

Public Works (1895) Department.

RAILWAY BRANCH.

G.O., No. 88 R

DATED 29th July

[Despatch Abstract.]

Establishment. — The scale of — for the Madras-
Kannur section of the Bezwada-Madras Railway,
detailed in Schedule A of the final issue of the
revised and budget estimates for 1894-95 and
1895-96, sanctioned.

IV-I.—Major Bridges—cont.

Soc- tion.	Number of bridge.	Description and span.	Excavation of founda- tions.	Concrete.	Masonry.	Ashlar.	Wrought iron girders,	Petty iron.	Timber.	Total cost. Indian.	Total cost, English.	Total cost.	Contin- genices.	Cost of each bridge.	Cost of each section.	Rate per mile.
IV.	..	1 X 60 girders ..	35,392	..	28,511	564	21-08	Archwork.	87	R.S.	4,215	R.S.	..	..	..	R.S.
	..	7 X 100 " ..	266,829	17,804	135,132	12,575	601-48	696	1,309	1,28,638	1,15,340	2,41,978	..	..	..	..
	..	" ..	24,971	6,243	64,112	286	9-04	..	58	21,813	1,808	23,651	..	..	..	..
	..	1 X 40 " ..	..	..	..	278	9-04	..	58	20,637	1,808	22,445	..	..	..	..
	..	1 X 40 " ..	23,870	5,968	50,916	..	..	..	..	..	..	..	..	..	..	..
	..	Total, IV Division ..	105,874 } 368,965 }	29,515 } Ra. 25 }	378,374 } Ra. 35 }	16,500 } Rs. 100 }	{ 152-96 { Rs. 70 { Ra. 75 }	696 } Ra. 75 }	1,873 } Ra. 8 }	..	..	..	..	..	..	..
	..	Rate ..	{ Ra. 10 { Ra. 20 }	7,379	132,431	16,500	65,871	322	5,619	2,36,761	1,48,081	3,84,842	..	..	..	..
		Cost ..	8,439	..	..	..	..	..	Add for 7 miles at Rs. 11,112 per mile ..	..	..	7,83,626	..	..	..	12,330
		..	..	..	..	..	..	..	Add for 25 miles at Rs. 10,000 per mile ..	..	..	2,50,000	..	..	..	16,170
Grand Total, Major Bridges, Arsikeri to Mangalore, 143 miles ..														..	23,12,303	16,170

Minor Bridges.

