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CONCERNS BOTH BRITISH INDIA
AND INDIAN STATES.

MADRAS RECORD OFFICE.

Government of Madras.

PUBLIC WORKS DEPARTMENT.

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Dated 30-8-	1865.

Not to be folded or roughly handled

No 559.

Superintending Engineer's Office
1st Division
Wattair. 1st July 1865.

From Captain J. G. Ryves R.E.
Superintending Engineer 1st Div.

To Colonel C. A. Orr R.E.
Secretary to Government P.W.D.

Sir Madras.

I have the honor to submit the estimates for the works proposed in my letter No 1051 dated 20th Jan^y last of which the general arrangement and principles of design met with the approval of Government in Proceedings No 484 dated 18th February 1865.

2 The delay which has occurred in the submission of these documents requires explanation, it is due: (1) to my wishing to examine the sites of some of the proposed works again before preparing the detailed plans and estimates, this I did in March last immediately after my return from Ganjam. (2) to the self acting shutters (which I propose for some of the outlets) requiring much consideration and a good deal of calculation before

before deciding on the plan to be adopted: and
(3) the large number of separate plans, estimates,
and specifications to be prepared: these I may
say have been very carefully considered and
prepared: it must be remembered that Draftsmen
of the Public Works Department can not
draw from a specification and rough sketch,
an accurately drawn copy to scale with every
detail that the fair copy is to show has to be
furnished them, and in anything at all out
of the common, several failures may be ex-
pected before a drawing fit to submit to
Government is obtained.

3 The works, for which detailed Plans and
estimates are now submitted, are twenty five in
number; eleven of which are inlet openings
through the bank on the upper side of the Canal,
eight are escapes on the opposite side, and four
are sub-passages: the remaining two are the
conversion of the Ellore Aqueduct across the
Toomolair into an inlet and outlet, and a
rough regulating work at the Bifurcation of
the Toomolair.

4 The positions of these works are marked
in the accompanying sketch map by red letters
which

which are the same as those marked on the
respective estimates and drawings. The existing
works for cross drainage are also marked in
their proper places.

5 I have included in this sketch map the
area of Country of which the drainage is inter-
cepted by the Canal - this may, as I have done
on the map, be divided into six catchment
basins. These, with the proposed and
existing works for passing the drainage
from each across the canal, I describe in the
following paragraphs.

6 First (commencing at the right hand),
the narrow triangular tract of country between
the Yerra Kalva watershed and the first
eighteen miles of canal with an area of only
some 60 sq. miles and a flat absorbent surface.

The canal here is not liable to damage, it is
well within soil and its upper bank so strong
and high that flood water would escape
over the watershed into the Yerra Kalva before
it would be topped or breached - but for the
sake of the country above I have deemed it
proper to allow four small intets and one 16 yard
low level outlet, in addition to the three small
under tunnels already provided for this
section. —

7 Next come the two catchment basins above Rykaram and Bheemadole where so much damage was done last November; the difficulty here is that, although there are two well defined hollows on the line of the Canal, a breach in a tank higher up may turn half of what ought to be Rykaram drainage into the Bheemadole hollow or vice versa. For each of these sections the estimates now submitted provide an under tunnel of 250 square feet. At the 20th mile near Rykaram I propose also to construct an inlet 32 yards long with crest 3 feet above the Canal bed and self acting shutters, there is already a 20 yard escape in the opposite bank.

8 There ought to be two sub-passages of the above waterway in the Bheemadole hollow: but the amount of the sanction will not cover the cost without reducing to a very small sum the share allowed for irrigation sluices and Rajbaras. I have therefore not included it in my revised estimate; nevertheless I recommend that the second additional under tunnel for the Bheemadole hollow be built and that the ^{funds for extension of} irrigation be provided

provided for separately.

9 The works in the Rykaram section will discharge 600,000 cubic yards per hour, and the one under tunnel in the Bheemadole section 350,000, that is about 8,000 and 4,800 cubic yards per hour per square mile respectively. I believe the discharge might be at a greater rate, i.e. the flood level higher than that taken for my calculation of discharges, without damage to the Canal: the figures above are the discharges without risk. If the second under tunnel for the Bheemadole hollow recommended above be built, that section would be relieved of flood water at the rate of 9,500 Cubic yards per hour per square mile.

10 The fourth is what I will call the Dendaloor drainage, this has a catchment area of 175 square miles and crosses the Canal at several points between the 28th and 35th mile (measured from Mandamoor Aqueduct). there is no well defined stream of any capacity: the water in floods stands all over the flat plain at the back of the Canal.

The additional works provided for this section are two high level escapes each 50 yards long with their corresponding Intakes each 32 yards in

in length; and an under tunnel of 150 square feet waterway: these, with the two under tunnels, one of 60 sq. ft. the other 90 sq. ft. we have there already, will give us a discharging power (water surface being not more than $\frac{1}{2}$ above the Canal bed) of about 875,000 Cubic yards per hour or 5000 per square mile.

11 This is barely sufficient. It would probably be enough to prevent damage to the Canal but the country above would I fear be flooded more than it ought to be.

12 The next is the Soomoolair drainage with a catchment area of about 450 square miles: at about six miles above the Canal this Torrent ceases to be a drainage, and from that point flows on a deltaic ridge, whence after heavy rains its flood water inundates the country from Sindaloor on the east to Gogulipad on the west. The stream bifurcates at about 3 miles above the Canal the east branch striking the line of Canal immediately above the site of the Lock and the west branch crossing the Canal three miles west of this on the other side of the Town of Ellore. —

The

13 The existing works in this section are the Aqueduct for the main stream and two small under tunnels for the inundation water: These proved to be utterly inadequate to carry off the flood of last November. what I propose and under the sanction granted in S. O. No. 484 dated 18 February 1865 and carrying out is as follows

- (1) To convert the Aqueduct into an inlet and outlet by lowering its side walls and piercing its down stream wall with sand sluices.
- (2) To pierce the bund at the bifurcation across the head of the eastern branch of the Soomoolair and allow the stream to flow down both branches, the discharge into each being regulated by a dividing dam of rough stone.
- (3) At the point where the eastern branch is blocked up by the Canal, to construct a larger inlet (96 yards long sill $2\frac{3}{4}$ feet above Canal bed) and outlet (64 yards long sill $1\frac{3}{4}$ feet above Canal bed) with self acting shutters: part of the water flowing in by the inlet will escape by the 20 yard high level outlet already constructed at this point.

point.

(4) For the inundation water I propose to have on the east or Dendaloor side a 48 yard low level escape with its opposite inlet and on the Kistina side an under tunnel of 166 $\frac{2}{3}$ sq. ft. waterway

14 - The works in the direct course of the stream will discharge at a safe level about two millions cubic yards per hour, and these to relieve the country of the inundation water about a million more, or in all three million cubic yards per hour; which I believe is about what comes down the Soomoolair after unusually heavy rain.

15 - For the impossible floods which happen once every ten or twelve years, I propose to leave a hundred yards of bank on both sides of the Canal comparatively low and weak, which, with a little assistance from half a dozen munitories would give way before such a flood, the ends of these low bits to be guarded by rough stone wings. The Canal here is well within soil and the Soomoolair bed is about four feet higher than its bed, there would therefore be no risk of damage.

⊕ opposite the old bed of Soomoolair west branch is about 150 yards west of the Aqueduct.

damage, but there would of course be a large deposit of sand and silt which we must put up with, happening as it would only every ten or twelve years.

15. I have not noticed the little triangular spaces of about 25 sq. miles each on either side of the British portion of the Soomoolair, the drainage from these, crosses the Canal at the same places as the Soomoolair inundation water and will pass away with it through the same works.

16. The last section is that across which the Ramilair drainage passes, at present there are here two under tunnels one of 90 the other of 60 sq. feet. I have provided two outlets with their opposite inlets, near Pooncole an inlet of 24 and outlet of 16 yds both low level with self acting shutters, and near the Ramilair under tunnel an inlet of 48 yards and outlet of 80 yards. the crown of the latter at the ordinary Canal water level. These with the existing tunnels will discharge between 8 and 900,000 cubic yards per hour or about 6500 cubic yards per

per hour per square mile, which I think will be found sufficient.

17 Besides the escapes and sub-passages for drainage in the Canal itself, measures ought to be taken for preventing, as far as possible, the unmanageable floods caused by breaches in tanks above the Canal; by putting these bunds into good order and constructing for each a calingulah of sufficient length and with its crest at the proper level.

18 The upper part of the Sornoolair valley is in the Hyderabad Territory and the greater part of the Ramelair valley belongs to the Hooped Zemindar; I believe that many of the tanks in these tracts as well as of those in our own limits, are in bad order and that very few of them are provided with proper escape calingulas.

The consequence is that they breach just when a flood is at its worst and the accumulated water comes down upon the Canal just at the time when its escapes for cross drainage are already tried to their

utmost

utmost.

19 As far as the means at my disposal will admit I will have the tanks in my limits put into proper order, I will also request the Superintending Engineer 2^d Division to do what he can in the Ramelair valley, and I beg to submit for the consideration of Government the advisability of addressing the Hyderabad authorities on the subject of the tanks in the upper part of the Sornoolair valley within their limits.

20 The particulars detailed in paras 6 to 16 I have arranged in a tabular form; for easy reference and use with the sketch this table is on a separate sheet.

The capacity for discharge of all the existing works is by this table shown to be rather more than one million cubic yards per hour of which about half is for the Sornoolair drainage; the proposed works will bring the total discharging power up to six millions of which three millions is for the Sornoolair.

This is

21 This is in the main the same as what I proposed last January: the principal difference is in ⁽¹⁾the increased size of the escapes for the east Soomoolair, which I have about doubled; ⁽²⁾the omission of the additional inlet and outlet for the west Soomoolair ordinary floods; and ⁽³⁾the number of inlets and outlets on the Kistna side which I have reduced, substituting an under tunnel for the large inlet and escape I originally proposed at the XXXV mile on that side: In consequence of the obstruction caused by the Aequeduct across the western branch of the Soomoolair I propose to construct the dividing dam at the bifurcation so that $\frac{3}{5}$ of the stream will flow down the eastern branch and not more than $\frac{2}{5}$ down the western; the above alterations in my scheme are intended to meet this altered state of things

22 The cost of these works will according to the detailed estimates be 88000 Rupees which is very nearly the amount stated in my previous report: the following

following is the re-distribution of the sums sanctioned by the Government of India on the 22nd October and 1st Nov^r 1864 amounting together to Rupees 110,284 compared with the distribution in the original estimate. —

66132
35767
12411
15769
110284
8. 11. 11. 11. 11.

	Original	Now Submitted	Incl: the add ^d Tunnel mile per 8.
Masonry and Tail. Races for Croon Drainage	79,150	88,000	102,000
Strengthening Banks	7,370	2,000	2,000
Totals {	15,240	10,000	2,000
	85,240	10,284	4,284
	110,284	110,284	110,284
	110,342		

The estimate now submitted, the totals of which, under the heads drainage and irrigation, are shown in the 2^d column of the above, will leave a sufficient sum for Irrigation to the full extent provided for in the original estimate; but if the second additional tunnel for the Bheemadole hollow be built, as recommended in para 8 supra there will, as shown in the 3^d column, be left for irrigation only some 6,000 Rupees, which will probably be enough for constructing sluices and cutting channels for existing irrigation, leaving however nothing

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Sluices	15,240	10,000	2,000
Rajbukas	85,24	10,284	4,284
	110,284	110,284	110,284
	110,342		

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nothing for its extension.

23 The works proposed are of five kinds.
The High level Inlet, which I adopt when x B.C.D.H.M.W.
the Canal is more than 3 feet in soil, the
Low level Inlet with self acting shutters, for o P.V.
cases where the Canal bed is less than 3 feet
below the ground (it will be observed that
there is in each case an under tunnel near
by which leakage water will be carried away)
the High level escape the principal adv. * K.Z.
bantage of which is that it does not require
a bridge. The Low level escape with self s E.N.R.
acting shutters which gives great discharging
power with a moderate length of Crest but
which requires bridging for the convenience
of towing Coolies and the ordinary traffic
along the Canal banks. And the Under
tunnel where the canal crosses streams, or o F.G.L.U.
drainage receiving hollows, at a level which
precludes the adoption of the cheaper and
better methods above specified.

