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MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

G.O. No.	647	Press
639.641		Mis.
Dated	28 - 2 -	1873 .

Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
28th February 1873.*

Read the following papers:—

No. 639. From the Consulting Engineer for Railways, to the Secretary to Government, Public Works Department, dated Madras, 26th November 1872, No. 651.

With reference to the Order of Government, No. 1,761, dated 24th July 1872, I have the honour to submit printed lists showing the levels taken at stations and principal bridges on the Madras and Great Southern of India Railways.

No. 640. Endorsement of the Chief Engineer for Irrigation, dated Fort St. George, 17th January 1873, No. 27 A.

From the Officiating Superintendent of the Great Trigonometrical Survey of India, to the Acting Chief Engineer for Irrigation, Ootacamund, Neilgherry Hills, dated Dehra Doon, 22nd August 1872, No. 277-1,025.

In reply to your letter No. 122, dated 11th ultimo, addressed to the Surveyor

General, and forwarded by him to me, and with reference to orders by the Government of India, No. 367-I, dated 8th May 1872, Public Works Department, I have the honour to call attention to the despatches from this office to your address as per margin, and to explain as follows.

- Charts (despatched on 9th instant)*
- | | |
|--|--|
| (1.) Madras Meridional Series, Season 1863-64, 1 copy. | |
| (2.) Do. do. 1864-65, 1 " | |
| (3.) Coast Series ... No. 7, 1 " | |
| (4.) Do. ... No. 8, 1 " | |
| (5.) Great Arc Series, Southern Section, 1 " | |
| (6.) Do. Northern Section, 1 " | |
| <i>Under despatch</i> | |
| (7.) Levels in the N.-W. Provinces, Sheet No. 9, 1 copy. | |
| (8.) Book of Table of Heights, 1863, 1 " | |

2. The preface to above despatch (8) describes the origin and purpose of the main lines of spirit levels which it is intended should be run all over India by the Great Trigonometrical Survey. These lines have not as yet been extended sufficiently south to reach Madras, but it is obviously desirable that a record of the reduced spirit levelled heights of all reliable levels throughout India, together with drawings and detailed descriptions of bench-marks, should be placed in my hands; the lines themselves, in the first instance, should be connected with the sea level of this department, even though it happens that in some cases this datum is only of a provisional nature, pending the extension of our main lines; unless this is done, the different plots or lines of spirit levels, of which many are disconnected and in terms of various origins, cannot be compared even approximately, while the record themselves are liable to be lost sight of unless placed in a recognised depository for their reception. In the North-West Provinces of India, where our main lines of spirit levels have been established, considerable contributions have already been made of spirit levels taken for various projects, so that at least twelve sheets of compilation, based on our main lines, have already been published, and further editions of these sheets are prepared and issued from time to time as additional material becomes available. These remarks, in conjunction with a sample sheet No. 9—under despatch (7)—will enable you to follow the objects in view, and the methods of delineation and publication adopted, and I trust the vast utility of the project will commend itself to your approval and enlist your co-operation in giving it effect.

3. This brings me to the particular lines of spirit levels mentioned in paragraph 2 of your letter under reply, and to my propositions for connecting them with the Great Trigonometrical Survey datum. As already remarked, our main lines of spirit levels have not as yet been extended to the Madras Presidency, but, pending this extension, there are excellent trigonometrical heights available which also originate from our datum of mean sea level at Karachee, checked at Calcutta

Proceedings of the Madras Government, Public Works Department.
23th February 1873.

published other books of heights, as the extension of the Great Trigonometrical Survey Levelling operations enabled him to do so.

3. As a further step towards meeting the wishes of Government, he undertook the compilation of charts of levels, embracing those of all branches of the Public Works Department, Railways, etc., "to show at a glance the water-shed, water-courses, and all the most important particulars connected with the contour of the country," and thus render this information generally available for the public service "in the form in which it will probably be most readily appreciated." He first confined himself to the North-West Provinces; but as time advanced, and the wishes of Government became more generally known, data were obtained, which afforded means for extending the undertaking.