Section.	Description.	Excavation.	Concrete.	Masonry.	Ashtar.	Arching.	Ironwork.	Timber.	Girders.	Total.
I	1,064	CUBIC FEET.	CUBIC FEET.	CUBIC FEET.	CUBIC FEET.	CUBIC FEET.	CWT.	CUBIC FEET.	TONS.	Rs.
II	Costing under Rs. 4,000	145,464	73,290	1,62,035	4,746	18,802	2-80	45½	..	2,66,000
	" over Rs. 4,000	39,884	16,671	56,614	807	11,969	..	..	..	
	Total quantities ..	185,348	89,961	2,47,649	5,553	30,771	2-80	45½	..	
	Rate	Rs. 10 per 1,000	Rs. 25 per 100	Rs. 30 per 100	Rs. 75 per 100	Rs. 75 per 100	Rs. 15 per cwt.	Rs. 3 per c. foot.	..	1,26,059
	Cost	1,863	22,490	74,295	4,165	23,078	42	136	..	6,314
									Add contingent at 5 per cent. ..	1,32,373
III	Costing under Rs. 4,000	304,507	156,221	{ 222,160	{ 6,925	{ 36,389	15-68	434-67	2-37	
	" over Rs. 4,000	218,768	87,126	{ 91,651	{ 2,285	{ 40,277	..	..	..	
	Total quantities ..	523,275	243,947	{ 860,215	{ 3,583	{ 76,666	15-68	434-67	2-37	
	Rate	Rs. 10 per 1,000	Rs. 25 per 100	{ 582,375	{ 10,518	{ Rs. 75 per 100	Rs. 15 per cwt.	Rs. 3 per c. foot.	Rs. 270 per ton.	3,84,911
	Cost	5,233	60,987	{ 141,923	{ 2,781	{ 57,500	236	1,303	640	19,241
				{ Rs. 30	{ Rs. 75	{ Rs. 75 per 100				
				{ 2,03,831	{ 10,518	{ 57,500				
				{ 42,577	{ 2,086	{ 57,500				
									Add contingent at 5 per cent. ..	4,04,152
									Total ..	64,576
									Unsurveyed 3 miles, at Rs. 18,192 ..	4,66,728
IV	Costing under Rs. 4,000	181,192	91,479	234,918	5,836	25,371	7-03	177-17	7-82	
	" over Rs. 4,000	301,035	118,610	580,374	6,130	67,768	2-10	42-67	2-86	
	Total quantities ..	482,227	210,289	815,292	12,066	93,129	9-13	219-84	10-68	
	Rate	Rs. 10 per 1,000	Rs. 25 per 100	Rs. 35 per 100	Rs. 100 per 100	Rs. 75 per 100	Rs. 15 per cwt.	Rs. 3 per c. foot.	Rs. 270 per ton.	4,28,345
	Cost	4,823	52,574	285,353	12,066	69,848	138	660	2,884	5,02,666
									Unsurveyed 32 miles, at Rs. 15,708 ..	9,31,001
									Grand Total ..	17,88,102
									Grand Total of Minor Bridging ..	12,506
									Rate per mile ..	

V.—Fencing.

Section.	Number of miles.	Fencing.	Road crossings.	Mile and gradient posts.	Total of section.	Rate per mile.
I	30.05	Rs. 14,420	Rs. 19,475	Rs. 12,66	Rs. 35,161	Rs. 1,170
II	28.24	7,836	21,900	1,100	30,836	1,092
III	25.21	2,766	10,827	1,034	14,627	580
IV	59.50	24,485	90,140	2,850	1,17,475	1,975
Total	143.00	49,507	1,42,342	6,250	1,98,059	1,385

PERMANENT-WAY.

DETAILS OF COST OF ONE MILE, 50 lb. RAIL.

Section I.					RS.
Rails	78.57 tons, at Rs. 80 per ton f.o.b.	...	...	...	6,286
Fish plates,	4.51 tons, at " 98 " "	...	...	...	442
Fish bolts,	0.62 ton, at " 164 " "	...	...	...	102
Spikes,	4.16 tons, at " 216 " "	...	...	...	899
Add—					
87.86 tons.	Total	...	...	...	7,729
Freight to Portuguese Frontier at As. 3-3 per maund	...	...	...	...	488
Port and customs dues	...	...	...	...	210
Carriage from Frontier to Arsikere at 1 anna per ton per mile	...	...	...	...	1,446
Unloading and stacking in depôt in Arsikere, Rs. 2 per ton	...	...	...	...	176
2,220 sleepers at Rs. 3-8-0 each	Total	...	...	...	10,049
	...	...	...	...	7,700
Total cost at Arsikere (167 tons)	...	...	...	...	17,749
Store charges, loading, &c., at 2½ annas per ton	...	...	...	...	26
Haulage, 15 miles, at 1½ annas per ton mile	...	...	...	...	209
Laying at 4 annas per yard	...	...	...	...	440
Maintenance, at Rs. 100 per mile per month, for six months	...	...	...	...	600
Total	...	...	...	...	19,024

MILES.	
Length of section	30.05
Sidings	2.794

Total ... 32.844 miles at Rs. 19,024 per mile... 6,24,824
Contingencies, 5 per cent. ... 31,241

Grand total ... 6,56,065

Cost per mile ... Rs. 21,832

Section II.