24 I have appended a Memo to the
self acting shutters Specification with
diagrams to explain its action. I think
it will answer well.

25 There remains to be considered the
bridging the Low level outlets. towing coolies
could pass along their crests but the water would
be up to their waists or if they passed by the
rear there would be risk of the tow rope foul-
ing the shutter. It happens however that the
64 yard and 48 yard escapes are the former
quite close and the latter not far from the
Ellore Lock and where the canal has no
current. in the former case indeed the
towing party would take care to be on the
opposite bank of the canal and in the
latter they would be taken on board and
the boat poled across to the other side
without risk. the same thing could be done
at the two smaller escapes.

26. Of course when the escapes are discharging
the tow rope must be on the opposite side
whether the escapes are bridged or not.

Yours truly,

Sir.

Your most obedient

H. J. Z. M. A. R.
Sup. Insp. 1st Div.

Drainage Name	Sq. Miles	Existing Works	Proposed Works	Additional discharge by proposed works	Total discharge	Acres	Drainage in Sq. Miles	Sq. Miles	Drainage in Sq. Miles
Commencing from Nundamoor Aqueduct.									
I. Escape 8 1/2 (0').									
I									
XVIII	60	XII. U. Tunnel. 30 sq. ft.	IV Inlet. 12 1/2 (+ 5 1/2)	380,000	1,20,000	7,000			
		XIV Escape 139 (+ 3)	VI do - do (+ 5 1/2)						
		XV 1/2 U. Tunnel 30 sq. ft.	VIII do - 16 (+ 5)						
		XVII U - do. 30 sq. ft.	XVI do - 24 (+ 4 1/4) outlet. 16 (+ 2 1/2)						
XXIV	75	XXI 1/2 Escape 20 1/2 (+ 3)	XX Inlet. 32 1/2 (+ 3 ft)	550,000	650,000	8,800			
		XXII U. Tunnel 90 sq. ft.	XXI U. Tunnel 250 sq. ft.						
XXV	75	XXV 1/2 Escape 13 1/2 (+ 3)	XXVI 1/2 U. Tunnel 250 sq. ft.	350,000	350,000	4,800			
XXXV	175	XXIX 1/2 U. Tunnel 60 sq. ft.	XXVIII Inlet. 32 1/2 (+ 4 1/2) Outlet. 50 1/2 (+ 5)	800,000	866,000	5,000			
			XXXI { do - do do - do						
			XXXIV U. Tunnel 150 sq. ft.						
XXXV	450	XXXV U. Tunnel 90 sq. ft.	XXXV { Inlet. 64 1/2 (+ 4) Outlet. 48 1/2 (+ 1 1/2)	750,000	2,050,000	4,800			
		XXXVII Escape 13 1/2 (+ 3)	XXXVIII Inlet. 32 1/2 (+ 4)						
		Ellore Lock.							
XXXIX	450	XXXIX Escape 20 1/2 (+ 4 1/2)	XXXIX { Inlet. 96 1/2 (+ 2 1/2) Outlet. 64 1/2 (+ 1 1/2)	1,500,000					
		XXXVII U. Tunnel 30 sq. ft.	Bifurcation Dam.						
		XXXVII Aqueduct	XXXVI Aqueduct alteration						
XXXII	130	XXXII U. Tunnel. 60 sq. ft.	XXXV U. Tunnel. 166 2/3 sq. ft.	225,000	850,000	6,500			
		XXXIX U. Tunnel 60 sq. ft.	XXXI { Inlet. 24 1/2 (+ 2 1/2) Outlet. 16 1/2 (+ 1 1/2)						
XXXVII		XXXVII do - 90 sq. ft.	XXXVII { Inlet. 48 1/2 (+ 3 1/2) Outlet. 80 1/2 (+ 4 1/4)	650,000					

17

W. J. ... Captain R. C.
Superintending Engineer 1st Division

Abstract of Estimates of Ellore High Level Canal.

Number of works +1	Letters marked on the Plans +1	Description of Works.	Amount of each Work.	Total	Grand Total.
		<u>High Level Inlets</u>			
1	A	Escape			1600
2	B	Inlet 12 yards at	250	500	
1	C	" " D ^o = 16 yards at		300	
1	D	" " D ^o = 24 yards at		400	
3	E	" " D ^o = 32 yards at	500	1500	
1	M	" " D ^o = 64 yards at		840	
1	IV	" " D ^o = 48 yards at		720	4260
		<u>High Level Outlets</u>			
2	K	Outlet 50 yards at	1500	3000	
1	L	" " D ^o = 80 yards at		2500	5500
		<u>Low level Inlets</u>			
1	P	Inlet 96 yards at		5500	
1	Q	" " D ^o = 32 yards at		1250	
1	V	" " D ^o = 24 yards at		960	5740
		<u>Low level Outlets</u>			
2	E	Outlet 16 yards at	2200	4400	
1	N	" " D ^o = 48 yards at		5500	
1	R	" " D ^o = 64 yards at		7200	17,100
		<u>Sub-passages</u>			
1	F	Sub passage at Pykrum at		14500	
1	G	" " D ^o = at Bheemadole at		13500	
+1	U	" " D ^o = at Dindaloor		10000	X
1	U	" " D ^o = at Krishna		10000	48000
1	S	alterations to aqueduct			1000
1	T	Dividing Dam at Bifurcation			X 1000
		Loam/oolair Pavements			X 300
		Contingencies			X 3500

Total Estimate Rs - 88,000

Supl Engineer's Office 17th
Waltair
1st Feb 1865

V. I. [Signature] Cap. R. E. [Signature]
1st Feb 1865

Asst. Secy to Govt

Asst. Secy to Govt
17th Feb 1865

Asst. Secy to Govt

Asst. Secy to Govt

Asst. Secy to Govt

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Asst. Secy to Govt

Asst. Secy to Govt

Asst. Secy to Govt

Asst. Secy to Govt

Asst. Secy to Govt

Sim. 30" depth 1/2" 1841/20.
#2519.

Abstract of Account
of More High Level
Canal. —
Expended 88,000.

ppp 2911/65.

^B
Details of Inlet 12 yards (without shutters)

No.	Measurements			Particulars of Work	Quantities
	Length	Breadth	Depth		
10	7	1	1 1/4	Retaining Wall	14 5/8
12	6	5	5/8	Apron behind	45
9	4	5	5/8	— do. at ends of Wings	22 1/2
2	0	7	2	Wings on ends of Apron	20
2	3	1/2	3/4	On ends of Retaining Wall	2 1/4
2	0	2	-	Pointing Wings	32
10	0	2 1/4	-	Excavating and removing banks and trench for retaining Wall	32 1/4

32 1/4 89 3/8 20 32

Abstract

25

Quantities Particulars of Work. Rate Per Amount.

29-³/₈ Cysd Rough stone in apron and Retain-
ing Wall — } 1 ³/₄ Cysd 155 ..
20 — D^o — D^o — Wings — 2 D^o 56 ..
32 — 40 yards Pointing Wings — 1/2 40 8 ..
326 Cysd Excavating and banking — 1/10 Cysd 18 ..
Balancing and levelling foundations — 6 ..
Surfing and trimming banks &c — 7 ..

Total Surplus — 250 ..

Sup^r Engineer's Office
Waltair
1st July 1865

V. L. Z. — Captain
Sup^r Engineer — H. N.

From 30 Aug 64 to 31 Aug 65

977 2911/05

Inlet 12 yards
(without shutters)
Estimate. Value 250.

B

C.
Details of Inlet 16 yards (without shutters)

measur- ments			Particulars of Work	Quantities
No	Length	Breadth		
22	$\frac{7}{8}$	$1\frac{1}{4}$	Retaining wall	$24\frac{7}{16}$
16	6	$\frac{5}{8}$	Apron behind	50
9	4	$\frac{5}{8}$	Do at ends of Wings	$22\frac{1}{2}$
2	8	$\frac{7}{8}$	Wings on ends of apron	20
2	3	$\frac{1}{2}$	On ends of Retaining Wall	$2\frac{1}{4}$
2	8	2	Joining Wings	32
22	8	$2\frac{1}{4}$	Excavating and removing bank and trench for retaining Wall	396

396 $100\frac{13}{16}$ 20 32

Abstract

21

Quantities	Particulars	Rate	Per amount
108 ¹³ / ₁₆	Cyds Rough stone in apron and Retaining Wall	1 ³ / ₄ Cys	190.69
28	No. 20 Wings	2 No.	56
32	Spryds Pointing Wings	¹ / ₄ Spryds	8
396	Cyds Excavating and banking	¹ / ₁₀ Cys	22
	Baling and leveling foundation		11
	Graveling and trimming banks for		12 9 8

Total Papers ——— 300 ———

Sup. Engineer's Office 17th No.
Wallace
1st July 1865

W. L. Z. ——— Captain R. S.
Sup. Engineer 1st Jn.

297/165

Inlet 16 yards
(without shutters)
Estimate Rs. 300 - 0.0

C.

D.

a)

Detail of D. Inlet 24 yards (without shutters) Godavery IV,
VIII, XI, XIV and XXXII. —————

Measurements			Particulars of Work.	Quantities.
No.	Length	Height		
30	$\frac{7}{8}$	$1\frac{1}{4}$	Retaining wall	$32\frac{13}{16}$
24	6	$\frac{5}{8}$	Apron behind	90
9	4	$\frac{5}{8}$	D ^o at ends of Wings	$22\frac{1}{2}$
2	8	$\frac{7}{8}$	Wings on ends of Apron	20
2	3	$\frac{1}{2}$	on ends of Retaining Wall	$2\frac{1}{4}$
2	8	2	Pointing Wings	32
30	8	$2\frac{1}{4}$	Excavating and removing bank and trench for retaining wall.	540
				<u>570 14$\frac{7}{16}$ 20 32</u>

Details of H Inlet 32 yards (without shutters)
Godavery XXXVII and Ramilair.

40	$\frac{7}{8}$	$1\frac{1}{4}$	Retaining Wall	$43\frac{3}{4}$
32	6	$\frac{5}{8}$	Apron	120
9	4	$\frac{5}{8}$	D ^o at ends of Wings	$22\frac{1}{2}$
2	4	$\frac{5}{8}$	on ends of Retaining Wall	5
2	8	$\frac{7}{8}$	Wings on sides of Apron	20
2	8	2	Pointing wings	32
40	8	$2\frac{1}{4}$	Excavating and removing bank and trench for retaining wall	720
				<u>720 19$\frac{1}{4}$ 20 32</u>

Copy Inlets
Details of M Inlet 64 yards (without shutters) Godavery XXXVI.

72	$\frac{7}{8}$	$1\frac{1}{4}$	Retaining wall	$78\frac{3}{4}$
64	6	$\frac{5}{8}$	Apron	240
				Carried over $318\frac{3}{4}$

Brought over .. 310 $\frac{3}{4}$ "

9	4	$\frac{5}{8}$	Apron at ends of Wings	22 $\frac{1}{2}$	
2	8	$\frac{7}{8}$	Wings on sides of Apron	20	
2	4	$\frac{5}{8}$	on ends of Retaining Wall	5	
2	8	2	Pointing Wings	32	
72	8	$3\frac{1}{4}$	Excavating and removing banks and trench for retaining Wall	1296	
				1296	346 $\frac{1}{4}$ 20 32.

Abstract of D. Inlet.

Quantities	Particulars of Work	Rate per cumb.
147 $\frac{9}{16}$	Cyds Rough stone in apron and retaining Wall	1 $\frac{3}{4}$ Cys 258 3 9
20	Do Do wings	at 2 Do 56 "
32	Sq yds Pointing Do	at $\frac{1}{4}$ Sq yd 8 "
340	Cyds Excavating and banking	at $\frac{1}{10}$ Cys 30 "
	Baling	25 "
	Surfing and trimming banks &c	22 12 3
		Total Purses — 400 "

Abstract of H Inlet.

