Pu' Works (1896) Department.

G.O., No. 999-1000 J

DATED 27th Nov 1896.

[Despatch Abstract]

Floods in the Kistna - Recording a further report from the Superintendent on the recent — exercising with satisfaction the excellent work done by the Executive & the Subordinates named by the Chief Engr for Irrigation & stating that H.E. in Council has pleasure in recording his approval of the same, & will forward copies of the Superintendent Engr Baddeley.

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BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.

FURTHER PAPERS.

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IRRIGATION.

Government [1896] of Madras.

PUBLIC WORKS.

Recd. } 1896. *Enclosures*

Regd. } 1896. *Spare copies*

G.O., Nos. 999, 1000 I., 27th November 1896.

NOVEMBER.

Floods in the Kistna

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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.

READ—the following papers:—

From Major W. L. C. BADDELEY, R.E., Superintending Engineer, II Circle, to the Chief Engineer for Irrigation, dated Bezwada, 5th October 1896, No. 1826 K.

In continuation of my No. 1244 K., dated 13th August 1896, I have the honour to forward the detailed reports of the three Kistna Divisional officers upon the recent floods in the Kistna river.

2. Mr. Keeling, the Executive Engineer, Kistna Northern Division, sends with his report six tracings and a copy of the water register on both sides of the river, and with regard to the latter some explanation may be advisable as the datums for the gauge readings vary.

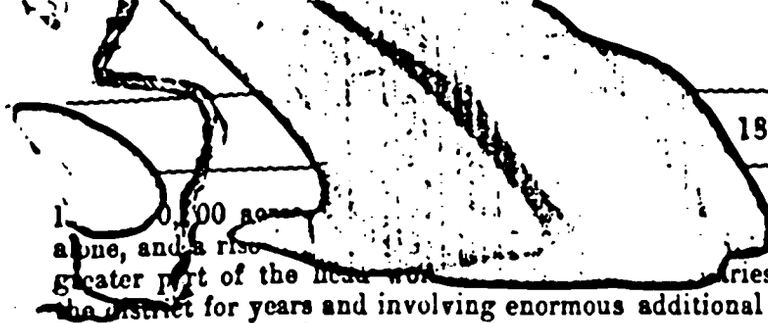
3. The readings in the columns "above" and "below" "anicut" refer to the datum of 23 feet below the crest of the anicut and, therefore, in order to ascertain the depth of the water on the crest, 23 has to be deducted from the reading given in the register. For example, the reading on the 6th August at 6 A.M. was 41·30 or 18·30 feet on the crest, and this is the highest reading ever registered at Bezwada; the highest previously being 40·04 or 17·04 feet on the crest.

4. The Pagatur gauge, which is situated on the Kistna in the Kurnool district about 250 miles from Bezwada, has its own zero, unconnected with any Bezwada datum. The readings are sent by telegram to Bezwada every day during the irrigation season; and, during the floods, I arranged with the Executive Engineer, Kurnool district, that the telegrams should be sent three times a day, as it was important that we should have early intimation of rises in the river.

5. The readings "front" and "rear" "head sluice" are taken from gauges, the zero points on which correspond with the cills of the sluices.

6. Turning now to Mr. Keeling's report, which is very clear and complete, I have merely to remark that the work of raising the head works is in rapid progress, the flood banks are being raised and strengthened, the scour hole in the anicut, of which I enclose a tracing and photograph, has been filled with Portland cement concrete and arrangements are being made to carry out all work that is necessary to make the works secure against a similar flood. As the working season here is very short, only three months, March to May, it is necessary to collect materials in advance, and I trust that any action that I take in this direction may be approved. I shall take care that the expenditure is regularised as soon as possible, but the most important matter is to ensure that next year shall not find us unprepared, and there is no time to lose.

7. The question of the railway bridge must be dealt with separately. I could merely repeat what I have already said, but would add that the state of the river, now that the floods have subsided, clearly proves that it is silting up on both sides, and it is absolutely certain that this silting will continue, until the river, unable to discharge freely through the contracted channel, will rise, during floods, to a dangerous height above and below the anicut. We cannot raise our flood banks and head works indefinitely, probably the height now fixed upon for the latter, viz., + 72 M.S.L. (the crest of the anicut is + 49·25 M.S.L.) is the maximum without rebuilding and widening the bases, and as the M.F.L. this year was + 67·55 M.S.L., it is evident that there is not much margin to spare. I can only hope that this important question may not be put on one side until it is too late. A crore and a half of rupees in capital will be sunk in the Kistna system before it is complete, at



[illegible] of 30 lakhs for water-rate alone, and a rise [illegible] would have wiped out the greater part of the head works, [illegible]ries, paralyzing the irrigation of the district for years and involving enormous additional capital outlay. With these facts before us, it is, in my opinion, absolutely necessary to do all that we can to relieve the contraction of the river below the anicut, and the obvious and only remedy is to remove the left training bank further back and increase the water-way of the bridge. If the question is looked at merely from a railway point of view, the bridge will remain as it is. If it is a question of funds, I would recommend that the cost of lengthening the bridge should be debited to the Kistna system; a more unfair debit it is hard to conceive, but any thing is better than to court a disaster which would ruin one of the richest and most important districts in the South of India.

8. I must now make a few remarks on the report of Mr. Loam, the Kistna Eastern Division Executive Engineer. This officer had only recently joined and had no knowledge of the district; he was, however, most ably assisted by his two Sub-divisional officers, Mr. U. N. Joyce and Sergeant C. J. Smith, and he himself was very energetic and did remarkably good work in closing breaches and protecting works. With his report he sent some sketch plans and photographs, from which I have selected the following as being of interest in giving a general idea of the damage done:—

(1) Site plan of breach at 3/2 Kistna left bank showing the ring bund now in progress.

(2) Sketch survey of Kistna left flood bank showing sites of twelve breaches between 31/0 and 33/1 with the ring bunds in progress or completed.

(3) Survey of breach in the Bandur canal between 27/7 and 28/0.

(4) Sketch-map showing the country flooded in the Kistna Eastern delta.

(5) Four photographs, the subject of each being entered on the back.

It will be observed that nearly the whole of the island of Divi was flooded, and the damage done to the tanks has been great, but it is satisfactory to think that the deposit of silt over the island will render it even more fertile than it now is.

9. The breaches in the Bandur canal have all been closed, the river bank work is in active progress, and I hope it will be found that the loss of crops has not been so great as estimated either on the main land or in Divi. A rather extensive programme of works is necessary to ensure the safety of the works in the Eastern Divison, where we are not only subject to damage from the Kistna, but also from the Budamēru, Ramilēru and Tammilēru, which cross the Ellore canal on their way to the Collair lake. I hope by the end of three years to have completed all works necessary for the Kistna Eastern Division, but, of course, this depends on funds being available.

10. Mr. L. D. Venkatarama Iyer, Assistant Engineer, was holding charge of the Kistna Western Division, as a temporary measure, owing to the sudden transfer of Mr. Malet, at the time of the floods, and I consider that he managed the division very well. A perusal of his report will show that the situation was an extremely trying one for a young officer. To the report I have nothing to add except that all repairs are being rapidly carried out and the necessary steps are being taken to prepare plans and estimates for strengthening and raising the flood bank on the right margin of the river.

11. I fear that the reports which I submit are in themselves somewhat long, and as there is nothing in them to induce me to modify the views I have expressed in my No. 1244 K., dated 13th August 1896, as to what should be done for the safety of the Kistna system, I beg to conclude my report by bringing to the notice of Government the general good work done by the members of the Public Works Department serving under me during the floods. There was at no time any hitch or confusion; and an extremely trying time and much anxious work only served to make every one work well and willingly.

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Mr. U. N. Joyce, Sub-Engineer in charge of the Northern Sub-division, Kistna Eastern Division, Sub-Conductor J. S. Joyce in charge of the Workshops, and Sergeant C. J. Smith in charge of the Southern Sub-division, Kistna Eastern Division. Mr. Keeling initiated the work of rescuing the inhabitants of the submerged villages, and, in this connection, I consider that Sub-Conductor Joyce deserves great credit for the skill he showed in taking the *Alexandra* across the river when the current above the anicut was about six miles an hour, and the vessel can only steam about seven under the most favourable circumstances. It was fortunate that the steamer was outside the lock at the time of the flood as I doubt if she could otherwise have gone to the relief of the villagers, and it is a question for the Revenue Department to consider how these villages should be dealt with in future floods, when it may not be possible for the Public Works Department to send a steamer across the river. The villages are mentioned in paragraph 4 of Mr. Keeling's report. Without the aid afforded by this department, several hundreds of people would have been drowned in these villages, and I would recommend that, when the river rises to some fixed level, which could be reported to the Revenue authorities in time for action to be taken, the villagers should be warned and, if possible, forced to seek shelter on higher ground before it is too late. There is no hardship involved in this, and if these or similar precautions are neglected there may be wholesale loss of life on some future occasion.

Throughout the flood Mr. Keeling worked day and night and I cannot too highly appreciate his services. All the upper subordinates mentioned by me did most excellent work, and Sergeant Smith, who was cut off entirely by the floods, displayed great energy and judgment in protecting the works under his charge; in my opinion he is a most useful sub-division officer and I shall be glad to see him promoted in the department.

ENCLOSURES.

From H. T. KEELING, Esq., Executive Engineer, Kistna Northern Division, to the Superintending Engineer, II Circle, dated 5th September 1896, No. 302 S.E.

I have the honour to make the following report on the recent flood.

2. To conform with your demi-official orders that I should be at head-quarters when any heavy flood occurred, I left instructions, when going into camp in July, that a telegram was to be sent to me when the river reached +35 on the Bezwada gauge, or if anything unusual happened. On the 30th, I received a telegram saying that the river was 35·2, I accordingly returned to Bezwada next day.

3. On my return the river was at 37·15, the telegram from Pagatur indicating that a further rise might be expected. The "planks" that had been prepared for the new head sluice vents at Seetanagaram were put in that water might be held up in the chamber between the old and new head sluices. The Executive Engineer, Kistna Western Division, was informed that water would have to be raised in the Main canal. The Executive Engineer, Kistna Eastern Division, was also informed that water might have to be raised in the eastern delta main canal to reduce the head on the sluices. The usual bunds were erected in the workshop yard, the workshop Superintendent vacated his quarters and the work of securing the timber and plant in the lower workshop yard was begun. The boat Superintendent was sent out to patrol the left flood bank with orders to strengthen all weak places.

4. On the 1st August, the river was still rising at Pagatur. I moved into camp at Seetanagaram to maintain a close watch personally on what I considered the weakest spot in the head works, viz., the Seetanagaram head sluices. On this day news was brought that the marinally-noted villages on the right bank above the anicut were submerged and in danger. The works being safe, I ordered the steamer across the river and made arrangements to go to their rescue. I informed Mr. Cumming, the Head Assistant Collector, of the state of the affairs and asked him to come, he being the nearest Revenue official. He came and a start was made at 4 P.M.; the steamer towing two cargo boats. The villagers at Undavally were safe on the hill, so they were passed by and we proceeded to Venkatayapalem. On reaching the village, one cargo boat with the Deputy Tahsildar entered the village at one end; the other boat went after five men on floats some distance from the village and then returned to collect people at the other end of the village. At 6 P.M., a start homewards was made with one boat, the other being left in the village. It got rapidly dark and the stream being strong, we were swept out of our course into a tree. I thought it too dangerous to proceed and so cast anchor. The other boat attempted to follow but was ordered to cast anchor and did so a short distance away. Every one spent an uncomfortable night without food. Next morning at dawn the first boat was taken to

Undavally.	Bodapalem.
Venkatayapalem.	Lingayapalem.
Kutnayapalem.	

Seetanagaram and the steamer returned for the second. In all 230 people were brought off. Mr. Cumming left at 9 A.M. on the 2nd for some villages down the Bandur canal. The steamer went out again at noon with the head-quarter Sub-divisional officer (Mr. G. R. Venkatarama Iyer) and Deputy Tahsildar. I also sent two cargo boats independently to Kistnayapalem to take villagers to Penumaka. On this day 87 people were brought to Seetanagaram and between 300 and 350 carried to Penumaka. On the 3rd, the Sub-Collector, Mr. Gillman, arrived and took charge of the operations, the head-quarter Sub-divisional officer accompanied him on the 3rd. Every assistance that was possible was given him (the Sub-Collector) in the way of men and boats, &c. On the 1st at Seetanagaram a rest camp was made of tents of tarpaulins and the new overseer's shed of the Kistna Western division was also used as a temporary shelter.

5. On the night of the 1st and 2nd, the stoppel revetment in rear of the old Seetanagaram head sluice began to slip. It was in some places packed with half filled sand bags and in others wedged up temporarily with rubble. This revetment continued to slip daily and was eventually pulled down and has since been temporarily re-built in mortar to + 15 above sill level of the sluice. The cause of the slip was partly a leak round the left flank of the sluice and partly the commotion in the chamber, but mostly I think the former in the first instance.

6. Information of what was happening was sent to the Superintending Engineer by express and also by telegram.

7. Gunny bags were collected and filled at Seetanagaram to make protective bunds on the road, tram line and round the works.

8. Matters went smoothly at Bezwada until the night of the 3rd, when the head sluice began to leak from the regulating or upper platform on to the lower platform. The head was reduced after the Executive Engineer, Kistna Eastern Division, had been informed.

9. On the 4th, the Superintending Engineer arrived and visited the works with the undersigned. It was determined to load the Bezwada sluice with sand bags to try to reduce the vibration. The bags were also necessary to prevent the water washing up through the gratings for the sluice gearing and on to the bridge over the canal. The slope above the masonry and dry stone retaining walls below the under sluices was being eroded, this was revetted with sand bags and brushwood. The bund from the head sluice was continued eastwards along the top of this slope and was made of earth revetted with sand bags. Sand bags were placed on the parapets round the lock bungalow and the Bezwada lock. The lock was kept half full and the front gates temporarily raised.

10. At Seetanagaram a bund of sand bags was made against the front parapet wall of the head sluice and the sluice roadway was floored with bags to break the impact of the water on the roadway, if the sluice should be topped. The various smaller bunds were strengthened. The lock was kept half full and the front gates raised temporarily.

11. Work on the various bunds was carried on day and night and completed by the 6th. On the 5th the dry stone retaining wall in rear of the Bezwada under sluices sank and bulged at the site of the old drain.

12. The water in the main canal, eastern delta, was raised with the river to keep the head to 15 feet. On the 4th—fifth night—the head was reduced to as near 14 as could be maintained to assist in diminishing the vibration of the head sluice. The greatest depth at which the water stood in the main canal was 12·90 on the 16th.

13. The planks in the new head sluice at Seetanagaram enabled water to be held up in the chamber between the two sluices. 2·65 feet was thus held up and the maximum depth in the main canal was only 11·20. Had it not been for the new head sluice the depth would have been 13·85 feet. What the extent of the damage would have been had this been the case, it is impossible to say.

14. The left flood bank breached on the 6th, near 7/3 miles on the Hyderabad road. At this point the flood bank is about 200 yards from the road. The boat superintendent and coolies were at work at a low place close by when the bank suddenly sank and water poured over the country. The breach occurred at the same place as in 1882. The water took line of the old drainage channel to the Budameru. The Nizam's State Railway was breached in several places. The water spread over the valley beyond the line nearly as far as Kothur. It breached into the Rayanapad tank, destroyed the flood banks of the surplus channels from Elaprole, Pydurpad, and Rayanapad tanks. (These are three Imperial tanks.) The length of the flood bank breached is about 150 yards and it has been scoured out 10 feet deep. The Hyderabad road in rear of the breach has been practically wiped out for a length of a quarter mile.

15. The right flood bank was nearly breached, but, fortunately, it proved possible to prevent it by revetting the weak places with brushwood and sand bags.

16. As regards the head works no further injuries beyond those previously mentioned became evident during the floods. Since the water fell, the following injuries on the Bezwada works have become known (those previously mentioned are recapitulated).

(*a*) The bank between the nose wall of the lock entrance and the head sluice has been much scoured. It is proposed to put in a concrete toe behind sheet piling to revet the bank (1 foot 6 inches depth of stone and 1 foot 6 inches backing) and to point this with surki mortar up to + 68.

The leakage through the head sluice was due to the filling of the top 3 feet consisting of quarry rubbish only; it is proposed to fill this in with concrete.

The crack in the front arch of No. 14 vent of the under sluices has opened out; the rail beams and trolly for working the under sluice shutters have been damaged, the pointing and plastering have been knocked about a good deal and the rails, which were torn up from their fastenings, were away two large stones on the rear face. The necessary repairs are in hand. The scour hole near the lower return of the under sluices on the anicut side has been much enlarged and has cut back towards the anicut body wall and under sluices. Nothing can be done here at present.* The slope above the masonry retaining wall was much eroded. Revetment, 15 inches deep with 15 inches back and slope 1 in 2, has been built here to repair the damages.

It will be necessary, I believe, to pull down and rebuild the dry stone retaining wall above the landing stage in one place where it has not only sunk but bulged below.

* Since writing this report, the scour hole has been ring bunded and the scour examined. The anicut has had a very narrow escape, the scour having cut back nearly to the body wall and right up to the main wall of the under sluices. The hole is being filled in with small stone at the bottom; then large jeddy stone packed to within 2 feet of the surface and the top 2 feet with Portland cement concrete. A drawing and photograph of the scour will be submitted in a few days.

17. In addition to the above repairs and protective works, it is proposed to raise the works on the Bezwada side to + 72.

18. So far as can be ascertained at present no damage has been done to the anicut and apron beyond the enlargement of the scour hole reported previously.

19. The eastern delta main canal and the head works of the Ellore, Ryves' and Bandar canals have large deposits of silt and sand. It is feared that dredging operations for the remainder of the season will be necessary in order to get the required quantity of water down the has been temporarily repaired. It is proposed to build a curtain wall in rear during next closure and repack the apron.

20. It would be a great advantage were it possible to shut the Bezwada head sluices altogether during heavy floods. This might be done by providing Stoney's shutters at some suitable site to be hereafter fixed in the main canal to hold up, say, 16 feet of water.

21. On the Seetanagaram side the following injuries have become evident:—

The rough stone floor of the chamber between the two sluices has been scoured in several places causing both retaining walls to crack and the one on the right to move forward in a curve and tilt over. It is proposed to floor the chamber with cut stone, to rebuild the retaining walls to a height of + 15 above the floor, with a larger section and set back at an angle on a deeper concrete foundation. Temporary measures to last the season are being adopted to prevent further movement of the right retaining wall, viz., a rough stone toe with a concrete bag retaining wall to prevent further forward movement. The front returns of the lock have cracked and show a tendency to move forward. They have been temporarily shored which has prevented further movement. It is proposed to make a concrete invert between the returns and to extend this concrete in front up to a row of sheet piles save 25 feet away and thus box in the foundations and prevent further movement.

It may, however, prove necessary to pull the returns down and rebuild after boxing in and levelling the foundations. It is thought that the cracks were due to unequal pressure and consequent sinking and tilting of the walls on which the work is said to be founded. The revetments in front of the lock have suffered considerably, a good deal of backing having been washed out. It is proposed to either close, grout the revetment with surki concrete or to rebuild it. A new pair of upper lock gates will be required for this lock, the heel posts being unsound. It is proposed to raise the works to correspond with the raising at Bezwada.

22. The maximum height to which the water rose was 41·30 on both the Seetanagaram and Bezwada gauges. Previously in 1882, the former registered ·66 more than the latter. The set of the river was as nearly as possible at right angles to the anicut.

Using the formula—

$$D = \angle \times c \sqrt{2g} \left[dd \sqrt{d + h} + \tfrac{2}{3} \left((d + h)^{\frac{3}{2}} - h^{\frac{3}{2}} \right) \right]$$

Were D = discharge.
" $\angle$ = length of the anicut.
" d = difference of water level above and below the anicut.
" dd = difference of water level below the anicut and the anicut crest.
" h = head due to velocity of approach.

I calculate the 1882 flood to have been 611,000 cubic feet per second and the recent flood 762,000 cubic feet per second, but in making the calculation for the 1882 flood I assumed the velocity of approach to be 8 feet per second only, and in the calculation for the recent flood I assumed 9 feet per second, this being the mean velocity at which I estimated the river to be flowing; assuming the estimated maximum of 890,000 cubic feet to be correct, there is at present an insufficient margin of safety before the works are topped.

Floods have a tendency to increase rather than decrease, and it is, therefore, proposed to raise the works to 72, the present level being 69·50.

23. A very large and important question is how the bridge below the anicut affects the safety of the head works on the Bezwada side and whether or not it raises the water level. The question is so large that I do not propose to touch on it further than to say that the greater portion of the water was discharged through spans 4, 5, 6, 7 and 8, and that large shoals have formed on both banks above the bridge. These shoals and the direction of the current are indicated on the tracing accompanying this report.

24. It is necessary to raise both flood banks above the anicut and to increase the section. Proposals in detail with estimates will be submitted later.

Roughly they will include raising to 6 feet above wave action in recent flood, increasing top width to 12 feet and the slopes to 1 in 2 and revetting the water face throughout the entire length of the bund. It is essential to ensure the safety of these bunds as both command railways, viz., the Nizam's line and the East Coast Railway on the left bank and the Southern Mahratta on the right.

The proposals made in this report were personally discussed with Superintending Engineer.

25. Accompanying the report are sketch plans showing the various important injuries and a copy of the water registers up to 9th August 1896.

26. The whole staff at head-quarters worked with the best will and results, and I beg to bring their services to your notice.

WATER Register of Bezwada station from 29th July 1896 to 9th August 1896.

[*N.B.*—Zero on gauge is 23 feet below anicut crest.]

Month and date.	Time.	Anicut.		Head sluice.		Head.	Number of vents and height opened.		Under sluices.		Pagitur gauge.
		Above.	Below.	Front.	Rear.		Breadth of vent, 6 feet.		Opened No.	Closed No.	
							No.	Shutters.			
29th July 1896.	6 A.M.	32·65	28·90	17·90	9·25	8·65					
	Noon	33·25	29·70	18·50	9·25	9·25	15	2·83	11	4	36
	6 P.M.	31·85	30·70	19·10	9·25	9·85					
30th "	6 A.M.	35·05	32·60	20·30	9·25	11·05					
	Noon	35·65	33·40	20·90	9·25	11·65	15	2·65	11	4	40
	6 P.M.	36·05	33·90	21·30	9·50	11·80					
31st "	6 A.M.	36·85	35·00	22·10	9·50	12·60					
	Noon	37·15	35·40	22·40	9·80	12·60	15	2·63	11	4	43
	6 P.M.	37·40	35·70	22·65	9·80	12·85					
1st Aug. 1896.	6 A.M.	38·25	36·70	23·50	9·90	13·60					
	Noon	38·65	37·20	23·90	9·90	14·00	15	2·68	11	4	48
	6 P.M.	39·05	37·60	24·30	9·90	14·40					
2nd "	6 A.M.	39·55	38·40	24·80	9·90	14·90					
	Noon	39·75	38·40	25·00	9·90	15·10	15	2·60	11	4	49
	6 P.M.	39·75	38·50	25·00	10·00	15·00					
3rd "	6 A.M.	39·85	38·40	25·10	10·00	15·10					
	Noon	39·95	38·50	25·20	10·00	15·20	15	2·43	11	4	47
	6 P.M.	39·95	38·50	25·20	10·00	15·20					
4th "	6 A.M.	40·05	38·50	25·30	10 30	15·00					
	Noon	40·20	38·60	25·45	10 45	15·00	15	1·83	11	4	50
	6 P.M.	40·40	38·85	25·65	10·65	15·00					
5th "	6 A.M.	40·70	39·30	25·95	10·80	15·15					
	Noon	40·80	39·40	26·05	11·05	15·00	15	3·20	11	4	53
	6 P.M.	40 85	39·50	26·10	11·10	15·00					
6th "	6 A.M.	41·20	40·00	26·45	12·60	13·85					
	Noon	41·25	40·00	26·50	12·70	13·80	15	4·10	11	4	56
	6 P.M.	41·30	40·00	26 55	12·90	13·65					
7th "	6 A.M.	41·30	40·00	26·55	12·80	13·75					
	Noon	41·10	39·70	26·35	12·80	13·55	15	3·83	11	4	50
	6 P.M.	40·95	39 50	26·20	12·20	14·00					
8th "	6 A.M.	40·55	38 90	25·80	11·80	14·00					
	Noon	40·35	38·50	25·60	11·60	14·00	15	2·97	11	4	42
	6 P.M.	40·05	38·30	25·30	11·30	14·00					
9th "	6 A.M.	39·25	37·20	24·50	10 50	14·00					
	Noon	38·65	36 30	23 90	9·90	14·00	15	1·83	11	4	36
	6 P.M.	30·00	35·40	23·25	9·25	14·00					

9th August 1896.

(Signed) P. SESHAYYA,
Bezwada Lock Superintendent.

EXTRACT of Water Register of Aniout on Soetanagaram side from 29th July to 9th August 1896.

[*N.B.*—Zero on gauge is 23 feet below aniout crest.]

Month and date.	Time.	Aniout. Above.	Aniout. Below.	Old head sluice. Front.	Old head sluice. Rear.	Head.	New head sluice rear.	Number of vents and height opened. Breadth of vents, 6 feet. No.	Number of vents and height opened. Breadth of vents, 6 feet. Shutters.	Number of under sluices opened.
29th July 1896 ..	6 A.M. ..	32·25	28·20	18·50	8·00	10·50	..	15	1·80	11
	Noon ..	32·85	29·10	19·10	8·00	11·10	..	15	1·70	11
	6 P.M. ..	33·65	30·20	19·90	8·00	11·90	..	15	1·70	11
30th ,, ..	6 A.M. ..	35·05	31·50	21·30	8·00	13·30	..	15	1·70	11
	Noon ..	35·65	32·20	21·90	8·50	13·40	..	15	1·60	11
	6 P.M. ..	36·05	32·70	22·30	8·50	13·80	..	15	2·00	11
31st ,, ..	6 A.M. ..	36·85	33·70	23·10	8·50	14·60	..	15	1·90	11
	Noon ..	37·25	34·10	23·50	9·00	14·50	..	15	1·90	11
	6 P.M. ..	37·45	34·40	23·70	9·00	14·70	..	15	2·20	11
1st August 1896 ..	6 A.M. ..	38·15	35·20	24·40	9·70	14·70	..	15	2·20	11
	Noon ..	38·55	35·80	24·80	11·50	13·30	10·00	15	2·60	11
	6 P.M. ..	38·85	36·10	25·10	12·00	13·10	10·00	15	2·60	11
2nd ,, ..	6 A.M. ..	39·35	36·70	25·60	12·00	13·60	10·00	15	2·60	11
	Noon ..	39·55	37·00	25·80	12·00	13·80	10·00	15	2·60	11
	6 P.M. ..	39·55	37·00	25·80	12·00	13·80	10·00	15	2·80	11
3rd ,, ..	6 A.M. ..	39·65	36·90	25·90	12·00	13·90	10·00	15	2·80	11
	Noon ..	39·70	37·00	25·95	12·00	13·95	10·00	15	2·60	11
	6 P.M. ..	39·70	37·00	25·95	12·00	13·95	10·00	16	2·80	11
4th ,, ..	6 A.M. ..	39·85	37·20	26·10	12·00	14·10	10·00	15	2·80	11
	Noon ..	39·95	37·40	26·20	12·40	13·80	10·10	15	2·60	11
	6 P.M. ..	40·15	37·60	26·40	12·50	13·90	10·20	15	2·60	11
5th ,, ..	6 A.M. ..	40·50	38·00	26·75	12·60	14·15	10·30	15	2·60	11
	Noon ..	40·65	38·20	26·90	12·80	14·10	10·40	15	2·80	11
	6 P.M. ..	40·85	38·40	27·10	13·30	13·80	10·70	15	3·00	11
6th ,, ..	6 A.M. ..	41·15	38·60	27·40	13·20	14·10	11·00	15	3·00	11
	Noon ..	41·25	38·70	27·50	13·40	14·10	11·00	15	3·00	11
	6 P.M. ..	*41·30	*38·70	27·55	13·70	13·85	11·20	15	3·10	11
7th ,, ..	6 A.M. ..	41·20	38·50	27·45	13·70	13·75	11·20	16	3·10	11
	Noon ..	41·00	38·30	27·25	13·30	13·95	11·00	16	2·90	11
	6 P.M. ..	40·85	38·20	27·10	13·30	13·60	10·90	15	2·90	11
8th ,, ..	6 A.M. ..	40·45	37·70	26·70	12·70	14·00	10·60	16	2·70	11
	Noon ..	40·20	37·60	26·45	12·45	14·00	10·50	15	2·60	11
	6 P.M. ..	39·85	37·20	26·10	12·20	13·90	10·30	15	2·50	11
9th ,, ..	6 A.M. ..	39·25	36·30	25·10	11·80	13·30	10·10	15	2·50	11
	Noon ..	38·25	35·50	24·50	11·30	13·20	10·00	15	2·30	11
	6 P.M. ..	37·65	34·80	23·90	10·90	13·00	9·80	16	2·10	11

*M.F.L.

9th August 1896. (Signed) Ch. VENKATARAMIAH,
Aniout Superintendent.

Report on flood damages in the Kistna Eastern Division in August 1896.

River bank.—The river had been rising steadily on the 31st July; it overtopped the ring bund opposite an old breach at 3 miles 2 furlongs of the river bank. When this took place water came against the bank made up over the old scour hole, and began to bubble up in the bank canal bed which runs alongside the river bank, the bank collapsed at 2 A.M. on the 2nd August. I inspected at midday and had the banks on either side of the breach protected by floating groynes.

The river bank at Yanamalakuduru has two low places at village crossing which were being raised. From commencement up to 3 miles 2 furlongs, the bank is low, there being 1·5 feet only to spare above flood line and was protected by bushes and leaves from wave action.

Looking up the river from the breach site, it appeared as if the midstream of river from the railway bridge impinged on the flood bank at this point.

On 14th I again inspected breach when water had gone down and had a survey made. Length of breach 255 feet, a ring bund 1,650 feet long will be required owing to the large scour hole 30 feet deep and extending far into the outside lunka.

The bund will be placed within the river margin and be brought up to full height required, it will not be advisable to put a bund across the scour hole, as at a certain depth sand is exposed and a bund may be expected to collapse from water percolating under it.

Survey attached, No. 1. Cost of repairs, Rs. 10,560. Photograph No. 1.

No breaches occurred to river bank down to 31st mile. 2nd September, I inspected twelve breaches on river bank from 31/1 to 33/0 miles.

	Miles.	Feet long.
First breach	31/1	180
Second ,, ...	31/1	260
Third ,, ...	31/1	200
Fourth ,, ...	31/1	220
Fifth ,, ...	31/1	420

A diversion to ring bund was started on the 20th August.

