut; in short there is no water over it at low tide, and the silt is so fine and semi fluid, that men cannot venture out of boat, the poling rods go down 8 to 11 feet in it, with very slight pressure: Stuff like this only a dredge could manage, it will be observed. The island cut between central and northern arms, has not silted very much more than in May's cyclone, but its borders have been eroded very much, there is about a foot of water, perhaps less at low tide, the southern mouth, besides the river approach to it before mentioned, is high and dry over low tide, for about a furlong. The northern arm, is not as deep now, as after last cyclone, the Southern shore has shallowed very much, thus obstructing South mouth of Island cut to some extent. The River beds, as in all these cases, alters year after year: but as I before advocated, the central arm should be closed up, by training the River, so as to keep the North and South arms permanently deep, and bars will open: the central arm bar which opened in the cyclone, has already closed up securely for the season.

III Pommair Pydaroo Section 117 to 124 Miles.

On 117 mile, no particular damage, the flood mark on mile seems 10½ feet, though the gauge on southern arm Pommair indicated only 9·3 at the same time, and in the canal south of Pommair 9 feet. — On 118 mile, no damages particularly, flood marks 10½ feet, generally shallowed, from influence of River floods, at one end and Pau atherkam drainage at the other.

On 119 mile, flood mark 10½ feet, on 1½ furlong large breach east side, from drainage having no outlet, no other damages, canal shallowed generally, for some reason as above. — On the 120 mile, the Ramatheerkam backwater crosses for about 4 furlongs length, this backwater was originally bunded up, leaving two little openings for outlets and inlets. In last May's cyclone the bunds were swept away and bar opened, the banks were not preformed, but merely low flat berms with very flat slopes outwards and two openings given for drainage on west side, the May's

opening left unobstructed on East side;
In the recent cyclone, the flood rose and
fell without injuring the low berms, the
bar opened, and has since closed. the high
tides only flowing over. — The outlet to sea needs
to be created a permanancy; along the reach
of this backwater the canal has shallowed
very much. — The 121 mile has 11 ft. of flood
line indicated on it. Deep sand cutting,
generally shallowed by wash and influence
of floods both ways. — The 122 mile is also
shallowed by the same influences, is through
deep cutting banks somewhat injured.

The 123 mile runs along border of Backwater,
with low berms generally, which have not
suffered very much more since May's
cyclone, the flood having risen and fallen
freely: the high banks, where they occur
are somewhat eroded. — On the 124
mile, 6 furlong, the Pydaroo crosses the
canal, just at crossing has a very ugly
bend, a right angle almost, which is far
from convenient for its navigation. —
The portion from 1 to 5 furlongs is along border

of backwater, not much injured, since May's
cyclone, by reason of the berms having been
washed down low; the canal is shallow
along here also.

IV Pydaroo River Section. The opening
proper is a furlong, but the high flood
waterway is several furlongs. — The bar is
now open, keeps open for a great part of the
year, — On the west of canal, the country is
a vast swamp, where the floods have time to
spread. — The range read 11·0 during the cyclone
at Mackay. — The Tides range from 7·9 to 5·9. —
The Swamp above referred to, is one vast
bed of Oyster. —

V Pydaroo, Chippalairoo section 124
to 132 Miles.

The 125 mile, indicates 11 feet flood. The mile
is along the border of same swamp as in 124 5
The west bank, which was washed down to a
low berm in May's cyclone, has hardly suffered,
save somewhat more washed. — The 126 mile
is also along the border of same swamp, and
its west bank or berm has the same features
as on preceding mile, only washed down

somewhat more.— The 127 mile has a 10ft. flood mark. The Eskapally river is crossed on 6½ furlong, but the flood waterway is indicated by the high ground borders at the 2½ & 6 furlongs.— The low-west berms have not suffered more since May's cyclone.— the River way openings has widened merely.— the last two furlongs are in cutting, with banks badly eroded.— The Eskapally bar is very extensively open, in a North East direction.—

The 128 mile has been much injured.— it has a flood mark of 10½ feet.— On 1½ furlong adjacent to Bar opening, This was an old drainage crossing bunded across.— the west bank on 5 and 4 furlongs also swept down, and East bank also breached opposite the breaches are adjacent to Bar, about 2 furlongs off.— what is left of both banks on this mile, are mere shells, being eroded quite behind, The 6 & 8 furlongs are scarcely injured, in deep cutting.— the canal is generally shallow on the mile from the breaches, and more so at Eskapally Ferry on 8 Furlong.—