191 $\frac{1}{4}$	Cyds Rough stone in apron and retaining Wall	1 $\frac{3}{4}$ Cys 334 11 "
20	Do Do wings	2 Do 56 "
32	Sq yds Pointing Do	$\frac{1}{4}$ Sq yd 8 "
720	Cyds Excavating and banking	$\frac{1}{10}$ Cys 40 "
	Baling and levelling foundations	35 "
	Surfing and trimming banks &c	26 5 "
		Total Purses — 500 "

Abstract of M Inlet.

346 $\frac{1}{4}$	Cyds Rough stone in apron and retaining Wall	1 $\frac{3}{4}$ Cys 605 15 "
20	Do Do in Wings	2 Do 56 "
32	Sq yds Pointing Wings	$\frac{1}{4}$ Sq yd 8 "
1296	Cyds Excavating and banking	$\frac{1}{10}$ Cys 72 "
	Baling and levelling foundations	60 "
	Surfing and trimming banks &c	38 1 "
		Total Purses — 840 "

Supl. Ingrs Office 1st Div.
1st July, Wallait
1865.

W. J. ... Cap. R. E.
Supl. Engineer 1st Div.

^K
Details of Out let 10 yards (with shutters) Godavery
I and VIII.

No.	Measurements			Particulars of Work.	Quantities
	Length	Breadth	Depth		
2	$6\frac{1}{2}$	2	$\frac{1}{4}$	Concrete foundation of front Wings	$6\frac{1}{2}$
	$20\frac{1}{4}$	6	$\frac{1}{4}$	D ^o . under floor between front and rear retaining Walls	$30\frac{3}{8}$
2	5	$3\frac{1}{4}$	$\frac{1}{4}$	D ^o . " of sluice and its wall	$8\frac{1}{8}$
	$18\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{4}$	Front retaining Wall	$11\frac{2}{16}$
	16	$\frac{1}{2}$	$1\frac{1}{4}$	Rear retaining Wall	10
	19	6	$\frac{1}{2}$	Floor between Retaining Walls	57
2	5	3	$\frac{1}{2}$	D ^o . of Sluice	15
	$\frac{7}{8}$	$1\frac{3}{8}$	$1\frac{1}{4}$	Front Buttripes	up to Canal bed $19\frac{3}{8}$
	$5\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	D ^o . Wings	
2	$\frac{3}{4}$	$1\frac{1}{8}$	$2\frac{3}{4}$	Front Buttripes	above Canal bed $4\frac{5}{8}$
	5	$\frac{3}{4}$	$2\frac{3}{4}$	D ^o . Wings	
	$21\frac{1}{2}$	$1\frac{3}{4}$	1	Body wall including ends under steps and Buttripes	$37\frac{5}{10}$
2	$\frac{3}{4}$	$\frac{5}{8}$	2	Steps	On each of D ^o . $5\frac{1}{2}$
	$\frac{3}{4}$	$1\frac{1}{8}$	$2\frac{1}{8}$	Buttripes	
2	$1\frac{1}{4}$	$\frac{3}{4}$	$2\frac{7}{8}$	Side wings in rear	$21\frac{1}{8}$
	4	$\frac{3}{4}$	$2\frac{5}{8}$		
	6	$\frac{3}{4}$	$\frac{3}{4}$	Side Walls	$6\frac{3}{4}$
	3	$2\frac{1}{2}$	$\frac{3}{8}$	Arch across	
2	$2\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{4}$	Rear face wall	$3\frac{5}{8}$
	$4\frac{1}{2}$	$\frac{9}{16}$	$1\frac{1}{2}$	Rear wings	$7\frac{19}{32}$
2	$\frac{10}{8}$	$\frac{5}{8}$	$\frac{1}{4}$	on wings and side walls	$2\frac{5}{8}$
	$1\frac{1}{2}$	$1\frac{1}{8}$	$\frac{1}{4}$	on Buttripes	

D. Out let 24 yards (without shutters) Godavery IV, VII, XI, XIV and XXXII. —
 Estimate Rupees 400.
 H. Out let 32 yards (without shutters) Godavery XXXVII. and XXXVIII.
 Estimate Rs 500.
 M. Out let 64 yards (without shutters) Godavery XXXVI. Estimate Rs 400.

C. 11. 27. 1/10

Abstract

7

12	0	$\frac{5}{8}$	Packed stone near Aphon	60
15	1	$1\frac{1}{2}$	side Restments Rear	$22\frac{1}{2}$
12	$1\frac{1}{2}$	$2\frac{1}{4}$	D° D° front	$30\frac{3}{8}$
				$53\frac{5}{20}$

Reduct for cut stone in body wall 7

$45 \quad 174\frac{5}{32} \quad 46\frac{5}{20} \quad 2\frac{5}{8} \quad 112\frac{7}{8}$

Quantities	Particulars of Work	Rate Per amount
45	Cyds Concrete work	$2\frac{3}{4}$ Cyl 123 12
$174\frac{5}{32}$	D° Rough stone in Chumam, or Cyclopean work	$3\frac{3}{4}$ D° 653 14
$46\frac{5}{20}$	D° D° with face joints dropped and filled close	$4\frac{3}{4}$ D° 219 11
$2\frac{5}{8}$	D° Cut stone work	0 D° 21
7	D° Crest and bond stones (Vide Details)	84
60	D° Packed stone Aphon	$1\frac{3}{4}$ D° 105
$52\frac{7}{8}$	D° D° Restments	2 D° 105 12
48	Running feet of Shutters	$7\frac{1}{2}$ Off 360
	Fixing and setting up	36
	Embanking, Excavation and Banks	80
	Walings	80
	Trimming and Turfing banks &c	31 11-8

Sail Race $800 \times \left\{ \frac{12 \times 1}{0 \times \frac{1}{4}} \right\} =$ 300

Total Purses 2200

Supl Engineer's Office
Wallaat
1st July 1865

W. J. ... Captain R. E.
Supl Engineer 1st Division

Details of Flyharum under Tunnel. Five Piers.

Measurements			Particulars of Work.	Quantities
No.	Length	Breadth		
2	27 $\frac{5}{8}$	1 $\frac{1}{2}$	Rough stone Chumam Retaining walls front & Rear	50 $\frac{5}{8}$
	32 $\frac{1}{2}$	27 $\frac{1}{4}$	Concrete bed between the above	219 $\frac{3}{8}$
	10	2 $\frac{1}{4}$	D ^o under ends of wings and Buttrises	5 $\frac{5}{8}$
	4 $\frac{1}{2}$	25 $\frac{1}{2}$	Floor Front	57 $\frac{3}{8}$
	20	22 $\frac{1}{4}$	D ^o under the Inverts	166 $\frac{7}{8}$
	8	25 $\frac{1}{2}$	D ^o Rear	102
	21	1 $\frac{1}{2}$	Abutments up to ground	141 $\frac{3}{4}$
2	20	7 $\frac{3}{4}$	D ^o above	30
5	20	4 $\frac{1}{4}$	Inverts and sharp backs } Dupet stone	521 $\frac{7}{8}$
	20	5 $\frac{1}{2}$	Arches	
2	6	1 $\frac{1}{8}$	Front } Wings to under passage	64 $\frac{1}{8}$
	8	1 $\frac{1}{16}$	Rear } wide Plan and section	72 $\frac{1}{4}$
4	8	1 $\frac{1}{8}$	Wings to Canal	171
	8	1	Buttrises to Wings	36
10	1 $\frac{1}{2}$	1	D ^o abutments	15
12	2	1	Arches over spaces between the buttrises to abutments	9
	20	22 $\frac{1}{4}$	Backing to Tunnel Arches	250 $\frac{7}{16}$
2	24 $\frac{1}{4}$	1 $\frac{1}{8}$	Acqueduct side Walls	150
12	7 $\frac{1}{16}$	1 $\frac{1}{2}$	Piers for foot bridge	67 $\frac{1}{16}$
	40	16	Concrete bed of aqueduct	80

305 1322 $\frac{7}{8}$ 521 $\frac{1}{8}$

Butt. 16 yards (with
shutter) - 16 days
I and VIII.
Contract No 2200.

See page 11/5

Abstract

Quantities Particulars of Work Rates Per amount.

305 Cyds Concrete work — at $2\frac{3}{4}$ Ctd 838 12 "
 1322 $\frac{7}{8}$ — D^o — Rough stone in Chumam — at 4 D^o 5291 8 "
 521 $\frac{7}{8}$ D^o — Riped stone in Chumam
 ————— (Arch work.) at 8 D^o 4175 "
 320 — D^o — Packed stone — at 2 D^o 640 "
 Excavation and Embanking ————— 200 "
 Baling ————— 250 "
 Contingencies ————— 354 12 "
 11,750 "
 Tail Piece $2400 \times 16 \times 1\frac{1}{2}$ — at $\frac{1}{16}$ 2750 "

Total Rupees ————— 14,500 " "

Sup Engineer's Office
 1st Bn Wattair
 1st July 1865

W. J. ———— Captain R. E.
 Superintending Engineer 1st Bn

W. J.

G
Details of Khoomadole under Tunnel. Fine Works.

Measurements			Particulars of Work.	Quantities
No	Length	Breadth		
2	27	$\frac{5}{8}$	$\frac{1}{2}$ Rough stone, Chumam, Retaining Walls } Front & Rear }	50 $\frac{5}{8}$
	32 $\frac{1}{2}$	27	$\frac{1}{4}$ Concrete bed between the above	219 $\frac{3}{8}$
	10	2 $\frac{1}{4}$	$\frac{1}{4}$ under ends of Wings and Buttresses	5 $\frac{5}{8}$
	4 $\frac{1}{2}$	25 $\frac{1}{2}$	$\frac{1}{2}$ Floor front	57 $\frac{3}{8}$
	20	22 $\frac{1}{4}$	$\frac{3}{8}$ under the Inverts	166 $\frac{7}{8}$
	2	25 $\frac{1}{2}$	$\frac{1}{2}$ under the Inverts	102
2	21	1 $\frac{1}{2}$	2 $\frac{1}{4}$ Abutments up to Ground }	141 $\frac{3}{4}$
	20	1	$\frac{3}{4}$ under the above }	50
5	20	4 $\frac{1}{4}$	$\frac{1}{2}$ Inverts and skin backs }	Duped stone 521 $\frac{7}{8}$
	20	5 $\frac{1}{2}$	$\frac{9}{16}$ Arches	
2	8	1 $\frac{1}{8}$	4 $\frac{3}{4}$ Front } Wings to under passage }	64 $\frac{1}{8}$
	8	1 $\frac{1}{16}$	4 $\frac{1}{4}$ Rear } Wide Plan and sections }	72 $\frac{1}{4}$
4	8	1 $\frac{1}{8}$	4 $\frac{3}{4}$ Wings to canal	171
	8	1	4 $\frac{1}{2}$ Buttresses to Wings	36
10	$\frac{1}{2}$	1	3 under the abutments	15
12	2	1	$\frac{3}{8}$ Arches over spaces between the buttresses }	9
			to abutments }	
	20	22 $\frac{1}{4}$	$\frac{9}{16}$ Backing to Tunnel Arches	250 $\frac{5}{16}$
2	24 $\frac{1}{4}$	1 $\frac{1}{8}$	2 $\frac{3}{4}$ Aqueduct side walls	150
12	$\frac{7}{16}$	$\frac{1}{2}$	2 $\frac{1}{2}$ Piers for foot Bridge	6 $\frac{9}{16}$
	40	16	$\frac{1}{8}$ Concrete bed of Aqueduct	80

305 1322 $\frac{7}{8}$ 521 $\frac{7}{8}$

Details and Abstract of
estimate of Khoomadole
under Tunnel. Fine
Works.
Estimated value Rs 14,500.

305 1322 $\frac{7}{8}$

Abstract.