RS.				
Total cost at Arsikere as per section I	...	...	...	17,749
Store charges, loading, &c., at 2½ annas per ton	...	...	...	26
Haulage from depôt to rail-head, 45 miles, at 1½ annas per ton per mile	...	...	...	626
Laying, &c., per mile	...	...	...	440
Maintenance, six months, at Rs. 100 per month	...	...	...	600
Total per mile	...	...	...	19,441

MILES.	
Length of section	28.24
Sidings	1.91

Total ... 30.18 miles at Rs. 19,441 ... 5,86,729
Contingencies at 5 per cent. ... 29,336

Grand total ... 6,16,065

Cost per mile ... Rs. 21,815

COST OF 1 MILE OF 60 lb. RAILS AT ARSIKERE.

Section III.					RS.
Rails,	94.28 tons, at Rs. 80 per ton	...	...	...	7,542
Fish plates,	5.00 ton, at " 98 " "	...	...	...	490
Fish bolts,	0.62 ton, at " 164 " "	...	...	...	102
Spikes,	4.16 ton, at " 216 " "	...	...	...	899
Bearing plates,	0.97 ton, at " 166 " "	...	...	...	161
Total					9,194
Freight to Portuguese Frontier at As. 3-3 per maund	...	...	...	...	582
Freight to Arsikere at 1 anna per ton per mile	...	...	...	...	1,726
Loading, &c., at Rs. 2 per ton	...	...	...	...	210
Port and customs dues	...	...	...	...	210
2,200 sleepers at Rs. 3-8-0	...	...	...	...	11,922
Cost of one mile at Arsikere (185 tons)	...	...	...	...	7,700
Loading and unloading at 2½ annas per ton	...	...	...	...	19,622
Haulage, 72 miles, at 1½ annas per ton per mile	...	...	...	...	29
Laying per yard at 4 annas	...	...	...	...	1,249
Maintenance, six months, at Rs. 100 per month	...	...	...	...	440
	...	...	...	...	600
	...	...	...	...	21,940

MILES.	
Length, Section III	25.216
Sidings	1.060

26.276 miles at Rs. 21,940 ... 6,16,495
Contingencies at 5 per cent. ... 30,825

Grand total ... 6,47,320

Rate per mile ... Rs. 25,671.

Section IV.

87 86 tons permanent-way, as section I	...	...	...	...	Rs.
2,200 sleepers at Rs. 3-8-0	...	...	...	...	7,729
					15,429
Loading, &c., 167 tons, at 2½ annas	...	...	...	...	26
Haulage, 167 tons, 30 miles, at 1½ annas	...	...	...	...	418
Laying, As. 4 per yard	...	...	...	...	440
Maintenance, Rs. 100 per month, for six months	...	...	...	...	600
					16,913
MILES.					
Length, 50 lb. rails	...	52.5			
Sidings	...	4.86			
MILES.					
Length, 60 lb. rails	57.36 miles at Rs. 16,913	...	...	...	9,70,130
	7.00 „ at Rs. 21,940	...	...	...	1,53,580
					11,23,710
Contingencies at 5 per cent.	...	...	...	...	56,185
Grand total	...	...	...	...	11,79,895
Rate per mile	...	...	...	...	Rs. 19,830.

STATIONS AND BUILDINGS.
Stations and Offices.