	Miles.	Feet long.	
Sixth breach	31/6	100	Closed by a small ring bund.
Seventh ,, ...	31/6	56	No. 7 breach not scoured and closed; began 25th August.
Eighth ,, ...	31/6	130	
Ninth ,, ...	31/6	170	Being ring bunded; began 25th August. Already closed but being brought up to full section.
Tenth and eleventh breaches	31/6	420	
Twelfth breach	33	320	Ring bunded; began 15th August, finished 25th; distressed coolies were employed.

Survey showing all breaches, attached No. 2.

All above ring bunds are within the flood bank on land side, and will be brought up to full section; they will be practically diversions, as there is no lunka to spare on the river side.

The first breach occurred on 1st August, water went down from lunka. 13th, again water came through the breaches and went down from lunka on 23rd.

Flood water from these breaches flooded the most part of the Tsallapally zemindary and large amount of indian corn crop near maturity was destroyed; this is however being resown.

Coolies in adjacent villages were much distressed and are now being found work on the ring bunds. About 1,000 are now employed and paid every three days and executing a fair outturn of work; they will be kept on for the present; food-grain prices have risen, but not exorbitantly.

On *6th*, I inspected flood bank from 34th mile to 24th mile. Diversion in good progress; from 31st mile to 29th mile 4th furlong almost overtopped throughout; breaches would have occurred, but were saved by small turf bunds in several places especially at 29th mile 1st furlong at a ring bund. From 29th mile 4th furlong to 24th mile damaged by wave action. The bank has apparently been raised at random. In some places, it is now 6 feet above flood line; no work of sanctioned estimate for raising has been carried out in this portion.

7th.—Inspected from 24th mile to 21st mile 4th furlong; at 23rd mile 1st furlong only 50 feet of lunka left of 125 feet before the flood, proposed diversion of 6 furlongs must be put in hand at once; the estimate was put in recently. Contractors' coolies were camped at 22nd mile diversion which, though incomplete, has stood the flood owing to protection afforded by hurdles of bamboos, brushwood and rolla grass; further work to complete was marked out, but is delayed by constant rain.

From end of new bank across this diversion to 21st mile 5th furlong the bank was overtopped in several places, but breaches were prevented by turf bunds. From 21st mile 5th furlong to 18th mile 5th furlong the bank was recently raised but has been damaged by floods. From 18th mile 5th furlong to 15th mile 4th furlong bank not yet raised and overtopped, breaches were stopped by timely precautions; 15th mile 4th furlong to 13th mile bank fully raised, but more or less damaged.

The sanctioned estimate for raising river bank will now be revised, the recent flood line will be marked on the sections and provision to raise the bank 6 feet above this will be allowed.

Divi Island—3rd September.—Right margin above rest-house badly eroded; survey is being prepared, protection work, if not undertaken by Conservancy sub-division, must at once be taken in hand by this division.

4th.—Inspected river bank from 1st mile 2nd furlong right bank to 3rd mile 4th furlong left bank, breaches in this portion were slight and have been closed. The river bank was almost overtopped throughout; pegs have been put in at maximum flood line and levels will be taken at an early date.

Remaining breaches were not inspected; sixteen breaches in left bank aggregating to 2,439 feet; all available labour is put on to repair it to prevent further damage in this monsoon. Cost of closing estimated Rs. 1,500 approximately.

Flood water within the flood banks was ·45 below top of basement of new cutcherry under construction at Avanigadda.

Flood right bank—Divi Island.—Inspected Kudi tank whole length of bund.

Breaches have all been closed and transplantation is in progress. Modumoody and two adjoining tanks have been filled.

5th September.—Inspected foreshore of river from 1st mile 2nd furlong to 6th mile 3rd furlong. A great deal of erosion has taken place here and there. Same measures must be taken as at Kottapatta where the groynes and rolls have stopped erosion and caught silt.

Inspected bank from 6th mile 3rd furlong to 1st mile 2nd furlong and settled position of ring bunds around scours at head of supply channels to Modellar and Annantuni tanks. There are six breaches in left bank aggregating to 1,365 feet, will cost Rs. 1,000 to close. As far as can be ascertained the dry crops for first 5 miles from Avanigadda have not been damaged except indigo.

Of the 33 imperial tanks, 6 are full, 3 partly full and 24 badly breached and empty, will cost on an average Rs. 800 each, making a total of about Rs 20,000.

Transplantation is going on under those containing water and seedlings on island being supplemented from main land.

The Paligadda branch of the Kistna river has been entirely cleared of rella grass and channel will soon be scoured out; several places in Divi Island will require protection by rella plantation.

Bandur Canal.—On the river rising and consequently the head sluice being raised to reduce head on the head works at Bezwada, the following steps were taken to get rid of the surplus water passed into first reach of Bandur canal.

Breaches were cut in right bank at 9 miles 3 furlongs and 9 miles 4 furlongs, also bunding in front of Bank canal lock weir was cut. This latter relieved Bandur canal considerably, surplusing through Bank canal down into flooded country below breach in river bank; breaches were also cut at 12 mile 0 furlong in left bank and at 12 miles 2 furlongs in right bank down to 2 feet from berm level and section of bank reduced to take water, if necessary.

It may be well to note that at 9 miles 2 furlongs, the old Pulleru crossed the present Bandur canal from right to left and only at a high level would water run off through the breach and at 9 miles 3 furlongs, the old Pulleru crossed from left to right, at the high level reached in Bundur canal, both these breaches took water into low-lying lands below and across Valur zemindari channel that takes off above Kunkipad and then into flooded country along wet side channel.

Further, the recently raised masonry body walls of west side channel sluice were removed to platform level and Pulleru fully opened till 6·5 was the gauge reading in rear of head sluice.

When the Northern Sub-division officer was called to Bezwada to regulate Ellore canal escapes and there was a probability that head sluices at Bezwada would be raised still more to save the head works irrespective of what damages might result to the main canals, a bund was raised in front of Kunkipad lock and we were prepared to hold up 12 feet full supply being 8 feet. The gates are old and will not stand more than full supply. There is an old proposal to make the six vent-sluice built in continuation of the lock weir of Kunkipad (the body walls of which were built up to F.S.L. level), having only three tambogy vents to supply west side channel, into a permanent surplus work and to convert the present west side channel into a drain as far as Medur head sluice. This must now be investigated and if carried out, the spoil would form a strong right bank to Bandur canal and to the first two miles of Medur channel.

In the event of the head sluice at Bezwada being raised as in the present year, a large surplus work in the first reach is absolutely necessary. The irrigation question will be dealt with separately. Only 2,300 acres are involved, 1,000 can be commanded by Vallur channel but the whole of it, except about 300 acres can be cultivated dry.

Flood water from the breach at 3 miles 2 furlongs of the river bank breached Bandur canal second reach right bank from 15 miles 4 furlongs to 16 miles 6 furlongs and crossed the canal into the country beyond, this is the side of an old breach in times of heavy rain; in former days drainage passed under the canal through an old brick under-tunnel now blocked up and of too small a size to be of any good.

Below, a series of breaches occurred from 18 miles 6 furlongs to 19 miles 6 furlongs to both banks owing to their being low; these were widened by water flowing back into the canal. When this happened, canal from 15 miles 4 furlongs to 19 miles 6 furlongs was silted up between breaches two and a half feet.

Flood water also breached left bank in 21 miles 6 furlongs and a large scour hole formed 12 feet deep. To relieve water on left of canal and save masonry works, a cut was made at 21 miles 7 furlongs in right bank and at 0 mile, 6 furlongs of new Bheemanady channel into head of Bheemanady drain.

Medur and Bheemanady sluices were fully raised. These breaches were all ring bunded by the 19th August. I inspected this reach on 18th and 21st August. On the evening of the 20th flood water again rose and entered canal at ring bund from 16 miles 2 furlongs to 16 miles 4 furlongs and by midday of 21st August all ring bunds were again breached; these were again closed by the 1st September; on night of the 3rd ryots of Vallur cut a ring bund between 16 miles 2 furlongs and 16 miles 4 furlongs to drain their fields.

There is a certain old tank here which is usually cultivated, but in times of rain or flood holds up water and the ryots have cut the canal bank here before to drain it off. I inspected this reach on 8th September, banks are being strengthened and silt removed. In order to save Inampudy village, there being a difference of level of 4 feet 6 inches between water on left of canal and water on the right, cuts were made in the left bank. Bandur canal at 27 miles 1 furlong and right bank at 27 miles 3 furlongs being fairly high ground and plenty of earth being available to close them and a large volume of water was passed from left to right. Flood water on left of canal was at a maximum at 2 A.M. on 5th August, it was 3 inches above the parapet of the accommodation bridge over Kanakavalli drain at Inampudy.

The breaches caused by flood water between 27 miles 7 furlongs and 28 miles 0 furlong are 320 feet long in left bank; right bank 180; right bank of old west side channel 130 feet. This breach scoured out to depth varying from 2 feet to 12 feet below bed of canal, scour extending 520 feet outside right bank of old west side channel.

From 28 miles 2 furlongs to 29 miles both tanks of Bandur canal and right bank of Urutur left side channel washed away. Bed of canal being scoured out to depth, varying from 2 to 13 feet below bed in 5 places aggregating to 1,095 feet and extending in many places beyond right bank. Foundation of Urutur sluice undermined near left front return and sluices overturned. In this reach from 29 miles 0 furlong to 29 miles 4 furlongs both banks were damaged and overstopped, but not scoured, the left bank being washed into canal to one-fourth of this distance to level of berm. A very bad breach occurred at Urutur crossing of 290 feet long in left and 300 feet in right banks. The scour on either side of remnants of crossing varying from 5 feet to 13 feet 6 inches below bed of canal, about one-half of metalling was washed away. Between 29 miles 5 furlongs and junction canal, 31·2 water crossed. Canal from left to right causing a series of breaches but no appreciable scour.

Surveys Nos. 3, 4, 5, 6 show breaches with their mileage, ring bunds being devoted by red line.
Six photographs enclosed.
Photo attached.

Between the scour holes from 28·2 to 31·2 canal is silted up from 2 to 5 feet as water drained off this silt was used for reforming left bank.

Small bunds were formed across breaches in left bank for foot traffic by 20th August, but were three-fourths washed away by fresh flood on 21st and 22nd. No further damage was done to third reach except a small breach at site of old Butter codu head sluice which was promptly closed when flood water went down on first occasion.

Canal was bunded below 27·6 and punts were utilized in conveying materials from above Veeranki lock for closing breaches. Here I may remark that this damage in the third reach was entirely caused by water passing from left to right, held up by Pulleru and Junction canals, which would probably not have occurred, had there been a suitably designed drain in place of west side channel from Kunkipad lock to Mopedivi drain. Navigation was resumed on 20th September. The Delta Superintendent now in charge will resume his ordinary duties—distribution of water and patching up the channels.

Fifth Reach.—For about ten days water crossed canal from right to left damaged both banks in 49th mile but not scoured; breaches have all been closed, sufficient to hold F.S.L. in canal.

Third reach was cross bunded on 16th August immediately above Junction canal and navigation restored between Bandur and Pulleru on 22nd August by water being passed through valve shutters of Pamarru lock; on 5th instant box sluice was fixed in left bank at 32·2 and water passed into canal from east side channel to supplement supply through Pamarru lock and enable fields on right of canal to get a moderate supply of water through Duggumally and Manager codu and Mallavole sluices. Most of the channels under last two sluices were badly damaged. East side channel head sluice Polleru was fully opened until third reach was re-opened. Throughout the flood, water was supplied through Medur and Bheemanady channels, three-fourths of the land under these channels being undamaged, Medur channel was not appreciably damaged and out of its two branches. Kristnapatam branch was safe and Gudapad branch was submerged. The Bheemanady main channel was not damaged up to 10 miles, but so far as excavated below this was submerged. Of the branches fully excavated Krosur north and south branches were submerged and badly cut up. Kapileswarapuram channel on left of Bandur canal is the only Government channel in Southern sub-division; on this side above Pamarru was completely cut up, it held up flood water for a short time.

All breaches were patched up by 5th September sufficiently strong to let water down and transplantation is again vigorously in hand. On the 31st August I went to Lakshmipuram at 10th mile of Tsallapalli road from Tidal lock up the Sivaganga drain; then alongside flooded pits above road; crossed at 6 miles 4 furlongs at road dam; then along Dyapucalva, the road being still unpassable having been submerged and formation damaged.

The course of the Dyapucalva is most tortuous and undefined, if this were properly aligned and excavated with a suitable bed width and full, it would dispose of flood water far more rapidly than at present and save considerable damage. 1st September Lakshmipuram inspected. Lands damaged by floods, the village itself and surrounding fields are high and not damaged.

Pulleru Canal.—Pulleru canal breached in the portion between Kunkipad and Weyyeru from excess water passed down it during the floods from first reach Bandur canal, but of no importance.

Ryves' Canal.—Also Ryves' canal breached at 12 miles 2 furlongs from the same cause. This has been repaired. No damage has taken place in Kowtaram sub-division, but temporary inconvenience was caused by reduction of water in canals after flood.

Ellore Canal.—Ellore canal gave an anxious time when the river flood bank breached above Bezwada and the Budameru was consequently in flood.

In the third mile at the site of an old breach, the ring bund and the canal bank started leaking. Due to prompt action of Mr. Joyce the cracks were puddled and the bank protected

Inspected bank from 6th mile 3rd furlong to 1st mile 2nd furlong and settled position of ring bunds around scours at head of supply channels to Modellar and Annantuni tanks. There are six breaches in left bank aggregating to 1,365 feet, will cost Rs. 1,000 to close. As far as can be ascertained the dry crops for first 5 miles from Avanigadda have not been damaged except indigo.

Of the 33 imperial tanks, 6 are full, 3 partly full and 24 badly breached and empty, will cost on an average Rs. 800 each, making a total of about Rs. 20,000.

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The Paligadda branch of the Kistna river has been entirely cleared of rella grass and channel will soon be scoured out; several places in Divi Island will require protection by rella plantation.

Bandur Canal.—On the river rising and consequently the head sluice being raised to reduce head on the head works at Bezwada, the following steps were taken to get rid of the surplus water passed into first reach of Bandur canal.

Breaches were cut in right bank at 9 miles 3 furlongs and 9 miles 4 furlongs, also bunding in front of Bank canal lock weir was cut. This latter relieved Bandur canal considerably, surplusing through Bank canal down into flooded country below breach in river bank; breaches were also cut at 12 mile 0 furlong in left bank and at 12 miles 2 furlongs in right bank down to 2 feet from berm level and section of bank reduced to take water, if necessary.

It may be well to note that at 9 miles 2 furlongs, the old Pulleru crossed the present Bandur canal from right to left and only at a high level would water run off through the breach and at 9 miles 3 furlongs, the old Pulleru crossed from left to right, at the high level reached in Bandur canal, both these breaches took water into low-lying lands below and across Valur zemindari channel that takes off above Kunkipad and then into flooded country along wet side channel.

Further, the recently raised masonry body walls of west side channel sluice were removed to platform level and Pulleru fully opened till 6·5 was the gauge reading in rear of head sluice.

When the Northern Sub-division officer was called to Bezwada to regulate Ellore canal escapes and there was a probability that head sluices at Bezwada would be raised still more to save the head works irrespective of what damages might result to the main canals, a bund was raised in front of Kunkipad lock and we were prepared to hold up 12 feet full supply being 8 feet. The gates are old and will not stand more than full supply. There is an old proposal to make the six vent-sluice built in continuation of the lock weir of Kunkipad (the body walls of which were built up to F.S.L. level), having only three tambogy vents to supply west side channel, into a permanent surplus work and to convert the present west side channel into a drain as far as Medur head sluice. This must now be investigated and if carried out, the spoil would form a strong right bank to Bandur canal and to the first two miles of Medur channel.

In the event of the head sluice at Bezwada being raised as in the present year, a large surplus work in the first reach is absolutely necessary. The irrigation question will be dealt with separately. Only 2,300 acres are involved, 1,000 can be commanded by Vallur channel but the whole of it, except about 300 acres can be cultivated dry.

Flood water from the breach at 3 miles 2 furlongs of the river bank breached Bandur canal second reach right bank from 15 miles 4 furlongs to 16 miles 6 furlongs and crossed the canal into the country beyond, this is the side of an old breach in times of heavy rain; in former days drainage passed under the canal through an old brick under-tunnel now blocked up and of too small a size to be of any good.

Below, a series of breaches occurred from 18 miles 6 furlongs to 19 miles 6 furlongs to both banks owing to their being low; these were widened by water flowing back into the canal. When this happened, canal from 15 miles 4 furlongs to 19 miles 6 furlongs was silted up between breaches two and a half feet.

Flood water also breached left bank in 21 miles 6 furlongs and a large scour hole formed 12 feet deep. To relieve water on left of canal and save masonry works, a cut was made at 21 miles 7 furlongs in right bank and at 0 mile, 6 furlongs of new Bheemanady channel into head of Bheemanady drain.

Medur and Bheemanady sluices were fully raised. These breaches were all ring bunded by the 19th August. I inspected this reach on 18th and 21st August. On the evening of the 20th flood water again rose and entered canal at ring bund from 16 miles 2 furlongs to 16 miles 4 furlongs and by midday of 21st August all ring bunds were again breached; these were again closed by the 1st September; on night of the 3rd ryots of Vallur cut a ring bund between 16 miles 2 furlongs and 16 miles 4 furlongs to drain their fields.

There is a certain old tank here which is usually cultivated, but in times of rain or flood holds up water and the ryots have cut the canal bank here before to drain it off. I inspected this reach on 8th September, banks are being strengthened and silt removed. In order to save Inampudy village, there being a difference of level of 4 feet 6 inches between water on left of canal and water on the right, cuts were made in the left bank. Bandur canal at 27 miles 1 furlong and right bank at 27 miles 3 furlongs being fairly high ground and plenty of earth being available to close them and a large volume of water was passed from left to right. Flood water on left of canal was at a maximum at 2 A.M. on 5th August, it was 3 inches above the parapet of the accommodation bridge over Kanakavalli drain at Inampudy.

The breaches caused by flood water between 27 miles 7 furlongs and 28 miles 0 furlong are 320 feet long in left bank; right bank 180; right bank of old west side channel 130 feet. This breach scoured out to depth varying from 2 feet to 12 feet below bed of canal, scour extending 520 feet outside right bank of old west side channel.

From 28 miles 2 furlongs to 29 miles both tanks of Bandur canal and right bank of Urutur left side channel washed away. Bed of canal being scoured out to depth, varying from 2 to 13 feet below bed in 5 places aggregating to 1,095 feet and extending in many places beyond right bank. Foundation of Urutur sluice undermined near left front return and sluices overturned. In this reach from 29 miles 0 furlong to 29 miles 4 furlongs both banks were damaged and overstopped, but not scoured, the left bank being washed into canal to one-fourth of this distance to level of berm. A very bad breach occurred at Urutur crossing of 290 feet long in left and 300 feet in right banks. The scour on either side of remnants of crossing varying from 5 feet to 13 feet 6 inches below bed of canal, about one-half of metalling was washed away. Between 29 miles 5 furlongs and junction canal, 31·2 water crossed. Canal from left to right causing a series of breaches but no appreciable scour.

Surveys Nos. 3, 4, 5, 6 show breaches with their mileage, ring bunds being devoted by red line.
Six photographs enclosed.
Photo attached.

Between the scour holes from 28·2 to 31·2 canal is silted up from 2 to 5 feet as water drained off this silt was used for reforming left bank.

Small bunds were formed across breaches in left bank for foot traffic by 20th August, but were three-fourths washed away by fresh flood on 21st and 22nd. No further damage was done to third reach except a small breach at site of old Butter codu head sluice which was promptly closed when flood water went down on first occasion.

Canal was bunded below 27·6 and punts were utilized in conveying materials from above Veeranki lock for closing breaches. Here I may remark that this damage in the third reach was entirely caused by water passing from left to right, held up by Pulleru and Junction canals, which would probably not have occurred, had there been a suitably designed drain in place of west side channel from Kunkipad lock to Mopedivi drain. Navigation was resumed on 20th September. The Delta Superintendent now in charge will resume his ordinary duties—distribution of water and patching up the channels.

Fifth Reach.—For about ten days water crossed canal from right to left damaged both banks in 49th mile but not scoured; breaches have all been closed, sufficient to hold F.S.L. in canal.

Third reach was cross bunded on 16th August immediately above Junction canal and navigation restored between Bandur and Pulleru on 22nd August by water being passed through valve shutters of Pamarru lock; on 5th instant box sluice was fixed in left bank at 32·2 and water passed into canal from east side channel to supplement supply through Pamarru lock and enable fields on right of canal to get a moderate supply of water through Duggumally and Managor codu and Mallavolu sluices. Most of the channels under last two sluices were badly damaged. East side channel head sluice Polleru was fully opened until third reach was re-opened. Throughout the flood, water was supplied through Medur and Bheemanady channels, three-fourths of the land under these channels being undamaged, Medur channel was not appreciably damaged and out of its two branches. Kristnapatam branch was safe and Gudapad branch was submerged. The Bheemanady main channel was not damaged up to 10 miles, but so far as excavated below this was submerged. Of the branches fully excavated Krosur north and south branches were submerged and badly cut up. Kapileswarapuram channel on left of Bandur canal is the only Government channel in Southern sub-division; on this side above Pamarru was completely cut up, it held up flood water for a short time.

All breaches were patched up by 5th September sufficiently strong to let water down and transplantation is again vigorously in hand. On the 31st August I went to Lakshmipuram at 10th mile of Tsallapalli road from Tidal lock up the Sivaganga drain; then alongside flooded pits above road; crossed at 6 miles 4 furlongs at road dam; then along Dyapucalva, the road being still unpassable having been submerged and formation damaged.

The course of the Dyapucalva is most tortuous and undefined, if this were properly aligned and excavated with a suitable bed width and full, it would dispose of flood water far more rapidly than at present and save considerable damage. 1st September Lakshmipuram inspected. Lands damaged by floods, the village itself and surrounding fields are high and not damaged.

Pulleru Canal.—Pulleru canal breached in the portion between Kunkipad and Weyyeru from excess water passed down it during the floods from first reach Bandur canal, but of no importance.

Ryves' Canal.—Also Ryves' canal breached at 12 miles 2 furlongs from the same cause. This has been repaired. No damage has taken place in Kowtaram sub-division, but temporary inconvenience was caused by reduction of water in canals after flood.

Ellore Canal.—Ellore canal gave an anxious time when the river flood bank breached above Bezwada and the Budameru was consequently in flood.

In the third mile at the site of an old breach, the ring bund and the canal bank started leaking. Due to prompt action of Mr. Joyce the cracks were puddled and the bank protected

by bushes and raised; at this time, the Tammileru came down in flood, the fender pile bridge in front of escape collected an immence amount of debris, the water falling over this caused a scour round several fender piles; this portion must be floored next year, for which estimates and plans have been submitted.

Breaches occurred at ½, ½, ½ on the right of Ellore canal 80 feet, 180 feet and 40 feet, respectively, in length. To save further damage the following cuts were made in 9/0 on the right 30 feet, 20 feet and 20 feet lengths respectively. All due to the flood waters entering the Ellore canal in the 7th mile and in addition to excess water from head sluices. Water from the Budameru passed 2 feet over the trough walls of Budameru aqueduct and one foot over Kesarapally aqueduct. A breach also occurred in the right bank at 10/6, also breach at 11/4 left to let Budameru flood into the canal. The canal breached at 11/4 last year.

Old Kesarapally lock has been provided with moveable planks to hold up full supply and to turn it into an escape in times of flood instead of being cross bunded as formerly.

The following are the estimated amounts required for closing the breaches:—

Southern Sub-division.

	Rs.
Masulipatam canal, second reach	
Third reach including Urutur sluice and left side channel	10,000
Fourth reach	20,700
Fifth reach	...
Sea dyke	1,550
Kapileswarapuram channel	350
Bheemanady channel	5,000
Mallavolu left side channel	1,375
Medur channel	500
Manager codu, Nibhanipudi and Mallavolu channels	260
River bank, 13/1 to 29/4	* 2,000
Do. 29/4 to 44/4	* 7,000
Divi Island, right bank	* 15,000
Do. left bank	1,000
Divi tanks, 24	1,500
	20,000
Total ...	86,235
or say ...	86,400

* Approximately.

Northern Sub-division.

	Rs.
Removing and re-fixing towpath bridge, Tammileru escape ...	4,100
Closing breaches of Dosapad channel and branch	6,000
Closing breaches of north side channel, Lingavaram, south side channel	50
Closing breaches of Ellore canal	3,815
Do. of river bank	10,600
	24,565
or say ...	24,600
Total ...	1,11,000

It is estimated not more than 10,000 acres will be lost in the Eastern delta due to this flood, but where seedlings are available, transplantations is still going on and this figure may be capable of reduction. In Divi Island 9,984 acres are lost for this year and 4,933 will be cultivated.

From personal inspection I have seen that the prompt measures taken to minimise the damage and to remedy it when the floods went down adopted by the two Sub-division officers, Sub-Engineer Mr. U. N. Joyce in the Northern Sub-division and Sergeant C. J. Smith in the Southern Sub-division have been most effectual and satisfactory and deserve great credit.

In the anxious time when the floods were at their height great discomfort and hardship were experienced by all, but work was smartly and cheerfully done on all occasions.

The measures taken in the third reach of the Bandur canal by Sergeant Smith were on his own initiative and deserve praise; they were prompt and effective. I was unable to advise him not having seen the country, being new to the division.

With exception of Urutur sluice overturned which was unavoidable, no other damage took place to masonry works in the division.

Reports on the working of overseers and others under these Sub-division officers are submitted with this report. I fully endorse Sergeant Smith's recommendation.

(Signed) M. LOAM,
Ex. Engr., Kistna Eastern Divn.

From M.R.Ry. L. D. VENKATARAMA IYER, Assistant Engineer in charge, Kistna Western Division, to the Superintending Engineer, II Circle, dated 7th September 1896, No. 239 S.

In continuation of this office Nos. 189 S., dated 13th August 1896, and 206 S., dated 21st August 1896, I have the honour to submit the following detailed report on the damages done to the Western delta by the recent heavy floods of the Kistna river.

2. *Damage to works.*—These floods are higher than the hitherto-recorded maximum and consequently the flood bank proved to be not high enough to withstand the floods and breaches were inevitable.

3. The first reach of Bank canal has been saved with great care. The flood bank in this reach was generally not less than 2 feet above the recent flood-level except at sites of Donkas and isolated weak places. These places were all strengthened in time, keeping pace with the rise of the river and breaches have been prevented.

4. In the second and third reaches, the flood waters began to overflow the flood bank in long lengths of about half a mile and more (*i.e.*), below Kollur lock and near Penumudi. Below Kollur lock Overseer K. Sreenivasa Iyer tried his best to prevent breaches by raising a small bund and worked for two days—31st July and 1st August—with about 250 men. As there was no place near at hand to dig earth from, he was not able to keep pace with the rise of the river and the flood bank below Kollur lock breached on the night of the 1st August.

5. Overseer V. S. Rangasamy Iyer and Delta Superintendent B. Paparazu Pantulu worked hard in preventing breaches between Vellatur and Penumudi and by their works at least half a dozen breaches have been prevented. Judging by the protective works done all along below Vellatur, I consider that the Overseer and Delta Superintendent have done their best to prevent breaches. Near Voleru and Rani Ananthavaram, the bank was low for long lengths and consequently breaches could not be prevented. Those breaches occurred on the morning of the 1st August. The breaches at Pedda Pulivarru, two miles below Vellatur lock, seem to have been cut intentionally by the villagers, who thought that they could save their houses by cutting these breaches.

6. The breaches in the fourth reach occurred at the central ramp of Peratlanka where the bank and the ramp was left incomplete by contractor K. Purnanandam. This man's contract was cancelled on 31st May, but he was allowed to do the work on piece-work on the distinct understanding that he will still be held responsible for any damages that may occur on account of the non-fulfilment of the conditions of his contract. The flood bank in the fourth reach was from 3 to 4 feet above the recent flood-level, and, if the work had been completed, no damages would have occurred. Opposite these breaches in the flood bank, the right bank of Bank canal has also been breached mostly on purpose in order to save masonry works.

7. The flood waters that flowed over the country from the Kollur breaches, breached the Kollipara channel and its branches at the tail end and also the Vellatur channel. These, together with the flood waters from the Pedda Pulivarru breaches, breached the spoil bank of the new Repalle main drain, straight cut at Nagaram, and also the old straight cut at Pudivada and the banks of the east side channel extension and got into Peddapallivada.

8. The flood waters from Penumudi and Voleru breaches breached the Repalle channel and branches and the Iskapalli channel and branches, passed through Alaparru parra and thence into the salt creek and reached Nizampatam vada. A portion of Nizampatam was under 3 feet of water. These waters backed up on the left of Nizampatam canal and breached the fourth reach and also the good water channel.

9. The details of the damages done to the flood bank, Bank canal, and the Iskapalli channel are given in the statement appended. I have not gone in for similar details for the Vellatur and Repalle channels, the east side channel extension and the good water channel, as that will only delay the submission of my report. As already stated in my previous report there are eleven breaches to the left bank and seven to the right bank in the fourth reach of Nizampatam canal. All the masonry works on the canals and distributaries are safe with a solitary exception of a small old road culvert on Peteru channel which is reported to have been much damaged.

10. These are the damages done by the high floods which lasted from the 1st to 7th August. The river began to fall on the 7th and it went down sufficiently low to allow of commencing the work of restoration on the 15th. Work was accordingly commenced at Kolluru, Peddapulivarru and Penumudi and was in good progress. But the rise of the river again on the 20th prevented any further progress and no work was done from 21st to 24th. The first two breaches at Kollur were very nearly closed, but the bank was not made high enough, as it was raised in layers. Overseer K. Srecnivasa Iyer has spared no pains in raising and strengthening this bank and judging from the work that has been done, I considered that the overseer deserves much credit.

11. All the water that flowed through the third reach was flowing through the Penumudi breaches and there was not a drop of water in the canal below the Iskapalli channel head-sluice. The ryots of Nallur, Chatragadda and Kamarazugadda, whose lands were not affected by the floods, had their lands transplanted and they were in need of water. I tried my best to close the Penumudi breaches on the right bank by putting in bamboo pegs and nanel rollers, but, on account of the rise of the river, my attempt proved unsuccessful. These men that were in need of water thought that the only way to get water is to cut open a breach to the flood bank below the Iskapalli channel sluice and accordingly, on the night of the 22nd, they stealthily cut two breaches—one about 15 feet long and the other about 30 feet long. The eastern Sub-divisional officer Mr. K. R. Rangasamy Iyengar, who was at Penumudi, at once ran to the spot and made a bold attempt to close the breaches by putting in ring bunds and succeeded in doing so by putting in bamboo piles, nanel rollers and palmyra trees, the depth of water on the lanka outside the breaches being not less than 4 feet. The Sub-Collector inspected the spot on 25th and proposed to levy penal assessment on the lands so irrigated and necessary lists were prepared by the Delta Superintendent.