4. The accompanying Index (Sheet No. 1) for Northern India will show what progress has already been made; and I have now the honour to invite your co-operation towards extending the project all over the country where spirit levelling operations have been carried on. The information I need is as follows:—

(1.) Tables of *reduced* heights of the local lines of levels obtained by connection with a Great Trigonometrical Survey bench-mark, or, in the absence of the latter, with a principal station of the triangulation.

(2.) Detailed drawings of bench-marks, etc.

(3.) Charts of lines of spirit levels plotted on a scale of 1 inch = 1 mile.

(4.) Notes of the instruments used, the procedure adopted, and the accuracy attained.

5. With regard to (1), it is very desirable that all levels should be connected with a Great Trigonometrical Survey bench-mark, should such exist within a reasonable distance; but failing this it will generally happen that a point, of which the height has been trigonometrically determined, can be made use of provisionally and when opportunity offers this point could be connected by spirit levelling with our main lines, and a constant determined, which applied to the levels would reduce them to the Great Trigonometrical Survey datum. It is unnecessary to connect any group of levels with more than one Great Trigonometrical Survey bench-mark, or trigonometrically determined point.

6. I need not impress upon you the importance of having one depository, such as this office, for data of so valuable a nature as that in question, nor the desirability of systematically supplying it so soon as obtained to avoid the chance of any being overlooked or mislaid.

7. The levelling operations of this department have hitherto been chiefly confined to Northern India, and although steps are being taken to extend them to the South, but little progress has been made at present: when more has been done it is in contemplation to publish Sheet No. 2 of this Index.

8. I send you herewith a specimen sheet of our level charts and some of the data which accompany it, in order to give you a general idea as to what is required.

Proceedings of the Madras Government, Public Works Department.
23th February 1873.
No. 123, dated 11th July 1st, (from Ootacamund,) was written, you were not aware of the proposals which I submitted to the Madras Government on the subject of the steps to be taken for connecting together the various groups of levels in the Presidency, and reducing them to the datum of the Great Trigonometrical Survey. I rather think too that my *locum tenens*, Major Montgomerie, cannot have been aware of them, or he would have quoted them in his reply No. 277-1,023, dated 22nd August, to your letter.

2. They will be found, together with the Resolution of the Madras Government on the subject, in Proceedings No. 121, dated 6th June 1863, in the Public Works Department. To these Proceedings I now beg leave to draw your attention, and to inform you that, while I concur with Major Montgomerie in all his suggestions, I cannot but think that the work to be done properly ought to be put into the hands of an officer of the Royal Engineers possessing the local knowledge and other qualifications which are specified in the 4th paragraph of my letter to the Madras Government. As the Governor in Council was then unable to place the services of an Engineer Officer at my disposal for the purpose in question, I obtained the sanction of the Government of India for an addition to the staff of the Trigonometrical Survey to permit of the work being taken in hand, but this sanction was shortly afterwards cancelled in consequence of the financial embarrassments of the Government, and nothing was done in the matter.

3. I have now to request that you will re-submit my proposals for the consideration of the Madras Government, and ascertain whether the Government is now able to provide the services of an Engineer Officer and of one of the Assistants in the Department Public Works and the requisite funds for the prosecution of the work, on the basis of the estimate in Financial Resolution, Government of India, No. 16, dated 9th January 1863, a copy of which will be found in the Proceedings.

No. 640B. Docket of the Inspector-General of Irrigation Works, dated Fort William, 21st December 1872, No. 19.

FORWARDED to the Chief Engineer, Madras Public Works Department, Irrigation Branch, for attention.

(Signed) C. T. SKIPWITH, Captain, R.E.,
For Inspector-General of Irrigation Works.

Circular from Major T. G. MONTGOMERIE, R.E., Officiating Superintendent, Great Trigonometrical Survey of India, to the Officiating Inspector-General and Deputy Secretary to the Government of India, Public Works Department, Irrigation Branch, dated Dehra Doon, 22nd October 1872, No. 356—I,303.