Name of station.	Class.	Mileage.	Distance apart.	Station buildings.	Goods shed.	Passengers platform.		Goods platform.	Latrine.	III Class shed.	Remarks.
					Sq. Ft.	Sq. Ft.	Length rail level.	Length 1-3 above rail.	Sq. Ft.	Sq. Ft.	
Talur	III	3½	3½	757	1,742	600	600	600	250	200	
Bagade	III	15½	11½	757	1,742	600	600	600	250	200	
Dudda	III	19	3½	757	1,742	600	600	600	250	200	
Hassan	III	22½	10½	1,500	1,742	600	600	600	250	200	
Alur	III	37½	7.50	757	1,742	600	600	600	250	200	
Belol	C.S.	47	9.50	757	1,742	600	600	600	250	200	
Masrapur	C.S.	52½	5.75	1,500	1,742	600	600	600	250	200	
Hebala	III	58½	5.75	757	1,742	600	600	600	250	200	
Manzarabad road	C.S.	60½	1.75	757	1,742	600	600	600	250	200	
Manzarbali Gorge	III	64½	4.25	757	1,742	600	600	600	250	200	
Kadmani	III	67½	3.25	757	1,742	600	600	600	250	200	
Kempkul	III	74½	6.75	757	1,742	600	600	600	250	200	
Siradi	Water.	79	4.50	757	1,742	600	600	600	250	200	
Galtata	III	90½	11.50	757	1,742	600	600	600	250	200	
Uppinangadi	III	101½	11.00	757	1,742	600	600	600	250	200	
Sweepadi	III	111½	10.00	757	1,742	600	600	600	250	200	
Buntwall	III	120	8.50	757	1,742	600	600	600	250	200	
Perinchipet	III	127½	7.50	757	1,742	600	600	600	250	200	
Jeppoo	III	134½	7.00	757	1,742	600	600	600	250	200	
		141½									
Total	...	...	...	15,869	19,678	8,200	1,800	1,800	2,250	13,950	
Rates	...	...	...	Rs. 2.7	Rs. 2	Rs. 1.5	Rs. 6	Rs. 1	Rs. 6	Rs. 2.3	
Cost	...	...	...	42,846	39,356	12,300	10,800	10,800	13,500	32,085	
	...	...	...	50,000	...	...	...	...	...	...	
Mangalore	...	...	...	92,846	39,356	12,300	10,800	10,800	13,500	32,085	
Grand Total	...	...	...								

Rs.
Total ... 2,02,287
Contingencies 5 per cent. ... 10,164
Grand Total ... 2,13,451
Rate per mile ... 1,493

Rupees 50,000 includes also goods shed and platforms.

Staff Quarters.

Name of station.	Class.	Mileage.	Distance apart.	Station Masters' quarters.	Assistant Station Master or signaller's quarters.	Menial's quarters.	Loco-motive Foremen.	P.W. Inspector.	A.P.W. Inspector.	Running room.	Guard's and Driver's.	Gangmen's quarters.	Loco-motive menial's quarters.	Remarks.
Talur ..	III	32	32	240	..	320	..	2,000	..	..	..	..	..	..
Bagade ..	III	151	11	240	..	320	..	..	..	..	..	..	..	..
Dudda ..	III	19	8	240	..	320	..	..	..	..	..	..	..	..
Hassan ..	III	293	10	900	240	480	..	..	240	..	..	..	..	..
Alur ..	III	27	7	240	240	320	..	..	..	..	..	..	..	..
Bilol ..	C.S.	47	5	..	240	320	..	..	..	..	..	..	..	..
Masralli ..	C.S.	53	5	..	240	320	..	..	..	..	..	..	..	..
Saklasapur ..	III	63	5	240	240	480	3,000	2,000	240	5,000	7,500	..	960	..
Halsala ..	III	64	5	..	240	320	..	..	..	..	..	..	..	..
Manarahad road ..	III	64	4	..	240	320	..	..	..	..	..	..	..	..
Marachalli Gorge ..	III	67	3	..	240	320	..	..	..	..	..	..	..	..
Katmani ..	III	74	6	..	240	320	..	..	..	..	..	..	..	..
Kempal ..	III	79	4	..	..	480	..	..	..	..	..	..	..	..
Siradi ..	III	90	11	240	240	320	..	..	..	..	..	..	..	..
Goliatu ..	III	101	11	240	240	320	..	..	..	..	..	..	..	..
Uppinangadi ..	III	111	10	240	240	320	..	..	..	..	..	..	..	..
Seerpadi ..	III	120	8	..	240	320	..	..	..	..	..	..	..	..
Pantwall ..	III	127	7	..	240	320	..	..	..	..	..	..	..	..
Feringipet ..	III	134	7	..	240	320	..	..	..	..	..	..	..	..
Jeppoo ..	III	141	7	240	240	480	..	..	..	..	..	..	..	..
On line ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total ..	..	..	..	2,820	3,840	6,720	3,000	4,000	1,200	5,000	10,000	9,600	1,920	..
Rates ..	..	..	..	RS. 27	RS. 24	RS. 20	RS. 27	RS. 27	RS. 27	RS. 27	RS. 27	RS. 1	RS. 2	..
Cost ..	..	..	..	7,614	9,216	13,440	8,100	10,800	3,240	13,500	27,000	9,600	3,840	..
Mangalore ..	..	..	..	6,000	580	2,400	6,000	4,000	..	13,500	27,000	..	2,000	..
Grand Total ..	..	..	..	13,614	9,796	15,840	14,100	14,800	3,240	27,000	54,000	9,600	5,840	..