Quantities	Particulars of Work	Rate Per Amount
305 Cys	Concrete ————— at 2 3/4 Cys	832 12.
1322 7/8	D ^o Rough stone in Chum am — at 4	D ^o 5291 0.
321 7/8	D ^o Super Stone in Chum am	
	(Arch work) — at 8 1/2	D ^o 4435 15.
320.	D ^o Packed Stone in apron and	
	————— Peristomb — at 2	D ^o 640 ..
	Excavation and Embanking —————	250 ..
	Balms —————	350 ..
	Rebuilding Ruins of old Tunnel —————	150 ..
	Contingencies —————	593 15.
		12550 ..
	Deduct for Stones available out of the removed ruins (400 Cys at 1 3/8 lbs)	550 ..
		12000 ..

To complete the Tail race as follows:

Bed starting from level of under Tunnel

Inverts with a fall to the rear of 3 ft } 3/4 (1000 x 16) } 1500 ..
per mile and widths 24 yards to 12 yds } x 1) at 1/10 }

Total Supers — 13500 ..

Cape Engineer's Office
1st Div, Wallcut
1st July 1865.

H. J. Z. Captam R. C.
Superintending Engineer 1st Div

K
 Details of high level outlet 50 yards. Godavary XXXII near
 Gondagall -

measures in feet			Particulars of Works	Quantities
No.	Length	Breadth		
50	$\frac{3}{4}$	1	Retaining Wall to outlet	$37\frac{1}{2}$
2	$\left\{ \begin{array}{l} 3 \\ 3 \end{array} \right\}$	$\left\{ \begin{array}{l} \frac{3}{4} \\ \frac{5}{8} \end{array} \right\}$	$\left\{ \begin{array}{l} 2\frac{1}{3} \\ 1\frac{1}{4} \end{array} \right\}$ - R ^o - Ramps	$15\frac{3}{16}$
50	$\frac{3}{4}$	$\frac{1}{2}$	Crest of outlet retaining Wall	$10\frac{3}{4}$
50	$2\frac{1}{4}$	$\frac{1}{6}$	Concrete floor in front of R ^o	$10\frac{3}{4}$
50	$2\frac{1}{4}$	$\frac{1}{3}$	Rough stone Chumam R ^o - R ^o	$37\frac{1}{2}$
50	9	$\frac{1}{2}$	Packed stone Aprons	225
5	1	2	Rough stone front Wings in Chumam $\frac{1}{2}$ yard in ground	20
2	$\left\{ \begin{array}{l} 8 \\ 4 \\ 6 \end{array} \right\}$	$\left\{ \begin{array}{l} \frac{3}{4} \\ \frac{1}{2} \\ \frac{3}{4} \end{array} \right\}$	$\left\{ \begin{array}{l} 1\frac{1}{2} \\ \frac{3}{4} \\ \frac{3}{4} \end{array} \right\}$ - R ^o - Revet wall to sides of Ramps	$16\frac{1}{2}$
	$\left\{ \begin{array}{l} 5 \\ 6 \end{array} \right\}$	$\left\{ \begin{array}{l} 1\frac{1}{2} \\ 1\frac{1}{2} \end{array} \right\}$	$\left\{ \begin{array}{l} \frac{3}{4} \\ \frac{3}{4} \end{array} \right\}$ - R ^o - R ^o of Rear Apron	$6\frac{3}{4}$
	$\left\{ \begin{array}{l} 5 \\ 6 \end{array} \right\}$	$\left\{ \begin{array}{l} 1\frac{1}{2} \\ 1\frac{1}{2} \end{array} \right\}$	$\left\{ \begin{array}{l} \frac{3}{4} \\ \frac{3}{4} \end{array} \right\}$ - R ^o - Pointing Wings	$20\frac{1}{2}$
2	6	$2\frac{1}{4}$	Concrete under Roadway on Ramps $4\frac{1}{2}$	
80	$2\frac{1}{4}$	$\frac{1}{6}$	Gravelled Roadway	30

$23\frac{1}{4} 90\frac{3}{16} 18\frac{3}{4} 43\frac{1}{4} 225 28\frac{1}{2} 30$

Details and Abstract of
 Estimate of Godavary
 outlet 50 yards. This
 Estimate is Rs 1,35,000.

Est. 29/11/05

Abstract.

59

Quantity	Particulars of Work.	Rate	Per amount
23 $\frac{1}{4}$	Cyds Concrete	2 $\frac{3}{4}$	Cyds 63 13 "
83.	D ^o Rough stone Chumam below ground	3 $\frac{3}{4}$	D ^o 311 4 "
7 $\frac{3}{16}$	D ^o — D ^o — above — D ^o —	4 $\frac{1}{2}$	D ^o 32 5.6
10 $\frac{3}{4}$	D ^o Rough dressed (close joints) large stones to crest of outlet	6	D ^o 112 8 "
43 $\frac{1}{4}$	D ^o stone Revetments	2	D ^o 86 8 "
225	D ^o — stone Aprons	1 $\frac{3}{4}$	D ^o 393 12 "
20 $\frac{1}{2}$	Sprayed Pointing Wings.	$\frac{3}{8}$	Sprayed 10 11 "
30	Cyds Gravelled Roadway	$\frac{1}{2}$	Cyds 15 "
	Removing banks and excavations	—	— 60 "
	Baling and preparing foundations	—	— 40 "
	Trimming banks &c	—	— 75.26
			1200 "
	Tail Race say $600 \times (\frac{25}{10}) \times \frac{1}{2}$		300 "

Total Pipes — 1500 "

Sup Engineer's Office
Wallace
1st July 1865.

W. J. Cattam
Sup Engineer

29/11/62

Highland
Outlet 50 yards,
Godavary XXXII near
Grandagate
Estimated 15000.

K

N
Details of Outlet 40 yards - Godavary XXXVI.

Measurements			Particulars of Work.	Quantities
No.	Length	Breadth		
2	6½	2 ¼	Concrete foundations of front Wings ———	6½
	52½	6 ¼	D ^o under floor between front and rear Retaining ———	78½
2	5	3¼	D ^o of sluice and its Wall ———	8½
	50½	1½	Front retaining Wall ———	31¾
2	1¼	1 ¼	Foundations to cutwaters of Piers ———	3½
	48	1½	Rear Retaining Wall ———	30
	57	6 ½	Floor between the Retaining Walls ———	153
2	5	3 ½	D ^o of Sluices ———	15
	7½	1¾	Front Buttresses } up to canal bed ———	19½
	5¼	1¼	D ^o Wings } ———	
2	5	1½	Front buttresses } above canal bed ———	4½
	5	2¾	D ^o Wings } ———	22½
	53½	1¾	Body wall including ends under steps and Buttress ———	93½
2	¾	5	steps } on end of D ^o ———	5½
	¾	1½	Buttresses } ———	
2	1¼	¾	Side Wings in rear ———	21½
	4	¾	Side walls ———	6¾
	3	2½	Arch across ———	5½
2	2½	1½	Rear face wall ———	3½
	4½	1½	Rear Wings } ———	7½
	1½	1½	One body wall } Piers ———	23
	½	1½	In front of D ^o } ———	
1	2	3¼	Cutwaters } ———	

Abstract

160

2	10	$\frac{5}{8}$	$\frac{1}{6}$	On Wings and Side Walls	
	$1\frac{1}{2}$	$1\frac{1}{8}$	$\frac{1}{6}$	on Buttrises	
2	$3\frac{3}{8}$	$1\frac{3}{8}$	$\frac{1}{6}$	on Piers	
44	8	$\frac{5}{8}$		Packed stone near apron	220
15	1	$1\frac{1}{2}$		side rest ments - Rear	$22\frac{1}{2}$
12	$1\frac{1}{8}$	$2\frac{1}{4}$		D ^o - D ^o front	$30\frac{3}{8}$

Deduct for Cut stone in Body wall $\frac{21\frac{1}{8}}{111\frac{1}{4}}$
 $93 \quad 313\frac{2}{32} \quad 132\frac{3}{8} \quad 4\frac{3}{16} \quad 27\frac{1}{2}$

Quantities	Particulars	Rate	Per amount
93	Cycle Concrete work	$2\frac{3}{4}$	D ^o 255 12
313 $\frac{2}{32}$	D ^o Rough stone Chumam or cycloped work	$3\frac{3}{4}$	D ^o 1174 12 10
111 $\frac{1}{4}$	D ^o - D ^o with face joints - dressed and fitted close -	$4\frac{3}{4}$	D ^o 528 7
$4\frac{3}{16}$	D ^o Cut stone	8	D ^o 33 8
21 $\frac{1}{8}$	D ^o Crest and bond stones Side		252
220	D ^o Packed stone apron	$1\frac{3}{4}$	D ^o 385
$52\frac{1}{8}$	D ^o - D ^o Restment	2	D ^o 105 12
144	Running feet of shutter	$7\frac{1}{2}$	Rft 1000
	Fixing and setting up		108
	Embanking, Excavation and banks		250
	Paving		250
	Trimming and Turfing banks &c		76 12 2
			4500

Tail Race say $1200 \times (\frac{36}{12}) \times (\frac{1\frac{1}{2}}{6})$
 $= 18,000$ Cords

Total Surplus 5500

Supr Engineer's Office
 Wallcut
 1st July 1865

W. J. Z. Captain R.E.
 Supr Engineer 1st Division

Outlet 40 yards.
 Roadway XXXVI.
 Estimate No 5570.

17

Details of ^{Small} ~~large~~ inlet 96 yards (with shutters) E. Joomoolair.

Measurements.			Particulars of Work.	Quantities.
No.	Length	Width		
100	$\frac{1}{4}$	1	Concrete retaining Wall	25
100	$2\frac{1}{2}$	$\frac{1}{4}$	Do - Floor	$62\frac{1}{2}$
2	$1\frac{1}{2}$	$2\frac{1}{4}$	Rough stone Chamfering to Buttresses and Steps on ends of R.	$6\frac{3}{4}$
4	$1\frac{1}{4}$	$\frac{5}{8}$	Do - Buttresses	$6\frac{1}{4}$
2	$\frac{3}{4}$	$\frac{3}{4}$	Do - steps	$2\frac{1}{4}$
96	$1\frac{7}{8}$	1	Do - Body wall	100
48	$\frac{4}{3}$	$\frac{3}{4}$	Cut stone in R. (D.R.)	24
4	$7\frac{1}{2}$	$1\frac{1}{8}$	Rough stone wings	$101\frac{1}{4}$
96	2	$\frac{5}{8}$	Pack stone front	120
96	2	$\frac{1}{2}$	Do - Rear	96
4	8	$\frac{1}{2}$	Do - ends of Wings	40
4	$4\frac{1}{2}$	3	Pointings	54
110	8	$2\frac{3}{4}$	Excavating	2420
Deduct Cut stone				24

2420 $87\frac{1}{2}$ $171\frac{1}{4}$ 24 $101\frac{1}{4}$ 264 54

Abstract.

Quantities	Particulars	Rate Per Amount
87 $\frac{1}{2}$	Cgls Concrete in foundation	2 $\frac{3}{4}$ cpl 240 10"
171 $\frac{1}{4}$	D ^o - Rough stone Chumam work in Butthaps, steps and body wall	4 D ^o 685 -
24	D ^o - Cut stone, bed stones for piers	8 D ^o 192 -
101 $\frac{1}{4}$	D ^o - Rough stone in revetments	2 D ^o 202 0
264	D ^o - D ^o - Apron	1 $\frac{3}{4}$ D ^o 462 -
54	D ^o - Pointing Wings	$\frac{1}{4}$ D ^o 13 0
	Excavating and removing bank	135 -
	Baling	100 -
96	Yards of Shuttles	8 $\frac{3}{4}$ yd 840 -
	Fitting and setting up	84 -
		2954 10"
	Embanking Loomolair - say 300 -	-
	Drain Pipe (5'-15' ft long) mchd	-
	ditto + top cast iron	50 -
	Concrete bed and masonry wings for D ^o	50 -
		400 -
	Grading and trimming banks to	145 6
	Total Rupees	3500

Supl Engr Office 18th }
Walter
1st July 1865

H. J. - }
Supl Engineer 1st D^o }
Captain R. E.

Details of Inlet 32 yards (with shutter) Flotilla XXX.