12. *Works of restoration.*—These second floods subsided on the 24th and work of restoration was commenced on the 25th, but, on account of rains, no real work was done on 25th and 26th. From the 27th forward steady progress is being made and I hope to be able to carry water for irrigation in the third and fouth reaches in about a week, provided rains do not interrupt the work. But the closing of breaches and formation of ring bunds can be fully completed only by about the end of September.

13. *Causes of damage.*—Having dealt with the damages done to the different works, I now proceed to look to the causes of these damages. The one general cause which is well known to all is that the floods are higher than the maximum on record. When I found that the flood-level below Mortota was generally from 3 to 4 feet below the top of flood bank and that the bank was overflowed from Kollur to Penumudi. I naturally thought that it should be due to the changes in the river-bed. I looked over the river charts and found that the width of waterway exclusive of the lankas in the bed of the river varies from 7,000 to 10,000 feet above Vellatur, but at Penumudi it is only 4,200 feet and lower down opposite Peratlanka, it is only 2,400 feet exclusive of the Puligadda arm. The Puligadda arm is silted up at head and although there is water flowing through the arm during high floods, the discharge through the arm will not be equal to the discharge through 500 feet width of the deep river-bed. The narrowness of the waterway below Penumudi led to the backing up of the flood waters above Penumudi and hence the banks were overflowed. This is only my conjecture and its correctness can be ascertained after the flood-levels are taken. It follows, however, that the ultimate width of the river should be laid down once for all and that the conservancy works should be done to suit this width. Some cross sections have been taken and I have ordered some more, and, when these are received, I shall calculate the ultimate width of the river and lay down a programme of work to be done.

14. *Damage to villages.*—The villages of Godavarru, Bommimadipalem, Chilamore, Vellatur, Turupupalem, Pedda Pulivarru, Rani Ananthavaram, Penumudi and Kamarazugadda to the east of Bank canal, and Kollur, Bhattiprole, Poteru, Répalle, Iskapalli and Surepalli to the west of Bank canal were under water during the floods. Several houses have fallen down, but there has been no loss of life. The people from the lankas in the bed of the river were all brought over on boats; but there has been some loss of cattle and this loss is very little. I have not heard of much loss of stores of grain.

15. *Fodder for cattle*—is very scanty as most of the straw heaps have been drifted away by the floods. People are now getting green leaves of all sorts including Tumma, Luvvi and Rani and some are even stealthily cutting away Rella grass from the lankas and Government plantations; special arrangements have been made to prevent such stealth of Rella, as the Rella now available is not even enough for carrying on the plantations during the ensuing working season.

16. *Damage to crops.*—These floods came in just at the time of transplantation. Some lands were transplanted and some were ready for transplantation. Both the seed beds and the transplanted lands from Kollur 21/0 to Nallur 35/0 were submerged in water for about twenty days and they are either silted up or washed away or rotten and the loss in this way is considerable. Between Kollur and Nallur there are some dry lands of Donapudi and wet lands of Bhattiprole, China Pulivarru, Vellatur and Pedda Pulivarru that have not been affected, and for these lands as much as water as is available is now being supplied. I am closing the breaches without closing the Bank canal entirely in order to assist cultivation in unaffected lands as much as possible. In the fourth reach of Bank canal there has not been much damage to crops. Except opposite the breach at Peratlanka and opposite the breach in the right bank in the 40th mile, the other lands were not affected by the floods. The flood waters flowing through the canal were utilized for irrigation and the lands from 40 to 41½ miles and from 42½ miles to 45 miles have been transplanted and the crops are in good condition. From 35 miles to 40 miles, the crops are withering for want of water and I hope to supply water in about four or five days.

17. *Restoration of cultivation.*—With regard to the affected lands, it is possible to supply water within a week, but neither seedlings nor seeds are available to make a fresh start for cultivation; seedlings as far as available are being purchased and I hear that in one or two places seeds have been sown, but this must bear a very small proportion to the requirements. As the stores of grain would also have been affected by the floods, and as it is not possible to get good seeds, most of the affected lands, about 20,000 acres, as far as I can make out, will be left waste or cultivated dry.

18. *Work done by members of Public Works Department.*—I do not consider it necessary to go into this subject again, as I have already dealt with it in my previous report—*vide* my No. 206 S., dated 21st August 1896. I herewith enclose extract from my inspection notes for the month of August and also progress reports of Overseer K. R. Rangasamy Iyengar, eastern Sub-divisional officer, for the periods—1st to 10th and 11th to 20th August—and eleven other progress reports of other subordinates.

Statement of breaches in Kistna right flood bank and the Bank canal of Western delta caused by the extraordinary flood of 1896 in the Kistna river.

Serial No.	Mileage of Bank canal	Position.	Bank. R.	Bank. L.	Length approximate.	Major M. or Minor P.	Natural or artificial.	Remarks.
1	2	3	4	5	6	7	8	9
		Kistna right flood bank.						
1	20/6 to 21/0	Opposite to Kollur village.	..	..	100	M.	Natural.	
2	..	....	..	..	500	M.	Do.	
3	..	....	..	..	100	P.	Do.	
4	22/5	Yalagalagundy ..	..	..	320	M.	Do.	
5	27/4	Near Pedda Pulivarru ..	..	..	220	M.	Artificial.	Made by Pedda Pulivarru villagers to get relief to their village.
6	28/0	Do. ..	..	..	200	M.	Do.	
7	28/3	Do. ..	..	..	320	M.	Do.	
8	31/0	Opposite to Pallipalem ..	..	..	120	M.	Natural.	
9	31/5	At Olora ferry	..	..	160	M.	Do.	
10	31/6	....	..	..	160	M.	Do.	
11	32/0	....	..	..	90	P.	Do.	
12	32/2	Near Rani Ananthavaram.	..	..	300	M.	Do.	
13	..	Do.	..	..	300	M	Do.	
14	32/2	Below Ananthavaram ..	..	..	190	M.	Do.	
15	32/2	Do. ..	..	..	75	P.	Do.	
16	..	Do.	..	..	140	P.	Do.	
17	34/4	Opposite to Aravapalli channel.	..	..	85	P.	Artificial.	Made by ryots of Nallur on 22nd night to water their fields.
18	34/6	Above Nallur sluice ..	..	..	15	P.	Do.	
19	41/6	Peratlanka	..	..	150	P.	Natural.	
20	..	Do.	..	..	170	M.	Do.	
21	41/6	Do.	..	..	100	P.	Do.	Due to gap left by contractor Purnanandam in forming flood bank.
22	..	Do.	..	..	70	M.	Do.	
23	..	Do.	..	..	240	P.	Do.	
24	..	Gollapalem ramp ..	..	..	180	M.	Do.	
		Bank canal—Right bank.						
1	20/6 to 21/1	Opposite to Kollur village.	R.	..	1,850	P.	Natural.	Scours here and there, not very serious.
2	22,5	Yalagalagundy ..	R.	..	350	M.	Do.	Bank washed away into scour. Scour considerable and about 20 feet.
3	27/0	....	R.	..	150	P.	Do.	
4	27/4	Near Podda Pulivarru ..	R.	..	270	M.	..	
5	27/7	Do. ..	R.	..	60	P.	..	
6	28/0	Do. ..	R.	..	400	M.	..	The Vellatur side channel bank too has been washed away at these places.
7	29/3	Do. ..	R.	..	350	M.	..	
8	29/6	....	R.	..	30	P.	..	
9	29.1	Near Garigapudi ..	R.	..	150	P.	..	
10	30/1	Near Jagajjera ..	R.	..	30	P.	..	
..	..	....	..	..	30	P.	..	

Statement of Breaches in Kistna Right Flood Bank and the Bank Canal of Western Delta caused by the extraordinary Flood of 1896 in the Kistna River—*cont.*

Serial No.	Mileage of Bank canal.	Position.	Bank. R.	Bank. L.	Length, approximate.	Major M. or Minor P.	Natural or artificial.	Remarks.
1	2	3	4	5	6	7	8	9
		Bank canal—Right bank—cont.						
11	31·0	At Volera	R.	..	40	P.	...	
12	31·4	Volera road ferry ..	R.	..	150	M.	..	
13	31,6	Below do. ..	R.	..	100	M.	..	
14	..	Do. ..	R.	..	140	M.	..	
15	32·2	Near Thurupulem ..	R.	..	300	M.	Artificial.	
16	..	Avantavaram	R.	..	300	M.	Do.	
17	32/7	Above Repalle sluice ..	..	L.	60	P.	..	
18	..	Do. ..	R.	..	250	P.	..	
19	..	....	..	L.	185	M.	..	
20	..	Opposite to Repalle sluice.	..	L.	170	M.	..	Bank half cut away.
21	33/0	....	..	L.	95	M.	..	Do.
22	33·1	Below Repalle sluice ..	..	L.	85	M.	..	
23	..	....	..	..	180	M.	Artificial.	Made by overseer.
24	33·2	....	..	L.	40	M.	..	
25	33·6	Above syphon sluice ..	..	L.	43	P.	Natural.	
26	..	Below do. ..	..	L.	190	M.	..	
27	..	....	R.	..	160	M.	..	
28	33·7	....	..	L.	80	P.	Natural.	
29	34·7	Chatragadda	R.	..	30	P.	Artificial.	Made by overseer.
30	42·0	Near Peratlanka ..	R.	..	165	M.	Do.	Made by tow-path gumastah.
31	..	Head of No. 8 channel ..	R.	..	15	P.	}	
32	42/5	Ramp of Peratlanka ..	R.	..	40	P.	}	
33	42/7	Above 43/0	R.	..	15	P.	} ..	Due to gap left in the new flood bank formed last year.
34	..	Below 43/2	R.	..	12	P.	}	
35	..	Do. ..	R.	..	8	P.	}	
36	45·3	Below Adivipalem ..	R.	..	30	P.	}	
		Iskapalli channel.						
1	1 3	....	R.	..	150	M.	Artificial.	Made by the Deputy Tahsildar with the permission of the overseer and delta superintendent.
2	..	....	..	L.	150	M.	Do.	
3	2 4	Near Uppuli donka ..	R.	..	600	M.	Do.	Made by the Deputy Tahsildar on his own responsibility.
4	..	....	..	L.	500	M.	Do.	
5	3 5	....	R.	..	80	P.	Do.	
6	..	....	..	L.	80	P.	Do.	
7	3·6	Ananthavaram ..	R.	..	600	M.	Do.	Made by the overseer to relieve Repalle and Peteru.
8	..	....	..	L.	500	M.	Do.	
9	4 1	Above aqueduct ..	R.	..	400	M.	Do.	Made by the overseer to save aqueduct.
10	..	....	..	L.	400	M.	Do.	
11	4 5	....	..	L.	250	M.	..	
12	..	....	R.	..	260	M.	..	
13	5,2	....	..	L.	180	M.	..	
14	..	....	R.	..	60	P.	..	
15	..	....	R.	..	120	M.	..	
16	..	....	R.	..	60	P.	..	
17	..	....	..	L.	190	M.	..	
18	..	....	R.	..	60	P.	..	
19	5,2	....	..	L.	70	P.	..	
20	..	....	..	L.	164	M.	..	
21	5 3	....	R.	..	60	P.	..	
22	5/5	....	R.	..	100	P.	..	
23	..	....	R.	..	100	P.	..	
24	..	....	..	L.	200	M.	..	
25	5/6	....	R.	..	120	M.	..	
26	..	....	..	L.	120	M.	..	
27	5/7	....	R.	..	60	P.	..	
28	..	....	R.	..	250	M.	..	
29	..	....	..	L.	174	M.	..	
30	6/0	....	R.	..	32	P.	..	
31	..	....	..	L.	16	P.	..	
32	6/1	....	..	L.	200	M.	..	
33	..	....	R.	..	200	M.	..	
34	..	....	R.	..	100	P.	..	
35	6/6	....	R.	..	90	P.	..	
36	..	....	R.	..	180	M.	..	
37	6/7	....	R.	..	160	M.	..	
38	..	....	R.	..	150	M.	..	
39	..	....	R.	..	60	P.	..	
40	7,0	....	..	L.	240	M.	..	
41	..	....	R.	..	140	M.	..	
42	..	....	R.	..	160	M.	..	
43	7/1	....	..	L.	60	P.	..	
44	7/2	....	R.	..	20	P.	..	

Statement of breaches in Kistna right flood bank and the Bank canal of Western delta caused by the extraordinary flood of 1896 in the Kistna river—*cont.*

Serial No.	Mileage of Bank canal.	Position.	Bank. R.	Bank. L.	Length, approximate.	Major M. or Minor P.	Natural or artificial.	Remarks.
1	2	3	4	5	6	7	8	9
45	7/4	....	R.	..	90	P.	..	
46	7/6	....	R.	..	53	P.	..	
47	..	....	..	L.	80	P.	..	
48	..	....	..	L.	90	P.	..	
49	..	....	R.	..	50	P.	..	
50	..	....	R.	..	120	M.	..	
51	..	....	R.	..	150	M.	..	
52	7/7	....	R.	..	120	M.	..	
53	8/0	....	R.	..	64	P.	..	
54	8/2	....	..	L.	60	P.	..	
55	..	....	R.	..	70	P.	..	
56	..	....	R.	..	60	P.	..	
57	8/3	....	..	L.	45	P.	..	
58	..	....	..	L.	30	P.	..	
59	8/5	....	..	L.	180	M.	..	
60	..	....	R.	..	90	P.	..	
61	..	....	R.	..	60	P.	..	
62	..	....	R.	..	50	P.	..	
63	..	....	R.	..	65	P.	..	
64	8/6	....	..	L.	50	P.	..	
65	..	....	..	L.	32	P.	..	
66	9/0	....	..	L.	60	P.	..	
67	..	....	R.	..	60	P.	..	
68	9/1	....	R.	..	100	P.	..	
69	..	....	R.	..	40	P.	..	
70	..	....	..	L.	40	P.	..	
71	9/4	....	..	L.	70	P.	..	
72	..	....	R.	..	220	M.	..	
73	..	....	..	L.	550	M.	..	
74	..	....	R.	..	100	P.	..	
75	9/5	....	R.	..	70	P.	..	
76	..	....	..	L.	100	P.	..	
77	..	....	R.	..	60	P.	..	
78	..	....	R.	..	60	P.	..	
79	..	....	R.	..	60	P.	..	
80	..	....	R.	..	120	M.	..	
81	9/6	....	R.	..	100	P.	..	
82	..	....	R.	..	106	M.	..	
83	..	....	..	L.	70	P.	..	
84	..	....	..	L.	64	P.	..	

Remarks: All these breaches were more or less cut on purpose by the villagers of Sajjavaripalem, Pallaputla and Ishapalli as these villages were submerged in about 3 or 4 feet of water. The overseer and delta superintendent were engaged in cutting breaches above aqueduct at suitable places, and before they could go lower down, the ryots cut breaches wherever they liked. By a judicious selection of the sites, about two-thirds of the number of breaches could have been avoided. It is much to be regretted that subordinates were not able to go from place to place quickly and that the villagers had no patience to wait.

M = Breaches with considerable scour. P = Breaches when the scour is either ordinary or nil.

(Signed) K. R. RANGASAMI AIYANGAR,
Sub-Divisional Officer.

30th August 1896.

From the Superintending Engineer, II Circle, dated 12th October 1896, No. 1891 K.

No. 193 I.

Note by the Chief Engineer for Irrigation.

A further report from the Superintending Engineer, II Circle, on recent floods in the Kistna, with detailed reports of the three Kistna Divisional officers, is submitted to Government.

2. The Superintending Engineer has already in G.O., No. 789 I., dated 29th September 1896, been given permission to institute measures for restoring damaged works and guarding against future damage with the proviso that departure from financial rules is to be restricted as much as possible. No further orders on the subject seem necessary. The provision of funds for the work expected to be done this official year is dealt with in other correspondence.

3. The report on the effect of the railway bridge referred to in this office-note printed with G.O., No. 789 I., dated 29th September 1896, is still awaited.

4. The undersigned concurs with the Superintending Engineer in considering the following officers as deserving of special mention for the excellent work they did during the floods:—

Mr. H. T. Keeling, Executive Engineer,
„ U. N. Joyce, Sub-Engineer,
Conductor J. S. Joyce,
Sergeant C. J. Smith;

and desires to bring to the notice of Government the unremitting and well-directed exertions of the Superintending Engineer, Major Baddeley.

CHEPAK,
13th October 1896.

(Signed) W. HUGHES,
Chief Engineer for Irrigation.

ORDER—No. 999 I., dated 27th November 1896.

Recorded.

2. His Excellency the Governor in Council notices with satisfaction the excellent work done by the Executive Engineer and the subordinates named in paragraph 4 of the note by the Chief Engineer for Irrigation. His Excellency in Council has pleasure in recording his approval of the unremitting and well-directed exertions of the Superintending Engineer, Major Baddeley.

3. A copy of these Proceedings will be forwarded to the Government of India, in continuation of those forwarded with endorsement No. 790 I., dated 29th September 1896.

[Here enter No. 1000 I., dated 27th November 1896.]

(True Extract.)

(Signed) W. HUGHES,
Joint Secy. to Government,
Irrigation Branch.

To the Chief Engineer for Irrigation.
„ „ Public Works Department.
„ Consulting Engineer for Railways.
„ Superintending Engineer, II Circle.
„ Examiner, Public Works Accounts.

ENDORSEMENT—No. 1000 I., dated 27th November 1896.

Forwarded.

(By order)

(Signed) W. HUGHES,
Joint Secy. to Government,
Irrigation Branch.

Ed. T. K. Narayana Aiyangar.

His Excellency the Governor.
The Honourable Mr: B.W.Bliss C.I.E. ✓
The Honourable Mr: J.Grose C.I.E.

PUBLIC WORKS DEPARTMENT.
IRRIGATION BRANCH.

No. 999 I dy 27 November 1896

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the

READ the following

Letter from the Supg: Engineer, Second Circle (H.E.No: 1826 K. dated 5th October 1896)
Letter from .....DO.....DO..... (H.E.No: 1891 K. dated 12th October 1896)
Note by the Chief Engineer for Irrigation (H.E.No: 193. I dated 13th October 1896)

Recorded.

2. His Excellency the Governor in Council ~~is pleased to~~ notices with satisfaction the ~~good work~~ done by the ~~Superintending Engineer~~, the Executive Engineer and the Subordinates named in para 4 of the note by the Chief Engineer for Irrigation. His Excellency in Council has pleasure in recording his approval of the unremitting and well-directed exertions of the Supg: Engineer, Major Baddeley.

3. A copy of these Proceedings will be forwarded to the Govt of India in continuation of those forwarded with endorsement No. 790-I dy 29th Sept 1896.

Forwarded accordingly.

To,

The Chief Engineer for Irrigation
.. Chief Engineer P.W.D.
.. Consulting Engineer for Railways
.. Supg: Engineer, Second Circle.
.. Examiner P.W.Accounts.

Public Works (1896) Department.

CURRENT No. 9501

Order 5/-

From The Chief Engineer
for Irrigation

No. 193 S-

Dated 13.10.96

Received 22.10.96

Enclosures 26 (11 plans, 5 photos & 1 map)

Spare copies

SUBJECT.

Further Report on recent floods in Krishna-

BACK PAPERS.

G.O.	No.	Department.	Date.
S.O.	789-903	P.W.	29-7-96
"	7679	"	16-7-96
"	7379	"	28-8-96
	6679	"	12-8-96
"	379	"	15-1-96
"	7119	"	19-8-96
	A		

FURTHER PAPERS

G.O.	No.	Department.	Date.

Public Works (1896) Department.

CURRENT No.

Order 1323/96

1

From Major W. L. C. Baddeley, RE
Subg: Engineer II Circle
Bezwada.

No. 1826 K.

Dated 5 October 1896

Received 7-10-96

Enclosures 1 List with 22 Enclos

Spare copies

SUBJECT.

The Kistna Floods of 1896- Forwards further reports in detail & on — with remarks.

7.10.96

8/10

10/10

BACK PAPERS.

G.O. Exempt	No.	Department.	Date.
R	263	Ko	15-5-96
R	488	I	19.8.96
R	446	I.	12.8.96
"	790	P.W.D. (Irrg.)	24-9-96

FURTHER PAPERS.

G.O.	No.	Department.	Date.

Irrg. Engineer's Office,
2nd Circle, Bezwada.
5 October 1896.

No 1826 K.

From

Major W. L. C. Baddeley R.E.
Irrg. Engineer
2nd Circle.

To

The Chief Engineer,
for Irrigation,
Madras.

Sir,

In continuation of my No 1244K. 13-8-96, I have the honour to forward the detailed reports of the three Kistna Divisional Officers, upon the recent floods in the Kistna River.

2. Mr Keeling, the Executive Engineer, Kistna Northern Dn, sends with his report six tracings and a copy of the waters register on both sides of the river, and with regard to the latter some explanation may be advisable as the datums for the gauge readings vary.

3. The readings in the columns "above" and "below" "Ancient" refer to the datum of

of 23 feet below the crest of the Anicut and, therefore, in order to ascertain the depth of the water on the crest, 23 has to be deducted from the reading given in the register. For example the reading on the 6th August at 6. A. M. was 41.30 or 18.30 feet on the crest, and this is the highest reading ever registered at Bezwada; the highest previously being 40.04 or 17.04 feet on the crest.

4. The Pagatur gauge which is situated on the Kistna in the Kurnool District about 250 miles from Bezwada, has its own zero, unconnected with any Bezwada datum. The readings are sent by telegram to Bezwada every day during the Irrigation season, and during the floods I arranged with the Executive Engineer, Kurnool District that the telegrams should be sent three times a day, as it was important that we should have early intimation of rises in the rivers.

5. The readings "front" and "rear" head sluice" are taken from gauges, the Zero points on which correspond with the cills of the sluices.

6. Turning now to Mr. Keeling's report, which is very clear and complete, I have merely to remark that the work of raising the head works is in rapid progress

progress, the flood banks are being raised and strengthened, the scour hole in the Anicut, of which I enclose a tracing and photograph, has been filled with portland cement concrete and arrangements are being made to carry out all work that is necessary to make the works secure against a similar flood. As the working season here is very short, only three months, March to May, it is necessary to collect materials in advance and I trust that any action that I take in this direction may be approved. I shall take care that the expenditure is regularised as soon as possible, but the most important matter is to ensure that next year shall not find us unprepared, and there is no time to lose.

7. The question of the Railway bridge must be dealt with separately. I could merely repeat what I have already said, but would add that the state of the rivers, now that the floods have subsided, clearly proves that it is sitting up on both sides, and it is absolutely certain that this sitting will continue, until the rivers, unable to discharge freely through the contracted channel, will rise during floods to a dangerous height above and below the Anicut.

No.

We cannot raise our flood banks and head works indefinitely probably to the height now fixed upon for the Ricot, viz, +72 M.S.L. (the crest of the Anicut is +49.25 M.S.L.) is the maximum without re-building and widening the bases, and as the M.F.L. this year was +67.55 M.S.L., it is evident that there is not much margin to spare. I can only hope that this important question may not be put on one side until it is too late. A crore and a half of rupees in Capital will be sunk in the Kistna System before it is complete, at least 6,00,000 acres will be irrigated, giving a revenue of 30 lakhs for water rate alone, and a rise of a few feet above the recent flood level would have wiped out the greater part of the headworks and main distributaries, paralyzing the irrigation of the district for years and involving enormous additional Capital outlay. With these facts before us, it is, in my opinion, absolutely necessary to do all that we can to relieve the Contraction of the rivers below the Anicut, and the obvious and only remedy is to remove the left training bank further back and increase the water way of the bridge. If the question is looked at merely from a Railway point of view, the bridge will remain (100') as it is. If it is a question of funds, I would recommend that the cost of lengthening the bridge should be debited to the Kistna System; a more unfair debit it is hard to conceive, but any thing is better than to court a disaster which would ruin one of the richest and most important districts in the South of India.

8. I must now make a few remarks on the report of Mr Loam, the Kistna Eastern Dn Executive Engineer. This Officer had only recently joined and had no knowledge of the district, he was, however, most ably assisted by his two sub-divisional Officers, Mr H.A. Joyce and Sergeant L.J. Smith, and he himself was very energetic and did remarkably good work in closing breaches and protecting works. With his report he sent some sketch plans and photographs from which I have selected the following as being of interest in giving a general idea of the damage done.

(1) Sketch plan of breach at 3/2 Kistna left bank showing the ring bund now in progress.

(2) Sketch survey of Kistna left flood bank showing sites of

12

12 breaches between 31/0 and 33/1 with the ring bunds in progress or completed.

(3) Survey of breach in the Bundar Canal between 27/7 and 28/5.

(4) Sketch map showing the country flooded in the Kistna Eastern delta.

(5) Four Photographs, the subject of each being entered on the back.

It will be observed that nearly the whole of the island of Divi was flooded, and the damage done to the tanks has been great, but it is satisfactory to think that the deposit of silt over the island will render it even more fertile than it now is.

9. The breaches in the Bundar Canal have all been closed, the river bank work is in active progress, and I hope it will be found that the loss of crops has not been so great as estimated either on the mainland or in Divi. A rather extensive programme of works is necessary to ensure the safety of the works in the Eastern Dn., where we are not only subject to damage from the Kistna, but also from the Budameru, Ramileru and Sammileru, which cross the Ellore Canal on their way to the Colair Lake. I hope by

by the end of three years to have completed all works necessary for the Kistna Eastern Division, but of course this depends on funds being available. 5/

10. Mr. L. D. Venkatarama Iyer, Assistant Engineer, was holding charge of the Kistna Western Dn. as a temporary measure, owing to the sudden transfer of Mr. Mallet, at the time of the floods, and I consider that he managed the Division very well. A perusal of his report will show that the situation was an extremely trying one for a young Officer. To the report I have nothing to add except that all repairs are being rapidly carried out and the necessary steps are being taken to prepare plans and estimates for strengthening and raising the flood bank on the right margin of the river.

11. I fear that the reports which

which I submit are in themselves some what long and as there is nothing in them to induce me to modify the views I have expressed in my No. 1242 K/7 13-8-96 as to what should be done for the safety of the Kistna System, I beg to conclude my report by bringing to the notice of Government the general good work done by the members of the D.P.W. serving under me during the floods. There was at no time any hitch or confusion; and an extremely trying time and much anxious work only served to make every one work well and willingly.

12. Among those deserving of special mention, I must include the names of Mr Keeling, the Sub Engineer in charge of the Kistna Northern Dn, Mr H.N. Joyce, Sub Engineer in charge of the Northern Sub Dn, Kistna Eastern Dn, Sub Condr: J.J. Joyce in charge of the workshops and Sergeant Le J. Smith in charge of the Southern

Southern Sub Dn, Kistna Eastern Dn, Mr Keeling initiated the work of rescuing the inhabitants of the submerged villages and in this connection I consider that Sub Conductor Joyce deserves great credit for the skill he showed in taking the "Alexandra" across the river when the current above the anicut was about 6 miles an hour, and the vessel can only steam about 7, under the most favourable circumstances. It was fortunate that the steamer was outside the lock at the time of the flood as I doubt if she could otherwise have gone to the relief of the villagers, and it is a question for the Revenue Department to consider how these villages should be dealt with in future floods, when it may not be possible for the D.P.W. to lend a steamer across the river. The villages are mentioned in para 4 of Mr Keeling's report. Without the aid afforded by this Dept several hundreds of people would have been drowned in these villages, and I would recommend that when the river rises to some fixed level, which could be reported to the Revenue authorities in time for action to be taken the villagers should be warned and if possible forced to seek shelter on higher ground before it is

too

too late. There is no hardship involved in this and if these or similar precautions are neglected there may be wholesale loss of life on some future occasion.

Throughout the flood Mr Keeling worked day and night and I cannot too highly appreciate his services. All the upper subordinates mentioned by me did most excellent work, and Sergt: Smith, who was cut off entirely by the floods displayed great energy and judgment in protecting the works under his charge; in my opinion he is a most useful Sub-Div. Officer and I shall be glad to see him promoted in the Department

I have the honor to be,
Sir,
Your most obt Servant,
W C Baddeley
Majr R.E.
Supg Engineer, II Circle.

Executive Engineer's Office.

Public Works (1896) Department.

CURRENT No. 10

Order

From Major W. C. Baddeley
R.E.
Superintending Engr.
II Circle

No. 1891 K

Dated 12 October 1896
Received
Enclosures /
Spare copies

SUBJECT.

Road showing the land submerged during the recent floods

BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.

Superintending Engineer's Office.
Bezwada

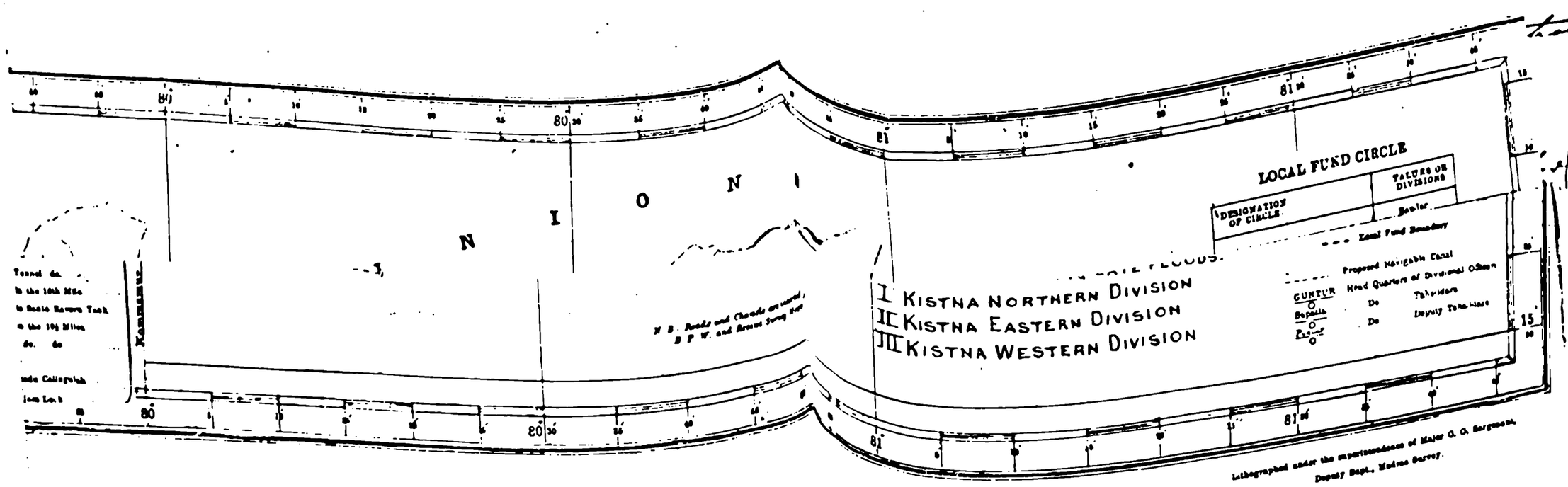
No. 1891 K.