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RS.
Total .. 1,67,830
Contingencies 5 per cent. .. 8,391
Grand Total .. 1,76,221
Rate per mile .. 1,232

Station Machinery.

Name of station.	Station asphalt.		Water columns.		Piping.		Water tank.		Weighting machine.		Carriage Examining pit.		Switches.		Crossing.		Main signals.		Distant signals.		Weight bridge.		Engine shed.		Engine turntable.		Platform crane.		Washing out apparatus.		Butterfly stops.		Hand pump.		Steam pump.		Tank house and well.		Remarks.																																																																																																																																																																																																																																																																																																																																																																																																																																																											
	No.	In.	No.	In.	Feet.	In.	Capacity.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.		No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

RS.
Total cost .. 2,71,740
Add—Contingencies at 5 per cent. .. 13,587
Total .. 2,85,327
Rate per mile .. 1,996

(Signed) W. G. GILCHRIST,
Engr-in-Chief, Arsikere Mangalore-Ry. Survey.

GOVERNMENT OF MADRAS.
PUBLIC WORKS DEPARTMENT.

Railway.

Read the following papers:—

ARSIKERI-MANGALORE RAILWAY.

Note by the Consulting Engineer for Railways.

The project is forwarded in an incomplete state; the approximate distance is 144 miles from ArsiKERI station on the Southern Mahratta Railway to the sea-port of Mangalore.

2. The portion from ArsiKERI to Hassan, mile 30, was surveyed by the Engineer of the Mysore Durbar in 1894. The present survey is submitted from Hassan, mile 30 to mile 80, and leaving a gap of 11 miles—from mile 91 at Seradi (the foot of the ghâts) to beyond Uppinangadi, mile 117, being a total of 76 miles—the ghât extends from Hebsala, mile 60, to Seradi, mile 91.

3. *Location.*—From Hassan to Hebsala the limit of curves is $60^{\circ} = 955$ feet and grades of $1/100$. Twenty miles beyond Hebsala is the division of British and Mysore territory, and the preliminary plan having been submitted to the Mysore Durbar for their instructions as to the route which was to be taken—this route followed very nearly that recommended by their own engineer in his reconnaissance of 1894—they replied that they had no opinion or criticisms to offer and it was therefore adopted.

4. From Hebsala to Seradi the general instructions to the Engineer-in-Chief were to choose the best engineering line, and this has resulted so far in locating a line of $\frac{1}{40}$ grades (compensated to $\frac{1}{47}$, $\frac{1}{50}$ and $\frac{1}{53}$ with curves of $11.4^{\circ} = 500$ R. and $16^{\circ} = 350$ R. getting base by means of two spirals at chains 203/207 and 213/217. Owing to the formation of the hills, neither a switch-back nor a line running round the north of the hill at mile 78 afford any better means of lengthening the line.