4

On 129 mile also, the East bank is badly eroded behind from outside action and breached in several places.— on 7 and 8 furlongs West Bank also eroded and breached Flood mark seems 11 feet.— The 130 mile breached to sea, east side, at old bar that opened in cyclone and since closed.— Banks generally eroded behind and in places washed down, with some minor breaches.— The 131 mile, has flood marks of 11 feet,— banks generally eroded both sides, and washed down in places.— The 132 mile has a flood mark of between 10½ and 11 feet,— Banks generally injured somewhat inside, but more outside,— On 1st furlong breach E. side, on 8 Furlong E. berm swept down mostly,— the banks on this mile, are more or less low berms. The 133 mile— the Chippalaroo South border is at end of 5th furlong,— the east bank, for the 5th furlongs has more or less suffered by the action of Chippalaroo south bar, breached and swept down in places; the mouth of the canal at Chippalaroo South border, is a great shoal, with a gully cut through, merely

to let boats pass, but there is no water at low Tide, - the mouth on east side, has been eroded and carried away, widenning the mouth therefore considerably. - canal much shallowed in this mile. -

VI Chippalairoo River section $\frac{132}{5}$ to $\frac{133}{4}$ Miles.

This is just such another reach as the Soonnamookie and quite as hard to maintain a deep channel along its bed owing to the ever shifting sands. - The River on its south border swept away a furlong length of canal banks which now into high flood waterway, it also opened its old southern bar, which for years had been closed: - the deep channel along bed which was staked out after monsoon floods, has so materially altered by cyclone floods, that it became necessary to order their removal, and the new deep channel alignment restaked. - the bed on the whole is shallowed than in September last, and the deep channel very tortuous. - The gauge reading of Chippalairoo during cyclone was 9·80 on 18th. 10·50 on 19th and 20th. - 9·50 on 21st, so that the duration of the flood period was very long here about. The Tide readings now range from 7·8 to 5·

The canal here needs to be led away westward entirely leaving River bed to itself. - Bar freely open. -

VII Chippalairoo to Mamaroo - $\frac{132}{4}$ to $\frac{160}{3}$ Miles.

In 134 mile, the flood mark is 10½ ft. / as on gauge /. - The 5 and 6 furlongs have been badly eroded behind, and parts washed down, - on 7 furlong breached both sides and ran to a bar, now closed, - the banks on this furlong are more or less much damaged, - on 8 furlong high banks outside erosions and east bank badly washed down, - This mile is exposed seaward to a very low sea board. - This mile has shallowed somewhat. -

The 135 mile, is also exposed on the sea side in the same way - sea bank much eroded, also land bank by the spill of Chippalairoo high flood, - a breach on East bank - and

2 to 4 furlongs banks much washed down.— flood mark 11 feet.— The 136 mile flood mark is also 11 feet, banks very badly erroded behind — breach on 1st furlong east side, and banks here and there washed down. The 137 mile, has the same 11 feet flood mark — banks erroded behind.— The 138 mile has also a 11 feet flood line, no particular damage inside, but erroded outside.— On 139 mile also the flood mark is 11 feet.— East bank breached, banks erroded behind, — generally washed over, — Tummalapentah is on this mile.— On 140 mile flood mark not visible distinctly, — low berms and banks, no material injury, save erosions behind, and breach east side.— On 141 mile, the flood mark is 11 feet.— low berms as in above mile, and damaged as in above not materially.— From 142 mile, the canal leaves the low swamp country and enters deep cutting from 7 furlongs. The first 7 furlongs are in swamps with low berm banks,

eroded behind,— On 8 furlong, breach East side, from drainage which must be left open.— From 143 to 145 miles through deep sand cutting there has been no damage, but canal shallow from wash, at 145 mile stone, the flood mark seemed 12½ feet.— On 146 mile, the flood mark looks 13 feet,— Deep sand cutting and canal shallow.— On 147 mile the flood mark shows 12½ and 12,— On 1st furlong is a great breach west side, from drainage, obstructed for miles both sides without an opening, the country about being wet land, with Tanks adjacent,— On 3 furlong also bank overtopped and breached west side,— On 5 furlong West bank overtopped and washed down somewhat. Flood mark on drainage channel banks / out side West Bank / is clearly seen as 14 feet,— On 6 furlong also west bank overtopped and washed down somewhat.— On 7 furlong breaches at Bridge, on old coast road, which now forms west bank of canal here,— On 8 furlong, the East bank has been washed over somewhat.— The 148 mile, shows a

a flood mark of 12 feet, – except on 6 furlong where West bank has badly breached and swept down, and on 7 furlong, where same bank is badly eroded behind, the rest of mile, has not materially suffered, – the banks were washed over generally by outside drainage, – drainage inlet required on west side on this mile, which has shallowed. –