II CIRCLE.

Dated 12 October 1896.

From, Major W.L.C. Bardsley R.E.
~~Engineer~~

gineer,
II Circle.



W L C Bardsley MAJOR R.E.
SUPERINTENDING ENGINEER 2ND CIRCLE.
9-10-96

BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.

Superintending Engineer's Office.
Bezwada

No. 1891 K.

II CIRCLE,
Dated 12 October 1896.

From,
Major W.L.C. Bardsley R.E.
~~Engineer,~~
Superintending Engineer,
II Circle.

To,
The Chief Engineer,
for Irrigation.

Sir,

I have the honor to forward herewith, for your information, a sketch of the Kistna District on a Scale 8 miles = 1 inch, showing approximately the land submerged during the recent floods of the Kistna.

I have the honor to be,
Sir,
Your most obedt Servt
W.L. Bardsley Major R.E.
Superintending Engineer
II Circle

No. 338/C5

From,

The Superintending Engineer,

II Circle.

To,

The

Dated

Received } 18

Enclosures.

NO.

SUBJECT.

No: 493 I

Note by the Chief Engineer for Irrigation

A further report from the Superintending Engineer, S. Circle, on recent floods in the Kistna with detailed reports of the three Kistna Divisional Officers is submitted to Government.

2. The Superintending Engineer has already in G.O.No: 78 dated 29th September 1896, been given permission to institute measur for restoring damaged works and guarding against future damage with the proviso that departure from financial rules is to be restricted much as possible. No further orders on the subject seem necessary. T provision of funds for the work expected to be done this official y is dealt with in other correspondence.

3. The report on the effect of the Railway bridge refer to in this office note printed with G.O.No: 789 I, dated 29th Septe 1896, is still awaited.

4. The undersigned concurs with the Superintending Eng inconsidering the following Officers as deserving of special ment for the excellent work they did during the floods.

Mr E.T.Keeling, Executive Engineer

" U.N.Joyce, Sub Engineer

Conductor J.S.Joyce

Sergeant C.J.Smith

and desires to bring to the notice of Government the unremitting and well directed exertions of the Superintending Engineer, Major Badd[illegible]

Chepauk

13th October 1896

W. Hughes

Chief Engineer for Irrigation

To, The Joint Secretary to Govt: P.W.D. Irrigation Branch.

List of enclosures accompanying Superintending Engineer's
No 1826 K. dt 5.10.96

Kistna Northern Division (En 11)

1 Report from Ex: Engineer
1 Tracing showing N.G.S. Rly and the approximate water spread
1 Tracing. Kistna River showing Anicut and Rly Bridge
1 Tracing of Ryves' Regulators at miles 1. Chains 0 from its head.
1 Photograph of scour holes in anicut. — X
1 Sketch showing the landing place &c below Kistna Anicut Bezwada
1 Plan of proposed head sluice.
1 Tracing showing the scour hole in the Anicut
1 Extract of water register of Anicut on Guntamagarum side from 29th July 1896 to 9th August 96.
1 Water register of Anicut on Bezwada side from 29th July 96 to 9th August 96.
1 Tracing. Sketch at Guntamagarlamu

Kistna Eastern Division (En: 9)

1 Report from Ex: Engineer
1 Survey No I. of breaches at 8 miles 2 & 3 Kistna river left flood bank -
1 Survey No II of Kistna left flood bank showing sites of 12 breaches between $\frac{31}{0}$ and $\frac{33}{1}$, with the lengths in progress or completed.
1 Survey No III of breach in the Bundar canal between $\frac{27}{7}$ and $\frac{28}{0}$.
1 Sketch map showing the country flooded in the Kistna Eastern Delta
× 4 Photographs, the subject of each being entered on the back

Kistna Western Division (En: 2)

1 Report from Ex Engineer
1 Statement of breaches in the Kistna Right flood bank and the bank canal.

W.R. Baddeley Major R.E.
Superintending Engineer D.C.

Letter from H. T. Keeling Esquire, Executive Engineer, Kistna Northern Div., to the Supdg Engineer, 2nd Circle, dy 5.9.96, No. 302 S.E.

I have the honour to make the following report on the recent flood.

2. In conformity with your demi-official orders that I should be at head quarters when any heavy flood occurred, & left instructions, when going into Camp in July, that a telegram was to be sent to me when the river reached +35' on the Bezwada gauge, or if anything unusual happened. On the 30th, I received a telegram saying that the river was 35.2. I accordingly returned to Bezwada next day.

3. On my return the river was at 37'5", the telegram from Pagator indicating that a further rise might be expected. The "planks" that had been prepared for the new Head sluices were at Sabanagaram were put in, that water might be held up in the Channel between the old and new head sluices. The Exc: Engineer, Kistna Western Div., was informed that water would have to be raised in the Main Canal. The Exc: Engineer, Kistna Eastern Div. was also informed that [illegible]

6 Ex S.C.
45 of 96

that water might have to be raised in the Eastern Delta Main Canal to reduce the head on the sluices. The manual bunds were erected in the workshop yard, the workshop Superintendent vacated his quarters and the work of securing the timber and plant in the lower workshop yard was began.

The Boat Superintendent was sent out to patrol the left flood bank with orders to strengthen all weak places.

4. On the 7th Augt: the river was still rising at Pagatar. I moved into camp at Seethanagaram to maintain a close watch personally on what I considered the weakest spot in the head works, viz the Seethanagaram Head Sluices.

On this day news was brought that the marginally noted villages on the right bank above the Anicut were submerged and in danger. The works being safe, I ordered the steamer across the river and made arrangements to go to their rescue. I informed Mr Cumming, the Head Asstt. Collector, of the state of the affairs and asked him to come, he being the nearest Rev. Official. He came and a start was

Undavally
Venkatayapalem
Krishnayapalem
Bodapalem
Linga yapalem

was made at 4 P.M. the steamer towing two Cargo boats. The villagers at Undavalli were safe on the hill, so they were passed by and we proceeded to Venkatayapalem. On reaching the village, one Cargo boat with the Dy: Tahsildar entered the village at one end; the other boat went after five men on floats some distance from the village and then returned to collect people at the other end of the village. At 6 P.M. a start home wards was made with one boat, the other being left in the village. It got rapidly dark and the stream being strong we were swept out of our course into a tree. I thought it too dangerous to proceed and so cast anchor. The other boat attempted to follow but was ordered to cast anchor and did so a short distance away. Every one spent an uncomfortable night without food. Next morning at dawn the first boat was taken to Seethanagaram and the steamer returned for the second. In all 230 people were brought off. Mr Cumming left at 9 A.M. on the 2nd for some villages

villages down the Bundar Canal.
The Steamer went out again at noon
with the Head Quarter Sub-Dr.
Officer (Mr. G. R. Venkatarama Iyer)
and the Dy. Tahsildar. Sales sent
two cargo boats independently
to Krishnayapalem to take villagers
to Penumaka. On this day 87
people were brought to Seetanagaram
and between 300 and 350 carried
to Penumaka. On the 3rd, the Sub
Collector Mr. Gillman, arrived
and took charge of the operations,
the H.Q. Quarter Sub-Dr. Officer ac
companied him on the 3rd. Every
assistance that was possible
was given him (the Sub Collector)
in the way of men and boats &c.
On the 1st at Seetanagaram a rest
camp of was made of tents of tarpaulins
and the new Overseer's shed of the
Kistna Western Dr. was also used
as a temporary shelter.

5. On the night of the 1st and 2nd
the stepped revetment in rear of
the old Seetanagaram H.d Sluice
began to slip. It was in some
places

places packed with half filled sand
bags and in others wedged up tem
porarily with rubble. This revetment 25
continued to slip daily and was
eventually pulled down and has
since been temporarily rebuilt in
mortar to +15 above sill level of
the sluice. The cause of the slip was
partly a leak round the left flank
of the sluice and partly the commotion
in the chamber, but mostly I think
the former in the first instance.

6. Information of what was happen
ing was sent to the Supg. Engineer
by express and also by telegram.

7. Gunny bags were collected
and filled at Seetanagaram to
make protective bunds on the road,
tram line and round the works.

8. Matters went smoothly at Pez
wada until the night of the 3rd,
when the head sluices began to leak
from the regulating or upper plat
form on to the lower platform.
The Head was reduced after
the Sup. Engineer, Kistna Eastern Dr.
had been informed.

9.

9. On the 4th the Subg Engineer arrived and visited the works with the undersigned. It was determined to load the Bezwada Sluices with sand bags to try to reduce the vibration. The bags were also necessary to prevent the water washing up through the gratings for the sluice gearing and on to the bridge over the Canal. The slope above the masonry and dry stone retaining walls below the undersluices was being eroded this was prevented with sand bags and brushwood. The bund from the Head Sluices was continued each wards along the top of this slope and was made of earth prevented with sand bags. Sand bags were placed on the parapets round the Lock bungalow and the Bezwada Lock. The Lock was kept half full and the front gates temporarily raised.

10. At Seetanagaram, a bund of sand bags was made against the front parapet wall of the head sluice and the sluice roadway was flooded with bags to break the impact of the water on the road way if the sluices should be topped. The various smaller bunds were strengthened. The Lock was kept half full and the front gates raised temporarily. 26 5

11. Work on the various bunds was carried on day and night and completed by the 6th. On the 5th the dry stone retaining wall in rear of the Bezwada Under sluices sank and bulged at the site of the old drain.

12. The water in the Main Canal Eastern Delta, was raised with the sluices to keep the head to 15'. On the 4th - 5th night the head was reduced to as near 14 as could be maintained to assist in diminishing the vibration of the head sluices. The greatest depth at which the water stood in the Main Canal was 12.90 on the 16th.

13. The planks in the new Head Sluice at Seetanagaram enabled water to be held up in the Chamber between

between the two sluices. 2.65' was thus held up and the maximum depth in the Main Canal was only 11.20. Had it not been for the new head sluices the depth would have been 13.85'. What the extent of the damage would have been had this been the case, it is impossible to say.

14. The left flood bank breached on the 6th, near 7/3 m. on the Hyderabad road. At this point the flood bank is about 200 yards from the road. The Boat Superintendent and Coolies were at work at a low place close by, when the bank suddenly sank and water poured over the country. The breach occurred at the same place as in 1882. The water took line of the old drainage Channel to the Budameru. The Nizam's State Railway was breached in several places. The waters spread over the valley beyond the line nearly as far as Kothur.

It breached into the Rayanapad (Tank, destroyed the flood banks of the Surplus Channels from Elapole, Pydurpad, and Rayanapad tanks (these are 3 Imperial tanks). The length of the flood bank breached is about 150 yards and it has been scoured out ten feet deep. The Hyderabad Road in rear of the breach has been practically wiped out for a length of 1/4 mile.

15. The right flood bank was nearly breached but fortunately it proved possible to prevent it by penetting the weak places with brush wood and sand bags.

16. As regards the Head works no further injuries beyond those previously mentioned became evident during the floods. Since the water fell the following injuries on the Bezwada works have become known (those previously mentioned are recapitulated):

(a) The bank between the north wall of the lock entrance and the head sluice has been much

much scoured. It is proposed to put in a concrete toe behind sheet piling, to reach the bank (4'6" depth of stone and 1'6" backing) and to point this with Surki mortar up to +68.

The leakage through the head sluice was due to the filling of the top 3' consisting of quarry rubbish only; it is proposed to fill this in with Concrete.

The crack in the front arch of No. 14 vent of the undersluices has opened out; the rail beams and trolly for working the undersluices shutters have been damaged, the pointing and plastering have been knocked about a good deal and the rails which were torn up from their fastenings wore away two large stones on the rear face. The necessary repairs are in hand.

The scour hole near the lower return of the undersluices on the Anicut side has been much enlarged and has cut back towards the Anicut loadey wall and undersluices, Matting. Can be done but at present +

The slope above the masonry retaining wall was much eroded. Revetment 15" deep with 15" backing and slope 1 in 2 has been built here to repair the damages.

It will be necessary, I believe, to pull down and rebuild the dry stone retaining wall above the landing stage in one place where it has not only sunk but bulged likewise.

17. In addition to the above repairs and protective works, it is proposed to raise the works on the Bezwada

Sched + 72.

18. So far as can be ascertained at present no damage has been done to the Anicut and apron beyond the enlargement of the Scour hole reported previously.

19. The Eastern Delta Main Canal and the Head works of the Elluru, Pynes' and Bundar Canals have large deposits of silt and sand. It is feared that dredging operations for the remainder of the season will be necessary in order

order to get the required quantity of water down the Canals. The apron to Rynes' Regulator was scoured to a depth ranging from 2 to 6'. This has been temporarily repaired. It is proposed to build a curtain wall at rear during next closure and repack the apron.

20. It would be a great advantage were it possible to shut the Bezwada head sluices altogether during heavy floods. This might be done by providing Stoneys Shutters at some suitable site below those fixed in the Main Canal to hold up say 16' of water.

21. On the Seetamagaram side the following injuries have become evident.

The rough stone floor of the Chamber between the two sluices had been scoured in several places causing both retaining walls to crack and the one on

on the right to move forward in a curve and tilt over. It is proposed to floor the Chamber with cut stone, to rebuild the retaining walls to a height of +15 above the floor, with a larger section and set back at an angle on a deeper concrete foundation. Temporary measures to last the season are being adopted to prevent further movement of the right retaining wall, Viz, a rough stone toe with a concrete bag to retaining wall to prevent further forward movement. The front returns of the lock have cracked and show a tendency to move forward. They have been temporarily shored which has prevented further movement. It is proposed to make a concrete invert between the returns and to extend this concrete in front up to a row of sheet piles some 25' away and thus box in the foundations and prevent further movement.

It may however prove necessary to

to pull the returns down and rebuild after boxing in and levelling the foundations. It is thought that the Cracks were due to unequal pressure and Consequent sinking and tilting of the walls on which the work is said to be founded.

The revetments in front of the locks have suffered considerably, a good deal of backing having been washed out. It is proposed to either close, grout the revetment with sunki concrete or to rebuild it. A new pair of upper lock gates will be required for this lock, the heel posts being unsound. It is proposed to raise the works to correspond with the raising at Bezwada.

22. The maximum height to which the water rose was 61.30 on both the Seetanagaram and Bezwada gauges. Previously in 1882, the former registered .66 more than the latter. The set of the river was as nearly as possible at right angles to the Anicut.

Using the formula

$$D = L \times c \sqrt{2g} \left[d\,d \sqrt{d} + h + \tfrac{2}{3} \left\{ (d+h)^{\frac{3}{2}} - h^{\frac{3}{2}} \right\} \right]$$

Where D = discharge
- L = length of the Anicut
- d = difference of water level above and below the Anicut.
- dd = difference of water level below the Anicut and the Anicut Crest.
- h = head due to velocity of approach.

I calculate the '82 floods to have been 611,000 C ft. per second and the recent flood 762,000 C ft per second, but in making the calculation for the 82 flood I assumed the velocity of approach to be 8' per second only, and in the Calculation for the recent flood I assumed 9' per second, this being the mean velocity at which I estimated the river to be flowing assuming the estimated maximum of 890 000 C ft to be correct there is at present an insufficient margin of Safety before the works are

tested.

topped.

Floods have a tendency to increase rather than decrease and it is therefore proposed to raise the works to 72 the present level being 69.50.

23. A very large and important question is how the bridge below the Ancient affects the Safety of the head works on the Bermuda Side and whether or not it raises the water level. The question is so large that I do not propose to touch on it further than to say that the greater portion of the water was discharged through Spans 4 & 6, 7 & 8 and that large shoals have formed on both banks above the bridge. These shoals and the direction of the Current are indicated on the tracing accompanying this report.

24. It is necessary to raise both flood banks above the Ancient and to increase the section. Proposals in detail with estimates will be submitted later.

Roughly they will include raising to 6' above wave action in recent floods, increasing top width to 12' and the slopes to 1 in 2 and revetting the water face throughout the entire length of the bunds. It is essential to ensure the safety of these bunds as both command railways, Viz the Nizams line and the East Coast Railway on the left bank and the Southern Mahratta on the right.

The proposals made in this report were personally discussed with Supg: Engineer.

25. Accompanying the report are sketch plans showing the various important sigmics and a copy of the water registers up to 9th Augt-96.

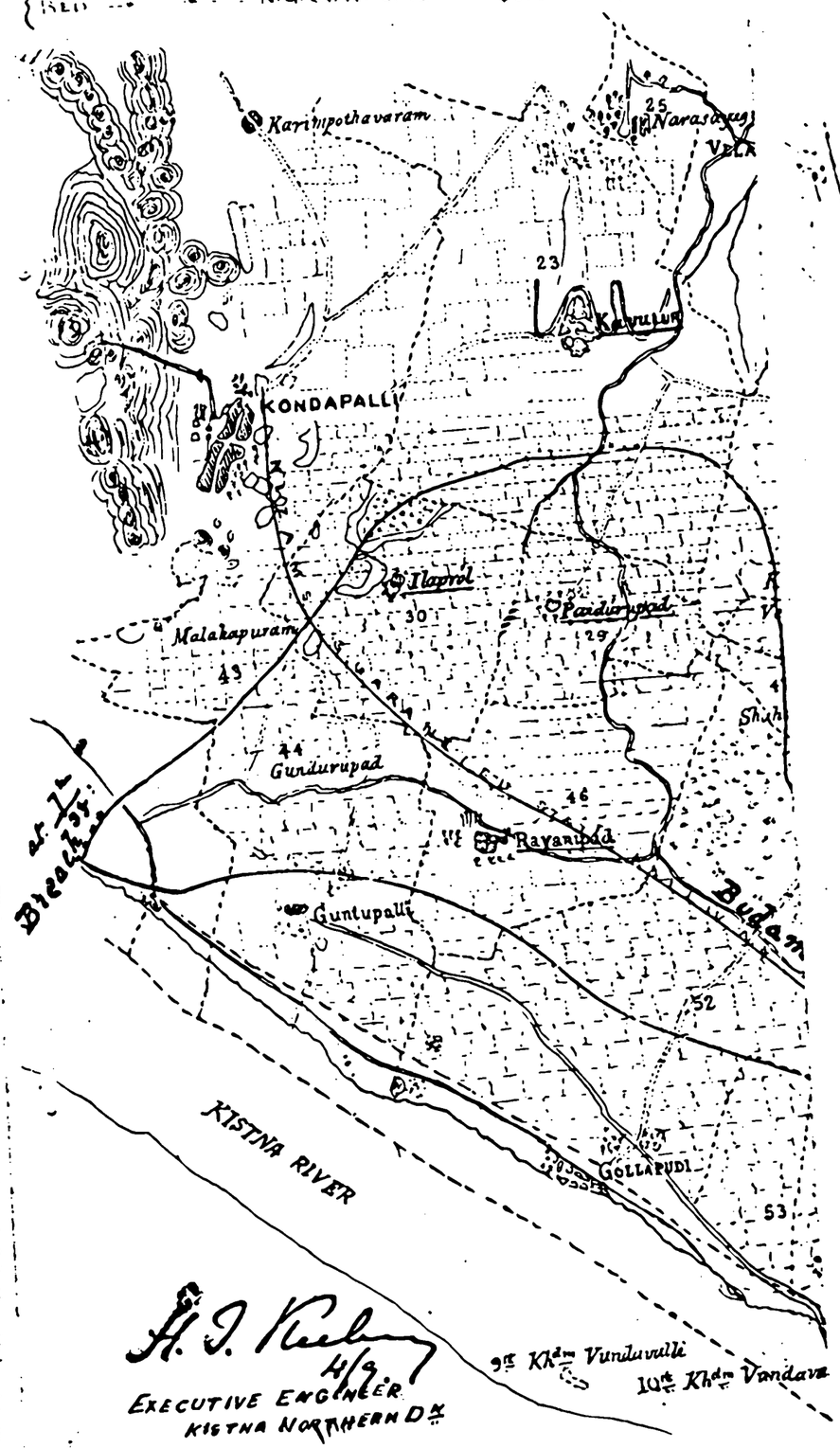
26. The whole staff at head Quarters worked with the best will and results and I beg to bring their services to your notice.

[illegible] Manager
Supdg Engrs Office Ist Circle

PLAN SHOWING
N.G.S. RE & THE APPROXIMATE WATER SPR

NOTE:
BLUE LINE DENOTES WATER SPREAD
RED ... N.G.S. RLY. LINE

SCALE 1" = 1 MILE.



A. J. Kulkarni
4/9
EXECUTIVE ENGINEER
KISTNA NORTHERN Dn

K N A B A L I

C A N A L

M A I N

S P

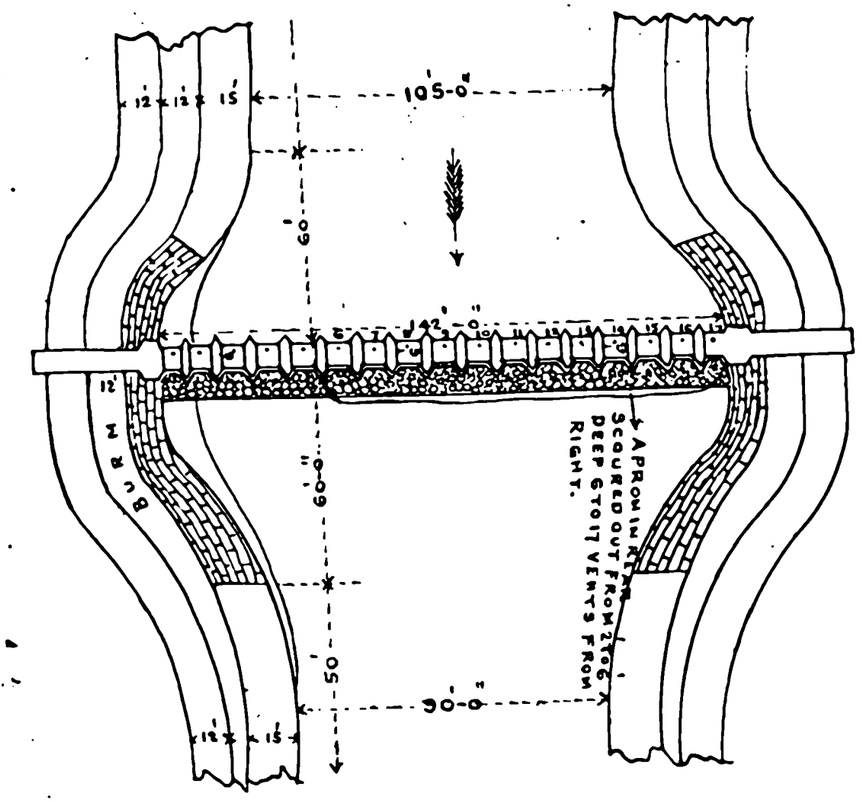
A. J.

EXECUTIVE ENGIN
KISTNA NORTH


KISTNA RIVER
SHOWING
ANICUT AND RAILWAY BRIDGE
SCALE 1/3000
ANICUT
RIVER
CRT
LEVEL +45.25
KISTNA
SHOAL
+45
BASIN
BRIDGE
RAILWAY BRIDGE (12 SPANS OF 300' EACH)

PLAN
OF
RYVES REGULATOR
AT MILES 1 CHAINS 0 FROM ITS HEAD

SCALE $\frac{1}{500}$

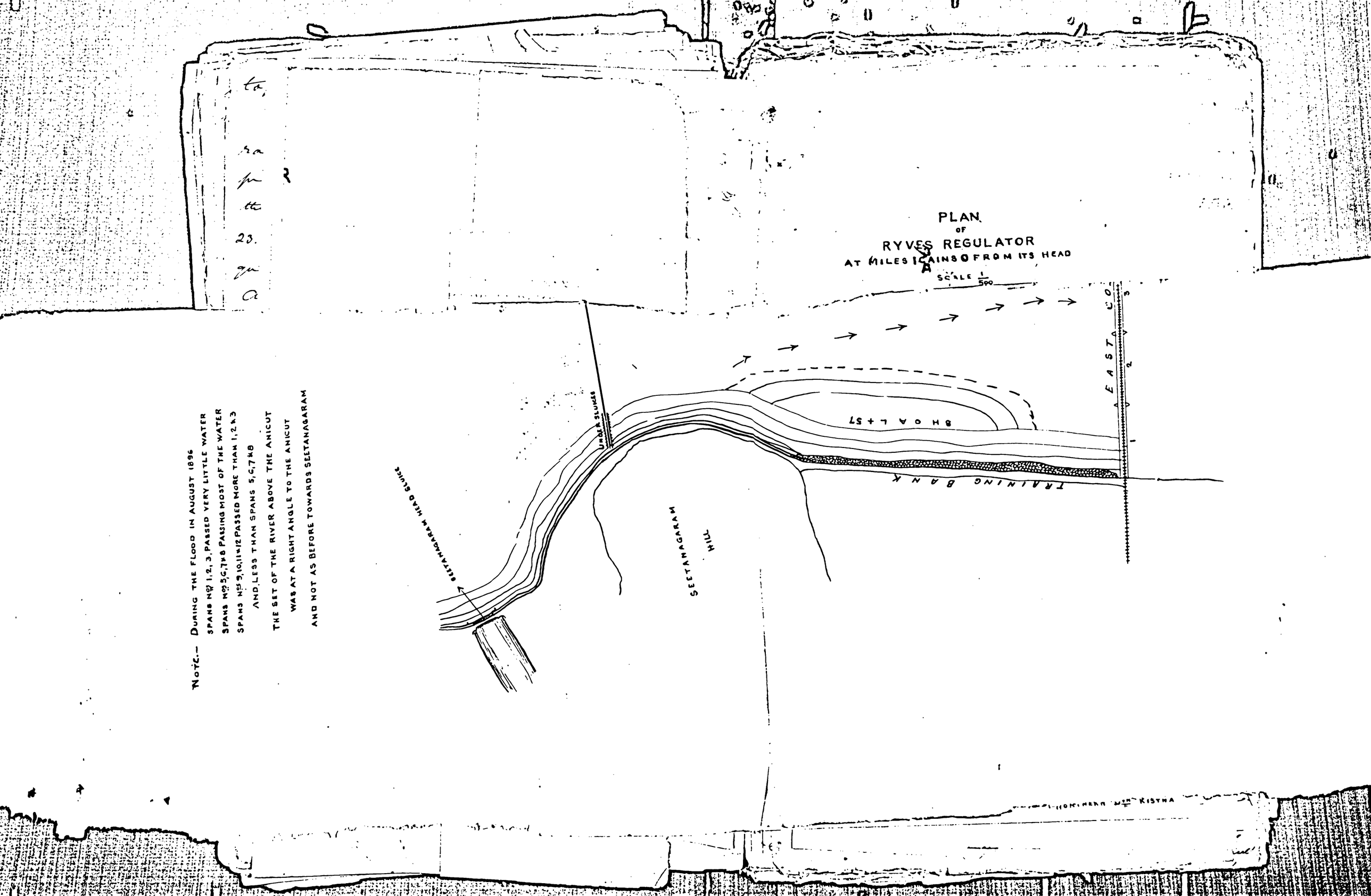


A. J. Ryves
4.9

EXECUTIVE ENGINEER
NORTHERN DIVN KISTNA

PLAN
OF
RYVES REGULATOR
AT MILES 1 CHAINS 0 FROM ITS HEAD

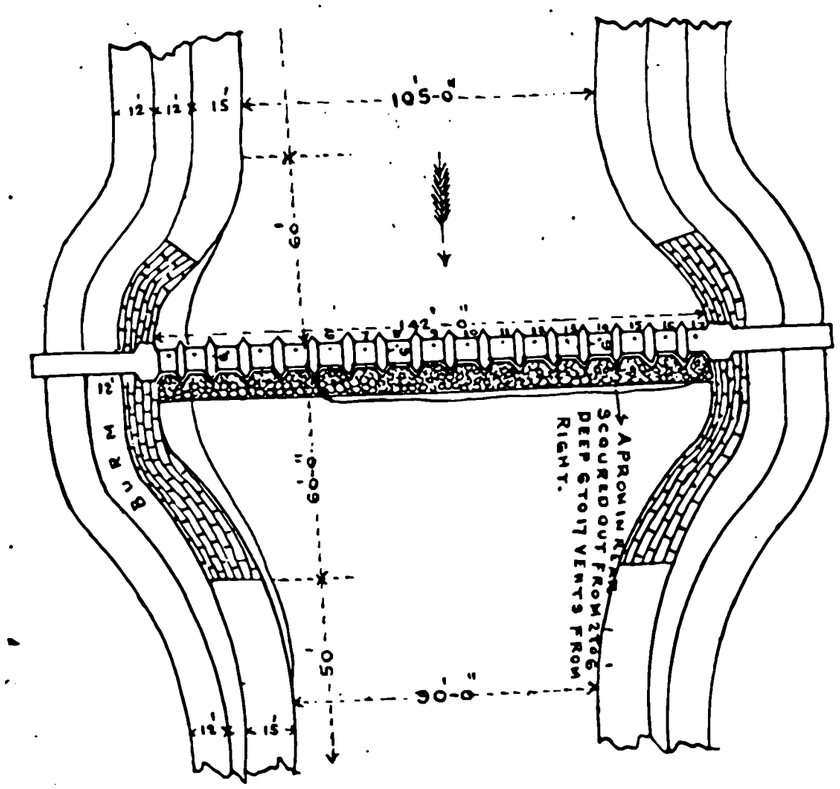
SCALE 1/500



NOTE.— DURING THE FLOOD IN AUGUST 1896
SPANS Nos 1, 2, 3, PASSED VERY LITTLE WATER
SPANS Nos 5, 6, 7 & 8 PASSING MOST OF THE WATER
SPANS Nos 9, 10, 11 & 12 PASSED MORE THAN 1, 2 & 3
AND LESS THAN SPANS 5, 6, 7 & 8
THE SET OF THE RIVER ABOVE THE ANICUT
WAS AT A RIGHT ANGLE TO THE ANICUT
AND NOT AS BEFORE TOWARDS SEETANAGARAM

PLAN
OF
RYVES REGULATOR
AT MILES 1 CHAINS 0 FROM ITS HEAD

SCALE $\frac{1}{500}$



H. D. Ryves
4.7

EXECUTIVE ENGINEER
NORTHERN DIVN KISTNA

E ENGINEER'S OFFICE

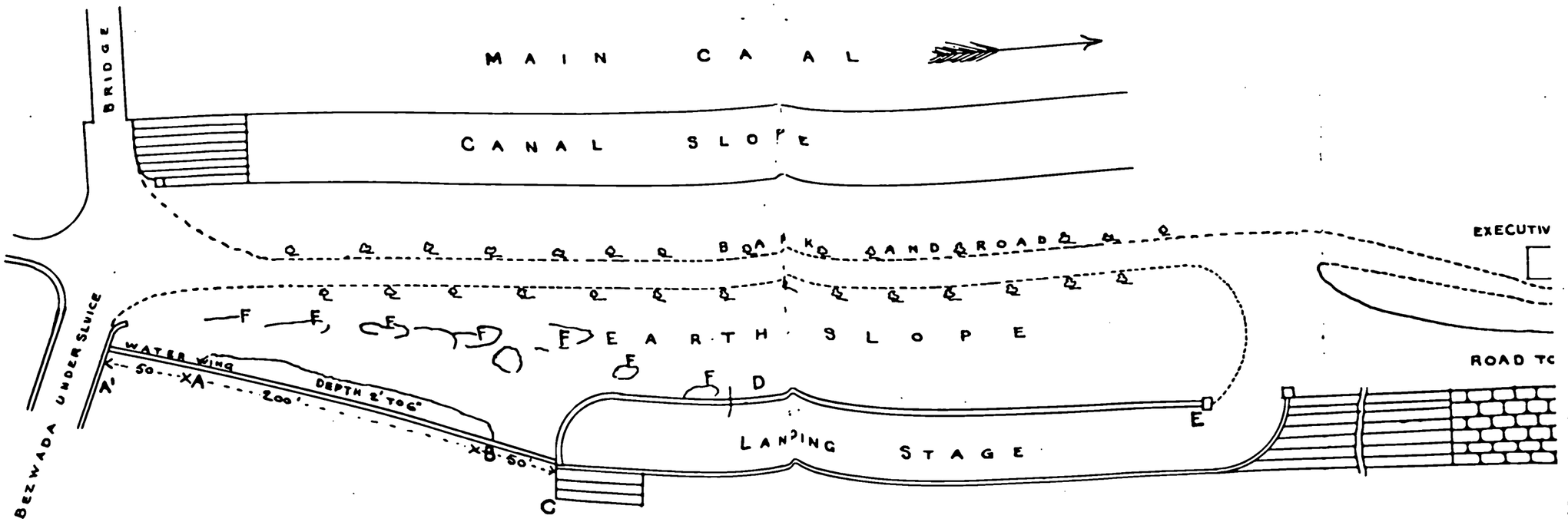
RAILWAY BRIDGE

GINEER
ERN DIV.