54

No	measurements			Particulars of Work	Quantities
	Length	Breadth	Depth		
36	$\frac{1}{4}$	1		Concrete retaining Wall	9
36	$2\frac{1}{2}$	$\frac{1}{4}$		Do floor	$22\frac{1}{2}$
2	$1\frac{1}{2}$	$2\frac{1}{4}$	1	Rough stone in Chunam (foundations to Buttrises and steps on ends of floor	$6\frac{3}{4}$
4	$1\frac{1}{4}$	$\frac{5}{8}$	2	Do Buttrises	$6\frac{1}{4}$
2	$\frac{3}{4}$	$\frac{3}{4}$	2	Do steps between them	$2\frac{1}{4}$
	32	$1\frac{7}{8}$	1	Do body wall	60
16	$\frac{1}{3}$	$\frac{3}{4}$	$\frac{1}{2}$	Cut stone bed stone for piers in body wall	8
4	6	$\frac{1}{8}$	2	Rough stone wings	42
32	2	$\frac{5}{8}$		Rough stone packed in front body wall	40
32	2	$\frac{1}{2}$		Do Do Do Do	32
4	6	3	$\frac{1}{2}$	Do ends of front wings	36
4	$4\frac{1}{2}$	2		Pointings	36
44	8	$2\frac{1}{4}$		Excavating and removing bank 792	$75\frac{1}{4}$
				D. D. for cut stone	8

792 $31\frac{1}{2}$ $67\frac{1}{4}$ 8 42 100 36

Elbow High Level Guard

Low Level Inlet 96
East Channel

Est. Rs. 3500

1879-29/1/85

Abstract

Quantities	Particulars of Work.	Rate	Per amount
31 $\frac{1}{2}$	Cyds Concrete in foundations ———	2 $\frac{3}{4}$	Cyds 86 10 ..
67 $\frac{1}{4}$	D ^o Rough stone in Chumam ———	4	D ^o 269 ..
8	D ^o — Cut stone in Chumam (Bed stone — for pier) ———	8	D ^o 64 ..
42	D ^o Rough stone in Wings and Revet- — ments ———	2	D ^o 84 ..
100	D ^o — D ^o in Apron ———	1 $\frac{3}{4}$	D ^o 189 ..
36	Square yds Pointing Wings ———	$\frac{1}{4}$	Sq yd 9 ..
792	Cyds Excavating and removing banks —	$\frac{1}{10}$	Cyds 44 ..
32	yards of Shuttles ———	8 $\frac{3}{4}$	yds 280 ..
	Fixing and setting up to ———	—	— 20 ..
	Surfing and trimming banks to ———	—	— 166 6 ..
	Baling ———	—	— 50 ..
Total Rupees ———			1280 ..

Sup Engineer's Office
1st Division, Wallais
1st July 1865.

H. J. ———. Captain R. B. }
Sup Engineer 1st Div. }
()

27/2/65

Estimated 32 yards (w.)
- structure -
Estimate No. 1230.

Details of 64 yards escape. Loomoolair. 67

measurements				Particulars of Work	Quantities
No.	Length	Breadth	Height		
2	6 1/2	2	1/4	Concrete foundations of front wings	6 1/2
59 1/2	8	1/4		D ^o under floor between front and rear retaining walls	139
5	3 1/4	1/4		D ^o D ^o of sluices and side walls	4 1/6
68	1/2	1 1/4		Front retaining wall	42 1/2
3	1 1/4	1	1 1/4	Foundations to cutwaters of piers	4 11/16
66	1/2	1 1/4		Rear retaining wall	41 1/4
69	8	1/2		Floor between the retaining walls	276
5	3	1/2		D ^o of sluices	7 1/2
7 1/2	1 3/8	1 1/4		Front buttresses	17 3/8
5 1/4	1 1/4	1 1/4		D ^o wings	
3 1/4	1 1/8	2 3/4		Front buttress	45 5/8
5	3/4	2 3/4		D ^o wings	
70 3/4	1 3/4	1		Body wall including ends and steps and buttresses	123 3/4
2	3/4	5/8	2	Steps	5 1/2
2	3/4	1 1/8	2 1/8	Buttresses	
2	1 1/4	3/4	2 7/8	Side wings in rear	29
6	3/4	2 5/8		Rear wall	41 3/8
63	1/8	3/4		Side walls	3 3/8
6	3/4	3/4		Arch across	2 13/16
3	2 1/2	3/8		Rear face wall	1 1/6
2 1/4	1/2	1 1/4		Rear	3 5/8
4 1/2	9/16	1 1/2		on body wall	12 3/16
3	1 1/2	1 1/4	2 1/8	In front of	6 7/16

$6\frac{2}{3}(1 \times 1\frac{1}{4}) 3\frac{1}{2}$ Cutwaters to Piers
 $5\frac{12}{5} \frac{5}{8} \frac{1}{4}$ on wings and side walls
 $1\frac{1}{2} 1\frac{1}{8} \frac{1}{4}$ on buttresses
 $3\frac{3}{5} 1\frac{3}{8} \frac{1}{6}$ on Piers
 $60 8 \frac{5}{8}$ Packed stone in apron
 $15 1 \frac{1}{2}$
 $12 1\frac{1}{2} 2\frac{1}{4}$ } D^o Rivestments

$24 8 2 \frac{1}{8}$ stretchers, Crest of weir
 at 7 Rs each. Rs 168.
 $72 6 \frac{2}{3} 1$ D^o anchor stone.
 at 1-12-5 $\frac{1}{3}$ each. 120
 $96 3 1 \frac{1}{2}$ Headers across D^o.
 at 0-0-0 each. 48
 In body wall.
 D.D.

Rs 344 &
 Deduct for cut stone in body
 Wall
 170 $\frac{2}{3}$
 20 $\frac{4}{7}$
 5 $\frac{3}{8}$ 20 $\frac{4}{7}$ 149 $\frac{9}{10}$ 45 $\frac{1}{2}$ 142 $\frac{1}{9}$ 41 $\frac{2}{8}$ 352 $\frac{1}{8}$

Abstract.

Quantities	Particulars of Work.	Rate Per Annum.
149 $\frac{9}{10}$	Cyds Concrete in foundation	2 $\frac{3}{4}$ Rs 1411 4 9
457 $\frac{1}{2}$	D ^o Coursed rubble in Chumam or cycloped work.	3 $\frac{3}{4}$ D ^o 1693 2
142 $\frac{2}{9}$	D ^o D ^o D ^o with face joints deep and fitted close	4 $\frac{3}{4}$ D ^o 575 8 10 $\frac{2}{3}$
41 $\frac{2}{8}$	D ^o D ^o D ^o D ^o selected stones large	8 D ^o 248 4
5 $\frac{3}{8}$	D ^o cut stone	8 D ^o 43
20 $\frac{1}{2}$	D ^o cut stones and counterpoise D ^o in Body side details &	- - 344
300	D ^o Packed stone in apron	1 $\frac{3}{4}$ D ^o 525
52 $\frac{1}{9}$	D ^o Rivestments	2 D ^o 105 12
192	Running feet of shutters	7 $\frac{1}{2}$ Rs 1440
	Fixing and setting up D ^o	- - 144
	Embanking, Excavation, and banks	300
	Balizing	360
	Trimming and turping banks, for wing Ramp &c	314 11 6
		6600

Tail Race say 600

Total Rupees 7200

Supg. Engineer's Office
 Watair
 1st July 1865

W. Jones. Cap. R.E.
 Supg. Engineer 1st R.W.

S
Details of alterations to Elmore Aqueduct to convert it into
an Inlet and outlet with sand sluices. 67

Measurements
Length
Breadth
Depth

Particulars of Work.

Quantities.

Up stream wall with be $1\frac{3}{4}$ ft above Canal
bed, and down stream or Rear wall
will be 5 ft above Canal bed.

75	1	$1\frac{1}{4}$	Remove top of Front side wall	} 210 $\frac{5}{16}$
"	$\frac{2}{3}$	$1\frac{1}{4}$	Do - Rear Do -	
"	$\frac{7}{12}$	$1\frac{1}{4}$	Do - Road way parapet	
100	4	$\frac{3}{8}$	Do - Gravel from Road way	

There will be 6 sand sluices, each 12
feet one under the soffit of each
large arch (i.e) over each of the
small piers.

Details of one sluice

5	$\frac{5}{6}$	$1\frac{1}{2}$	Remove lower part of rear side wall to level of Chamam bed	} each 9 $\frac{1}{16}$ for 6 54 $\frac{3}{8}$
	$2\frac{1}{4}$	$\frac{1}{4}$	below Do -	
2	$1\frac{1}{2}$	1	Side and stem backs	} Draped stone in Chamam } each 7 $\frac{1}{4}$ for 6 43 $\frac{1}{2}$
	$4\frac{1}{2}$	$1\frac{1}{2}$	Arch above Do -	
	$5\frac{1}{2}$	$1\frac{1}{2}$	Between Do and Road arch	} Rough stone in Chamam } each 6 $\frac{3}{8}$ for 6 38 $\frac{1}{4}$
	$5\frac{1}{2}$	$\frac{1}{8}$	Cutwaters	
2	$\frac{5}{8}$	$\frac{5}{8}$		} Floor - Draped stone in Chamam - each 11 $\frac{1}{16}$ for 6 4 $\frac{1}{8}$
	4	$1\frac{1}{2}$		
	$4\frac{1}{2}$	$\frac{5}{8}$		} Cast iron posts each } Details furnished to work shop
5	$5\frac{3}{4}$	$(1\frac{1}{2} \times \frac{3}{4} \times \frac{1}{4})$	uf 50 ft	
3			Folding shutters each 4 wide. Chain	

There will be (5) fine sluices, each 6
feet - one through each spanrail (i.e
over big piers) of Road arches -

Details of one sluice

Details and Abstract
estimate of 64 yards
to each of 2 spans
estimate in 7200

R

off 2411/65

$3\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{5}{8}$	Remove centre of channel for	each 25 $\frac{5}{8}$ for 128 $\frac{1}{8}$	
$2\frac{1}{4}$	$1\frac{1}{2}$	$\frac{1}{2}$	Arch over emb		
2	$4\frac{1}{2}$	$\frac{3}{4}$	Side skm backs	Dressed stone in Chumam } each 14 $\frac{1}{2}$ for 72 $\frac{1}{2}$	
2	$1\frac{1}{2}$	$\frac{3}{8}$	Invert floor		
$3\frac{1}{2}$	$4\frac{1}{2}$	$\frac{3}{8}$	Backmg over arch	Rough stone	
2	$\frac{3}{4}$	$\frac{3}{4}$	Cutwaters	in Chumam } each 20 $\frac{5}{8}$ for 40 $\frac{25}{8}$	
$2\frac{1}{4}$	$\frac{3}{4}$	$\frac{3}{8}$	Flat stone across or archway		
			across - Dressed Stone in Chm	each 5 $\frac{5}{8}$ for 3 $\frac{1}{8}$	
2			(same as above) Cast iron posts	Details furnished to Work shop }	
			each 50 for		
1			Folding shutter 6 wide, Chain for		

The Clear inlet and outlet - each from Wing wall to wall will be 22 1/2 feet or say 75 yards -

75 1 1/4 } Reaping with dressed stone, the top of front and rear side walls and road parapet

75 4 3/32 Paving in cement for Road way
 " 4 1/8 Gravel over Road way
 25 4 3/8 Ramming Road Approaches.
 " 4 1/4 Gravel over Do

392 13/16 79 1/32 163 7/8 150

Abstract

64

Quantities	Particulars of Work	Rate Per amount.
392 - 13/16	Cyds yards of Masonry Removing	3/2 Cys 147 6
150 -	Do of Gravel removing from Road way -	1/16 Do 9 6
79 - 1/32	Do of Rough stone in Chumam	4 Do 316 2
163 - 7/8	Do of Dressed Stone in Do	8 Do 1311
6	sets of folding sheet iron shutters with cast iron posts & Chain for Complete	126 each 756
5	Do Do Do	60 Do 300
50	Cyds Paving in cement for Road way	2 1/2 Cys 125
150	Cyds Gravel on Road way and approaches	- - 30
	Trimming banks and Approaches and Contingencies	- - 105 15
		3150

Deduct for value of stone from drop wall and lapron and from aqueduct sides. say

Rough Stone 400 at 1 Rupee }
 Dressed Stone 500 at 3 1/2 Rupees } 2150

Total Rupees - 1000

Supy Engineer's Office
 Wallair
 1st July 1865

W. H. Z. Capt. 1st Bn
 Supy Engineer 1st Bn

Detail of Five vents under Tunnel Ristna XXXV.