The 149 mile also shows 12 feet flood mark, – the first 3 furlongs have erosions behind, – On 4 furlong the Ramapatam River so called crosses, which originally had merely sluices as outlet and inlet, but in May's cyclone, these openings were materially enlarged, – In November cyclone they have still more enlarged, and need to be provided for permanently, as this drainage, runs to the bar adjacent, which opens yearly, which is indication enough it is not to be trifled with, – the 5 to 8 furlongs banks are badly eroded especially East bank as the river runs parallel to it behind, – generally the banks on this mile have suffered. – this mile has shallowed. – On 150 mile, the flood mark rouges from 12 to 12½ feet, –

the 1st furlong East bank which is exposed to the bar, has been swept down quite, and breached, the West bank also somewhat damaged, – the 2 furlong East bank suffered in the same way, and there is a great breach and bank swept down, On the rest of mile, in deep cutting, no particular damage has been done, though West bank was overtopped, and washed down somewhat, – The Sub Division Officer's temporary Bungalow in this mile, was flooded, and seriously damaged, and had to be abandoned by Mr. French's family who were occupying it at the time. – the Storeshed all came down, – the Toll office had it's roof blown off. – this mile has shallowed somewhat. The 151 mile shows 12½ feat flood – 1st furlong west bank overtopped & breached; 2nd furlong west bank breached & 3 and 4 furlongs overtopped and damaged, East bank eroded, – 5 furlong eroded both sides, – 6 furlong East bank much damaged and west bank eroded behind – On 7 furlong the Elepharo crosses, and has swept away both banks for a full furlong, – This drainage was originally embanked with a small inlet openings –

The cyclone of May, made large openings both sides, — November's cyclone increased the opening, and no doubt extensive outlets are required to the Bar here, which is very close, the waves during high tide, washing across the crossing which is very deep, there are two bars still open, but will soon shut up to all appearances, — On 8th furlong banks have breached and East bank being exposed to the Bar, has been badly washed behind also, — this mile has shallowed —

The 152 mile indicates 12½ feet flood, — On 1st furlong west bank breached several places and East bank also badly injured, from the Elephanto floods, and expensive to bar, — On 2nd furlong also there is a breach on west bank. — There should be no banks in these furlongs, but low terms only. — On 5 to 8 furlongs also banks overtopped and somewhat damaged. The 153 to 160 miles the canal runs in very deep and cutting and much shallowed from wash off banks and terms and erosions of borders, — flood mark 12 feet, — On 1st furlong of 159 there is a breach on west bank. — On 161 mile

6 — the Mamouroo crosses, — The 1st furlong west side has been badly breached by the river, which runs parallel behind, and canal much filled up; the 2 furlongs also from the river flood, has been badly eroded behind, — the banks of 3 furlongs, have been quite swept away, being across high flood waterway, — properly there should be no banks on these 3 furlongs.

VIII Murmair River Section 160 / 2 —

This river which was very shallow in this year, has now deepened extensively, and has swept down, much of its north or left border, carrying away much of head of canal on that side. — The gauge having been swept away by the floods, there is no record in its Register of rise of flood, but the flood marks are seen all along both sides and herein recorded, — The gauge has since been recovered. The Tides range from 3·0 to 5·8. — This river crossing is very awkward to which is to be attributed its very serious effect on the canal, both sides for several miles, which it silts up

to almost low Tide level yearly - there is a good open bar throughout the year.

IX Mumair to Palairoo Section, 160 to 169

miles. - The entire length of this section has a very low exposed sea board and canal close to sea, the storm wave from the sea, is clearly indicated by the effects on sea (east) bank of canal and washing down of sand hills along the shore, the canal is a complete wreck in this reach and several old bars have opened out the drainages leading to which having been obstructed by banks, - On 161 mile the 4 Furlong East Bank at River junction has been quite swept away, and canal mouth eroded and enlarged on that side, a great sand bank also formed across the mouth, west bank eroded behind, - on 5 furlong both banks eroded behind, - the same is the case on 6 furlong, and on 7 furlong. - The 8 furlong has badly breach both sides, and more or less swept down, - the flood mark seems 11½ feet. - The 162 mile has 11½ feet of flood mark, - the 1st furlong west bank more or less washed down, East bank badly breached and damaged. - the 2 furlong banks badly damaged & eroded both sides, - the 3 furlong bank also are badly damaged and breached, - the 4 furlong banks have been swept down and breached, the 5 furlong west bank more or less swept down & East bank badly eroded behind, the 6 furlong west bank quite destroyed, the East badly eroded, - the 7 furlong banks have been destroyed and breached, and pumbar adjacent, what is left of banks are mere shells, - the 8 furlong banks are badly eroded, - This mile has a very low seaboard, and may be said to be a continuous bar of the Mumairoo. - The 163 mile indicates 12 feet flood, - the store shed and overseers shed on this mile, at Oolapalem have been quite swept away, and road from village to ~~Canal~~ pumbar, breached, the flood went over banks quite all along, on 1st and 2 furlongs, banks behind quite shelled, bar adjacent pumping from the Mumairoo, - 3 to 5 furlongs continuously