ETCH

SHOWING THE LANDING STAGE &c BELOW KISTNA ANICUT

BEZWADA



AB. Scour behind Coping 6" to 2' deep
D. Site of old drain where coping has sunk and worst bulging has occurred
A'C. Masonry Retaining Wall
CDE. Revetment with dressed faces damaged in many places
FF. Erosions in Bank

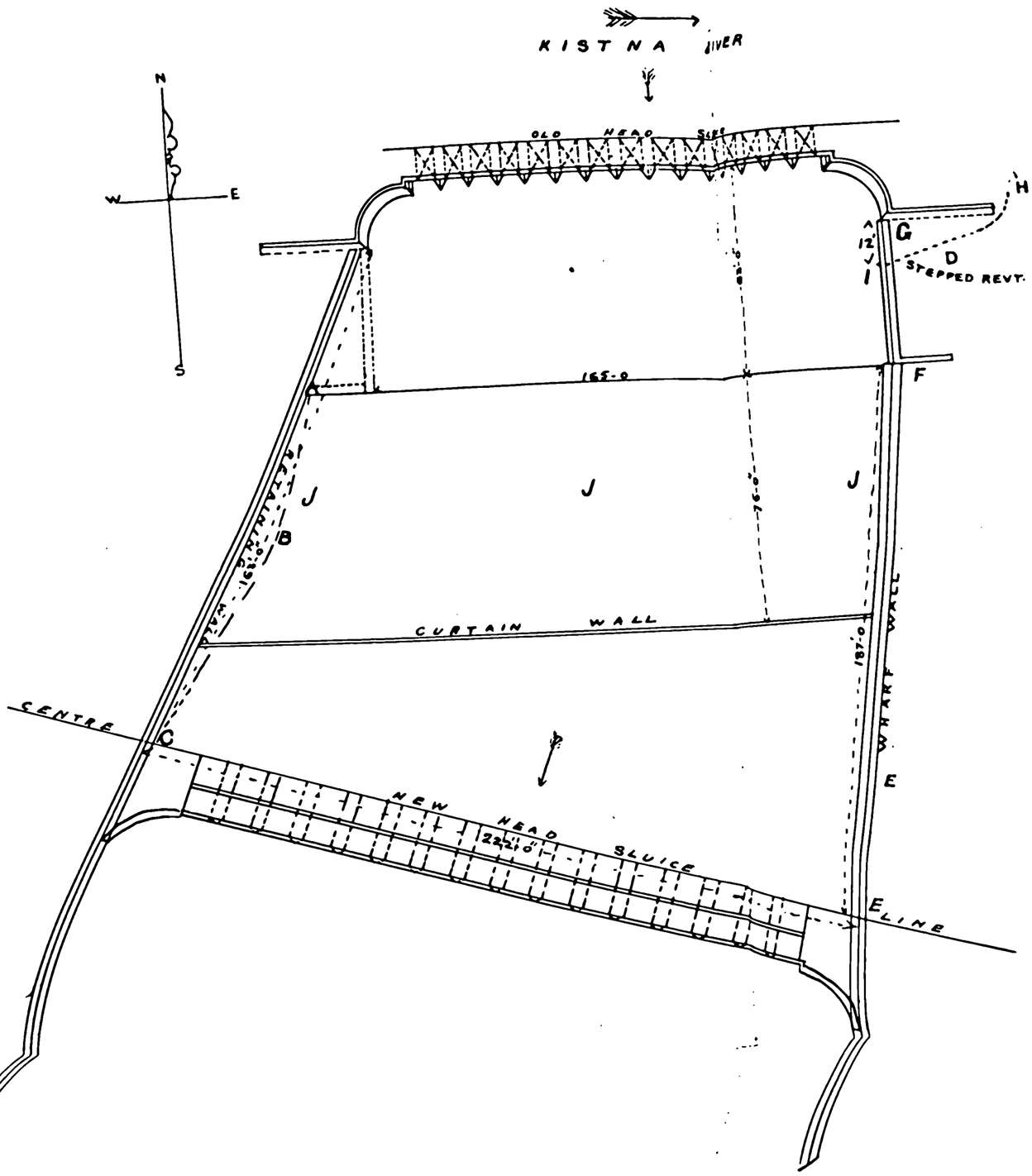
KISTNA RIVER

A. J.,

Executive En
Kistna North

SITE PLAN
OF
PROPOSED HEAD SLUICE.

SCALE 1/400

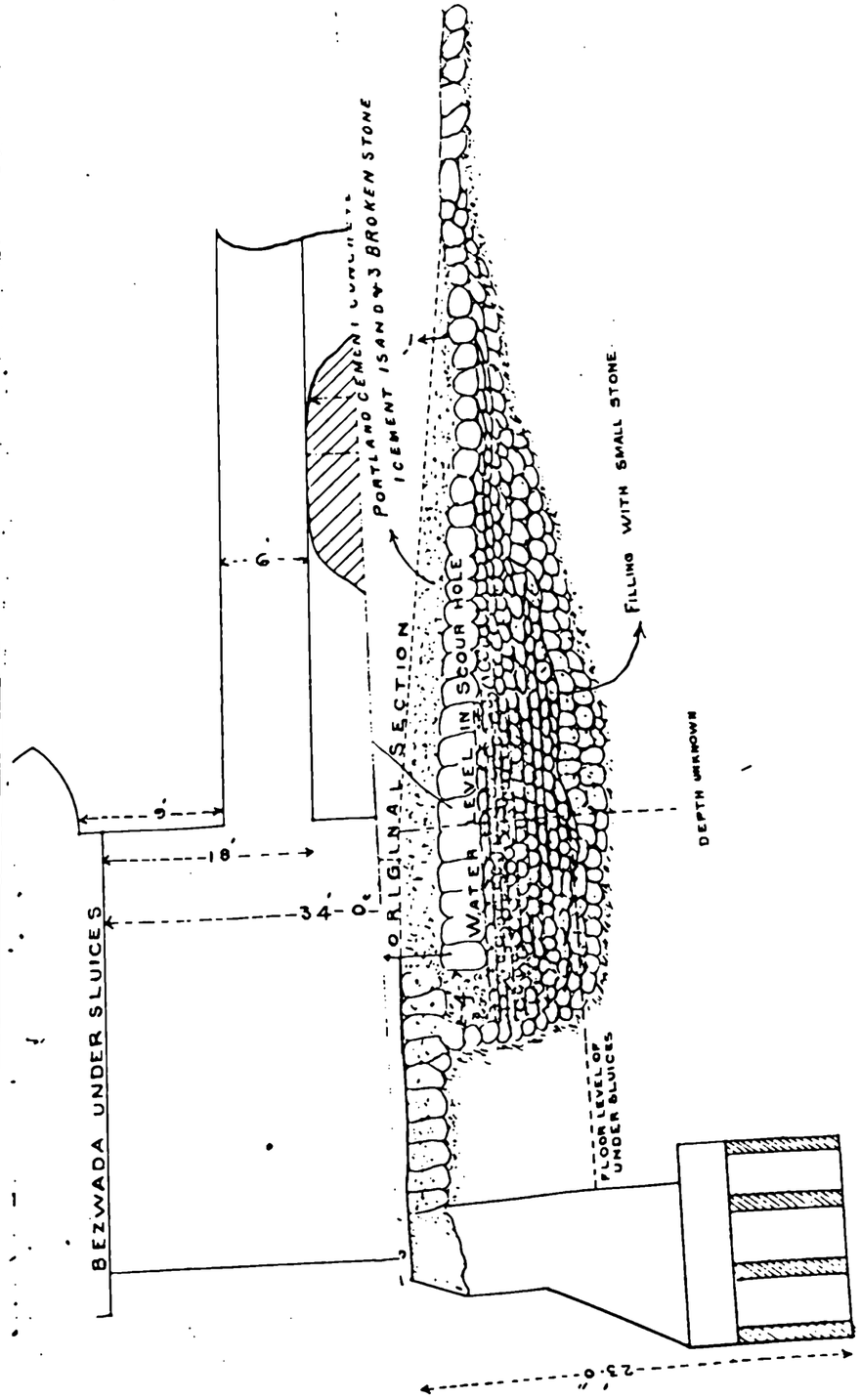


REFERENCE

ABC. Curve which retaining wall has taken
D. Stepped revetment that sank first.
F.G. " " total length 200' approx.
EEF. Retaining wall cracked in places
HI. Probable line of leak
JJJ. Portion of floor scoured

EXECUTIVE ENGINEER
KISTNA NORTH DIVN

Water Register of Permanent Standard



SIDE

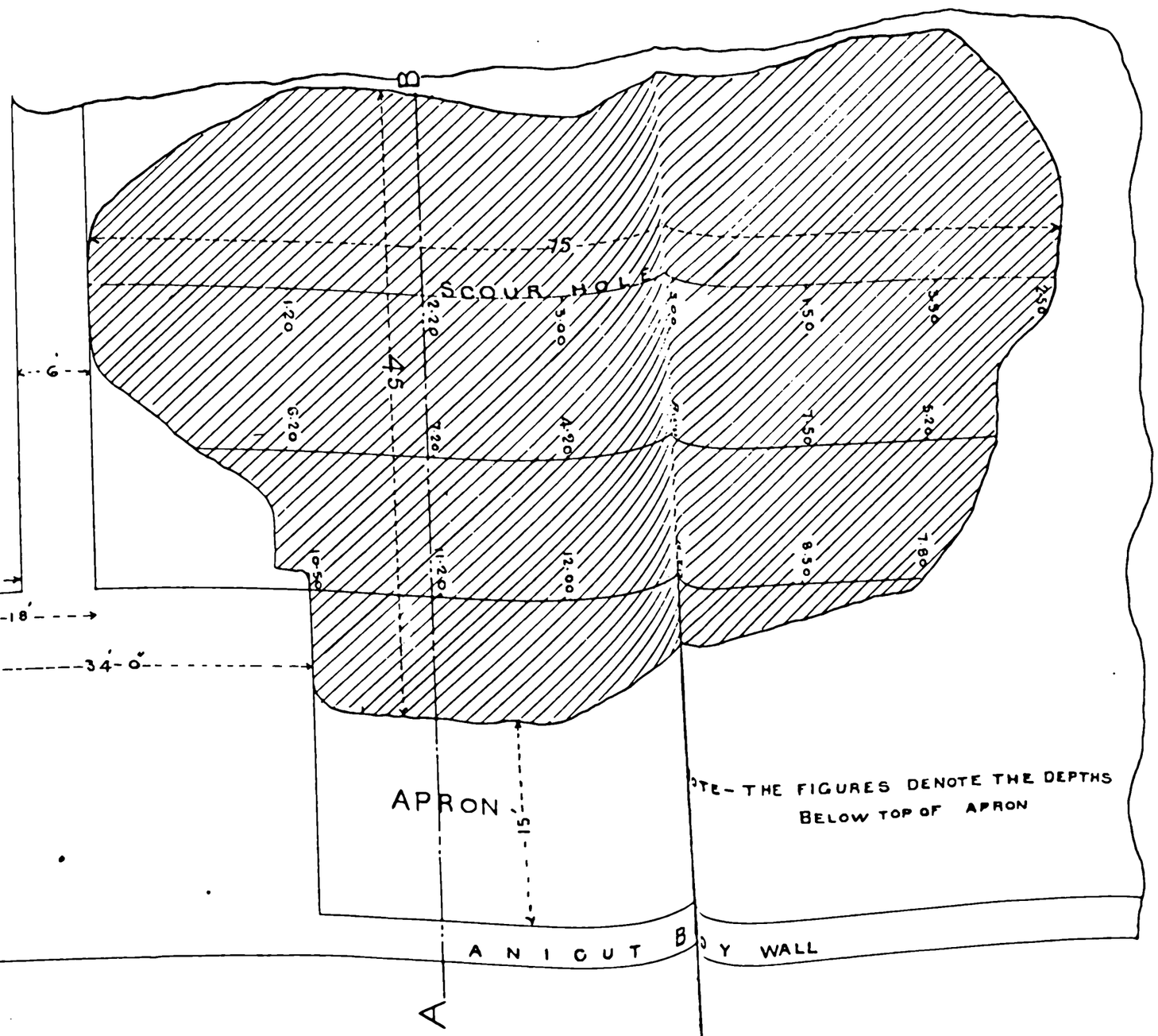
14	Noon	W. J. Fleming	Alexander Kirkcaldy	
	6 P M	Executive Engineer		
		Nos Krishna Dist.	9-8-96.	The same

SCOUR

IN THE APRON NEAR

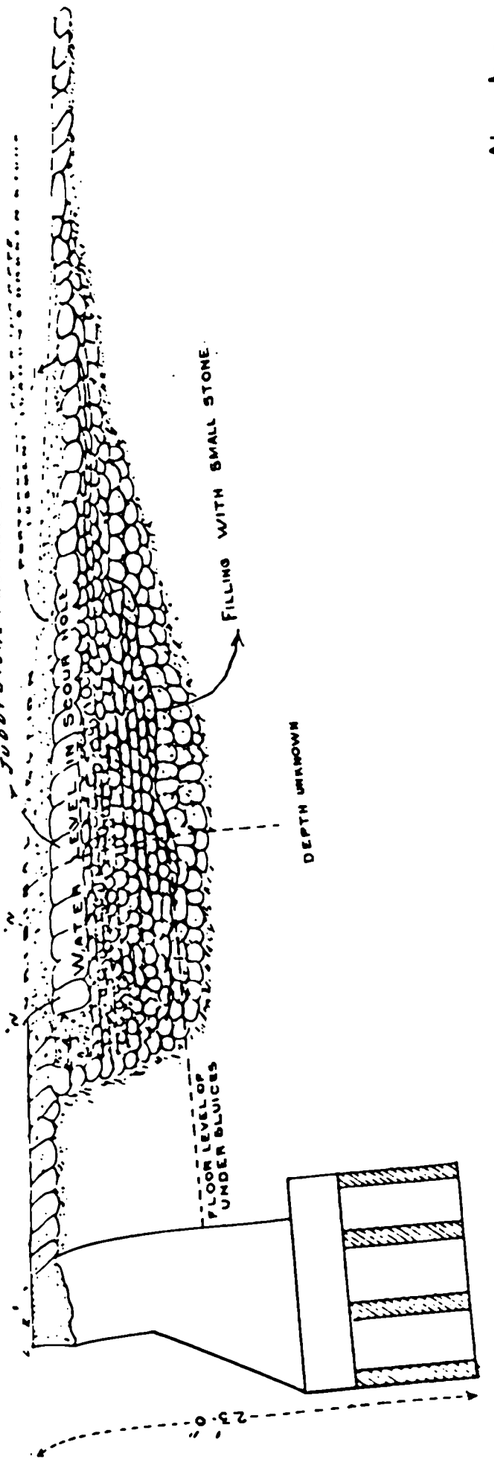
BEZWADA UNDERSLUICES

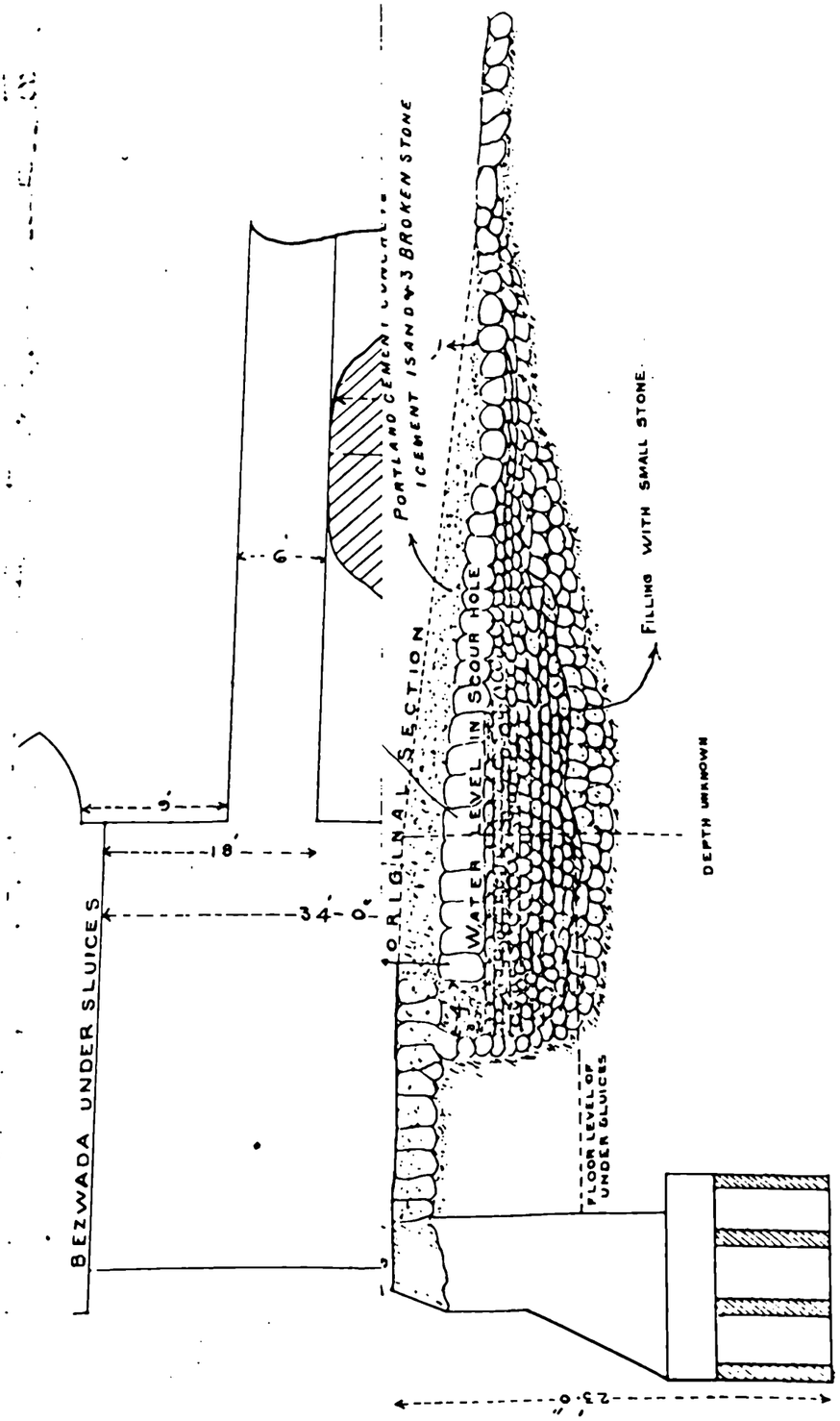
SCALE 1/100



NOTE- THE FIGURES DENOTE THE DEPTHS BELOW TOP OF APRON

SECTION ON AB





Water Register of D...

SIDE

13

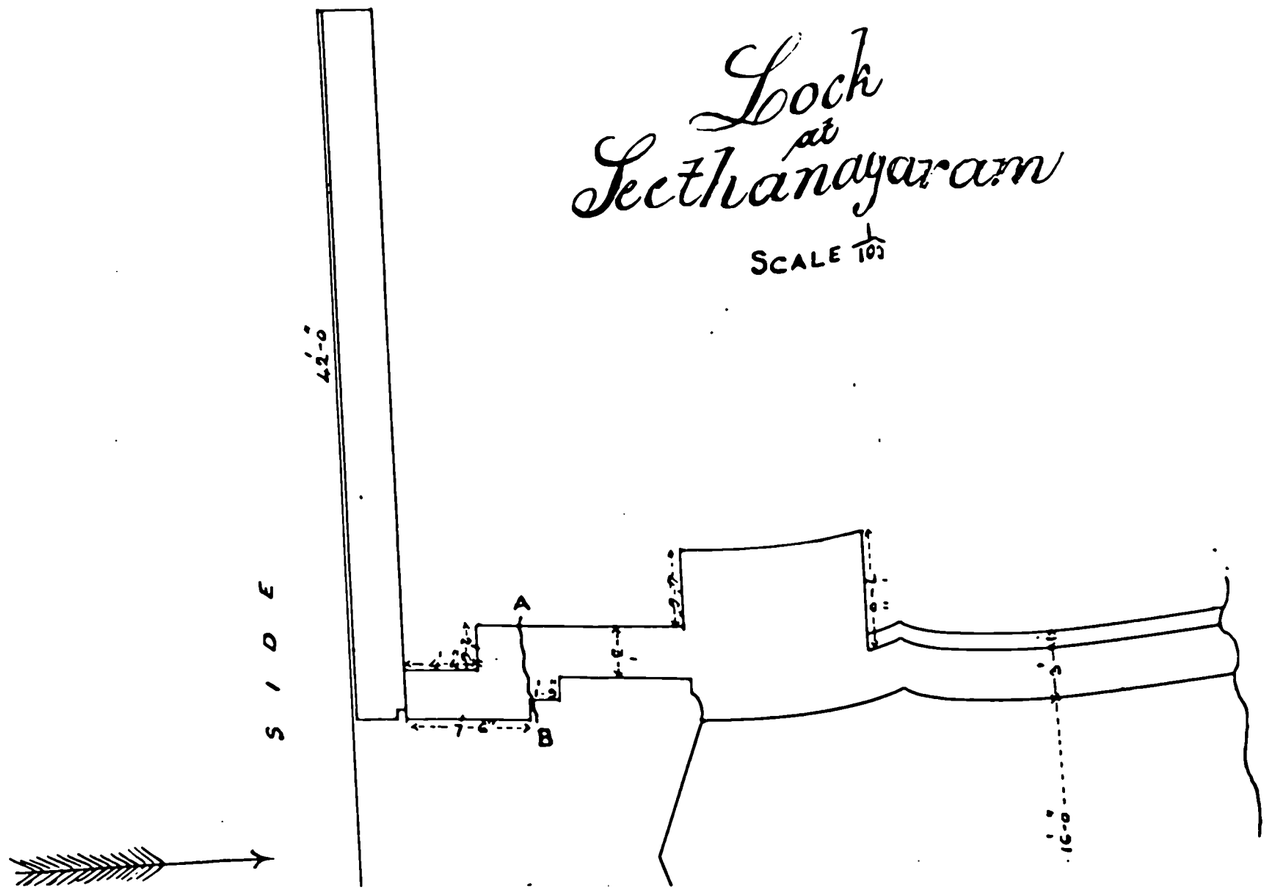
14 Noon
6 P M

W. J. Pickering
Executive Engineer
Nos. Circle, Dt. C.

Alexander Lockhart
9-8-96.

Lock at Sethanayaram

SCALE 1/63



the month of 189

No. of vents and height opened		Under Sluices		Gauge
Breadth of vents 6 ft.		Opened No	Closed No	
No.	Shutters.			
15	2·83	11	4	36
15	2·66	11	4	40
15	2·63	11	4	39
15	2·68	11	4	
15	2·60	11	4	37
15	2·43	11	4	34
5	1·83	11	4	30
	3·20	11	4	48
	4·10	11	4	54
	3·83	11	4	50
	2·97	11	4	42
	1·83	11	4	26

14 | 6 A M | Noon | 6 P M

H. T. Rushby
Executive Engineer
Northern Division

Bezwada Lock Office
9896.

Water Register of Bezvada Station for the month of

M.L. Lyon on Gauge is 23 feet below Guage zero

Time	Anicut. Above	Anicut. Below	Head Sluice. Front	Head Sluice. Rear	Head	No. of vents and height opened. Breadth of vents 6 ft. No.	Shutters.	Under Sluices Opened No	Under Sluices Closed No	Gauge	Remarks.
6 A M	32.65	28.90	17.90	9.25	8.65						
Noon	33.25	29.70	18.50	9.25	9.25	15	2.83	11	4	36	
6 P M	33.85	30.70	17.10	9.25	9.85						
6 A M	35.05	32.60	20.30	9.25	11.05						
Noon	35.65	33.40	20.90	9.25	11.65	15	2.65	11	4	40	
6 P M	36.05	33.90	21.30	9.50	11.80						
6 A M	36.85	35.00	22.10	9.50	12.60						
Noon	37.15	35.40	22.40	9.80	12.60			11	4		
6 P M	37.40	38.70	22.65	9.80	12.85	15	2.63				
6 A M	38.25	36.70	23.50	9.90	13.60						
Noon	38.65	37.20	23.90	9.90	14.00	15	2.68	11	4		
6 P M	39.05	37.60	24.30	9.90	14.40						
6 A M	39.55	38.40	24.80	9.90	14.90						
Noon	39.75	38.40	25.00	9.90	15.10	15	2.60	11	4	7	
6 P M	39.75	38.50	26.00	10.00	15.00						
6 A M	39.85	38.40	25.10	10.00	15.10						
Noon	39.95	38.50	25.20	10.00	15.20	15	2.43	11	4	17	
6 P M	39.95	38.50	25.20	10.00	15.20						
6 A M	40.05	38.50	25.30	10.30	15.00						
Noon	40.20	38.60	25.45	10.45	15.00	15	1.83	11	4	50	
6 P M	40.40	38.85	25.65	10.65	15.00						
6 A M	40.70	39.30	25.95	10.80	15.15						
Noon	40.80	39.40	26.05	11.05	15.00	15	3.20	11	4	52	
6 P M	40.85	39.50	26.10	11.10	15.00						
6 A M	41.20	40.00	26.45	12.60	13.85						
Noon	41.25	40.00	26.50	12.70	13.80	15	4.10	11	4	54	
6 P M	41.30	40.00	26.55	12.90	13.65						
6 A M	41.30	40.00	26.53	12.80	13.75						
Noon	41.10	39.70	26.35	12.80	13.55	15	3.88	11	4	5	
6 P M	40.95	39.50	26.20	12.20	14.00						
6 A M	40.53	38.90	25.80	11.80	14.00						
Noon	40.35	38.60	25.60	11.60	14.00	15	2.97	11	4	42	
6 P M	40.05	38.30	25.30	11.30	14.00						
6 A M	39.25	37.20	24.50	10.60	14.00						
Noon	38.65	36.30	23.90	9.90	14.00	15	1.83	11	4	26	
6 P M	38.00	35.40	23.25	9.25	14.00						
6 A M											
Noon											
6 P M											
6 A M											
Noon											
6 P M											

A. J. Pelling
Executive Engineer
Nos Cheva Division

Bezvada Lock Dept.
9896.

Water Registe

Month and Date

Time

6 A M
15 Noon
6 P M
6 A M
16 Noo
6 P
6
17 N
1

Extract of Water Register from 29th July 96 to 9th August 96.
Ride from 29th July 96 to 9th August 96.
N.B. Zero on gauge is 23 feet below crest

Month and Date	Time	Aricut Above	Aricut Below	Old Head Sluice Front	Old Head Sluice rear	Head	New Head Sluice rear	No of vents & height opened Breadth 2 vents 6 ft Ft	Shutters	No of under Sluices opened
									15	1·80	11
24/96	29 6 Am	32·25	29·20	18·50	8·00	10·50	"		15	1·70	11
	Noon	32·85	29·10	19·10	8·00	11·10	"		15	1·70	11
	6 pm	33·65	30·20	19·90	8·00	11·90	"		15	1·60	11
	30 6 Am	35·05	31·50	21·30	8·00	13·30	"		15	2·00	11
	Noon	35·65	32·20	21·90	8·50	13·40	"		15	1·90	11
	6 pm	36·05	32·70	22·30	8·50	13·80	"		15	1·90	11
	31 6 Am	36·85	33·70	23·10	8·50	14·10	"		15	2·20	11
	Noon	37·25	34·10	23·50	9·00	14·50	"		15	2·20	11
	6 pm	37·45	34·40	23·70	9·00	14·70	"		15	2·60	11
August/96	1 6 Am	38·15	35·20	24·40	9·70	14·70	"		15	2·60	11
	Noon	38·55	35·80	24·80	11·50	13·30	10·00		15	2·60	11
	6 pm	38·85	36·10	25·10	12·00	13·10	10·00		15	2·60	11
	2 6 Am	39·35	36·70	25·60	12·00	13·60	10·00		15	2·60	11
	Noon	39·55	37·00	25·80	12·00	13·80	10·00		15	2·60	11
	6 pm	39·55	37·00	25·80	12·00	13·80	10·00		15	2·60	11
	6 Am	39·65	36·90	25·90	12·00	13·90	10·00		15	2·60	11
	Noon	39·70	37·00	25·95	12·00	13·95	10·00		15	2·60	11
	6 pm	39·70	37·00	25·95	12·00	14·10	10·00		15	2·60	11
	4 6 Am	39·85	37·20	26·10	12·00	13·80	10·10		15	2·60	11
	Noon	39·95	37·40	26·20	12·40	13·90	10·20		15	2·60	11
	6 pm	40·15	37·60	26·40	12·50	13·90	10·30		15	2·60	11
	5 6 Am	40·50	38·00	26·75	12·60	14·15	10·40		15	2·80	11
	Noon	40·65	38·20	26·90	12·80	14·10	10·70		15	3·00	11
	6 pm	40·85	38·40	27·10	13·30	13·80	11·00		15	3·00	11
	6 6 Am	41·15	38·60	27·40	13·30	14·10	11·00		15	3·00	11
	Noon	41·25	38·70	27·50	13·40	14·10	11·20		15	3·10	11
	6 pm.	41·30	38·70	27·55	13·70	13·85	11·20		15	3·10	11
	7 6 Am	41·20	38·50	27·45	13·70	13·75	11·00		15	2·90	11
	Noon	41·00	38·30	27·25	13·30	13·95	10·90		15	2·90	11
	6 pm	40·85	38·20	27·10	13·30	13·80	10·60		15	2·70	11
	8 6 Am	40·45	37·70	26·70	12·70	14·00	10·50		15	2·60	11
	Noon	40·20	37·50	26·45	12·45	14·00	10·30		15	2·50	11
	6 pm.	39·85	37·20	26·10	12·20	13·90	10·10		15	2·50	11
	9 6 Am	38·65	36·30	25·10	11·80	13·30	10·00		15	2·30	11
	Noon	38·25	35·50	24·50	11·30	13·20	9·80		16	2·10	11
	6 pm.	37·65	34·80	23·90	10·90	12·80					

H. J. Reeks
Executive Engineer 6/8

Asst Engineer
Divisional Supdt.
7-8-96.