It is now some time since the Survey Department was called on by Government to collect and reduce all the data of levels existing in the Public Works Department, Railway and Survey Offices throughout India.

2. As a first step towards carrying out this order, Colonel J. T. Walker, R.E., the Superintendent, published in 1863 a book of heights, determined by the Great Trigonometrical Survey in Sindh, the Punjab, and North-West Provinces, where the execution of lines of spirit levels under his superintendence, enabled him to furnish a large number of points scattered over that part of India, which could be made use of by any officers who required them for special purposes. He has since

*Proceedings of the Madras Government, Public Works Department,
28th February 1873.*

SUBMITTED to Government.

2. In the opinion of the Chief Engineer for Irrigation it is at the present time perfectly impossible to place the services of any officer in the department at the disposal of the Superintendent of the Great Trigonometrical Survey of India for the purpose specified.

3. It is with the greatest difficulty that the current work of the department can be carried on, in fact, under the recent organization how this is to be done may be said to be as yet unsolved. There can be no question as to the desirability of the measure advocated by the Superintendent, Great Trigonometrical Survey of India, but the difficulty experienced in meeting the demands of even the delta districts and in securing the efficient maintenance of works already constructed, leaves no room whatever for hesitation in the matter. Officers have already been directed to reduce all recorded levels to mean sea datum, and they will now be called upon to submit their lists for record in the office of the Chief Engineer for Irrigation.

(Signed) C. J. SMITH, Captain, R.E.,
For Chief Engineer for Irrigation.

No. 641. ORDER THEREON, 28th February 1873, No. 647.

CIVIL WORKS, No. 40.

THE Government much regret that the present strength of the Public Works Establishment in this Presidency does

not admit of the services of an Engineer Officer and of an Assistant in the Public Works Department being made available for the purpose indicated by the Superintendent of the Great Trigonometrical Survey of India. His Excellency the Governor in Council fully recognizes the value of the work which it is proposed to carry out, and if Colonel J. T. Walker can obtain from the Government of India an establishment to be employed under his own orders, every assistance will be afforded by the Public Works Establishments of Madras, and all available information will be placed at his disposal. Efforts will be made to continue the systematic record and reduction to mean sea datum of existing lines of level, with a view to their being placed at the disposal of any officer who may hereafter be made available for the duty of connecting them with the Trigonometric series.

(True Extract.)

Colonel, R.E.,

Secretary to Government.

To the Superintendent of the Great Trigonometrical Survey of India.
.. Consulting Engineer for Railways.
.. Chief Engineer for Irrigation.

Exd. S. T. Austin.

GREAT SOUTHERN OF INDIA RAILWAY.

List showing the height of Rail level of Stations and principal Bridges,
Referred to the centre of Negapatam Station, which is 135.57 feet
above the datum adopted for the levels of this Railway.

Distance from Negapatam.		Distance from last point.		Name of Station or Bridge.	Height in feet of Rail level above datum.
Miles.	Chains.	Miles.	Chains.	EASTERN SECTION.	
0	21	0	21	Negapatam Station.....	
0	56	0	35	Davanady Bridge... .. below.	1.05
3	40	2	64	Sickle Station... .. above.	5.28
4	68	1	28	Codamoorthy Bridge... .. "	7.98
7	20	2	32	Kevalore Station... .. "	12.78
14	40	7	20	Trivalore do. "	26.70
16	48	2	8	Vellay Voykal... .. "	32.12
18	2	1	34	Kulikerry Station... .. "	34.91
18	70	0	68	Cattaur Bridge... .. "	36.47
24	40	5	50	Kordacherry Station... .. "	52. 3
28	58	4	18	Vennar Bridge..... "	64.51
29	49	0	71	Needamungalum Station.. "	66.08
29	68	0	19	Coryaur Bridge..... "	66. 8
30	30	0	42	Pamanyaur do. "	66. 8
31	3	0	53	Condayar do. "	66.81
35	60	4	57	Ammapettah Station... .. "	93.71
39	0	3	20	Saliangungalum do. "	108.99
39	54	0	54	Vadavaur Bridge..... "	115.95
48	60	9	6	Tanjore Station..... "	179.34
49	21	0	41	Rajah's Bridge... .. "	181.56
52	8	2	67	Moothalay Moothoo Bridge "	154.00
59	0	6	72	Boodalore Station... .. "	176.23
61	62	2	62	Bridge, name unknown ... "	167.60
62	40	0	58	Do. "	169.71
62	76	0	36	Do. "	172.22
64	1	1	5	Do. "	177.92
64	75	0	74	Do. "	183.35
73	0	8	5	Teroovembore Station..... "	220.70
75	22	2	22	Weyacondam Bridge... .. "	228.24
78	40	3	18	Trichinopoly old Station... "	252.13