No.	Measurements			Particulars of Work.	Quantities			
	Length	Breadth	Height					
1	38 $\frac{1}{2}$	13	$\frac{1}{4}$	Concrete floor	174			
				Rough stone Chumam Retaining Walls		43		
2	28 $\frac{2}{3}$	$\frac{3}{4}$	1	Concrete under ends of Wings	4 $\frac{1}{2}$			
1	2	$2\frac{1}{4}$	$\frac{1}{4}$	Rough stone in } Front		70 $\frac{3}{4}$		
3	$2\frac{1}{2}$	25 $\frac{1}{8}$	$\frac{3}{4}$	Chumam floor } Rear		75 $\frac{1}{2}$		
6		25 $\frac{1}{8}$	$\frac{1}{2}$					
	20	22 $\frac{1}{6}$	$\frac{1}{4}$	D ^o under invert		110 $\frac{7}{8}$		
							115	
2	20	$1\frac{1}{4}$	2	Abutments				421 $\frac{7}{8}$
	20	$\frac{3}{4}$	$\frac{1}{2}$					37 $\frac{1}{2}$
10	20	$3\frac{3}{4}$	$\frac{1}{16}$	Arches and inverts				
2	20	$\frac{5}{8}$	$1\frac{1}{2}$	Abutments skew backs				99
4	22	$\frac{3}{4}$	$1\frac{1}{2}$	Piers and skew backs and cutwaters				
				Front } Wings to towers } Rough stone		45 $\frac{1}{2}$		
2	7 $\frac{1}{2}$	$\frac{7}{8}$	$3\frac{3}{8}$	Rear } passage } in Chumam		41 $\frac{7}{16}$		
							14	
14	$\frac{1}{2}$	1	2	Buttresses to abutments				9
12	2	1	$\frac{3}{8}$	Arches between D ^o		37 $\frac{1}{8}$		84
4	$8\frac{1}{4}$	$1\frac{1}{2}$	$\frac{3}{4}$	Below canal bed } Canal Wings				
	$8\frac{1}{4}$	$\frac{7}{8}$	3	above canal D ^o		110 $\frac{7}{8}$		
	22 $\frac{1}{6}$	20	$\frac{1}{4}$	Backing to arches				102 $\frac{2}{3}$
2	26 $\frac{1}{8}$	1	2	Asymmetrical side walls				
	17	26 $\frac{1}{6}$	$\frac{1}{8}$	Concrete bed of canal over under	55 $\frac{10}{16}$			
				Tunnel	57 $\frac{6}{16}$			
2	$8\frac{1}{2}$	18	$\frac{3}{16}$	D ^o - D ^o between wings				
					291 $\frac{1}{2}$	221 $\frac{5}{8}$	413 $\frac{11}{16}$	538 $\frac{3}{8}$
2	8	18	$\frac{1}{4}$	Course gravel & small stone and quarry rubbish over				72
	23 $\frac{2}{3}$	8	$\frac{5}{8}$	Rough stone apron				236 $\frac{1}{2}$
	23 $\frac{2}{3}$	8	$\frac{5}{8}$					
4	8	$\frac{7}{8}$	2 $\frac{1}{2}$	Rough stone Revetments				70

Alterations to plan required. —
 Estimate Rs. 1000.

20/2/1885

Abstract

Quantity	Particulars of Work.	Rate	Per amount.
291 $\frac{1}{2}$	Cyds concrete —————	2 $\frac{3}{4}$	Cyds 801 10 -
448 $\frac{1}{8}$	D ^o Rough stone in chumano in floor backing to arches —————	3 $\frac{1}{2}$	D ^o 1568 7 -
413 $\frac{11}{16}$	D ^o — D ^o — D ^o in walls and abutments —————	4 $\frac{3}{4}$	D ^o 1965 - 3
558 $\frac{3}{8}$	D ^o Rough stone in Chumam in arches inverts and skew backs —————	6	D ^o 3300 53
236 $\frac{2}{3}$	D ^o Rough stone in Apron —————	1 $\frac{2}{3}$	D ^o 394 72
70	D ^o ————— D ^o Pierment —————	2	D ^o 140 -
72	D ^o Coarse gravel and small stone and quarry rubbish —————	3 $\frac{3}{4}$	D ^o 54 -
	Excavating and banking —————		300 -
	Building and foundations —————		530 -
	Surfing and trimming banks &c - - -		116 34
			9000 -
	Trail Race —————		1000 -
	Total Rs		10,000 -

Sup. Engineer's Office
Waltair
1st July 1865.

H. J. ... Cap. R.E.
Sup. Engineer 1st D.V.

Details of ~~work~~ ^{work} in 24 yards (with shutters) Hykamm
and Kistna XXX. 15

No.	Measurements			Particulars of Work.	Quantities.
	Length	Breadth	Depth		
20	$\frac{1}{4}$	1		Concrete retaining Wall	7
20	$2\frac{1}{2}$	$\frac{1}{4}$		Do Floor	$17\frac{1}{2}$
2	$1\frac{1}{2}$	$2\frac{1}{4}$	1	Rough stone Chumam foundations to Buttraps and steps on ends of floor	$6\frac{3}{4}$
4	$1\frac{1}{4}$	$\frac{5}{8}$	2	Do Buttraps	$8\frac{1}{4}$
2	$\frac{3}{4}$	$\frac{3}{4}$	2	Do steps between them	$2\frac{1}{4}$
24	$1\frac{7}{8}$		1	Do body wall	45
12	$\frac{4}{8}$	$\frac{3}{4}$	$\frac{1}{2}$	Cut stone bed stone for first in body wall	6
4	6	$\frac{7}{8}$	2	Rough stone Wings	42
24	2	$\frac{5}{8}$		Rough stone packed in front body wall	30
24	2	$\frac{1}{2}$		Do Rear	24
4	0	3	$\frac{1}{2}$	Do ends of front Wings	36
4	$4\frac{1}{2}$	2		Pointing Wings	36
36	0	$2\frac{1}{4}$		Excavating & removing banks	$64\frac{1}{2}$
				Deduct for cut stone	6

$64\frac{1}{2} 24\frac{1}{2} 54\frac{1}{4} 6 42 90 36$

Details and Abstract
estimate of fine work
under dam & still
XXXX and of brickwork
estimate 10000.

11

Sept 29/11/55

Abstract

Quantity	Particulars of Work.	Rate Per Unit	Amount
24 1/2	Cyds Concrete in foundation	2 3/4	Cyds 67 6"
54 1/4	D ^o Rough stone Chumam	4	D ^o 217 "
5	D ^o (12 Cut stone in Chumam Bed stone)	8	D ^o 40 "
	for Pier No. 3		
42	D ^o Rough stone in Wings & Rostments	2	D ^o 84 "
90	D ^o — D ^o — Apron	1 3/4	D ^o 157 8"
36	Sqyds Pointing wings	1/4	sqyds 9 "
648	Cyds Excavating and removing banks		35 "
	Balms		25 "
24	yards of shutters	8 3/4	cyds 210 "
	Finishing and setting up D ^o		21 "
	Surfing and trimming banks		86 20 "

Total Rupees - - 960 ..

Supl Engineer's Office
18th Wattait
1st July 1865

W. J. Z. Captain R. E.
Supl Engineer 1st Gw

measurements			Particulars of Work.	Quantities.
No.	Length	Breadth		
56	$\frac{7}{8}$	$1\frac{1}{4}$	Retaining Walls	614
48	6	$\frac{5}{8}$	Apron	180
9	4	$\frac{5}{8}$	— at ends of Wings	22 $\frac{1}{2}$
2	4	$\frac{5}{8}$	on ends of retaining Wall	5
2	8	$\frac{7}{8}$	Wings on sides of Apron	20
2	8	2	Pointing Wings	32
56	8	$2\frac{1}{4}$	Excavating and removing bank and trench for retaining Walls	1008

1008 268 $\frac{3}{4}$ 20 32.

24 yds
 Subst 48 yds
 Kitna
 Amilaia
 0.0

877 294/65

Abstract

Quantities	Particulars of Work.	Rate per amount.
$268\frac{3}{4}$	Cyds Rough stone in apron and retaining Walls	$1\frac{3}{4}$ cys 1,705.
28	$\frac{1}{2}$ — $\frac{1}{2}$ — Mugs — — — 2	$\frac{1}{2}$ 56 ..
32	sqare yds Pointing rough stone — — — $\frac{1}{4}$	sqare 8 ..
1008	Cyds Excavating and banking — — — $\frac{1}{10}$	Cys 56 ..
	Ballast and levelling foundations — — —	— 60 ..
	Surfing and trimming banks & — — —	— 69 11 ..

Total Dupes ————— 720. " "

Sup Engineer's Office 1st Lt
Maitland
12th July 1865.

W. L. Z. — — — Captain R. E.
Sup Engineer 1st Lt

Details of Out let 80 yards / *Plan XXVII Ramalair*

Measurements				Particulars of Work	Quantities
No.	Length	Breadth	Depth		
80	$\frac{3}{4}$	$1\frac{1}{2}$		Retaining Wall to out let	$67\frac{1}{2}$
2	$\left\{ \begin{array}{l} 4 \\ 4 \end{array} \right\}$	$\left\{ \begin{array}{l} \frac{3}{4} \\ \frac{5}{8} \end{array} \right\}$	$\left\{ \begin{array}{l} 2\frac{1}{2} \\ 1\frac{1}{2} \end{array} \right\}$	Continuation of R ^e for Ramps	$22\frac{1}{2}$
80	$\frac{3}{4}$	$\frac{1}{2}$		Curt of out let	30
80	3	$\frac{1}{6}$		Concrete floor in front	40
80	3	$\frac{1}{3}$		Rough stone in Chumam R ^e R ^e	80
80	9	$\frac{1}{2}$		Packed stone apron	360
2	$\left\{ \begin{array}{l} 5 \\ 6 \end{array} \right\}$	$\left\{ \begin{array}{l} 1\frac{1}{2} \\ \frac{3}{4} \end{array} \right\}$	$\left\{ \begin{array}{l} 2\frac{1}{4} \\ 1 \end{array} \right\}$	Rough stone front wings	$25\frac{5}{16}$
				R ^e Rear - R ^e	9
2	$\left\{ \begin{array}{l} 8 \\ 8 \end{array} \right\}$	$\left\{ \begin{array}{l} \frac{3}{4} \\ \frac{3}{4} \end{array} \right\}$	$\left\{ \begin{array}{l} 1\frac{1}{4} \\ 1\frac{1}{4} \end{array} \right\}$	R ^e R ^e wall to sides of Ramps	15
2	$\left\{ \begin{array}{l} 5 \\ 6 \end{array} \right\}$	$\left\{ \begin{array}{l} \frac{1}{2} \\ 1\frac{1}{3} \end{array} \right\}$		Pointing Wings	$28\frac{1}{2}$
2	8	$2\frac{1}{4}$	$\frac{1}{6}$	Concrete under Ramps, roadway	6
120	3	$\frac{1}{6}$		Gravelled road way	60

46 170 30 $49\frac{5}{16}$ 360 $28\frac{1}{2}$ 60

11

Outlet 80 yards (within
chutlers) *Plan XXVII*
(Ramalair) —
Estimate No 720 - 0.