A.M.F.L.

- ment etc to 3 & 2 furlongs. The
Canal

Report on flood damages in the Khistna Executive Engineer's Circle

River Bank. The river had been rising slowly on the 31st July; it overtopped the river bank opposite an old breach at 3 m. 2 furlongs of the river bank. When this took place water came against the bank made up over the old breach hole and began to bubble up in the Bank Canal bed which runs along side the River Bank, the Bank collapsed at 2 A.M. on the 2nd August. I visited it at midday and had the banks on either side of the breach protected by floating groynes.

The river bank at Kanamadi Kudumu has two low places at village crossing which were being raised. From commencement up to 3 m 2 furlongs the bank

bank is low there being 1.5 ft only to spare above flood line and was protected by bushes and leaves from wave action.

Looking up the river from the breach site, it appeared as if the mid stream of river from the Railway Bridge impinged on the flood bank at this point.

On 14th I again inspected breach when water had gone down and had a survey made. Length of breach 250 ft, a ring bund 1650 ft long will be required owing to the large scour hole 30 ft deep and extending far into the outside lands.

The bund will be placed within the river margin and be brought up to full height required, it will not be advisable to put a bund across the scour hole as at a certain depth, sand is exposed and a bund may be expected to collapse from water circulating under it.

No breaches occurred to River Bank down to 31½ mile. 2nd September. I inspected 12 breaches on River Bank from 31/1 to 33/0 miles.

Survey showing all breaches attached No 2

1st Breach 31/1 mile 100 ft long.
2nd —— " —— 260 " "
3rd —— " —— 200 " "
4th —— " —— 220 " "
5th —— " —— 420 " "

A diversion bund was started on the 23rd August.

6th Breach 31/6 — 100 ft long: closed by a small ring bund.

7th —— " —— 56 } No 7 breach not
8th —— " —— 130 } deemed advisable.
9th —— " —— 170 } began 26th August.
10th & 11th —— " —— 420 } being ring bunded.
} began 25th August.
} Skeuz closed but
} being brought up
} to full section.

12th —— 33 mile — 320 ft Ring bunded; began 15th August finished 20th; distressed coolies were employed.

All above ring bunds are within the flood bund on land side — and will be brought up to full section; they

Survey attached No 1. Cost of repairs Rs 10560. Photograph water No 1

they will be practically diversions
to as there is no bunda to shave
off on the River side.

The 1st Breach occurred on 8th August;
water went down from bunda.
13th: Again water came through
the breaches and went down from
bunda on 23rd.

Flood water from these breaches
flooded the most part of the Vaalla
- pally Zemindary and large
amount of Indian Corn crop near
maturity was destroyed; this is
however being reserved.

Coolies in adjacent villages
were much distressed and are
now being found work on the
ring bunds. About 1000 are now
employed and paid every three
days and exerting a fair outturn
of work; they will be kept on for
the present; food grain prices have
risen but not exorbitantly.

On 6th I inspected flood wand from

from 34¼ mile to 24¼ mile. Diver-
- sion in good progress; from 31¼
mile to 29¼ mile 4 furlong al-
-most overtopped throughout; breac
would have occurred, but were
saved by small turf bunds in
several places especially at
29m 1fur: at a ring bund. 29m
29m 4fur: to 24m damaged by
wave action. The bund has adde
- rently been raised at random.
In some places it is now 6'
above flood line; no work of
Sanctioned estimate for raising
has been carried out in this
portion.

9th: Inspected from 24m to 21. 4fur
at 23m 1fur only 50 ft of bunda
left of 125ft before the flood;
proposed diversion of 6 furlongs
much

must be put in hand at once: the es-
timate was put in recently to
Contractors, Coolies were coaxed
to do 22nd mile diversion which though
inconclusive has stood the flood
owing to protection afforded by
hurdles of bamboos, brushwood
and rullu grass; further work to
complete cost marked out but
is delayed by constant rain.

From end of new mound across
this diversion to 21m 5fur: the bank
was over topped in several places,
but breaches were prevented by
hurdles. From 21m 5fur to 18m 5fur
the bank was recently raised but
has been damaged by floods.
From 18m 5fur to 15m 4fur bank
not yet raised and overtopped,
breaches were stopped by timely
precautions; 15m 4fur to 13m bank
fully raised but more or less damaged.

The Sanctioned estimate for
protecting river bank will now be
revised from

revised, the recent flood line
will be marked on the sections
and provision to raise the bank
6 ft above this will be allowed.

Divi Island.

3rd September. Right margin above
Rest House badly eroded; survey
is being prepared, Protection work,
if not undertaken by Contractors
before 30th, must at once be taken in
hand by this Division.

4th :— Inspected River Bank
from 1m. 2 fur: right hank to 3m 4f
left hand, breaches in this portion
were slight and have been closed.
The River bank was almost over-
topped throughout; pegs have been
put in at maximum flood line
and levels will be taken at an
early date.

Remaining breaches were not
inspected; 16 breaches in left hand
aggregating

aggregating to 2439 ft; all avail-
able labour is put on to repair
it to prevent further damage in
this monsoon. Cost of closing
estimated Rs 1500 approximately.

Flood water within the flood
bands was 4/5 below top of raise-
ment of new catchwork under
construction at Avanigadda.

Flood Right Bank.

Divi Island.

Inspected Divi Bank
whole length of bund.

Breaches have all been
closed and transplantation is
in progress. Modumoody and two ad-
-joining bunds have been filled.
5th September. Inspected foreshore
of river from 12m 2 fur to 6m 3 fur.
A great deal of erosion has taken place
here and there. Some measures must
be taken as at Kottapatta where
the groynes and rubble have stopped
erosion and caught silt.

Inspected

Inspected Bund from 6m 3 fur
to 1m 2 fur and settled position of
spring bunds around. Sluices at hea
of supply channel to Modekur
& Avanantum bunds. There are six
breaches in left bank aggregating
to 1365 ft. will cost Rs 1000 to close.
As far as can be ascertained,
the dry crops for first 5 miles from
Avanigadda have not been damaged
except indigo.

Of the 33 Imperial bunds 6
are full; 3 partly full; and 24 badly
breached and empty; will cost on
an average Rs 800 each making a
total of about Rs 21000.

Transplantation is going on
under those containing water
and seedlings on Island being
supplemented from main land.

The Paligadda branch of the
Kistna

Kistna River has been entirely
cleared of rubbish grass and channel
will soon be cleared out; Several
places in Divi Island will require
protection by rubble plantation.

Bunder canal

On the river rising and consequently the head sluice being raised to renew lead on the head works at Bezwada, the following steps were taken to get rid of the surplus water passed into 1st reach of Bandar Canal:

Breaches were cut in right bank at 9 m 3 fur and 9 m 4 fur: also land in front of Bank canal lock weir was cut. This latter pulled Bunder canal considerably, surplussing through Bank Canal down into flooded country below breach in River bank; breaches were also cut at 12 m 0 fur in left hand and at 12 m 2 fur in right hand down to 2 ft from berm level and station of Bank reduced to take water, if necessary.

It may be well to note that at 9 m 2 fur: the old Pullem crossed the present Bunder canal from right to left and only at a high level would water run off through the breach and at 9 m 3 fur: the old Pullem crossed from left to right at the High level marked in Bunder canal, both these breaches took water into low lying lands below and across Valavazmendari channel that takes off above Kundiroad and then into flooded country along east side channel.

Further the recently raised masonry heavy walls of west side head sluice were removed to platform level and Pullem fully opened till 6.5 was the guage reading in rear of head sluice.

When the Northern Inspector officer was called to Bezwada to regulate Eluru canal escapes and there was

Kiss was a probability that Head sluices
ella at Bezwada would be raised
will still more to save the Head works
ple irrespective of what damages might
pri result to the main canals, a bund
was raised in front of Kumkidad
Sei lock and we were prepared to
ra hold up 12 ft. full supply being 8 ft.
wo the gates are old and will not
Sl stand full supply. there is an old
the proposal to make the 6 vent sluice
1st built in continuation of the lock wall
of Kumkidad (the body walls of
ba which were built up to F.S.L. level)
al having only 3 tumbogy vents to subsidy
lo west side channel, into a permanent
pa surplus work and to convert the present
-a west side channel into a drain as
Bo far as Mewr head sluice. This must
Co now be investigated and if carried
ba out, the bund would form a strong
in right hand to Bunder canal and
do to the first two miles of Mewr channel.
f. In
ne

In the event of the Head sluices at
Bezwada being raised as in the
present year, a large surplus work
in the 1st reach is absolutely necessary
The irrigation question will be dealt
with separately. Only 2300 acres are
involved. 1000 can be commanded
by Vadur channel but the whole
of it, except about 300 acres can be cul-
-tivated dry.

Flood water from the breach at
32 m 2 fur: of the River bund breached
Bunder canal 2nd reach right bank
from 15 m 4 f to 16 m 6 fur: and crossed
the canal into the country beyond
this is the site of an old breach in
times of heavy rain; in former days
drainage passed under the canal
thro' an old brick under tunnel
now blocked up and of too small
a size to be of any good.

Below, a series of breaches occurred
from

from 18m 6fur to 19m 6fur to both
Kis: banks owing to their being low,
& these were widened by water flow-
-ing back into the canal. When
& these had ceased, canal from 15m 4fur
to 19m 6fur was silted up between
breaches two and a half feet.

Flood water also breached left
bank in 2m 6fur and a large scour
hole formed 12 ft deep. To relieve
water on left of canal and Sama-
-maliny works, a cut was made
at 2m 7fur in right bank and
at 0m 6fur of new Bheemanady
channel into head of Bheema-
-nady drain.

Medur & Bheemanadhi Sluices
were fully raised. These breaches were
all ring bunded by the 19th August.
I inspected this reach on 18th and
21st August. On the evening of the
20th flood water again rose and
entered canal at ring bund from
16m 2fur to 16m 4fur and by midday
of

21st August all ring bunds were
again breached; these were again
closed by the 1st September, on night
of the 31st ryots of Vallur cut a ring
bund between 16m 2fur: and 16m 4fur
to drain their fields.

There is a certain old bund here
which is usually cultivated, but
in times of rain or flood holds
up water and the ryots have cut
the canal bund here before to
drain it off. I inspected this reach
on 8th September, bunds are being
strengthened and silt removed.

In order to save Inambedy
village there being a difference
of level of 4ft 6in between water
on left of canal and water
on the right, cuts are made in
the left bund. Bunder canal
at 27m 1fur: and right bund
at

on

from 18 m 6 fur to 19 m 6 fur to waste
banks owing to their being low,
these were widened by water flow-
ing back into the canal. When
this happened, canal from 15 m 4 fur
to 19 m 6 fur was silted up between
breaches two and a half feet.

Flood water also breached left
bank in 2 m 6 fur and a large scour
hole formed 12 ft deep. To relieve
water on left of canal and save
masonry works, a cut was made
at 2 m 7 fur in right bank and
at 0 m 6 fur of new Bheemanady
channel into head of Bheema-
nady drain.

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There is a certain old bund here
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in times of rain or flood holds
up water and the ryots have cut
the canal bund here before to
drain it off. I inspected this reach
on 8th September, bunds are being
strengthened and silt removed.

In order to save Swamibady
village there being a difference
of level of 4 ft 6" between water
on left of canal and water
on the right, cuts are made in
the left bank. Bunder canal
at 27 m 1 fur and right bank
at

...at 27m 3 fur. being fairly high ground
...and plenty of earth being available
...to close them and a large volume
...of water was passed from left & right.
...Flood water in left of canal was
...at a maximum at 2 P.M. on 5th inst:
...it was 3' above the parapets of
...the accommodation Bridge over
...Kanakavalli Drain at Kampur.

The breaches caused by floodwater
between 27m 7 fur and 28m 0 fur are
over 320 ft long in left bank; right
bank 180. right bank of old west side
channel 130 ft. This breach scoured
out to depth varying from 2 to 12
below bed of canal, scour ex-
tending 520 ft out side right bank
of old west side channel.

From 28m 2 fur: to 29m both banks
of Bunder canal and right bank
of Uruttur left side channel washed
away. Bed of canal being scoured
out to depth, varying from 2 to 13 ft
below bed in 5 places aggregating

to 1075 ft and extending in many

Surveys Nos 3, 4, 5, 6 places beyond right bank. From at
Show breaches
with their mileage;
ring bunds being of Uruttur sluice undermined near
denoted by red
lines
6 Photographs left front return and sluices over-
enclosed.
Photos attached. - turned. In this reach from 29m 0 fur
to 29m 4 fur both bunds were
damaged and overtopped but not
scoured. the left bank being
washed into canal to one fourth
of this distance to level of berm.
A very bad breach occurred at
Uruttur crossing of 290 ft long in
left and 300 ft in right banks.
The scour on either side of remnants
of crossing varying from 5' to 13'.6"
below bed of canal; about one
half of metalling was washed
away. Between 29m 5 fur: and
Junction Canal, 31.2 water crossed
Canal from left to right causing
a series of breaches but no
appreciable
on

appreciable scour.

Between the Stone Locks from 25·2 to 31·2 canal is silted up from 2 to 5ft as water drained off this silt was used for reforming left bank.

Small bunds were formed across breaches in left bank for foot traffic by 20th August but were washed away by fresh flood on 21st and 22nd. No further damage was done to 3rd reach except a small breach at Site of old Butler Codu head Sluice which was promptly closed when flood water went down on first occasion.

Canal was bunded below 27·6 and punts were utilized in conveying materials from above Peranki Lock for closing breaches. Here I may remark that this damage in the 3rd reach was entirely caused by water passing from left to right, held up by Pullern and Jeniatiu canal which would probably not have occurred, had there been a suitably designed drain in place of west side channel from Kumbikad Lock to Mahadivi Bridge.

Navigation was resumed on 20th September. The Asst in charge will resume his ordinary duties, distribution of water and patching up the channel.

5th Reach. From ... about 10 days water crossed canal from right to left: damaged both bunds in 49th mile but not scoured; breaches have all been closed, sufficient to hold F.S.L. in Canal.

3rd Reach was cross bunded on

on 16th August immediately above
Junction canal, and navigation
restored between Bunder and
Pullerum on 22nd August by water
being passed through valve
shutters of Pamarrum Lock, on 31st
instant Box Sluice was fixed in
left bank at 32.2 and water passed
into canal from East side chl
to Supplement Supply through
Pamarrum Lock and enable fields
on right of canal to get a
moderate Supply of water through
Duggumally and Manager coder
and Mallavotic Sluices. Most of
the channels under last two sluices
were badly damaged. East side
channel Head Sluice Pullerum was
fully opened, until 9th reach
was to reopened. Throughout the
flood, water was supplied thro'
Meour and Bhamanady channels

three fourths of the land under the
channels being undamaged, Mem
channel was not appreciably da-
maged, and out of its two branches
Kristnapatam branch was safe
and Gudagaad branch was
submerged. The Bheemanady main
channel was not damaged up
to 10 miles, but so far as excavated
bel-ow this was submerged. Of
the branches fully excavated
Kroser North and South branches
were submerged and badly cut up.
Kaveriwarrupuram channel
on left of Bunder canal is the
only export channel in Southern
Division, on this side above Pama-
-rum was completely cut up, it
held up flood water for a short time
All breaches were patched up
by

by 5th September sufficiently strong to let water down and transplantation is again vigorously in hand. On the 31st August I went to Lakshmipuram at 10½ mile of Trallo-allie road from Sidal look up the Sivaganga drain; then alongside flooded fields above road; crossed at 6m 4fur: at Road dam; then along Dyaheendra, the road being still impassable having been submerged and formation damaged.

The course of the Dyaheendra is most tortuous and undefined. If this were properly aligned and excavated with a suitable bed width and fall, it would dispose of flood water far more rapidly than at present and save considerable damage.

1st September Lakshmipuram inspected. Lands damaged by floods, the village itself and Surrounding fields are high and not damaged.

Pullem Canal — Pullem canal breached in the portion between Kunhipaid and Weyyur from excess water passed down it during floods from first reach Bunder canal but of no importance.

Rayes Canal — Also Rayes canal breached at 12m 2fur from the same cause. This has been repaired. No damage has taken place in Kootaram Subdn but Subdy inconvenience was caused by retention of water in Canals after flood.

Ellore Canal — Ellore canal gave anxious time when the River flood bank breached above Bezwada and the Bundareru was

Consequently

three

Consequently in flood.

In the 3rd mile at the site of an old breach, the ring bund and the canal bank started leaking. Due to prompt action of Mr. Joyce the cracks were puddled and the bank protected by bushes and raised; at this time, the Tammilern came down in flood; the fender pile bridge in front of escape collected an immense amount of debris, the water falling over this caused a scour round several fender piles; this portion must be floored next year, for which estimates and plans have been submitted.

Breaches occurred at 8/3. 8/6 8/7 on the right of Ellore canal 80. 180 & 40 respectively in length. To save further damage the following cuts were made in 9/0 on the right 33.20 & 20 feet lengths respectively. All due to the flood waters entering the Ellore canal in the 7th mile and in addition to excess water from Head Sluices. Water from the Badamerru passed 2ft. over the trough walls of Badamerru aque- -duct and one foot over Kesara- -pally aquidnet. A breach also occurred in the right bank at 10/6, also breach at 11/4 left bank, but this, it is suspected, was cut by the ryots under a mis- -taken idea of saving their village to let Badamerru flood into the canal. The canal breached at 11/4 last year.

The Kesarapally Lock has been provided with movable

planks

to hold it in full liability and to turn it into an escape in times of flood instead of being cross bunded as formerly.

The following are the estimated amounts required for closing the breaches.

Southern Subdn

Madulisatam Canal 2nd reach Rs 10000
3rd reach inclding, Venture
sluice and left side channel 20,700
4th reach — 1550
5th reach — 350
Sea Dyke —
Kopalleswaraburam channel 5000
Bheemanady channel — 1375
Mallavolu left side channel 500
Medur channel — 260
Manager cost Nibhanipeta 2000 *Cabbs Approximate
and Mallavolu channels
River bank 13/ to 29/4 — 7000 *
do — 29/4 to 44/4 — 15000 *
Divi Island right bank — 1,000
Left bank — 1500
Divi Lands 24 — 2000
86235 or Say Rs 86400

Three

Northern Subdn

Removing and refixing Sowkath bridge Tammilcum escape — 4100
Closing breaches of Borada channel & branch — 6000
Closing breaches of North Side channel Singavaram
South side channel — 50
Closing breaches of Sluice canal 3815
" of river bank 10,600
24565
or Say 24600

Total — 1.11.000

It is estimated that more than 100000 acres will be lost in the Eastern Delta due to this flood but where breakings are available, Inundation is still going on and this figure may be capable of mention. In Divi Island 9984 acres are lost for this year and 4933 will be cultivated.

From personal inspection
I have seen that the prompt
measures taken to minimise
the damage and to remedy it
when the floods went down
adopted by the two Subdn
officers, Sub Engineer Mr W.
Joyce and in the Northern Subdn
and Sergeant C. J. Smith in
the Southern Subdn have been
most effectual and satisfactory
and deserve great credit.

In the anxious time
when the floods were at their
height great discomfort and
hardship were experienced by all
but work was smartly and cheer-
fully done on all occasions.

The measures taken in
the 3rd reach of the Bundee
canal by Sergt Smith were
on his own initiative and deserve
praise; they were prompt and

and effective. I was unable
to advise him not having seen
the Country, being new to the
Division.

With exception of Venture
Sluice overturned which was
unavoidable, no other damage
took place to masonry works
in the Division.

Reports on the working
of overseers and others under
these Subdn Officers are sub-
mitted with this report. I
fully endorse Sergt Smiths'
recommendation.

Jos. M. Loam.
Executive Engineer
Kistnah Eastern Dn

(Forwarded)

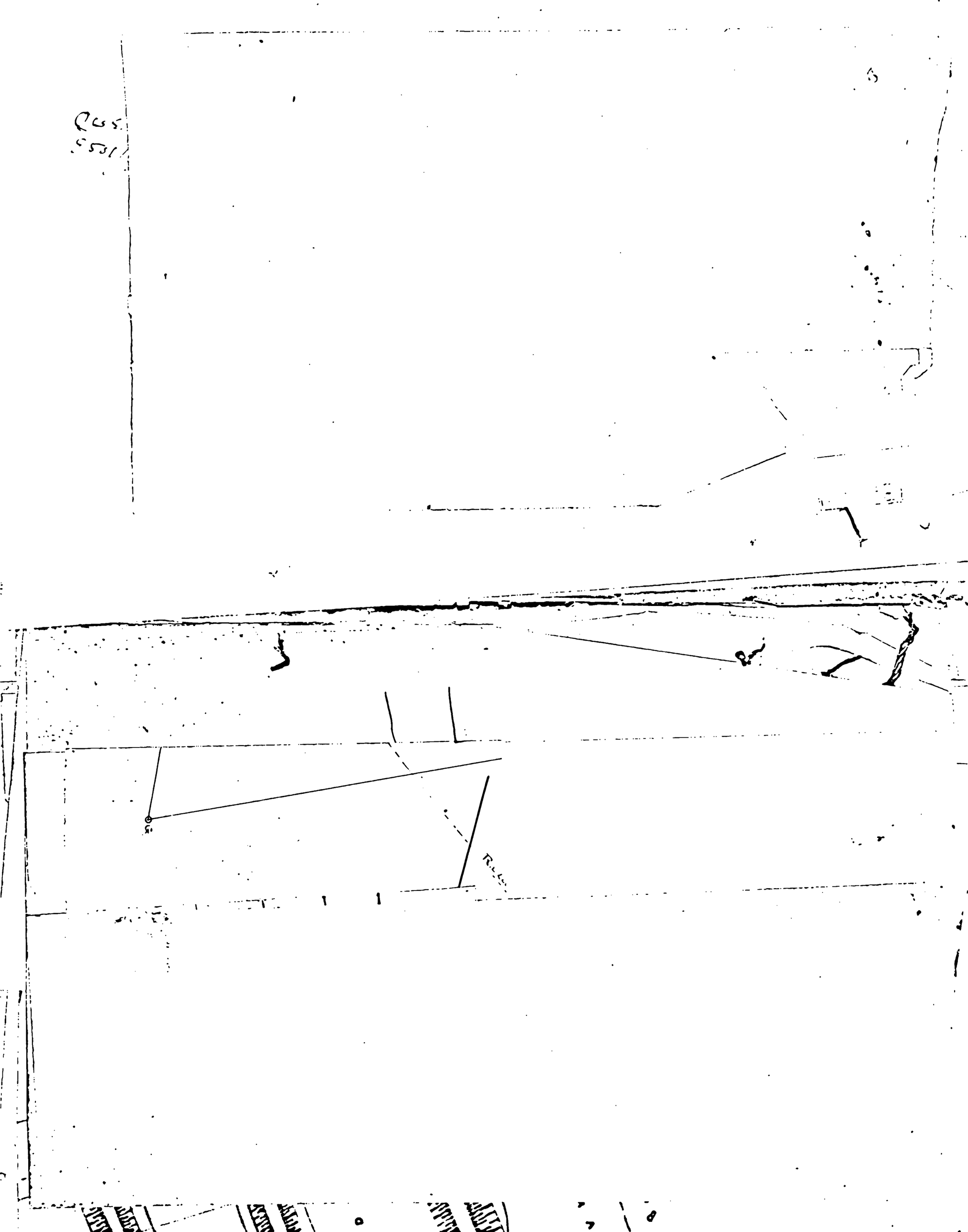
Wm. Upperton Manager
Bundee Engrs Office

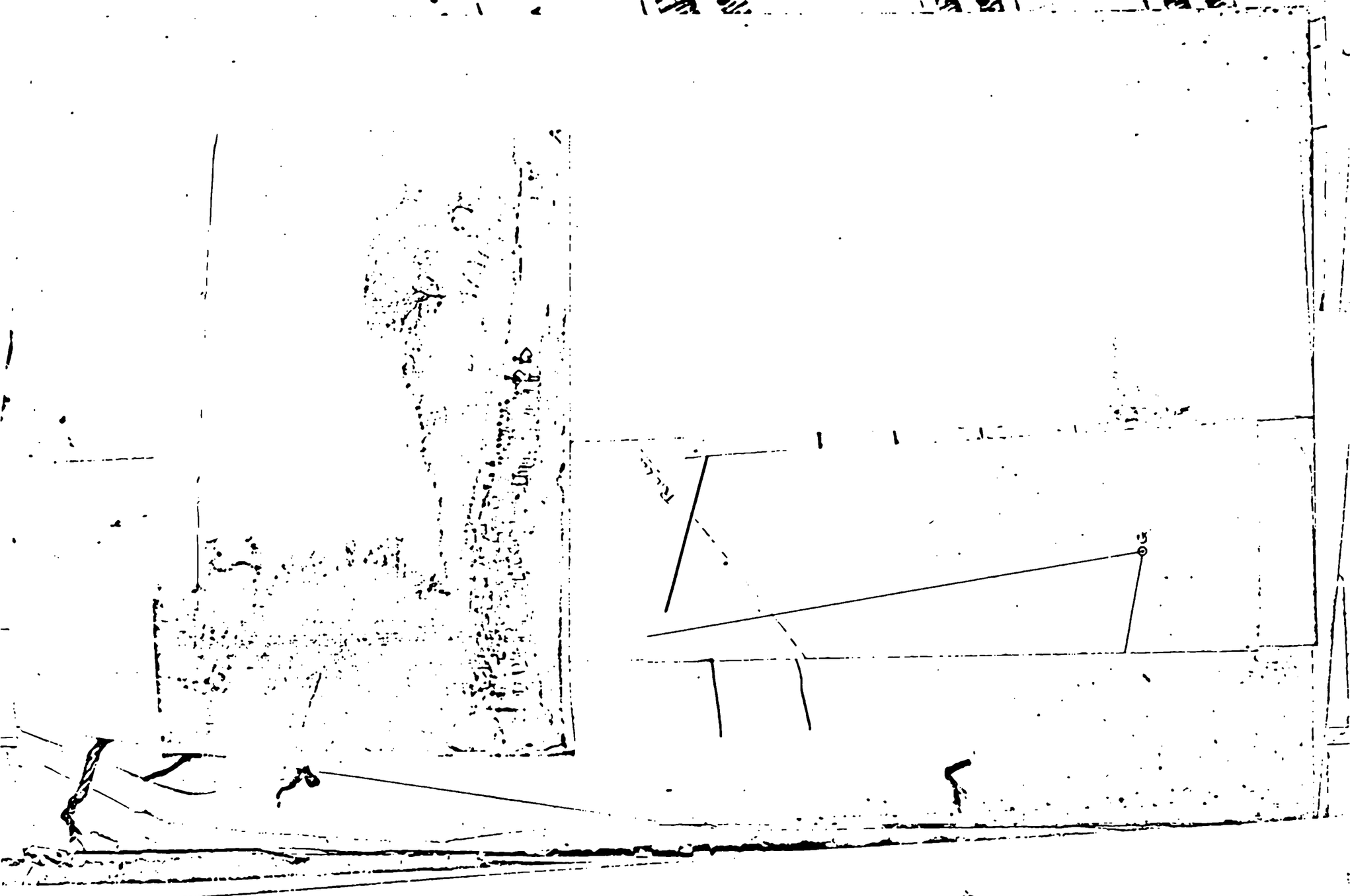
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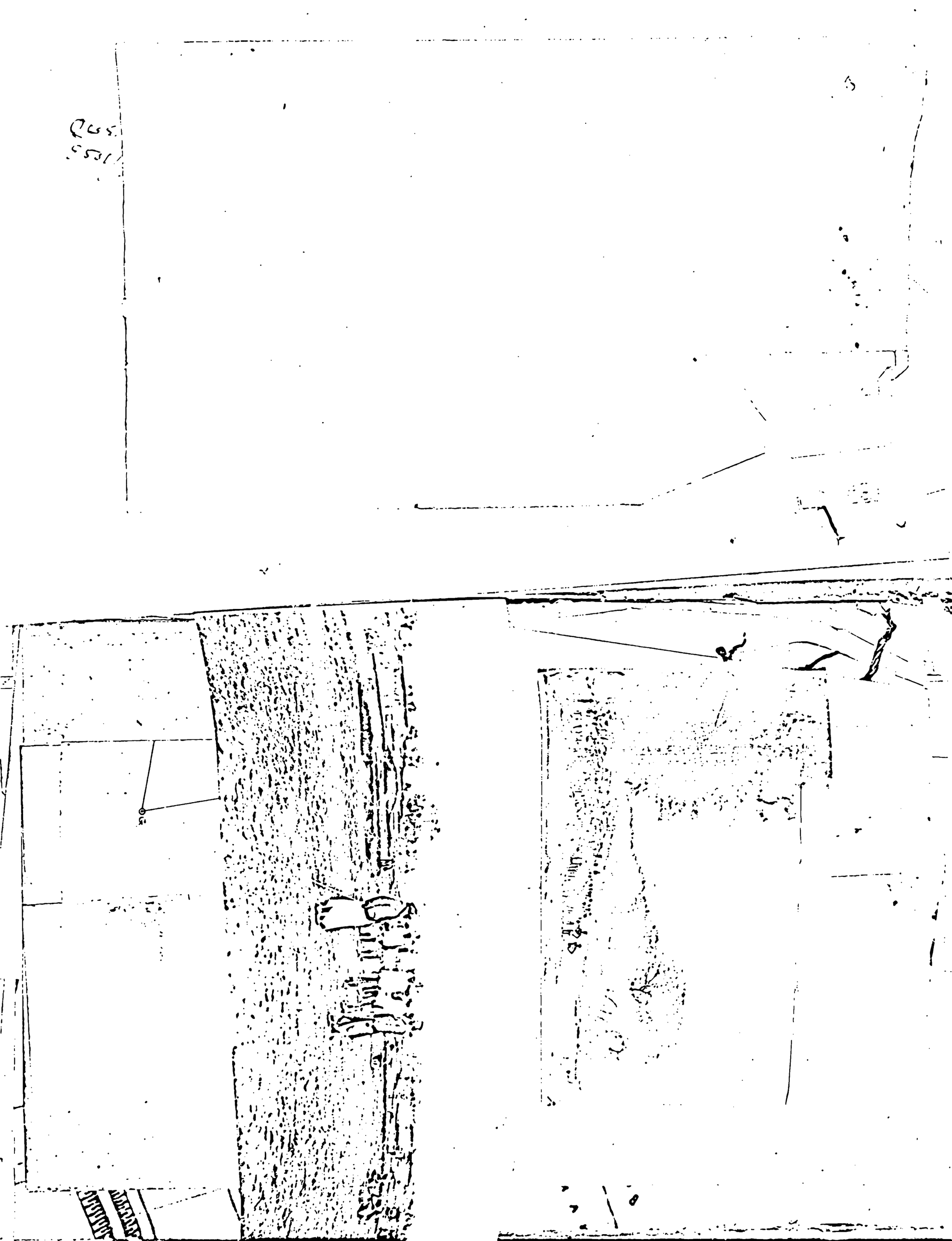
Photographs.