List showing the height of Rail, &c.—(Continued.)

Distance from Negapatam.		Distance from last point.		Name of Station or Bridge.	Height in feet of Rail level above datum.
Miles.	Chains.	Miles.	Chains.		
ERODE EXTENSION.					
80	1	0	0	Weyacondam Bridge.....	241.16
81	8	1	7	Trichinopoly Station.....	216.52
82	15	1	7	Kudamurty Bridge... ..	222.46
90	39	8	24	Elambanore Station.....	246.53
96	42	6	3	Weyacondam Bridge.....	267.70
101	60	5	18	Kulithalai Station.....	283.02
107	48	5	63	Lalapatai do.	306.43
114	50	7	2	Cuttalaipillai do.	335.25
125	41	10	71	Ambravathy Bridge.....	380.43
125	68	0	27	Caroor Station.....	380.43
135	25	9	37	Poogalore do.	490.04
139	35	4	10	Noyal Bridge.....	413.76
142	45	3	10	Codumoodi Station... ..	419.80
144	66	2	21	Korungumpalium Nullah... ..	425.46
149	77	5	11	Colanelly Station.....	443.83
166	0	16	3	Erode Station.....	539.87

NEGAPATAM.

NEGAPATAM,
15th July 1868. }

(Signed) WILLIAM BETTS,
Agent.

NORTH-WEST LINE.—(Continued.)

Distance from Madras.			Distance from last Point.			Name of Station or Bridge.	Height in feet of Rail level above datum.
Ms.	Chs.	lks.	Ms.	Chs.	lks.		
77	68	39	5	6	...	Poody Station	436.99
81	6	39	3	18	...	Soornamookey River	403.74
83	43	39	2	37	...	Tripetty Station	371.46
96	71	39	13	28	...	Ballapilly Siding	791.01
109	2	39	12	11	...	Coodoor Station	647.45
109	59	39	0	57	...	Mooshtyair River	636.85
112	75	39	3	16	...	Goondalair River	639.19
121	60	39	8	65	...	Reddypully Station	565.25
123	51	39	1	71	...	Poolungaair River	531.65
129	60	39	6	9	...	Rajampett Station	465.75
135	49	99	5	69	60	Cheyair River	476.28
136	49	99	1	...	...	Nundaloor Station	482.51
147	33	99	10	64	...	Ontimetta "	429.86
152	30	99	4	77	...	Bankrapett River	494.64
161	20	64	8	69	65	Cuddapah Station	459.69
174	75	...	13	55	...	Paupugnee Bridge	463.44
176	...	...	1	5	...	Camalapoore Station	464.36
185	45	...	9	45	...	Yerragoontla "	547.44
195	40	...	9	75	...	Moodanoor "	617.50
210	20	...	14	60	...	Kondipuram "	720.64
211	60	...	1	40	...	Chittravutty Bridge	702.24
227	40	...	15	60	...	Todputree Station	781.85
233	25	...	5	65	...	Pennair Bridge	815.85
242	47	...	9	22	...	Royalcherroo Station	940.85
257	20	...	14	53	...	Ghooty "	1202.99
273	...	...	15	60	...	Goondacul "	1410.94
291	10	...	17	10	...	Veerapoor "	1427.16
296	66	...	5	56	...	Huggry Bridge	1350.16
305	5	...	8	19	...	Bellary Station	1484.16
280	40	...	7*	40	...	Nuncherla "	1552.65
294	45	...	14	5	...	Auspree "	1496.55
306	74	...	12	30	...	Adoni "	1364.35
324	25	...	17	30	...	Kosgee "	1236.35
333	20	...	...	60	...	Toongabudra Bridge	1080.55
339	26	...	6	6	...	Mutmurri Station	1205.60
350	6	...	10	60	...	Raichore ...	1311.21