D.M. 2911/85

Abstract

Quantities	Particulars of Work.	Rate	Per Amount
46 Cys	Concrete	$2\frac{3}{4}$	46 126 0 "
160	D ^o Rough stone in Chinam below ground	$3\frac{3}{4}$	D ^o 600 "
10	D ^o — D ^o — D ^o above — " —	$4\frac{1}{2}$	D ^o 45 "
30	D ^o Roughly dressed (close joints) large stones, Crest of Outlet.	6	D ^o 180 "
49 $\frac{5}{16}$	D ^o stone Pavements	2	D ^o 98 10 "
300	D ^o stone Aprons	$1\frac{3}{4}$	D ^o 630 "
20 $\frac{1}{2}$	sq yards Pointing Wings	$\frac{3}{8}$	sq yds 10 "
60	Cys gravelled Roadway	$\frac{1}{2}$	Cys 30 "
	Removing banks and excavation		120 "
	Baling and preparing foundations		100 "
	Trimming and turbing banks &c		59 3 "
			2000 "
	Contingencies		100 "
	Tail race say $600 \times (\frac{30}{15}) \times \frac{1}{2}$		400 "

Total Impus — 2500 "

Supy Engr's Office
Waltair
1st July 1865.

H. J. Captain R. E. G.
Supy Engineer 1st Division.

From
 C. Pearson Esq
 Secy to the Govt of India
 To
 Sir H. C. Montgomery
 Chief Secy to the Government
 of Fort St George
 Dated the 26th January 1855

Sir,
 I am directed by the Hon^{ble}
 the Governor General in Council
 to acknowledge the receipt of your letter
 No 435 dated the 11th October last, with
 Enclosures, (being the annual report of pro-
 jected public works for 1854/55 submitted
 in accordance with the dispatch of the Hon^{ble}
 Court of Directors No 32 dated 24th May
 1853), and No 1530 dated the 28th November
 last (requesting authority to undertake
 in anticipation of sanction certain works
 connected with the River Godavary).
 This being the first occasion on
 which a report on the projected works of the
 Madras Presidency has been submitted
 for the consideration of the Governor General
 in

7

Highest
 1 Bullock 80 yards.
 No 1800 XVIII Ram
 Estimate No 2500

1854/55

in Council, in compliance with the instructions of the Honble Court, His Lordship will review briefly the nature of those instructions and of the subsidiary ones issued by the Government of India. He will then, in considering the several projects submitted by the Madras Government, remark how far in each case or each group of similar cases the Honble Court's instructions appear to have been followed and their views carried out. And finally, the Governor General in Council will give such directions as may seem necessary towards the preparation of these Reports in future years in more complete accordance with the design of the Honble Court and in uniformity with those of the other Presidencies.

3. In their despatch of the 24th May 1853 already alluded to the Honble Court stated that in considering the proceedings of the Madras and Bombay Governments with regard to proposed public works and especially in the case of roads, they had often noticed the irregular and unsystematic manner in which the plans laid before those Governments had been dealt with; that the sanction given to or the recommendation made in favor of such schemes seemed to be frequently grounded on considerations limited to each project without

without reference to the general wants of the Country; and that as regards roads the consequence had been that a large outlay had been incurred in lines of inferior importance while trunk lines had been neglected for want of funds. Previous to this the Honble Court in their Despatch of the 30th January 1850 (in which they referred for the consideration of the Governor General in Council the question of re-organizing the whole department of public works) had remarked strongly on the evils arising from this isolated mode of considering particular schemes of improvement and had dwelt on the importance of taking into view all such projects, especially of roads, as portions of one connected system; but in 1853 they desired that in anticipation of a decision on the general subject no time should be lost in applying a remedy for the particular defect complained of. 5. As the best means of attaining this object the Court suggested that each local Government should require annually from the Officers in charge of the roads in each Presidency a Statement of new works most urgently required for intercommunication which could be undertaken during the ensuing year; that on receipt of this Statement the local Government having regard to the circumstances

circumstances of the Presidency at the time should decide whether the proposed works had been properly selected; and that the whole scheme involving the proposed expenditure on new roads and bridges for the coming year should be submitted for the final sanction and approval of the Governor General of India in Council.

The Honble Court further directed that this plan though peculiarly required with reference to the means of internal communication, should be applied to public works of every description, and they anticipated that much benefit would arise from the means thus afforded of bringing annually under the review of the General Government the wants of each Presidency as regards buildings, irrigation and other miscellaneous works. The Statements, it was decided, should exhibit the entire expenditure proposed to be incurred on new works whatever might be the amount of the Estimates for each, and a form was suggested in which (modified according to local circumstances) they might be conveniently drawn up.

The Honble Court concluded by disclaiming any desire to place restriction on the annual there before expended on public works, or to deprive the local

Governments

Governments of any power they then possessed of authorizing expenditure in such works. Their objects were to secure the most beneficial application of the funds to be expended, to preserve to the Governor General in Council that general control over the finances of India which it is intended that he should possess; and to relieve the general Government from the distraction of attention and waste of time arising from many separate projects of a kindred nature being brought under consideration at different times.

The Honble Court's despatch was communicated to the Government of Madras in Mr. Secretary Allen's letter N^o 242 dated the 1st March last, and further communications were made on the same subject in Mr. Secretary Allen's letters N^o 555 dated the 19th May, N^o 795 dated the 28th July, and N^o 1207 dated the 1st November last.

The instructions conveyed in these several communications were 1) that the annual estimates were to be prepared and submitted to the Supreme Government in the forms then prescribed; 2) that the budget should include works within the competence of the local Government to execute so that the Governor General in Council might obtain at once a comprehensive view of the intended operations and of the expenditure to be incurred on them; 3) that the repairs of old works were not to be entered in the returns; 4) that the returns should be made up for each official year

and

and submitted to the Government of India in the month of March preceding, (4) that the new method was not intended to supersede the rule that all new works estimated to cost more than Rs 25,000 must be sanctioned by the Government of India before being undertaken, and that in respect of all such works as full explanation was to be given in the letter accompanying the returns as when each project was sent up separately; (5) that reference was to be made in the returns to all previous correspondence relating to every new project included therein; (6) that only such works were to be included in the returns for any year as could be commenced during that year if sanction were immediately granted; (7) that new projects first proposed for sanction should be distinguished and entered in a separate return from those already sanctioned, on which it might be proposed to spend money within the year; and (8) that the local Government might commence any work included in the budget not estimated to cost more than Rs 25,000, but that such works not included in the budget must not be commenced unless the necessity for them were urgent and unexpected.

9 It was of course impossible, at the commencement of a new system, to conform with that part of the instructions above referred to, which relates to the time of year at which the budget is to be submitted. The forms having been settled only on the 28th July it is obvious that the returns could not be prepared until a later date and that they could not be laid before the Government of India

97 in time to admit of proper consideration and the issue of orders before the commencement of the working season. It is clear however that the returns, both of any year must be prepared and submitted in future years at a much earlier date, and that in order to give time for full deliberation and for obtaining such further explanations regarding any part of the budget as may be required it should not leave Madras later than the month of January preceding the official year to which it relates. It will probably not be practicable to accomplish this with the budget for 1855/56, but there seems no reason why it should not be furnished by March next as already required, and in all future years the earlier date may without difficulty be attained. The consideration of these statements for 1854/55 shows that much time is required for the necessary calls for further explanation which will frequently have to be made before the sanction of the Government of India can be finally accorded, and the Governor General in Council therefore desires me to request that the officers of the department may be required to exercise such a degree of forethought as will enable them to mature and submit their projects, at least those of such magnitude as require the sanction of the Supreme Government, before the commencement of the working season preceding that in which they are to be undertaken, so that as above directed the Government of Madras may be able to forward the estimates to the Govt. of India before the end of the month of January in each year.

Statement

10 Statement No 1 for 1854, includes 33 projects, each involving an outlay of more than Rs 10,000, to which the sanction of the Govt of India is requested. From these may be separated the projects estimated to cost less than Rs 25,000, that being the larger limit to which the authority of the local Government now extends. There will then remain 21 projects involving a total estimated cost of Rs 13,49,000.11, of which it is proposed to spend Rs 8,02,483.13 within the year. It is further proposed to spend within the year Rs 32,48,370.8 on the works included in Statement No 2 and Rs 123,294.11 on the smaller projects contained in Statement No 1, making altogether an estimated expenditure within the year of Rs 41,74,049.2 of which about one fifth requires the sanction of the general government. Such is briefly the financial view of the matter; and it may be added that although the ultimate cost of each work may perhaps exceed the estimate, the actual expenditure thereon within the year will probably fall short of it.

11 With regard to the projects requiring the sanction of this Government your letter describes briefly the objects of the several works, states the probable cost and period of completion of each, and gives the opinion of the local Officers as to their value and utility. The description is generally illustrated by sketches and maps showing the topographical position of the works, but is not accompanied by drawings and specifications or by any data on which an opinion

Project No 3 - 85,777.00
 14 - 20,425.10
 16 - 14,417.2
 19 - 9,502.46
 20 - 1,400.00
 23 - 14,175.00
 24 - 1,511.2
 25 - 14,945.11
 26 - 21,500.00
 27 - 12,857.83
 28 - 14,000.00
 32 - 11,192.00
1,77,299.4

95
 opinion can be formed as to the means proposed to effect the object in view. In this respect there is a very material difference between the course now adopted and the practice heretofore observed. The explanation given is not by any means so full as when such project was sent up separately. And it is plain that whatever confidence the Government of India may repose in the skill of the local Engineer Officers and the judgment and knowledge of the Revenue Authorities of the Presidency, it cannot without a total abrogation of its prescribed functions give its sanction to any undertaking involving a larger outlay than Rs 25,000, unless in possession of the fullest information both as to the nature and objects of the work, but as to the means by which it is to be accomplished. I have directed, therefore, to request that in future years detailed plans and estimates of every work of the description contained in Statement No 1 may invariably accompany the budget, and that the Secretary's letter may contain a complete explanation of the grounds on which each work is proposed by the local officers and of those in which the Major Govt. determine to recommend it for the sanction of the Government of India.

12 With the exception of one project for the improvement of a Harbour, the works now proposed for sanction are either of irrigation or internal communication. There is a marked distinction between these two classes of works, the former being generally complete in themselves and such as may be presented

proposed separately and for local objects without special reference to a general plan, while the latter though subserving very important local objects can only properly be considered as part of a general system and in reference to the place they should occupy in it. Bearing this distinction in mind I am directed to observe on the several projects as follows.

13. The five estimates noted in the margin relate exclusively to works of irrigation. These are approved by the Revenue and Engineer Officers, they are expected to prove both directly and indirectly remunerative, and they will interfere with no existing interests. On the recommendation of the Madras Govt. they are therefore approved and sanctioned.

14. The two projects next to be considered are for combined objects of irrigation and navigation. No. 9 is part of a chain of navigable communication parallel to the Coast and extends from Rayamunth to Collore. The advantages for irrigation are said to be very great but the return to Capital from the canal is not estimated, the length of the canal is not stated and there is no mode to the mind by which it can be accurately ascertained. The principal object of No. 10 is irrigation, but it is considered important to provide also for the passage of boats. Both of these schemes are connected with the Godavery, Amicut, and are said to be in part of the measures necessary to extend the benefit and develop the capabilities of that great work. The Govt of Madras would have sanctioned them in anticipation but for the

* Rs. 1-29999.13
2-52951.12
4-34,134.
7-31,205.13
30-2677.8

* Rs. 9-287,643.4
10-113,198.11
100,842.5

"stringent orders" regarding the budget, and which requires authority to deal with similar projects in future.

15. Connected with this in the subject of your letter of the 28. November already acknowledged. In that letter the Government of Madras reports that the Civil Engineer of the Godavery division urges the necessity of pushing forward in anticipation of sanction certain projects connected with the Amicut, two of which are those referred to in the preceding paragraph, and of the rest all that is stated is that apparently is known to the Madras Government.