5. The ghât portion to be satisfactorily examined requires another season's work. It is not severe enough for a rack line which would only be justified by a grade worse than $\frac{1}{5}$ and at least 5 or 6 miles long in one continuous length, and as the direct line between Seradi to Hebsala, a distance of about 16 miles and a difference of level of 2,763 feet, would give an approximate grade of $\frac{1}{30}$, the only alternative seems to be to try and improve the present necessarily hasty location on a basis of $\frac{1}{40}$ compensated grade.

6. The length from Seradi, mile 91, to Uppinangadi, mile 111, with curves of 6° and grades of $\frac{1}{60}$ approximate in character to the Hassan-Hebsala portion. The deviation from mile 97 to 100 would eliminate the long and heavy bank.

7. The estimate of *preliminary expenses* of Rs. 1,416 per mile includes the expenditure incurred for the Mysore State in the ArsiKERI-Hassan location *plus* the sanctioned expenditure of Rs. 88,000 during the present survey *plus* the estimated amount of Rs. 92,000 required to complete the survey.

8. The rate per mile for *formation* in earth-work and tunnels is moderate by comparison for the heavy grades; there is much uncertainty about the necessity for lining the tunnels, and the *bridge work* is rather light in amount. Of the sketch designs, I

approve of the large number of arched bridges, but not of the steel viaducts, for which, if the curves admit, I believe 60 feet spans would be more economical. The information regarding foundations is meagre and the cost of the masonry and steel bridges is not separated.

9. *Fencing* should be of wire and not live.

10. *Ballast and Permanent-way*.—No mention is made of the character of the ballast, but it is most likely that abundant stone of good quality is to be had.

The weight of rails of 50 lb. for the easy and 60 lb. for the steep grades and the use of teak sleepers is approved.

11. Generally the estimate is reliable for the surveyed portion of the line, but as has been before stated, it requires the completion of the survey.

12. *Traffic*.—Under the orders conveyed in Government of India No. 798 R.C. of 24th August 1894, Mr. Gilchrist submits a plan and report on the coffee traffic estimates.

13. The result of these inquiries is given in the abstract of traffic and works out to the same visible return on capital as was arrived at before by the Southern Mahratta Railway authorities and are here given for comparison:—

Southern Mahratta Railway estimate.

	RS.	RS. A. P.
5,884 tons per annum at 9 pies per ton mile over 137 miles	37,786	5 5 0 per mile week.
75 per cent. of 300,000 passengers over 69 miles	1,66,718	23 0 0
Add—10 per cent. for rebate under branch line terms and deduct 60 per cent. for working.		
Result is 87,782, which is less than 1 per cent. on capital of 94 lakhs.		

Mr. Gilchrist's estimate.

	RS.
Goods, 61,562 tons per annum at 9 pies per ton mile over average 57 miles	2,11,432
300,000 passengers at 2 pies over 70 miles	2,10,000
Deduct—Working expenses at 60 per cent.	
Result is 168,573, which is a return of 1 per cent. on capital of 169 lakhs.	

14. *Mangalore Port*.—Mr. Gilchrist sends with his report a short note on the works needed in his opinion to make this port efficient. As this is being dealt with by Mr. Walch, I refrain from offering any remarks beyond saying that there appears to be only a slight difference of opinion as to the character of the engineering work required to effect the improvement.

28th September 1895.

(Signed) F. R. UPCOTT,
Consulting Engineer for Railways.

Note by the Consulting Engineer for Railways.

Note on estimate submitted to complete the survey.

The total length is 144 miles; of this 30 miles has been located by Mr. Groves, costing Rs. 22,602, half of which sum was supplied by the Mysore State.

2. The result of Mr. Gilchrist's work has been 76 miles surveyed, of which 30 miles are finally and 46 miles partially located (requiring further examination), at a cost of Rs. 88,000. Thus leaving 38 miles unsurveyed.