* Nuncherla from Goondacul Station 7 M. 40 Chs.

CHIEF ENGINEER'S OFFICE,
25th April 1870.

(Signed) H. R. P. CARTER,
for Ag Chief Engineer.

Ms. 28th Aug 1873 15h. 1.39.
P.M. 5.8.32/2.

MADRAS RAILWAY SOUTH-WEST LINE.

LIST showing the Height of Rail Level at the centre of each Station and at the principal Bridges, referred to the Mean Sea Level at Madras as shown by Colonel D'Haviland's Bench-mark near Fort Saint George.

Distance from Madras.			Distance from last Point.			Name of Station or Bridge.	Height in feet of Rail level above datum.
Ms.	Chs.	lks.	Ms.	Chs.	lks.		
...	...	...	...	...	...	Madras Terminal Station	14.34
1	51	...	1	51	...	Cocharne's Canal	19.11
3	34	...	1	63	...	Perambore Station	22.57
12	78	50	9	44	50	Avady "	80.65
17	68	...	4	69	50	Tinnanore "	115.51
25	64	...	7	76	...	Trivalore "	155.36
29	27	...	3	43	...	Cuddumbatore "	170.47
32	50	...	3	23	...	Cortilliar River	183.56
36	3	50	3	33	50	Chinnamapet Station	197.11
42	50	34	6	46	84	Arconum Junction	298.39
48	70	...	6	19	66	Cortilliar River (branch)	353.41
55	63	...	6	73	...	Sholingur Station	420.96
65	7	...	9	24	...	Arcot "	570.38
71	30	...	6	23	...	Poincy River	635.32
73	...	...	1	50	...	Trivellum Station	630.04
80	40	...	7	40	...	Vellore	700.88
95	55	...	15	15	...	Gooriathum "	870.30
97	37	...	1	62	...	Gooriathum River	879.76
105	40	...	8	3	...	Mailputty Station	952.75
106	20	...	...	60	...	Palar River	961.36
112	67	50	6	47	50	Amboor Station	1061.07
122	67	...	9	79	50	Vaniembady "	1153.18
125	68	...	3	1	...	Godar River	1182.83
129	2	...	3	14	...	Kullar "	1259.20
129	61	...	...	59	...	Godar "	1271.19
132	...	...	2	19	...	Jollarpett Junction	1321.77
136	72	...	4	72	...	Tripatoor Station	1272.09
144	50	...	7	58	...	Fauperputty River	1231.34
146	77	...	2	27	...	Muttoor "	1204.37
151	27	36	4	30	36	Samulputty Station	1264.19
161	3	...	9	55	64	Panar River	1217.46
166	6	50	5	3	50	Moorapoor Station	1305.81
180	1	36	13	74	86	Muilapoorum "	1391.02
180	61	...	...	59	64	Toopoor River	1370.05
192	11	36	11	30	36	Ahtoor or Shervroy Station	1240.98
199	10	...	6	78	64	Shervaroy River	989.52
206	61	36	7	51	36	Salem Station	922.38
219	65	...	13	3	64	McDonald's Choultry Station	784.85
219	74	...	...	9	...	Pund River	786.23
230	49	65	10	55	65	Sunkerry droog Station	872.23
239	3	...	8	33	35	Kottypollum River	590.97
241	20	...	2	17	...	Cauvery "	502.19
243	4	...	1	64	...	Erode Station	540.63
252	13	19	9	9	19	Perandooray River	843.94
266	40	61	14	27	42	Wutkallee "	976.29
274	73	...	8	32	39	Avanashy "	987.93
280	26	...	5	33	...	Venkatakaray "	1045.72
285	72	...	5	46	...	Soomanoor Station	1114.78
300	59	...	14	67	...	Noyel River	1286.66
301	68	...	1	9	...	Coimbatore Station (Pothanore)	1303.48
307	76	56	6	8	56	Muddackerry "	1112.07
316	35	99	8	39	43	Walliar "	687.12
323	49	22	7	13	23	Conjecode "	370.81