breached both sides, continuous bar adjacent
now nearly closed, sand hills swept away,
canal has no water at low tide by reason
of the silting caused by breaches, – The High
Tide waves wash across canal through
breaches, – the 6 & 8 Furlongs are through deep
cutting and high banks, no damage to them
inside, but quite eroded outside, the East
bank particularly by the Sea waves. –
The 164 mile, shows 12 feet flood mark –
this mile is through deep sand cutting
East Bank eroded behind, canal
shallowed. – The 165 mile shows also 12 feet
flood, – through deep sand cutting
shallowed much, – On 5 furlong great
breaches both sides, with open bar closely
and waves at High tide washing across,
canal quite filled up here, permanent
outlets and inlets are required here, where
in May's Cyclone, Breaches occurred but
now materially enlarged, – the banks
on rest of mile, are eroded on Sea side only –
On 166 mile on 1 & 4 furlongs through deep
land cutting, only outside erosions east

side, – On 7 furlong both banks for half furlong
swept away, being across high flood waterway
& drainage, – the 8 furlong is a continuous
breach, with an open bar and waves washing
across, – this part breached in May's Cyclone,
and now has extensively enlarged, – This is
the Palairos spill water and must be kept
out, & only 2 inlet still there do here – Canal
quite silted up along here. – The 167 mile
indicates 12 feet flood mark. – The 1st
furlong is a continuous breach with
8 furlongs of adjoining mile, – the 2 furlong
for half length, is breached continuously
with the above furlongs – The 3d furlong is
badly eroded, – the 4 and 5 furlongs eroded
also slightly but more outside eastward,
The 6 furlong has a large breach to Eastward
with open bar, West bank badly eroded
behind, – the 7 furlong badly eroded, –
the 8 furlong badly breached and eroded. –
The 168 mile shows 12 feet flood mark, –
1st furlong, both banks eroded and are
mere remnants, – 2 & 3 furlongs west bank
nearly all swept down, east bank also
to some & some extent and what is left

badly eroded, – the 4 furlong banks damaged and eroded, – The 5 furlong breached and eroded, also 6 furlong, – 7 furlong East bank except down, west bank eroded, – 8 furlong both banks eroded behind.

On the 169 mile the Palairoo crosses on 2 furlong, the 1st furlong banks destroyed & eroded, being across high flood waterway – The entire reach from Murmairoo to Palairoo has shallowed up very much, particularly at Murmairoo end for 3 miles, & at the breaches canal quite filled up at Low Tide

X Palairoo, Moosee River Section $\frac{168}{1}$ to $\frac{169}{2\frac{1}{2}}$ Miles –

The Palairoo crosses on 2 furlongs of 169 mile, and the Moosee on 1 to 3 furlongs of 170 mile. the flood mark is 12½ feet distinct, the Gauge Tide readings range from 7.2 to 3.9. – the Palairoo bed which was very shallow, previously, has become very deep, – the Moosee keeps as usual very deep, – Both Rivers have open bars, which were continuous during cyclone, but now separate, – From $\frac{168}{3}$ to $\frac{169}{1/2}$ is in a Cut between the two rivers. This cut has quite silted up and very badly breached, at which breaches the canal bed is 15 inches over low tide, – There used always to be a deep channel, round the point eastward, behind the bars, and this channel, when I was going up was all right, and boats navigated along it, owing to obstruction in the cut above described but on my return, I found the channel, no where, the high North East winds having caused the sea to encroach inwards, and the Channel has thus been blocked, – the cut is therefore only practicable at high tide, – this cut gives trouble yearly from the Combined action of the River either end, – it filled up in Bray's cyclone, and was deepened, and is now much worse than before. –

XI Moosee, Gundalcamma Sections $\frac{169}{2\frac{1}{2}}$ to $\frac{185}{7}$ Miles