To The Superintending Engineer
2nd Circle
Bhagalpur

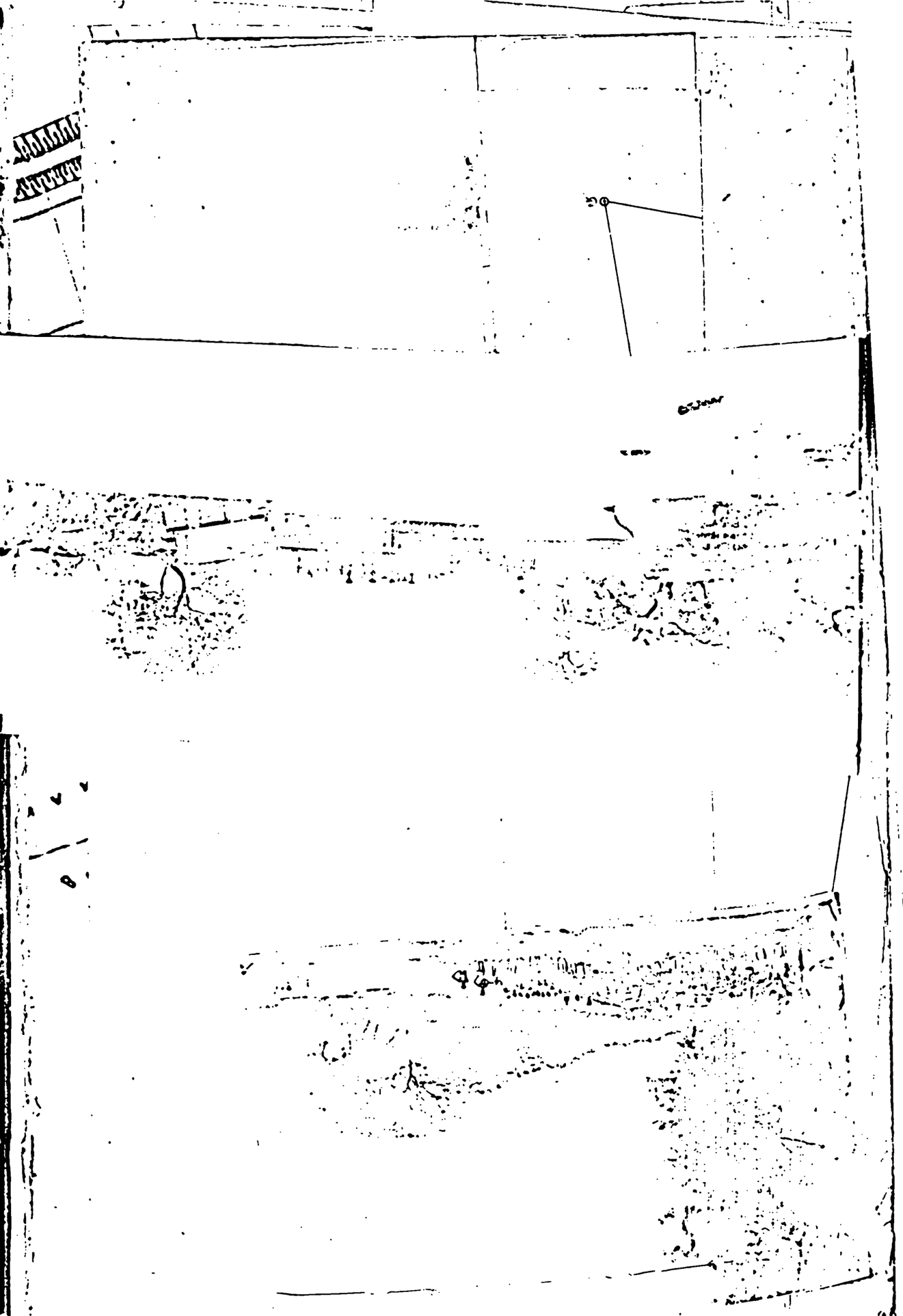
From K. E. Div. Office

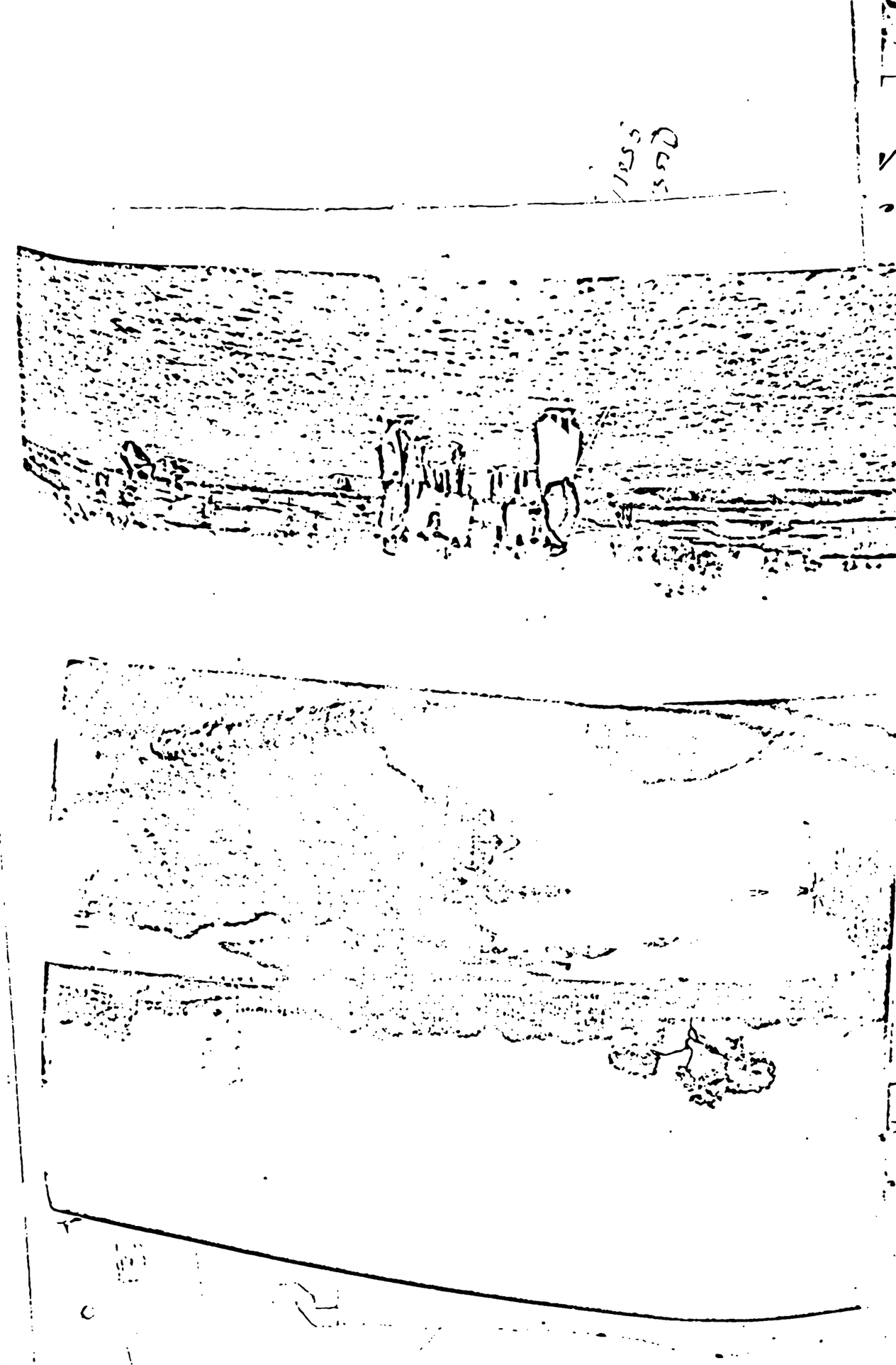












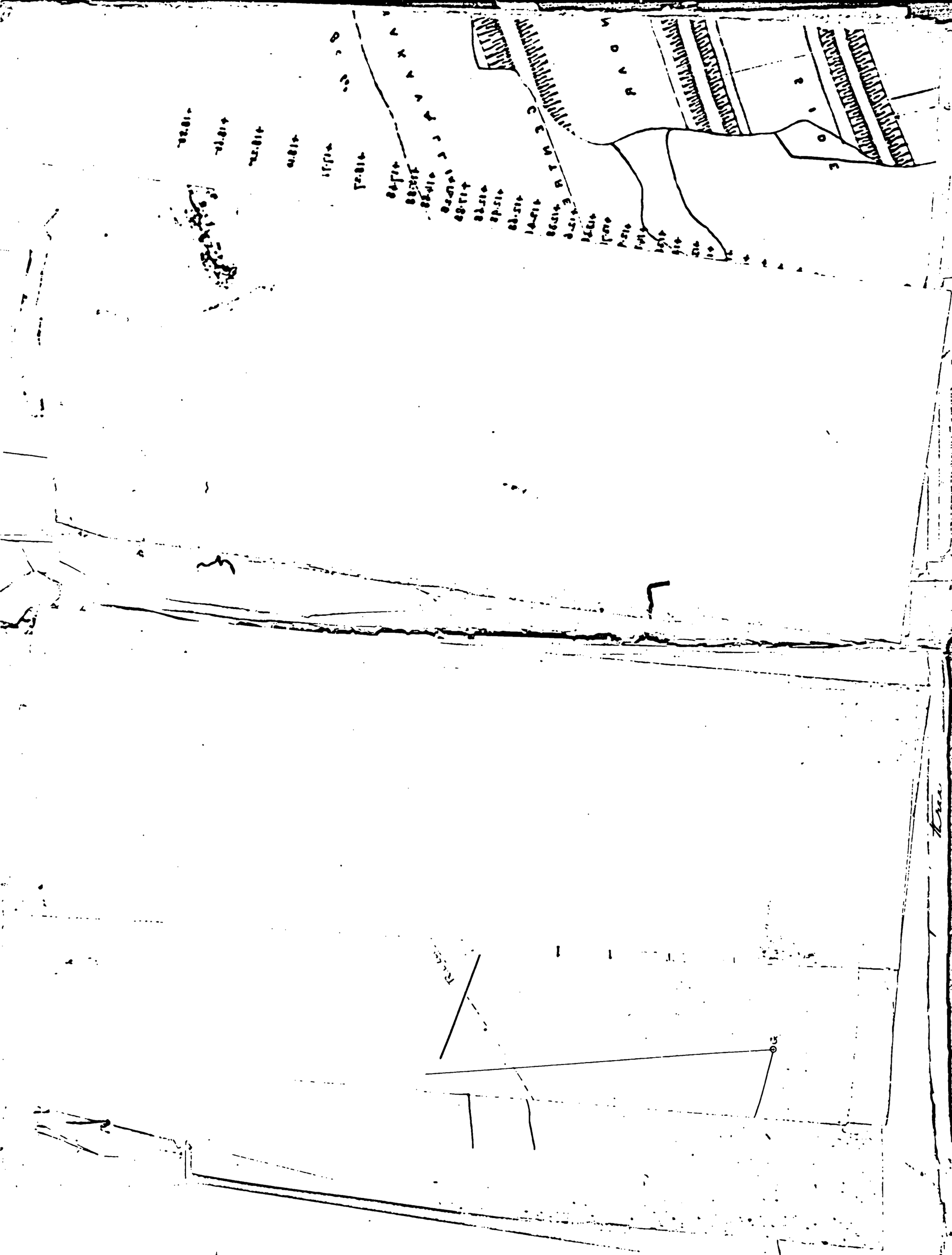


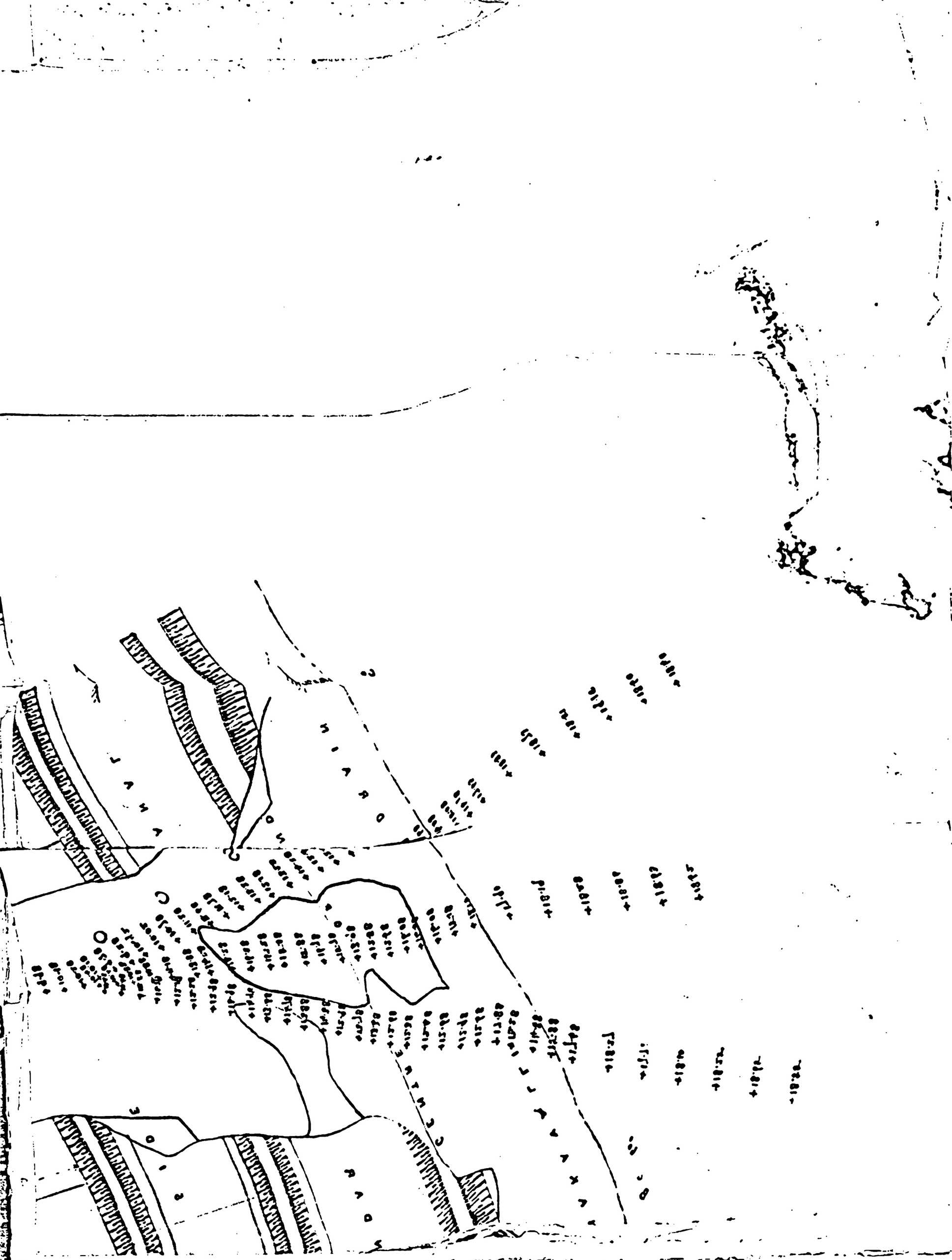
Bank Canal.

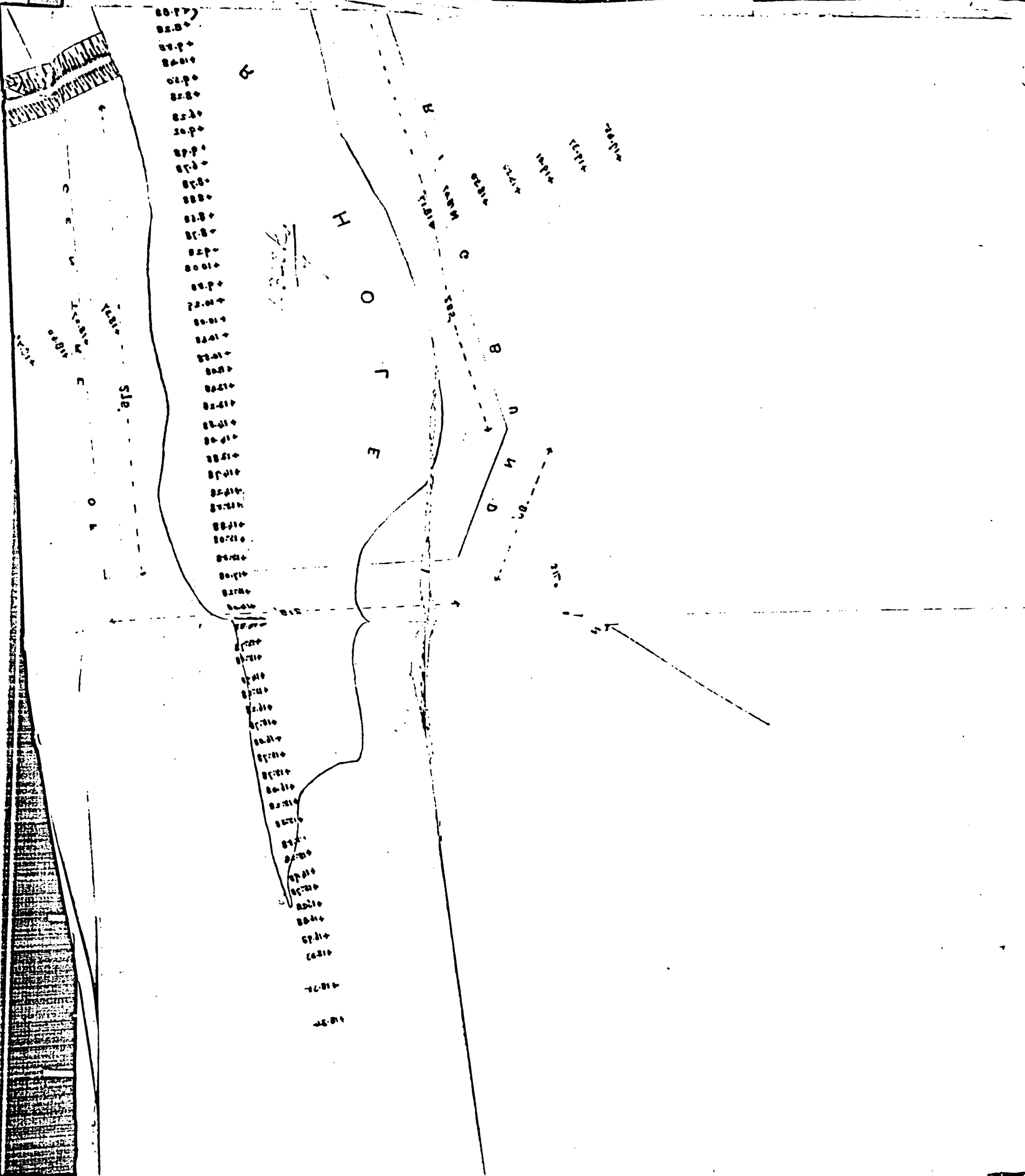
Survey of Breach
at 3 m. 2 f. of
Kistna River Left flood bank.
Scale 100 feet = 1 inch.
or 1/1200.

R. Logan
Sr. Surv
Bezwada Div
17.9.26.

Western Entrance Channel

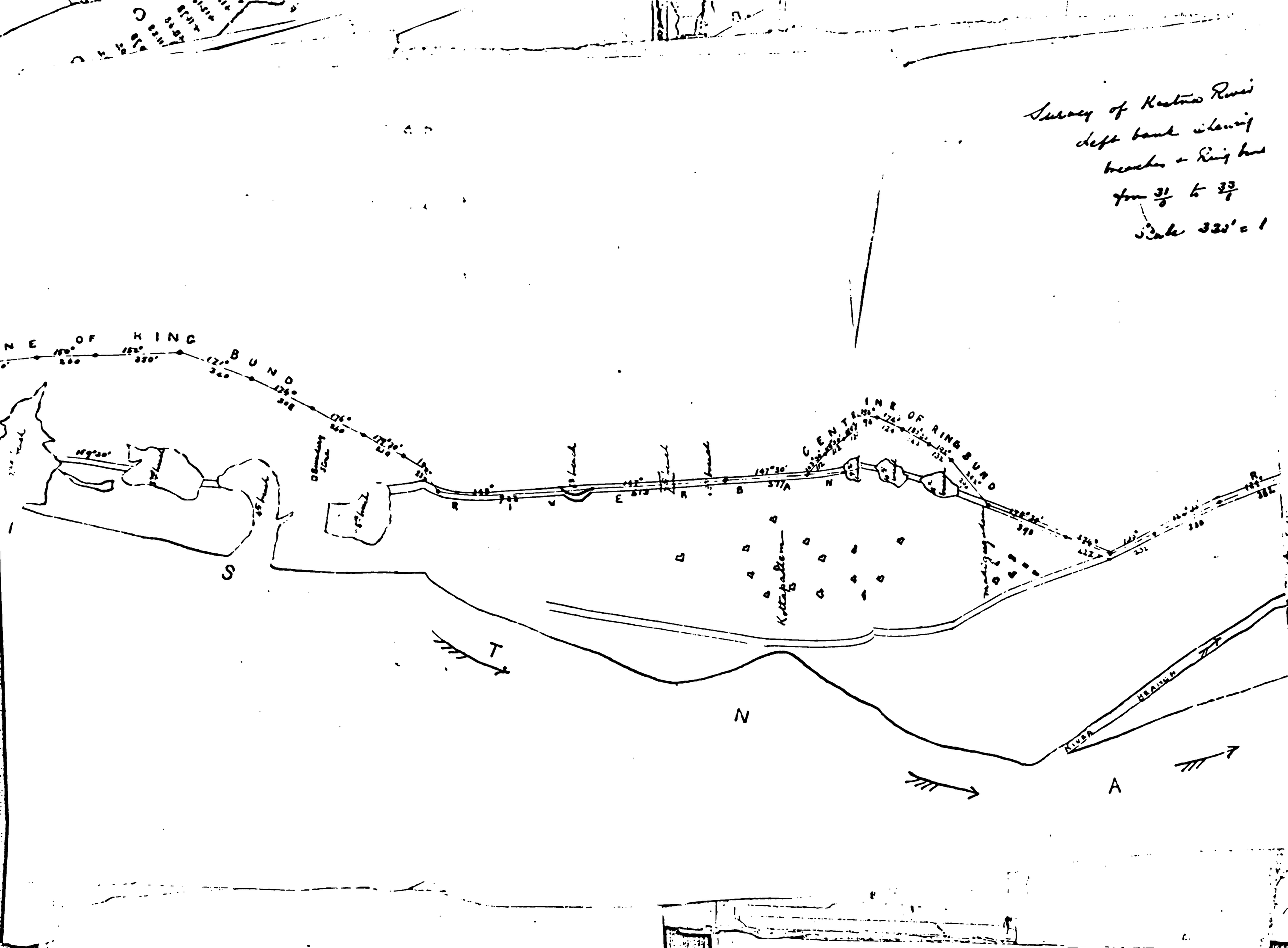








Survey of Kaduna River
left bank showing
branches & King bund
from 31/5 to 33/1
Scale 330' = 1

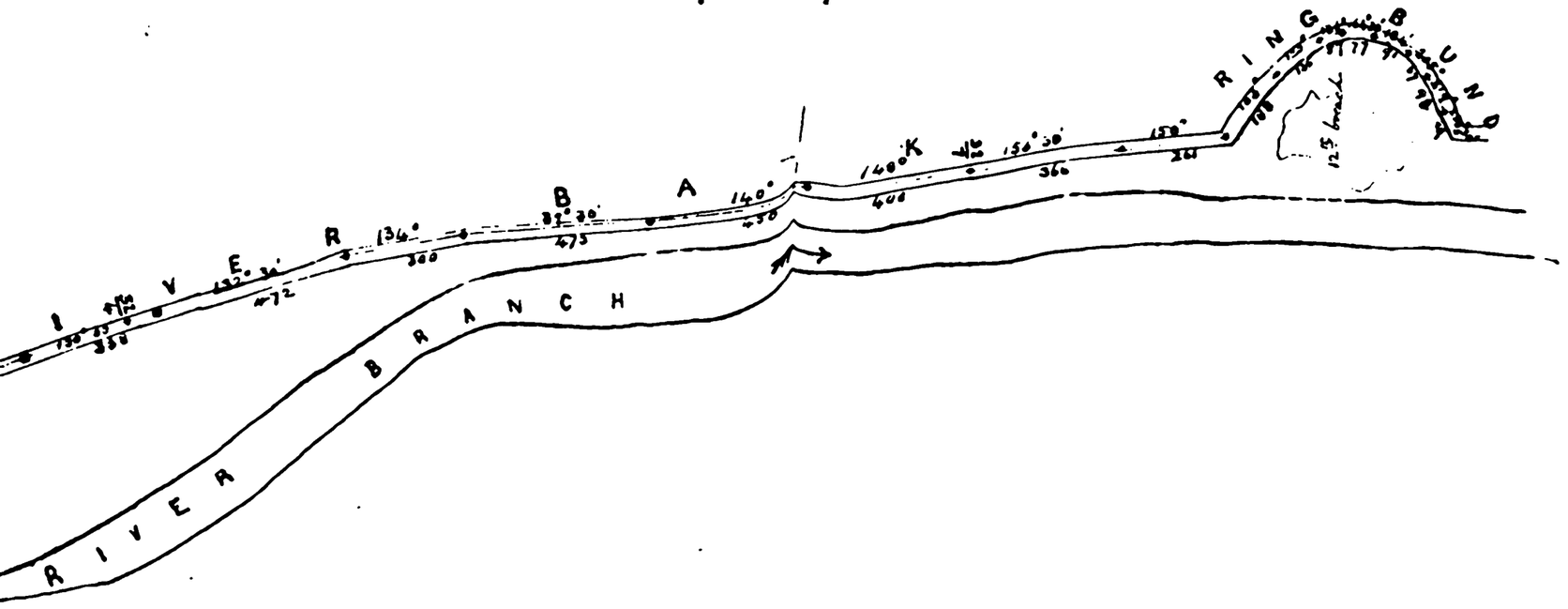


Branch no 12 – surv[illegible]

no 8 - closing with [illegible] completed by 13th

no 7 - closed

no 6 - surv[illegible]



C. A. Smith
24/3

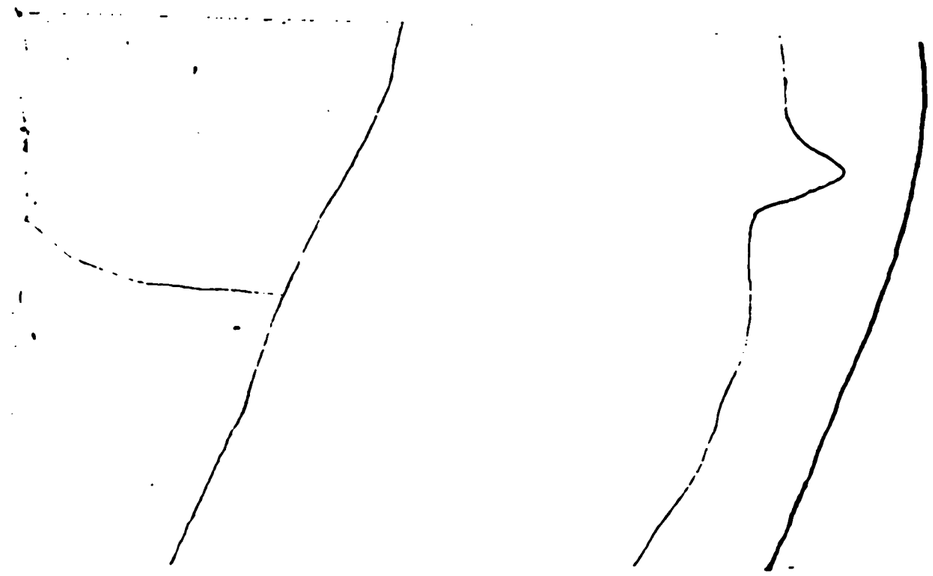
SCALE 1" = 1 MILE

Portion coloured blue shows area on mainland submerged during floods of August-1896

J Hewitt
17/9/96

J M Lowan
Esq Engr.