Ms. 28 Feb 1913
 P.M. 5.00 PM
 639

MADRAS RAILWAY, SOUTH-WEST LINE—(Continued.)

Distance from Madras.			Distance from last Point.			Name of Station or Bridge.	Height in feet of Rail level above datum.
Ms.	Chs.	Is.	Ms.	Chs.	Is.		
332	7	13	8	37	91	Palghat Station ...	252.82
337	70	40	3	63	27	Porlay " ...	196.16
346	73	41	9	3	1	Lockady Cottah Station ...	135.83
351	44	21	4	50	80	Wettappilum " ...	109.53
359	48	"	8	3	79	Shoranur " ...	98.60
366	53	11	7	5	14	Puttambly " ...	84.88
373	10	"	6	36	86	Thozha River " ...	45.50
378	12	59	5	2	59	Kootypooram Station ...	38.73
387	43	43	9	39	84	Tirur " ...	13.94
392	39	"	4	75	57	Tannoor " ...	20.65
397	38	6	4	79	6	Purpanengady " ...	85.45
402	50	"	5	11	94	Kudlichandy River " ...	7.62
406	23	42	3	53	42	Beypoor Terminus ...	11.77

CHIEF ENGINEER'S OFFICE,
8th June 1868.

(Signed) J. A. PINSON,
for Acting Chief Engineer.

BANGALORE BRANCH LINE.

Distance from Madras.			Distance from last Point.			Name of Station or Bridge.	Height in feet of Rail level above datum.
Ms.	Chs.	Is.	Ms.	Chs.	Is.		
132	"	"	"	"	"	Jolarpet Junction ...	1321.77
136	6	"	4	6	"	Single 12 feet opening ...	1444.69
145	36	"	9	30	"	Double 30 feet arch ...	1963.59
154	20	"	8	64	"	Coom Station ...	2244.51
157	20	"	3	"	"	Single 30 feet arch ...	2329.83
162	77	"	5	57	"	Three 30 feet arches ...	2493.53
175	40	"	12	43	"	Colar Station ...	2666.57
175	58	"	"	13	"	Three 20 feet openings ...	2667.17
183	16	"	8	2	"	Konakancarena River ...	2796.85
192	20	"	8	40	"	Mahar Station ...	2969.92
203	39	"	11	19	"	Penair River ...	2829.14
204	51	"	1	12	"	Quidgody Station ...	2856.85
214	71	"	10	20	"	Single 30 feet Arch ...	2983.27
216	26	50	1	35	59	Bangalore Station ...	3033.97

CHIEF ENGINEER'S OFFICE,
8th June 1868.

(Signed) JOHN A. PINSON,
for Acting Chief Engineer.

NORTH-WEST LINE.

Distance from Madras.			Distance from last Point.			Name of Station or Bridge.	Height in feet of Rail level above datum.
Ms.	Chs.	Is.	Ms.	Chs.	Is.		
42	50	34	"	"	"	Arconam Junction ...	298.39
50	20	34	"	"	"	Tritany Station ...	285.62
51	23	34	7	65	"	Tritany River ...	283.54
59	57	34	0	73	"	Nazgery Station ...	400.18
59	75	34	8	34	"	Nazgery River ...	394.69
69	18	39	0	15	"	Palloor Station ...	496.86
72	62	39	9	23	5	Tadiky River ...	564.39

Dist- 680

From P.W.D. 186/73

The Supt. G.T. Survey

of India Deh.

on Dun

To Secretary to Govt.