This section also, like the Murmairoo, Palairoo Section is a wreck from 178 mile to the end, – the Seaboard is low and exposed and is one continuous bar, and very extensive drainage

cross which unfortunately were banked across.—The Canal has consequently shallowed up much in these reaches and at the breaches quite filled up.—On 170 mile the 3rd furlong banks, are so badly eroded behind that mere shells of them are left.—these banks are across the high flood waterway of Moosee so can never be maintained, and should be levelled down,—The 4 and 5 furlongs, for the same reason are badly breached and eroded,—6 & 8 furlongs are badly eroded inside and outside these also are across the high flood waterway of Moosee, the slopes also are swept away, and canal widened consequently, flood mark 12½ feet. The 171 mile, has 13 feet flood line seen,—In deep cutting, high banks, borders eroded, west bank, outside eroded,—the 1st furlong East Bank badly eroded outside also.—The 172 mile indicates 13 feet flood, in deep sand cutting 170 yds shallowed—borders washed down in places. The 173 mile indicates 14 feet,—in deep cutting high banks,

borders slightly washed down, with breaches at Ramps,—bad erosions behind, West bank the result of Moosee flood.—The 174 mile shows also 14 feet,—in Deep cutting, borders washed down ramps breached, West bank eroded as on preceding mile.—The 175 mile shows also 14 feet,—Deep cutting banks somewhat overtopped west side from outside, west bank eroded by Moosee spill water; Ramps badly breached and Canal filled up.—The 176 mile, also shews 14 feet, west bank eroded behind, as in preceding mile,—Banks overtopped,—Ramps breached, and canal filled up.—The 177 mile, bank & flood is 13 feet, not distinct, west bank eroded behind, for same reason as in above miles,—banks overtopped and washed into canal, bank slopes and borders eroded,—The 178 mile shows 14 feet flood mark—The 1st furlong ramp breached both sides, & filled canal, bank overtopped and washed in, west bank eroded,—The 2 to 6 furlongs are through the boundary

creek, - its west bank has been eroded by Moosee spill floods, and the cross bank at north end badly breached and destroyed. - The 7 and 8 furlong through deep cutting, are not particularly injured. -

The Moosee flood spills over the entire country on its left bank from 3 to 4 miles width extending from Trunk road on west side, to sand ridges of coast line on East side, and originally discharged by the Thondaroo creek, into the Pottapatam swamp - the canal cut through this drainage valley, and its high banks on west side offered some obstructions but the entire blinding up of the Thondaroo, was injudicious as objected by me all along, for this past outlet, was substituted by a petty channel on outside, which would never have done the duty, - the obstruction therefore raised the flood level in Canal to 14 feet in this reach, the only way I can account for this very high flood line hereabouts, - This prie of flood outside swamped the - adjacent villages and it is said damaged

the Allore Tanks also, close by, on borders of flood line, - the Road to Ongole, was also breached badly by the immediate prie of flood, though the Road suffers more or less, in the same way in ordinary floods also. -

The 179 mile, shows also 14 feet flood, which went over the approaches, of temporary bridge at Pottapatam carrying them away, - but withal the Bridge stood firm so I cancelled the order for dismantling it and ordered approaches to be made up again, - the 1 1/2 furlongs are in deep cutting, only west bank somewhat eroded behind owing to Exposure to swamp, the Overseers and Store sheds, at Pottapatam, were all knocked down, and swept away, the 4 to 8 furlongs, banks overtopped more or less and west bank badly eroded exposed to swamp, - The flood mark above bridge is 14 x below it 13, the result no doubt of the obstruction, the high Embankment the road offered till it breached away quite, - On 180 to 183 mile the canal is through swamp, & banks quite exposed, the west bank more

exposed, has been quite eroded behind, washed over and damaged, and canal shallowed, — the East bank, having been originally made a low berm, more or less, did not suffer much more since last Gray's cyclone. The 184 mile shews 12 feet flood, — on this mile, that vast drainage the Mudigondy crosses, which has an open bar at all times, — This drainage ordinary spreads over several miles which have been banked across and drainage forced into the opening of stream proper, the consequence of which has been, that the banks on this mile have, more or less been swept away and Leporitedian Canal, shallowing it much, — the sea board is very very low along here, without any sand hills. — The 185 mile flood mark seems 11 feet, — this mile like the preceding runs across Mudigonda drainage, and its banks more or less swept down and otherwise damaged, low sea board as in above miles, with continuous bars. — The 186 mile has the same features as the preceding two miles, and as badly injured, low sea

board, continuous bars, flood mark 11 feet, erosions of remnant of banks before and behind also. — The 187 mile shows 12 feet flood, — on 1st furlong great breaches with a bar opened out, furlongs 2 to 5 borders swept away and canal materially widened, the result of Gundlacumma floods, banks somewhat injured and eroded behind, — On 6 furlong east side breached, banks erroded inside and outside canal borders erroded to toe of banks, on 7 furlong, the banks made across Gundlacumma high flood waterway, have been swept away, and canal head much shallowed, — The River crosses on 7 furlong. —

X 11 Gundlacumma River section 186. — 7

The river right border seems more shallowed than before, the left border remains deep, and is gradually erroding away further left at Southern side, a great shoal has been thrown up at mouth of canal obliquely leaving however deep channel beyond, — On north border the River erosion

exposed bar

widened channel mouth materially on East side and threw up a great shoal at mouth, leaving a narrow channel on one side only. — The gauge having been swept away, no register was made of flood, but the flood mark clearly indicates 12 feet.