- * 1. The extension of the Vijaya Channel to Collore
2. The extension of the Paleole Channel
3. The Tronoe Canal
4. Canal between Samulcottah and Cannanore
5. Canal from the Capotauroo to Masulpatam
5. Do. from Do. to Cannanore
7. Extension of the works of irrigation & navigation in the Cutch Delta

is the nominal list given in the margin of your letter and here transcribed. Before these works the Government of India without any further information, is asked to authorize an expenditure of Rs 65,000 a month, or nearly 8 lakhs of rupees in the year, the only reason assigned for proposing

this unusual course being that the Civil Engineer thinks it of importance at the same time by taking up a number of great improvements to be prosecuted simultaneously instead of confining his operations to a few on account of their magnitude.

16. Thus, the Governor General in Council observes, may be a good reason for simultaneously preparing and submitting the estimates of a large number of works connected with the Amicut, but is no reason for authorizing to commence a large number of works, and to expend a large sum of money on them without any estimate or information at all. And although it may be very true, as the Board

Board of Revenue are said to observe, that the
 "Godavery project, can no longer be limited by
 the original rough Estimate long since executed."
 It is essential that for every material
 departure from the sanctioned Estimates and
 for every additional work not included in
 them a revised Estimate, regularly prepared,
 with the necessary plans and maps, should be
 submitted to the Government before the work can
 be commenced, or the sanction of Government
 accorded to it. In all other great public works,
 such, for instance, as the Great Ganges Canal,
 the original Estimates for which have been largely
 executed, this course has been invariably pursued,
 and the Governor General in Council is aware
 of no reason for departing from it in the case
 of the operations on the Godavery.

17. The Governor General in Council
 must therefore decline to sanction the proposal
 contained in your separate letter above referred
 to, and he must also give a decided negative to
 the request that is made by the Govt of Madras
 for authority to sanction in anticipation of the
 orders of the Supreme Government all works,
 of whatever magnitude and cost, connected
 with the Godavery Canal, there being in His
 Lordship's opinion no sufficient reason for
 considering these works exceptional to the
 general rule.

In

18. On regard to the two projects of 1840
 the Governor General in Council, I am directed
 to observe, that great difficulty is coming
 to a decision. Not only are the Estimates not
 submitted and plans and sections of the proposed
 works not forthcoming, but the information con-
 tained in your letter is of a very meagre description
 and the means of forming a correct judgment
 as to the adaptation of the means to the ends
 proposed, and indeed as to the very utility of the
 works, is altogether wanting. It is therefore the
 Governor General in Council, unwilling to
 throw any unnecessary obstacle in the way of
 prosecuting and completing the channels sub-
 sidiary to the Canal and intended to diffuse
 its benefits, is pleased, in reliance on the judgment
 and in accordance with the recommendation of the
 Honble the Governor in Council, to sanction
 these two projects. It must be understood
 however that the Governor General in Council
 will be under the necessity of refusing
 sanction to every work in any
 future budget the nature of which is not
 set before him to the full extent required
 before the practice of including the public
 works of each year in a general budget was
 introduced.

19. The projects of 1841 and 1842 are
 sanctioned. On regard to 1843 it may be
 observed that a considerable sum of money

1842 - 66,717
 31 - 55,000
 8 72,073

to

has already been spent upon the improvement of the Channel of the Moiny, without much apparent advantage, and that the alteration now designed, if, as would seem, it involves the construction of an artificial fall greater than the surplus to be disposed of, may check the velocity of the stream, and lead to inconvenient results.

20. The projects Nos 17, 18, 21 and 22 are for the completion of roads undertaken with a view of emptying the population of certain districts suffering from drought, and seem necessary to complete undertakings already begun. The two latter refer to a line of road of considerable importance, but in regard to the two former no map has been furnished nor has any means been afforded for forming an opinion of the value of these roads as part of a general plan. The works, however, are the recommendation of the Madras Government, and are sanctioned.

21. Projects Nos 25 and 29, the one for the completion and maintenance of 430 miles of road in Cuddalore, and the other for a road across a portion of the Cauvery Delta; projects Nos 5 and 6 for the construction of roads to bring parts of the districts of North Arcot and Chingleput into communication with the Railway; and Project No 33 for reconstructing the

Rs 17. 136,430
18. 119,166
21. 71,000
22. 39,000

Rs 15. 34,995.8
29. 42,165.4
5. 32,052.15
6. 27,260.2
33. 42,000.-

the road from Cuddalore to the Coleroon in connection with the general system of roads in Tanjore, are also sanctioned.

22. But with regard to these projected roads and navigable Canals and to those contained in Statement No 2, I am directed to observe that much difficulty has been felt in consequence of the want of accurate knowledge regarding the roads and Canals previously existing and now under construction in each district; and I am desired to request that with all future budgets a skeleton map may be furnished showing the general system of roads and Canals as designed, and distinguishing by different colours those completed, those in progress, and those which are deemed necessary but have not been sanctioned.

23. Project No 13 is for a Steam dredge for deepening the Coringa roads, including the expense of working it for a year. This, in the recommendation of the Madras Government is sanctioned. It may be observed however that in Statement No 2 there is an item of Rs 17,887.13 entered as having been already sanctioned for the same purpose.

24. The Supplemental Estimate No 11 is for works of irrigation and navigation on the Moyai Channel in the Raghunadhy district, which has already been sanctioned. I am what is stated in the 39th para of your letter.

(L)

letter it would appear that this estimate is
founded on little more than guesswork, and
that while it is admitted that former Estimates have
been too low with reference both to prevailing
rates and to the necessary strength of the works,
there is no security whatever that the present
Estimate is founded on more reliable data.

Nevertheless the Governor General in Council
relying on the recommendation of the Madras
Government, in order to obviate delay in
the completion of the works, sanctions the Estimate
and authorizes the expenditure of the additional
amount.

25 In conclusion I am directed by the
Governor General in Council to draw the special
attention of the Governor in Council to the
instructions contained in the 11th, 18th & 21st
paragraphs of this letter with a view to
the correct and timely preparation of the
budget in future years, and also to request that it
may be expressly and invariably stated with
regard to the projected works in each district
that the Government of Madras has at its
disposal sufficient means & scientific experi-
ence to ensure the proper application of the
outlay involved in them. In the present
instance nothing of the kind is stated in your
letter under acknowledgment nor can it be
inferred whether the cost of establishment

is included in the Estimates; and though
His Lordship in Council does not suppose
that these important points have been lost
sight of yet the amount which it is
proposed to disburse within the year is
so much larger than heretofore that the
mention of them ought not to have been
omitted.

26 The original maps received
with your letter are returned as requested.

Fort William

The 20th January
1855

I have the honor to be,

Yr
Most Obedt Servant

Genl. Macdougall
Secy to the Govt of India

E. C. B.

Gloucester, 21st Feb 1865

2 Pub. Works 1854/55
84 Cons 13th February

N^o 74
From the Secy to the
Gov^t of India.

21st Jan 1865
24th Feb 1865

N^o 98

[Signature]

[Signature]

[Signature]

[Signature]

Recd by Secy to Govt

N^o 1.

Passing orders on the Annual
Report of projected public
works for 1854/55.

Public Works Dept

N^o 2529

Proceedings of the Madras Government
Under date the 30th August 1865
Read the following

From the Superintending Engineer
of the 1st Divⁿ
Reports on the works
in the Ellore High level (For order 1st July 1865
N^o 559)

x In letter N^o 1501
20th Jan 1865

[Signature]
[Signature]

Only in the current
year, the Superintending
Engineer of the 1st Division
laid before Government a
report upon the condition
of the Ellore Canal, men-
tioning in detail the
damage which it had sus-
tained during the great
flood in November 1864,
and stating generally the
arrangements which he
had for carrying the

local drainage across
the canal, so as to secure
it, as far as possible,
from injury on the occurrence
of any similar inundation.

2 To those proposals
the Government gave a
general approval: and with
the letter recorded at the
head of these Proceedings
Capt. Pyre submits
plans and estimates for
the works in question.

3 The total sum sanc-
tioned by the Government
of India for completing
that portion of the Ellore
Canal which lies within
the first division, between
Nundamoor and Perikere,
was Rs. 1,10,342,-

G. O. No. 484
18 Feb 1865

Including the second
Tunnel at Bheemadole.

of which sum the work
for conveying the drainage
across the canal amount-
ed to Rs. 86,517, and
those for irrigation pur-
poses to Rs. 23,825.
The inundation
of last year having
proved the inadequacy
of the works intended
to provide for the cross
drainage, Capt. Pyre
now proposes to allot
to the works under this
head the sum of Rs.
1,04,000, - thus leaving
for irrigation works only
Rs. 63,42, which however
he deems sufficient to
supply water to all the
land now irrigated. In
this case separate pro-
vision

provision will have to
be made for any ex-
tension of irrigation.

4 The Governor in
Council approves of
the plans submitted
by Captain Rynes,
and the estimates now
before Government, amounting
to Rs. 1,04,000, including
a sum of Rs. 2000 for
strengthening the banks
of the Canal, are hereby
sanctioned. A sum of
Rs. 12000 has been
already granted for
the execution of these works,
and, if possible, a further
allotment will be made
in the Budget for 1865.

G.O. No 1254
dated 9 May 1865

request that you will
have the goodness to
call the attention of His
Highness the Nizam's
Minister to the condition
of the tanks in that part
of the Valley of the Toodoolair
river, which, to the extent
of about 200 square
miles, lies within His
Highness's territories -

2 The security of the
important line of Canal
communication between
Dowlaisheram and
Bezwarrah depends
in a great measure upon
the adequacy and
efficiency of the means
adopted for carrying
it across the large
drainage basins which

necessarily encounters.

By far the largest
of these basins is

that which drains into

the Ponnolair river;

and although the work

now under execution

provide for the safe

discharge across the

Canal of the volume

of this stream to the

extent of three millions

of cubic yards per hour,

it is clear that no pro-

vision, within reasonable

limits, will avail to

save the Canal

should the water of

the

5 The Superintending
Engineer will submit a
separate report upon the
irrigation works, specifi-
ing those which he pro-
poses to execute from
the available balance
of Rupees 6,342, and fur-
nishing estimates for the
additional work which
the probable extension
of the system of irrigation
will render necessary.

6 Application will
be made to His Highness
the Nizam, thro' the
Resident at Hyderabad,
with a view to insure the
timely and effectual re-
pair of the tanks in the
upper part of the Ponnolair
Valley.

6 To S. E. & Dr. H. H. & Plang
" H. H. H. H. H.
" H. H. H. H. H.

4 To Controller of P. W. Acc. H. H. & Plang
" H. H. H. H. H.
" H. H. H. H. H.

2 To Rev. Dept. with refer. H. H. & Plang
" H. H. H. H. H.
" H. H. H. H. H.

To Acct. H. H. & Plang
" H. H. H. H. H.
" H. H. H. H. H.

To The President at
Ityhabad.

in this Depto, and to - No 2529 dated 31st Aug/65

3 The Governor in Council has reason to believe that, in the upper part of the Toomookur Valley, there are many large tanks in bad order, and unprovided with Colingulabs of sufficient size to insure the due discharge of their surplus water; and, as a large expenditure is now being incurred in completing the Canal, His Excellency trusts that early orders will be issued by His

This is to certify that
 Vizanti with a view to
 the tanks in question
 being placed, as soon
 as possible, in an efficient
 state of repair.

$$\frac{14}{2}$$

Sept 31st August
 W. L. D. 252

Start of George
 30th Aug 1865

51 131
20/8/11
2/11/11

278W

To J. V. 1865 Depa
P. of Govt for Aug

No 2529 & 2530

P. of the Algot
D. of Augt 1865

CONCERNS BOTH BRITISH INDIA
AND INDIAN STATES.

Sanctioning estimates
amounting to Rs 104,000 for
Completing that portion of the
Ellore Canal which lies within
the P. & Div. between Gundarra
and Perikere.

No 702-700 & 704

21st Aug 1865 On road.