POINT DEVI LIGHT HOUSE



SCALE 1" = 1 MILE

Portion coloured blue shows area on mainland submerged during floods of August-1896

J Smith
17/9/96

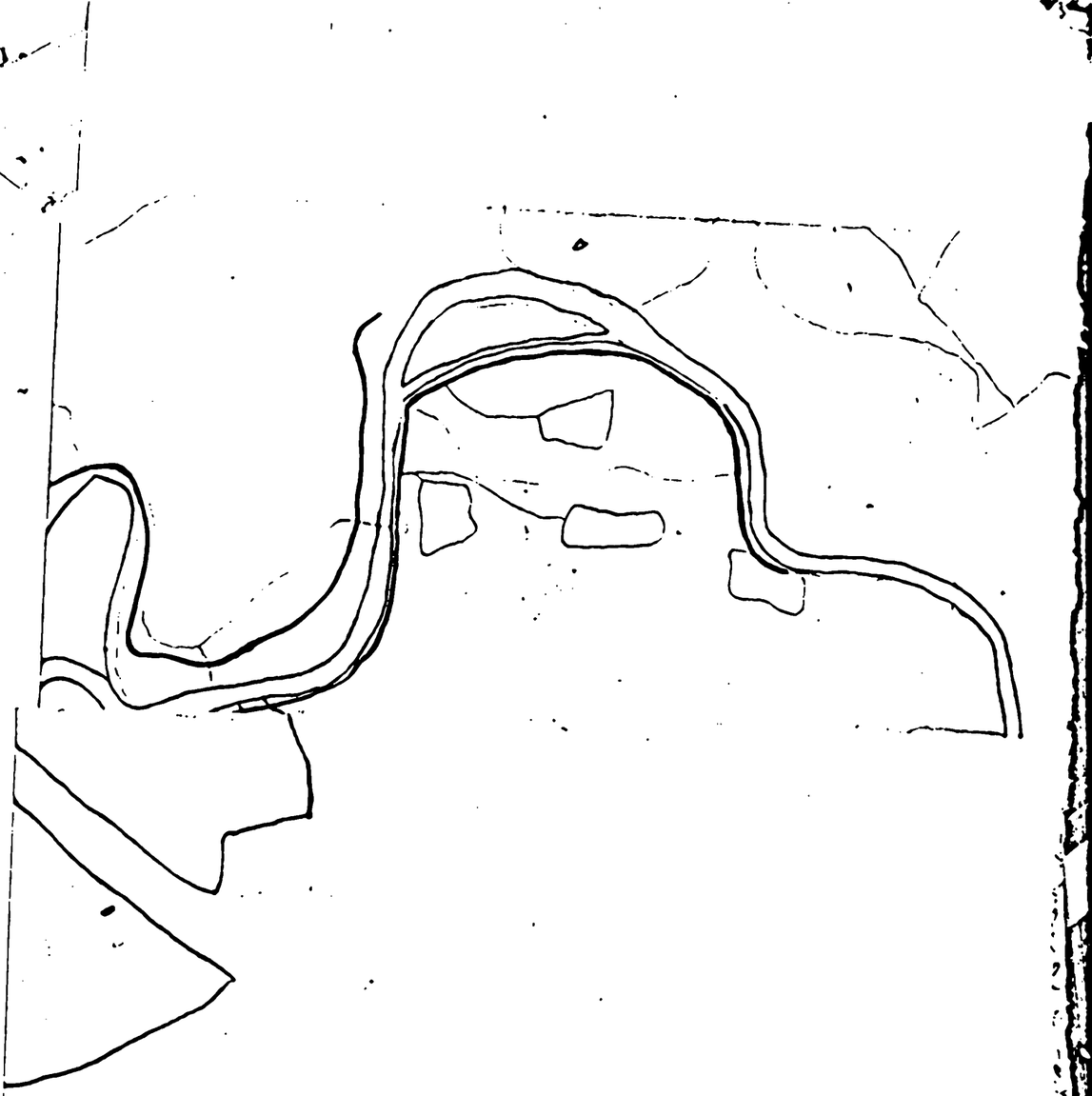
J M Lowan
Esq Govt.

MILE

shows area
surged during
6

C. Smith
17/9/96

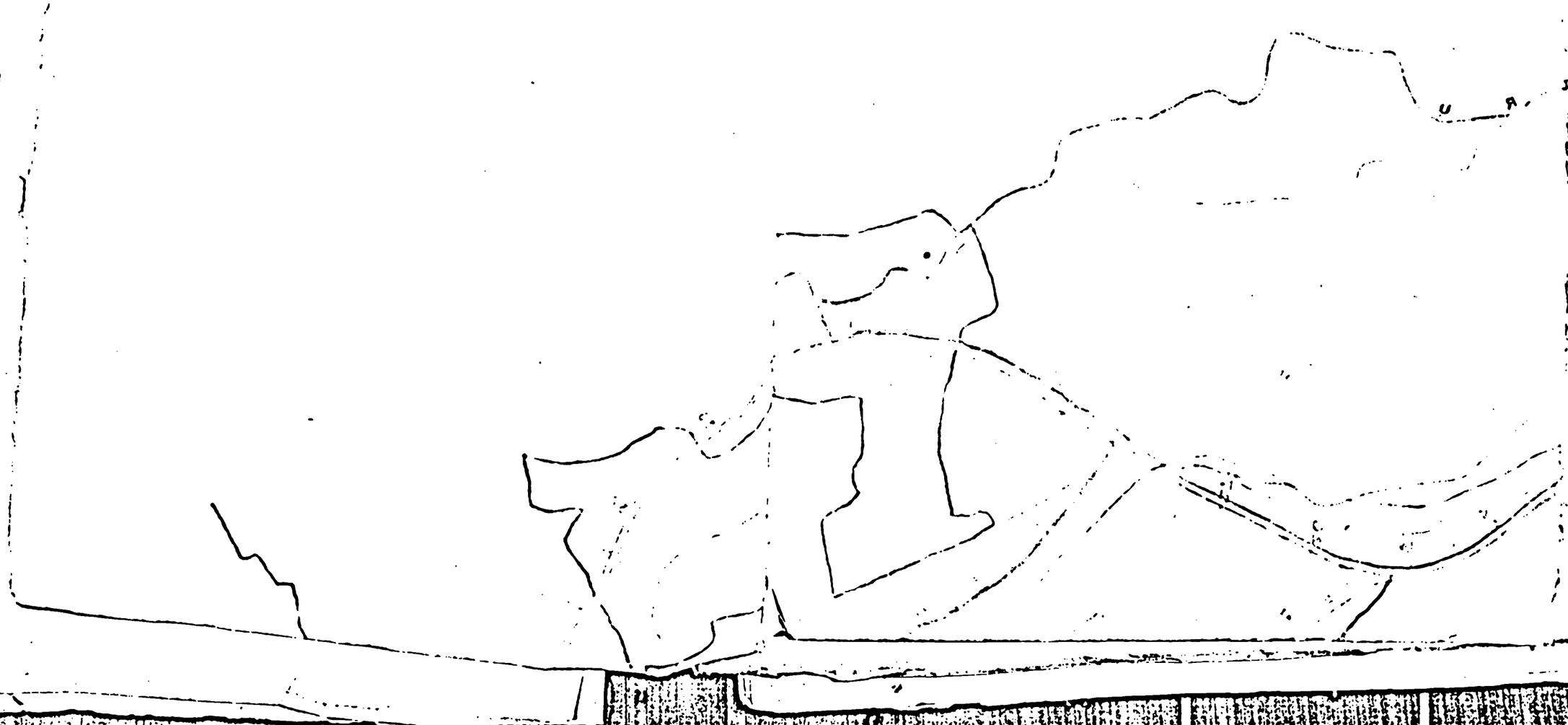
J. W. Lowe
Esq Engr.



MILE

shows area
ensed during
6

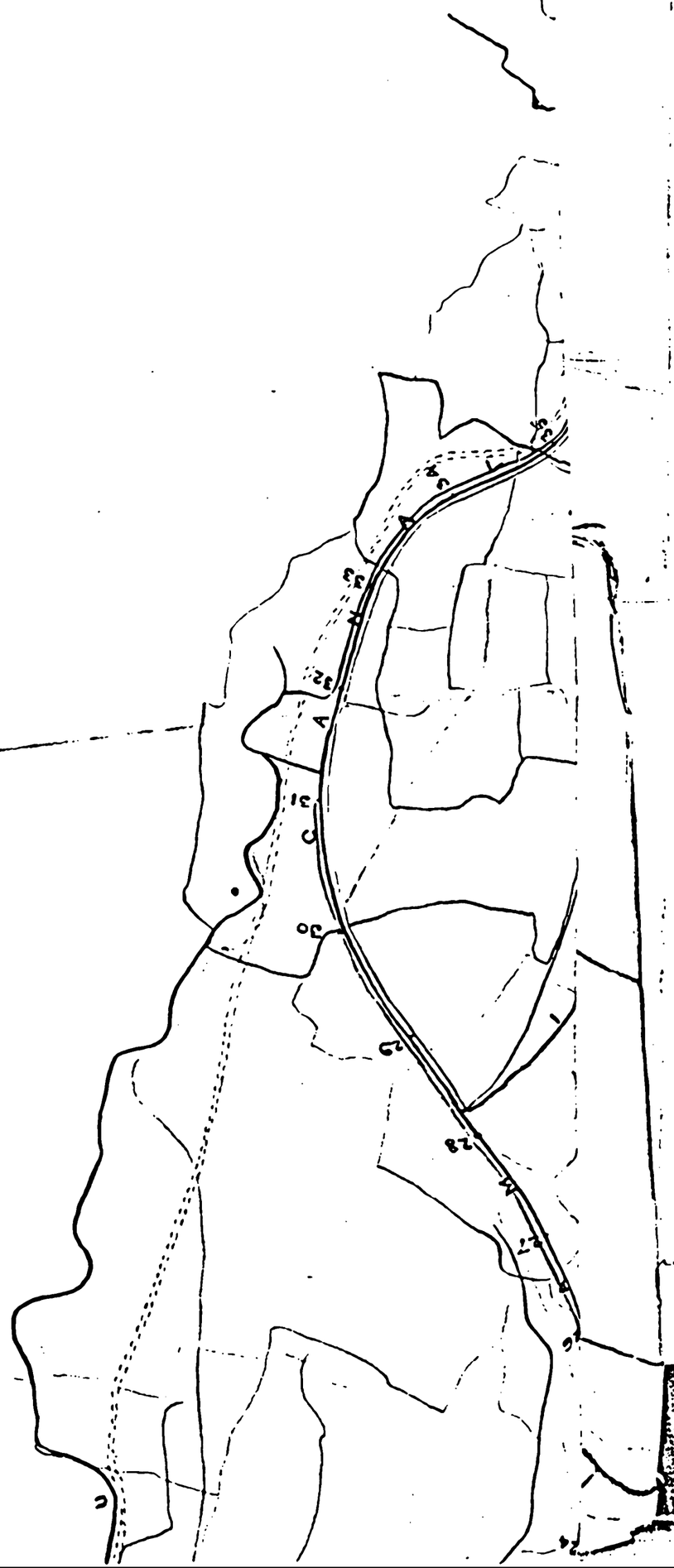
C Smith
17/9/96



MILE

shows area
surveyed during
6

C Smith
17/9/96



DURGA CHANNADICHANNEL

HEMAVATHI

PALLY

KAKULUM

TSALLAPALLI

LANDAPALLI

N

MILE

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MILE

shows area
surged during
6

C. Smith
17/9/96

Letter from Mr. L. D. Venkatarama

the flood bank in long lengths of
about half a mile and more (i.e.)
below Kollen Lock and near Pennundi.
Below Kollen Lock Overseer K. Seeni
naicken tried his best to prevent
breaches by raising a small bund
and worked for 2 days 31st July and
1st Augt: with about 250 men. As
there was no place near at
hand to dig earth from he was not
able to keep pace with the rise of
the river and the flood bank below
Kollen lock breached on the night
of the 7th August.

5. Overseer V. S. Rangasamy Ayer
and Delta Supt. B. Paparayer
Pantulu worked hard in preventing
breaches between Vellakuvi and
Pennundi and by their works
at least half a dozen breaches
have been prevented. Judging
by the protective works done all
along below Vellakuvi I consider
that the Overseer and Delta Supt.
have done their best to prevent
breaches. Near Volevu and Rami
thanthavanam the bank was
low

low for long lengths and consequently
breaches could not be prevented.
Those breaches occured on the morn-
ning of the 1st Augt. The breaches
at Peddapulivarru two miles below
Vellakuvi lock seem to have been cut
intentionally by the villagers who
thought that they could save their
houses by cutting these breaches.

6. The breaches in the 4th reach
occured at the central ramp of
Perakanka where the bank and
the ramp was left incomplete by con-
tractor K. Punnanandam. This man's
contract was cancelled on 31st May
but he was allowed to do the work
on Piecework on the distinct unde-
standing that he will still be
held responsible for any damages
that may occur on account of the
non-fulfilment of the conditions of
his contract. The flood bank
in the 4th Reach was from 3 to 4 ft.
above the recent flood level and
if the work had been completed
no damages would have occured.

Opposite these breaches in the flood
bank

the flood bank in long lengths of
about half a mile and more (viz)
below Kollen Lock and near Pennundi.
Below Kollen Lock Overseer K. Sreeni
vasan Iyer tried his best to prevent
breaches by raising a small bund
and worked for 2 days, 31st July and
1st Augt. with about 250 men. As
there was no place near at
hand to dig earth from he was not
able to keep pace with the rise of
the river and the flood bank below
Kollen Lock breached on the night
of the 1st August.

5. Overseer V. S. Rangasamy Iyer
and Delta Supt. B. Paparayer
Pantulu worked hard in preventing
breaches between Vallaturu and
Pennundi and by their works
at least half a dozen breaches
have been prevented. Judging
by the protective works done all
along below Vallaturu I consider
that the Overseer and Delta Supt.
have done their best to prevent
breaches. Near Volevu and Ram
chandravaram, the bank was
low

low for long lengths and consequently
breaches could not be prevented.
Those breaches occured on the morn
ning of the 1st Augt. The breaches
at Peddapulivarru, two miles below
Vellaturu lock seem to have been cut
intentionally by the villagers who
thought that they could save their
houses by cutting these breaches.

6. The breaches in the 4th reach
occured at the central ramp of
Peraklanka where the bank and
the ramp was left incomplete by con
tractor K. Punnanandam. This man
Contract was cancelled on 31st but
but he was allowed to do the work
on Piecework on the distinct unde
standing that he will still be
held responsible for any damages
that may occur on account of the
non-fulfilment of the conditions of
his contract. The flood bank
in the 4th Reach was from 3 to 4 ft.
above the recent flood level and
if the work had been completed
no damages would have occured.

Opposite these breaches in the flo
ban

the flood bank in long lengths of
bank the right bank of Bank Canal
has also been breached mostly on
purpose in order to save masonry works.
7. The flood waters that flowed
over the country from the Kollair breaches
breached the Kollipara Channel and
its branches at the tail end and also
the Vellaturu Channel. These together
with the flood waters from the Pedda
pulivarru breaches breached the spoil
bank of the new Repalle main drain
straight cut at Nagaram and also
the old straight cut at Pudivada
and the banks of the east side channel
extension and got into Peddapallivada.
8. The flood waters from Penumudi
and Vemu breaches breached the
Repalle Channel and branches
and the Lankapalli Channel
and branches passed through Ma
pavu para and thence into the
salt creek and reached Nizampatam
Vadu. A portion of Nizampatam
was under 3 ft of waters. These
waters backed up on the left of
Nizampatam Canal and breached
the 4th Reach and also the good
water Channel.
9. The details of the damages

done to the flood bank, Bank Canal
and the Lekapalli Channel are given
in the statement appended. I have
not gone in for similar details for
the Vellaturu and Repalle Channels,
the East side Channel extension and
the Good water Channel, as that will
only delay the submission of my report.
As already stated in my previous
report there are 11 breaches to the left
bank and 7 to the Right bank in the
4th reach of Nizampatam Canal.
All the masonry works on the Canals
and distributaries are safe with
a solitary exception of a small old
road culvert on Peteru Channel
which is reported to have been much
damaged.
10. These are the damages done by
the high floods which lasted from
the 1st Augt. to 7th Augt. The rivers
began to fall on the 7th and it went
down sufficiently low to allow of
commencing the work of restoration
on the 15th. Work was accordingly
commenced at Kollum, Peddapalivam
and Penumudi and was in
progress. But the rise of

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the prieus again on the 20th prevented any further progress and no work was done from 21st to 24th. The 1st two breaches at Kollum were very nearly closed but the bank was not made high enough as it was raised in layers. Overseer K. Sreenivasa Iyen has spared no pains in raising and strengthening this bank and judging from the work that has been done, I consider that the overseer deserves much credit.

11. All the water that flowed through the 3rd reach was flowing through the Penumudi breaches and there was not a drop of water in the Canal below the Sekapalli Channel Head sluice. The ryots of Kallum, Chatragadda and Kamarazugadda whose lands were not affected by the floods, had their lands transplanted and they were in need of water. I tried my best to close the Penumudi breaches on the right bank by putting in bamboo pegs and naval rollers but on account of the rise of the prieus

prieus, my attempt proved unsuccessful. These men that were in need of water thought that the only way to get water is to cut open a breach to the Flood bank below the Sekapalli Channel sluice and accordingly on the night of the 22nd, they stealthily cut two breaches one about 15 ft. long and the other about 30 ft. long. The Eastern Sub Ovr Officer Mr K.R. Rangaswamy Iyengar, who was at Penumudi at once ran to the spot and made a bold attempt to close the breaches by putting in ring bunds and succeeded in doing so by putting in bamboo pales, naval rollers and palmyrah trees, the depth of water on the banks outside the breaches being not less than 4 ft. The Sub Collector inspected the spot on 25th and proposed to levy penal assessment on the lands so irrigated and necessary lists were prepared by the Delta Superintendent.

Works of Restoration

12. ~~Works of Restoration~~. These second floods subsided on the 24th and work of restoration was commenced on the 25th but on account of

of rains, no real work was done
on 25th and 26th. From the 27th forward
steady progress is being made and
I hope to be able to carry water
for irrigation in the 3rd and 4th reaches
in about a week provided rains
do not interrupt the work. But
the closing of breaches and formation
of ring bunds can be fully completed
only by about the end of Septr:

13. Causes of damage. Having dealt with the damages done to the different works I now proceed to look to the causes of these damages. The one general cause which is well known to all is that the floods are higher than the maximum on record. When I found that the flood level below Mortota was generally from 3 to 4 ft: below the top of flood bank and that the bank was overflowed from Kollur to Penumudi I naturally thought that it should be due to the changes in the River bed. I looked over the River charts and found that the width of waters may exclusive Causes of damage.

enclusive of the banks in the head of the rivers varies from 7000 to 10,000 ft above Vellatur, but at Penumudi it is only 4200 ft and lower down opposite Peraklanka it is only 2400 ft exclusive of the Puligadda Arm. The Puligadda arm is silted up at head and although there is water flowing through the arm during high floods the discharge through the Arm will not be equal to the discharge through 500 ft width of the deep river bed. The narrowness of the waterway below Penumudi led to the backing up of the flood waters above Penumudi and hence the banks were overflowed. This is only my conjecture and its correctness can be ascertained after the flood levels are taken. It follows however that the ultimate width of the rivers should be laid down once for all and that the conservancy works should be done to suit this width. Some cross sections have been taken and I have

have ordered some more and when these are received I shall calculate the ultimate width of the rivers and lay down a programme of work to be done.

4. Damage to Villages. The villages of Gudavanam, Bommindipalem, Chilamuru, Vellaturu, Tirumpalem, Pedda Pulivarru, Rani Anantavaram, Penumudi and Kamarajugadda to the east of Bank Canal, and Kollur, Bhattiprolu, Pekeru, Repalli, Ikkapalli, and Surepalli to the west of Bank Canal were under water during the floods. Several houses have fallen down but there has been no loss of life. The people from the bunkers in the bed of the rivers were all brought over on boats; but there has been some loss of cattle and this loss is very little. I have not heard of much loss of stores of grain. Damage to Villages.

15. Fodder for Cattle is very scanty as most of the straw heaps have been drifted away by the floods. People are now getting green leaves of all

all sorts including Tumma Tenni and Rani and some are even stealthily cutting away Rella grass from the bunkers and Government plantations; special arrangements have been made to prevent such stealth of Rella, as the Rella now available is not even enough for carrying on the Plantations during the ensuing working season.

Damage to Crops 16. Damage to Crops. These floods came in just at the time of transplantation. Some lands were then planted and some were ready for transplantation. Both the seed beds and transplanted lands from Kollur 21/0 to Nallur 35/0 were submerged in water for about 20 days and they are either silted up or washed away or rotten and the loss in this way is considerable. Between Kollur and Nallur there are some dry lands of Donapudi and wet lands of Bhattiprolu, Chinapulivarru, Vellaturu and Pedda pulivarru that have not been affected and for these lands as

as much as water as is available is now being supplied. I am closing the breaches without closing the Bank Canal entirely in order to assist cultivation in unaffected lands as much as possible. In the 4th reach of Bank Canal there has not been much damage to crops. Except opposite the breach at Periakankai and opposite the breach in the Right bank at the 46th Mile, the other lands were not affected by the floods. The flood waters flowing through the Canal were utilised for irigation and the lands from 40 to 41½ miles and from 42½ miles to 45 miles have been transplanted and the crops are in good condition. From 35 miles to 40 miles the crops are withering for want of water and I hope to supply water in about 4 or 5 days.

17. Restoration of Cultivation. With regard to the affected lands it is possible to supply water within

Restoration of cultivation.

within a week but neither seedlings nor seeds are available to make a fresh start for cultivation; seedlings as far as available are being purchased and I hear that in one or two places seeds have been sown, but this must bear a very small proportion to the requirements. As the stores of grain would also have been affected by the floods and as it is not possible to get good seeds, most of the affected lands about 20,000 acres as far as I can make out, will be left waste or cultivated dry.

Work done by members of P.W.D.

18. Work done by Members of P.W.D. I do not consider it necessary to go into this subject again as I have already dealt with it in my previous report — Vide my No. 206 dy 21.8.96. I herewith enclose extract from my Inspection notes for the months of August and also Progress Reports of Oneraek K.R. Rangasamy Iyengar, Eastern Sub-Div. Officer, for the periods 1st to 10th & 11th to 20th Augt

Thiruvadi Mdu.

Augt. and 11 other progress reports
of other subordinates.

—

/ True Copy /

Wm. Upshur Manager,

Supy Engr Offr, II Circ.

(Sd) K. L. Rayasamy Iyer
30.8.96. Sub Asst Officer.

/True Copy/

(Sd) L. D. Venkatasamman
Asstt. Engineer in charge
Wadlem Dn Kistna.

/True Copy/

Mr. Upadhyay Manager

Supdg. Engr's Office II Circle

60			L	90	P	
61			R	60	P	
62			R	50	P	
63			R	65	P	
64	8/6		R	60	P	
65			R	32	P	
66	9/0		L	60	P	
67			L	60	P	
68	9/1		R	100	P	
69			R	40	P	
70			R	40	P	
71	9/4		L	70	P	
72			L	220	M	
73			R	550	M	
74			L	100	P	
75	9/5		R	70	P	
76			R	100	P	
77			L	60	P	
78			R	60	P	

waters. The Overseer and Asstt Supt were engaged in cutting branches above aqueduct at suitable places and before they could go lower down the system to cut branches wherever they liked. By a judicious selection of the sites, about 2/3rds of the nos of branches could have been avoided. It is much to be regretted that subordinates were not able to go from place to place quickly and that the villagers had no station to work.

50

40	7/0		L	230	M	
41			R	140	M	
42			R	160	M	
43	7/1		L	60	P	
44	7/2		R	20	P	
45	7/4		R	90	P	
46	7/6		R	53	P	
47			R	80	P	
48			L	90	P	
49			L	50	P	
50			R	120	M	
51			R	150	M	
52	7/7		R	120	M	
53	8/0		R	64	P	
54	8/2		R	60	P	
55			L	70	P	
56			R	60	P	
57	8/3		R	45	P	
58			L	30	P	
59	8/5		L	180	M	

All these branches were more or less cut on purpose by the Villagers of Sajjanapalem - Pallapalla and Lekapalli as these villages were submerged in about 3 or 4 ft of

149

23			R		100	P				
24				L	200	M				
25	5/6		R		120	M				
26				L	120	M				
27	5/7		R		50	P				
28			R		350	M				
29				L	174	M				
30	6/0		R		32	P				
31				L	16	P				
32	6/2			L	200	M				
33	"		R		200	M				
34			R		100	P				
35	6/6		R		90	P				
36			R		180	M				
37	6/7		R		150	M				
38			R		150	M				
39			R		50	P				

5	3/5		R		80	P	Artificial	Made by the engineer		To replace Repalle & Peteru
6				L	80	P	do			
7	3/6	Anantharavaram	R		600	M	do	do		
8				L	500	M	do			
9	4/1	Above aqueduct	R		400	M	do	do.	So Sam aqueduct	
10				L	400	M	do			
11	4/5			L	250	M				
12			R		250	M				
13	5/2			L	160	M				
14			R		60	P				
15			R		120	M				
16			R		60	P				
17				L	190	M				
18			R		60	P				
19	5/2			L	70	P				
20				L	164	M				
21	5/3		R		60	P				
22	5/5		R		100	P				

29	34/7	Chattagadda	R		30	P	Artificial	Made by Overseer
30	42/0	Near Peratlanka	R		165	M	do	Made by Tahsildar Kumarakulam
31		Head of No 6. Channel	R		15	P		
32	42/5	Ramp of Peratlanka	R		40	P		
33	42/7	Above 43/0	R		15	P		Due to safe left in the New flood bank formed last year.
34		Below 43/2	R		12	P		
35		do	R		6	P		
36	45/3	Below Adimisfalam	R		30	P		

46

Vaipalli Channel.

1	1/3		R		150	M	Artificial	Made by the Dy: Tahsildar with the permission of the Overseer and Delta Superintendent.
2				L	150	M	do	
3	2/4	Near Ithpundi donka	R		600	M	do	Made by the Dy: Tahsildar on his own responsibility.
4				L	500	M	do	

11	31/0	At Valiyu	R		40	P		
12	31/4	Valiyu Road ferry	R		150	M		
13	31/6	Below do	R		100	M		
14		do	R		140	M		
15	32/2	Near Thurupalam	R		300	M	Artificial	
16		Anantavaram	R		300	M	do	
17	32/7	Above Repalle Sluice		L	66	P		
18		do	R		250	P		
19				L	185	M		
20		Opposite to Repalle Sluice		L	170	M		Bank half cut away
21	33/0			L	95	M		do
22	31/1	Below Repalle Sluice		L	85	M		
23					180	M	Artificial	Made by Overseer
24	33/2			L	40	M		
25	33/6	Above Syphon Sluice		L	63	P	Natural	
26		Below do		L	190	M		
27			R		160	M		
28	33/7			L	80	P	do	

45

22		do		70	M	do	Due to gaps left by Contractor Punnavandam in forming flood bank.
23		do		240	P	do	
24		Gollapalem ramp		180	M	do	

Bank Canal
Right bank.

44

1	20/6 to 21/1	Opposite to Kollur Village	R	1850	P	Natural	Scours here & there not very serious.
2	23/6	Yelagalagunday	R	350	M	do	Bank washed away in 6 Scours. Scours considerable and about 20 ft
3	27/0		R	150	P	do	
4	27/6	Near Peddapulivarru	R	270	M		The Vellatur Side Channel bank too has been washed away at three places.
5	27/7	do	R	50	P		
6	28/0	do	R	400	M		
7	28/3	do	R	350	M		
8	28/6		R	30	P		
9	29/1	Near Garigapudi	R	150	P		do do do
10	30/1	Near Pagajjeru	R	30	P		
				30	P.		

Krishna Right Flood Bank.

1	20/6 to 21/0	Opposite to Kollur Village	100	M	Natural	
2	-	" "	500	M	do	
3	-	" "	100	P	do	
4	22/5	Yalagalagunday	320	M	do	
5	27/4	Near Pedapulivarru	820	M	Artificial	Made by Pedapulivarru Villagers to get relief to their village
6	28/0		200	M	do	
7	28/3		320	M	do	

22		do		70	M	do		Due to gaps left by Contractor Punnavandam in forming flood bank.
23		do		240	P	do		
24		Gollapalem ramp		180	M	do		

Right Bank (Penna)

44

1	20/6 & 21/1	Opposite to Kollur Village	R	1850	P	Natural	Seems low & there not very serious.
2	22/6	Yelagalagundy	R	350	M	do	Bank washed away into Seam. Seems considerable and about 20 ft
3	27/0		R	150	P	do	
4	27/6	Near Peddapulivarru	R	270	M		The Vellatur Side Channel bank too has been washed away at these places.
5	27/7	do	R	50	P		
6	28/0	do	R	400	M		
7	28/3	do	R	350	M		
8	28/6		R	30	P		
9	29/1	Near Garigapondi	R	150	P		do do do
10	30/1	Near Jagajjeru	R	30	P		
				30	P.		

Kistna's Right Flood Bank.

1	20/6 & 21/0	Opposite to Kollur Village	100	M	Natural	
2	-	do	500	M	do	
3	-	do	100	P	do	
4	22/5	Yalagalagundy	320	M	do	
5	27/4	Near Pedapulivarru	320	M	Artificial	Made by Pedapulivarru Villagers to get relief to their village
6	28/0		200	M	do	
7	28/3		320	M	do	

22		do		70	M	do	Due to gaps left by Contractor Punnavandam in forming flood bank.
23		do		240	P	do	
24		Gollapalem ramp		180	M	do	

Right Bank Penna
(Right bank.

44

1	20/6 & 21/1	Opposite to Kollur Village	R	1850	P	Natural Seems low & there not many serious.
2	23/0	Yelagalagumdy	R	350	M	do Bank washed away in 6 Seems Considerable and about 20 ft
3	27/0		R	150	P	do
4	27/4	Near Peddapulivarru	R	270	M	The Villakum Side Channel
5	27/7	do	R	50	P	bank too has been washed away at these places.
6	28/0	do	R	400	M	
7	29/3	do	R	350	M	
8	28/6		R	30	P	
9	29/1	Near Garigapudi	R	150	P	do do do
10	30/1	Near Jagajjeru	R	30	P	
				30	P.	

Kistna Right Flood bank.

1	20/6 & 21/0	Opposite to Kollur Village		100	M	Natural
2	-	" "		500	M	do
3	-	" "		100	P	do
4	22/5	Yalagalagumdy		320	M	do
5	27/4	Near Pedapulivarru		320	M	Artificial Made by Pedapulivarru
6	28/0			200	M	do Villagers to get relief to their village
7	28/3			320	M	do

FOR INFORMATION
ONLY
13.7.10

Statement of Breaches in Krishna Right flood bank and the Bank Canal of western delta caused by the extraordinary flood of 1896 in Krishna River.

Aug 6.23
4531/97

FOR INFORMATION
ACCESS
No. 7775

Statement of Breaches
in Krishna Right flood
bank and the Bank
Canal of western
delta caused by the
extraordinary flood of
1896 in Krishna River.

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