XIII Gurdlacumma to Rumpero

Section 186 to 197/3 1/2 miles. —

This section also for several miles has a low exposed sea board, with several old bars, all which now opened in, by the drainages which were obstructed breaking through the banks. — The 188 mile shows 11 to 11½ flood, — 1st furlong, erosions both sides, canal widened, and banks also eroded, — 2 to 7 furlongs no particular damages, save erosions of banks and border. The 6th furlong is one enormous breach with an open bar, — this opening should be a permanency, — it breached in May's cyclone, and has breached still more now. — The 189 mile has 12 feet flood mark — 1st furlong erosions only, — 2nd furlong badly breached at old drainage, — 3 furlong badly breached also and eroded bar adjacent, — the rest of mile, not particularly damaged; save erosions to banks, berms &c. The 190 mile shows 12 feet flood, — except 4 and 1st furlongs badly breached, the other damages are erosions merely of no consequence, — bar adjacent. — The 191 mile shows also 12 feet flood, — On first 5 furlongs no particular damages: — 6 furlongs & one half its length west side swept away, — and east bank badly eroded 7 furlongs, great breach east side to bar, this opening should be kept, as a large drainage has to be disposed of here, — On rest of mile, the low berms escaped. — The 192 mile indicates 12 ft flood, — The low berms on this mile, escaped — the higher banks have been eroded inside and outside in places somewhat eroded, — On 7 and 8 furlongs West bank washed down quite and east

banks badly eroded.— The 193 mile shows also 12 feet flood,— the 2 and 3 furlongs breached, on other furlongs, banks washed over inward shallowing canal, and some erosions on outside.— The 194 mile.— Sundry breaches in several furlongs,— banks also washed over depositing into canal, and eroded behind,— On 195 mile, the flood mark is 12½ feet. On first 6 furlongs no serious damages, sundry breaches and erosions, and washed over in places,— 7 furlong East bank breached,— 8 furlong both banks swept away for 100 yards north end, being across Flood waterway of Reddaganj am creek,— This locality breached before, but has extended now, showing particular waterway requires,— for outlet and inlet.— The 196 mile has aled 12 feet of flood mark,— The 1st furlong is a continuous breach with last furlong of preceeding mile and is bed of creek,— On 2d furlong West bank somewhat injured, east bank swept away.— 3 and 4

furlong, bad erosions both sides, more on East being exposed to swamp, and East bank also otherwise destroyed on 3 furlong, on 5th furlong both banks breached and more or less swept away, swamp both sides 6 to 8 furlongs, no great damage inside, outside erosions.— The 197 mile, 1st furlong, not particularly injured,— The Ramperoo is joined at 3½ furlongs,— the 2 to 3½ furlongs banks which were obstructed across Ramperoo flood waterway have more or less been swept away and deposited in canal, which is much shallowed. This reach should have no more than low levees, over which the flood can rise and fall freely.— The Toll shed at Reddaganj was destroyed and being rebuilt.— The Ramperoo Bar is permanent, always open,—

IVX.— General observations—

1 In addition to damages & banks recorded above recorded, I have to state, that several furlong stones have been displaced

and thrown down, including many that were sent since May's Cyclone.

2. The Canal tow-paths berms, and slopes of banks, have been extensively sown over with prickly pear, which I have ordered to clear away before it takes root. —

3 All the old bars, where drainage went to sea, of old, and had been closed for years, opened out, on the occasion of this cyclone. —

I observed that several of these bars which were open when I passed up, had all but closed up, when I was returning, and it is said will all close, as soon as the wind changes southward, — leaving only the permanent river bars open. —

In those places where the canal is very close to the bars, I found difficulty in passing the reaches of canal exposed to the Bars, by reason of the waves washing across, driving the boat out of canal, into the Swamps. —

4 That a storm wave was blown up the sea board all along the line, from the Mimmair northwards to Pedda Sayaun, is very evident, 1, from the erosions of the sea banks, and wash inward of breaches, — 2d from the rise of inland drainage to unusual height, — & 3 from the testimony of all the villagers along the coast line, who state that the water, was also like sea water at first, after which the land floods came down, — It is also reported by villagers more inward, but along the swamped western borders, that but for the storm wave, the land floods should never have risen upon their villages, and that the canal banks and closing of natural drainage are proving disastrous all along the Seaboard villages: There should be no question about this.