3. Mr. Gilchrist forwards an estimate of Rs. 91,920 for establishment only for 12 months to complete the work. I think the survey should be completed in nine months at a monthly cost of an Engineer establishment of Rs. 4,000 = 36,000 and petty establishment of Rs. 600 = 5,400 which should be 84 miles at 500 per mile = 42,000.

4th October 1895.

(Signed) F. R. UPCOTT,
Consulting Engineer for Railways.

ORDER—No. 639 R., dated 4th October 1895.

The Consulting Engineer for Railways submits plans and estimate and a report on the Arsikere-Mangalore Railway Survey sanctioned in Government of India letter No. 1075 R.C., dated 25th October 1894.

2. In the note by the Consulting Engineer it is pointed out that the project is incomplete and the approximate estimate of cost, 1.2 lakhs per mile, somewhat high, and that further survey work to complete the unsurveyed portion and to obtain a more economical alignment of the ghât section is very desirable.

3. The data on which the estimate of traffic is based are very meagre, and it is the opinion of His Excellency the Governor-in-Council that the prospective benefits to be gained by the Mysore State, which has no port within a reasonable distance connected by rail, and the future advantages to the South Canara district and the coffee estates served by the proposed line cannot be adequately gauged by the present traffic which would be greatly developed by the railway.

4. The reports, plans and estimates are therefore submitted to the Government of India with the opinion of His Excellency the Governor in Council that the completion of the survey with a further examination of the prospects of traffic is justified by the enormous importance of this line to the Mysore State and the suggestion that that state might reasonably be invited to bear its proportion of the cost of the survey, if the concession granted to Messrs. Kirby and Lonsdale for one year has lapsed.

[Here enter No. 640 R., dated 4th October 1895.]

(True Extract.)

(Signed) F. R. UPCOTT,
Joint Secy. to Govt., P.W.D.,
Railway Branch.

To the Engineer-in-Chief, Arsikere-Mangalore Railway Survey.
" Resident in Mysore.
" Examiner, Public Works Accounts.
" Collector of South Canara.
" Revenue Department.

ENDORSEMENT—No. 610 R., dated 4th October 1895.

Forwarded.

(By order.)

(Signed) F. R. UPCOTT,
Joint Secy. to Govt., P.W.D.,
Railway Branch.

Exd. J. P. Oliver.
Spare Copies

RAILWAY.

Govt. of {1895} Madras.
PUBLIC WORKS.

Dated October, 4th.

Recd.

Encl.

G.O. Nos. 639, 640 R., 4th Oct.
1895.

OCTOBER.

Arsikeri-Mangalore Railway
Survey

Forwarding Proceedings on the plans,
estimate and report on the — submitted by
the Consulting Engineer for Railways.

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Govt. Orders. No 619 R d/23 Mar 92

" " 818 R d/6 May 1893.

" " 819 R d/6 May 1893

" " 152 R d/10 March 1894.

" " 2043 R d/20 Aug: 1892

Report.

Preliminary (a). The Survey of the Arsikere-Mangalore Railway was undertaken under the orders of the Government of India conveyed in notification Public Works Department No 416 dated 27th October 1894.

The object is to establish Railway connection with Mangalore, a seaport on the Western Coast from Arsikere a station on the Southern Mahratta Railway (Mysore Section) about 100 miles North of Bangalore. The length of the line has been estimated at 137 miles but this has been obtained from the length of the Road and in the final result it is expected to be about 143 miles, the extra length being due to the gradients necessary for an adhesion line. The origin of the survey is an application from Messrs Kirby and Lonsdale for a concession for the

G. O. 619 R. 23rd March 1893.

G. O. 818 R. 6th May 1893.

G. O. 819 R. 6th May 1893.

G. O. 152 R. 10th March 1894.

construction of a line from Arsikere through Hassan to Mangalore with branches from Hassan to Mysore and Chikmagalur and an extension from Annajenqud in Mysore Territory through Satya. Mangalur

to Erode on the Madras Railway where it would effect a junction with the narrow gauge system of the South Indian Railway. As a result of these negotiations the survey now under submission was taken up as it really forms the main feature in the schemes proposed.