5 The May's Cyclone breaches were left unclosed, at the several natural outlets, — the November's cyclone, has materially enlarged these breaches, indicating more waterway being needed for the drainage. —

The outside flood on west or land [illegible] has been very high, due no doubt

to the general breaching of Tanks — & this is particularly observable, along the Kundakur and Ongole Talugs limits, where the the Tank breaches are I understand very very extensive —

6 It has been practically demonstrated both in last May's and November's cyclone, that, till such time as regulating flood and drainage works, and Locks to shut out floods, are constructed, it is best to have the canal imbanked at the confluences of all the extensive drainages: — The low berms wherever made have weathered out with very little damage: — indeed through both cyclones, — The only fault in them is, that the rear slopes are too steep, and that if made 3 or 5 to 1, will stand any flood, rising and falling freely over them

7. The Canal has materially shallowed on the whole, the result of the drainage being impounded by the storm wave, — or otherwise a general scour might have resulted. The extensive breaches inward by land flood on one side

11

and sea flood on the other have thrown the banks into the canal, and all these localities are badly filled up.

The reaches most effected by general shallowing, are, that from Ramperoo, to Gundlacumma, northern portion; that from Gundlacumma to Moosee, northern portion; that of the Moosee, Palairoo section as a whole blocked very seriously; that of the Palairoo. Munnairoo sections as a whole seriously; that of the Munnairoo Chippalairoo section, northern and Southern portions seriously effected by the Rivers, and central portions on deep sand cuttings; that of the Chippalairoo River section as a whole; — that of the Chippalairoo Ramatheertham Section, more o less, especially southern portion effected by the Backwater and River floods; —

That of the Ramatheertham Pennair Section as a whole; — that of the Pennair Section through island as a whole & very badly blocked; —

That of the Pennair and Kundalairoo Section in places only, and northern portion

affected by the River.

7. I have no intention of closing any breach, till such time, as it is determined, whether the canal is to be an open, or closed one, for present purposes.—

The obstructions to navigation are being now first removed, after which the general deepening in most reaches will be undertaken, so far as present grants will permit, and for the rest a special estimate will be submitted, for which soundings will be taken as soon as obstructions are cleared for present emergency.—

8. The highest level of tavernier cyclone is on Mooree-Gundalcumma section as will be seen, the flood having risen to 14 feet, owing to high floods of Mooree and Gundalcumma streams and the impounded waters of the Kudigondi drainage centrally, which must have been greatly obstructed, till the banks gave way—The Kottapatam Ingale road, high embankment, must have also helped to raise the outside flood level.—

W Brereton
Sub Engineer
In charge Buckingham Canals

Buckingham Canal Division Office
Madras Boat Basin
25th December 1877
Desp. 24 do.

Buckingham canal Dn.

1/543/79

Enclosure to letter No. 3166 d/ 25th December 1879 from the Executive Officer B.C. Dn. to the Supt. Engr. 3rd Circle.

No. 2 Report regarding the damages caused to the canal by recent cyclone.

To be forwarded to the Chief Engr. in original to avoid delay

H. [illegible]

30/12/79. of SE

No. 3166.

Buckingham Canal D Office

Madras Basin 25th December 79.

Despatched 28th

From

The Executive Officer in charge, Buckingham Canal Divn

To

The Superintending Engineer 3rd Circle

Sir,

In continuation of my first report that accompanied my letter No. 3119 of 15th Instant, I have the honor to submit herewith my 2nd Report, of damages, which completes the observations made of the canal from end to end.—

This 2nd report has been delayed in its submission, for the following reasons,— on getting into the new canal from Kundalam Northwards, and which is most damaged, I confined myself when going up, to taking soundings at every half

Enclos. 1

[illegible] of No. 283 W / 6.2.80. It may be [illegible] [illegible] 14/2/80

furlong, so as to ascertain definitely all shallows, in order to issue orders for deepening and clearing. I deferred the observations of the conditions of banks, to my return trips, and which I did, noting every furlong. I completed these observations on 21st, and was only now enabled to compile this report.

2. The Canal suffered most severely north of Pennair the results of the storm wave on one side, and the pent up inland drainage on the other, as you are aware the sea boards of Canal in the above reach is very exposed & low, and in many places the Canal is much too near the sea.—

The effects of the storm wave are seen on the sea bank of Canal—by the breaches inwards, and the villagers all along

state, they had to contend with sea water at the first, & afterwards with the inland drainage, this drainage did much damage to the outside of land bank also, from having been pent up, till the sea wave receded.

3. A Complaint has also been made by many inland villagers, that the obstruction to drainage, caused by canal banks, exposed them to a flood, of which they had no experience or fears heretofore, and this report was corroborated by the Inspector of Police of Ongole, who mentioned to me that the villages on west border of the swamps, extending from Kottapatam to Chinnaganjam and northward, were flooded, which state of things was never experienced before. There is no question that this has been the effect of the floods, considering

that so many drainages had been wholly obstructed, and the flood water way of others much reduced.

4. As directed in Memorandum No. 7145, Soundings of Canal, referred to datum, will be taken, as was done on the occasion of your inspection, and flood marks also denoted thereon and submitted for your information.—

I regret to state, that the 15 feet flood above datum, reported by the Sub Division Officer, as the height about Peddajanjam, is incorrect. I did not find the flood line any where in that locality over 12 feet or 7.5 over M. S. L. In my Observations accompanying this report, I have indicated the flood mark on every mile more or less, & I have also noted in a few cases the flood mark outside the canal on the land side.

5. Mr Carlier having been absent from Peddajanjam when I reached there, I could not gather specific information regarding the loss of life in the Komparoo / to Families of Troops, proceeding up Canal / as called for in your Memorandum before referred to.— I understand, all the people left the boat when it became unmanageable, & made for a high part of bank. It was when going from this bank / as wate began to rise / to Serungi = =dibba Bungalow, that some were carried away, through a breach in bank which was submerged, in their endeavours to rush to the other shelter, and but for the Dresser who accompanied these Families of Troops, I believe several more lives would have been lost.

6. I have made every arrangement & put on coolies every where at the obstructions to deepen the places. The obstructions at the Pennair Island cut, at the Palaroo, Moosee cut,— cannot be overcome, except at high tide, & it is just possible there may be a little delay, in the Suvarnamukhee & Chippalam,— I have left instructions to clear these places fully, but as the reaches are

long, the work of clearing may not be fully done, by the first week of January, in which His Grace the Governor purposes starting.

I have the honor to be
Sir
Your most Obedient Servt.

[illegible]
[illegible]
Gen. Offr. in charge Division

39/283

This report to some time should be forwarded in original to the Chief Eng[r]

[signature]
A S E

30/12/79

From
The Executive Officer in charge
Buckingham Canal.

To
The Superintending Engineer
3d Circle.

Dated 25th December 1879
Despatched 28th
Recd.

Enclosure in letter 7543/30-12-79

No. 3166

Damages caused to the Canal.—

Submitting 2d report regarding the — by the recent Cyclone.

No. 7543

3RD CIRCLE, SUPERINTENDING ENGINEER'S OFFICE,
Chepauk, 30th Decr. 1879

From

THE SUPERINTENDING ENGINEER,
3RD CIRCLE,

40/297

To

The Chief Engineer
Public Works Department

SIR,

In continuation of my No. 7530 dated 24th December 1879, I have the honor to forward herewith in original letter No. 3166 dated 25th December 1879 and its enclosure submitted by Mr. Oltmann Sub Engineer Buckingham Canal Division being his final report on the damages sustained by the Canal during the late Cyclone in November

Encls. Two.

I have the honor to be
Sir
Your most obedient Servt.
[signature]
Major R.E.
A. S. Supg. Engr. 3rd Circle

P. W. 1879/D.

No. 9181

From
The Superintg Engr
3rd Circle

No. 543

Dated 30
Desp 30 } Decr /79
Recd

Encls 2

* 1 Enclos marked 'P.W. 9181/79'

Buckingham canal —
Forwarding Original letter containing a final report on the damages sustained by — during the late cyclone in November.

Proc. of Govt of 6th Feb/80 No 283 Back No 14

W
31/12

— Mr U. —

The missing enclosure appears to be the No. II report by Mr Oltmann recorded with O. G. No. 283 W d/6/2/80. If so, please attach these to the original of that order, — if necessary, registering this covering letter separately, as in a similar case sent down today: a Ct. No. has already been given to Mr Oltmann's report.

A.S.P.
14/9

M

sent
Estabt

P.W. Dept.
No 2536 dy 6 Feby 1880

Proceedings of the Madras Govt.

Read the following

From the Supdg Engr
3d Circle (H.E. No 7530 of 24 Dec 79)

Recorded.

Aug 181

Govt. of (1880) Madras.

PUBLIC WORKS.

47/87

To

7-2-80

Dated

Issued

Recd. Encl.

G. O., 6 Feby 1880, No. 2836

Nos. 14 & 15

Buckingham Canal

~~Ex. officer~~: Report on the damages sustained by the ~~—~~ during the cyclone of 18 & 19 Nov 1879, recorded