The primary object is to obtain an outlet for the Mysore State to a port and Mangalore has been for ages the port which has served Mysore. From its situation on the West Coast it is liable for 3 months every year to the full force of the monsoon and the only routes by which either merchandise or travellers can leave involve a long land journey over roads much cut up during the heavy rains. Mangalore contains a large mercantile population and is a wealthy town and is about the Northern limit of the Koorlah population who are known to

to the extent of $3\frac{1}{4}$ miles. At Saklaspur the Hemavati is crossed by the Road on an Iron Bridge of 4 spans of 120 feet supported on screw piles and immediately to the West of the River lies the town of Saklaspur, head quarters of the Manjarabad Taluk. Saklaspur is situated on the end of a ridge branching out from the actual Watershed of the Western Ghats and along this ridge the road runs to close to the Manjarabad Hill on which is an old Fort evidently built to command the pass in former days. The actual ridge of the Ghats between the East and West Watersheds runs North at about 1 mile North of Manjarabad and along this watershed the Mudugherri road has been laid out. Mr. Groves' trace crosses this Mudugherri road at a saddle about 3 miles North East of Manjarabad and measured directly about $1\frac{1}{2}$ miles from Saklaspur. There is, therefore, a very peculiar physical feature at this point in the fact of a River of considerable volume, requiring to span it 4 spans of 120 feet, running parallel to the actual Watershed of India only $1\frac{1}{2}$ miles distant and only 83 feet below the saddle, which has been selected for the proposed Railway to pass through for the descent to the Western plains. The

Red: Level of Saklaspur is 2960.

Red: Level of Saddle is 3043 } difference 83.

The River on the Western face is the Yettenhalle and the Road circles under the Manjarabad Hill until it reaches a point in the valley 6 miles from Saklaspur where it crosses the Yettenhalle at Red: Level 2628. The reason for this is that the Road abandons the Yettenhalle valley and rises in 2 miles 300 feet to cross into the Maranhalle valley and so work through easier country. The actual descent of the Road begins only at 11 miles from Saklaspur up to which point the total fall has been only 525 feet. The Railway trace sticks to the Yettenhalle valley and falls only 533 feet in a distance of $7\frac{3}{4}$ miles from the ridge

to be subject to periodical turbulent outbreaks and were this to occur at Mangalore from where the garrison has been now removed it would take at least a week before troops could be brought upon the scene.

Further the province of South Canara is rich in crop irrigated by the Nittavati and other large rivers which never fail owing to the South-West Monsoon, and had transport been available much of the distress in Mysore during the disastrous famine of 1876-'77 would have been prevented.

- (b) The previous reports will be found in the Government orders quoted above and with regards to them it is only necessary to point out that a very serious clerical error has crept into the report by Mr. McFarlane at page 8 which

G.O. 2043.R. 20th Aug. 1892.

has led to the hope that a gradient of 1 in 84 would be possible. This results from the level of the road at the frontier being given as 1733 feet above sea-level instead of 733 feet, and this error has been carried through much of the subsequent notes.

- (c) From Arsikere to Hassan the country is much the same as Mysore generally, open rolling plains with deep depressions and high ridges between the valleys. For these 30 miles the line proposed has been located as far as Hassan by the Mysore Government and the attention of the party was chiefly directed to the portion to be done between Hassan and Mangalore. After leaving Hassan the country falls for some 4.9 miles to the Yagatchi River and after crossing another smaller river rises to Palya on the main Road. Beyond Palya the rise continues to a place called Barlo at which coffee land is first met. From Barlo to Saklasput the fall is 360 feet, the whole of which occurs on the Road in the first 4 miles from Barlo and the Railway has therefore to take a route to the Eastward along the ridges dividing the watershed between the Yagatchi River and the Hemavati which entails increased length to