Public Works

Dehra Dun

N^o 353

1800

Dated 22

Rev: 29 } Oct-1892

Cust: 14

Regarding collec-
tion & reduction of
all levels existing
in the P.W.D.
Railway & Survey
Offices throughout
India.

N^o 353
1300

CIRCULAR.

From,

The Superintendent Great Trigonometrical Survey of India
Dehra Dun.

To,

The Secretary to Government
Public Works Department
Dehra Dun.

Sir,

It is now some time since the Survey Department was called on by Government to collect and reduce all the data of levels existing in the Public Works Department, Railway and Survey Offices throughout India.

2. As a first step towards carrying out this order, Colonel J. T. Walker, R.E., the Superintendent, published in 1863 a book of heights, determined by the G. T. Survey in Sind, the Panjáb and North-West Provinces, where the execution of lines of Spirit Levels under his superintendence, enabled him to furnish a large number of points scattered over that part of India, which could be made use of by any officers, who required them for special purposes. He has since published other books of heights, as the extension of the G. T. S. Leveling operations enabled him to do so.

3. As a further step towards meeting the wishes of Government, he undertook the compilation of Charts of Levels, embracing those of all branches of the Public Works Department, Railways, &c., "to show at a glance the watershed, water-courses, and all the most important particulars connected with the "contour of the country," and thus render this information generally available for the public service "in the form in which it will probably be most readily "appreciated". He first confined himself to the N. W. Provinces; but as time advanced, and the wishes of Government became more generally known, data were obtained, which afforded means for extending the undertaking.

4. The accompanying Index (Sheet No. 1) for Northern India, will shew what progress has already been made; and I have now the honor to invite your co-operation towards extending the project all over the country, where Spirit Leveling operations have been carried on. The information I need is as follows:—

- (1.) Tables of *reduced* heights of the local lines of levels obtained by connection with a G. T. Survey Bench-Mark, or in the absence of the latter, with a Principal Station of the triangulation.
- (2.) Detailed drawings of Bench-Marks, &c.
- (3.) Charts of Lines of Spirit Levels plotted on a scale of 1 inch=1 mile.
- (4.) Notes of the instruments used, the procedure adopted, and the accuracy attained.

5. With regard to (1), it is very desirable that all levels should be connected with a G. T. Survey Bench-Mark, should such exist within a reasonable distance; but failing this it will generally happen that a point, of which the height has been trigonometrically determined, can be made use of provisionally

(2)

and when opportunity offers this point could be connected by Spirit Leveling with our main lines, and a constant determined, which applied to the levels would reduce them to the G. T. Survey datum. It is unnecessary to connect any group of levels with more than one G. T. Survey Bench-Mark, or trigonometrically determined point.

6. I need not impress upon you the importance of having one depository, such as this office, for data of so valuable a nature as that in question, nor the desirability of systematically supplying it so soon as obtained, to avoid the chance of any being overlooked or mislaid.

7. The Leveling operations of this Department have hitherto been chiefly confined to Northern India, and although steps are being taken to extend them to the South, but little progress has been made at present: when more has been done it is in contemplation to publish Sheet No. 2 of this Index.

8. I send you herewith a specimen Sheet of our Level Charts and some of the data which accompany it, in order to give you a general idea as to what is required.

I have the honor to be,

Sir,

Your most obedient servant,

T. G. MONTGOMERIE, MAJOR, R.E.

Offg. Superintendent G. T. Survey of India.

No. 277
10 25

OFFICE OF SUPERINTENDENT G. T. SURVEY,

Dehra Dun 22nd August 1872

From

The Offg. Superintendent Great Trigonometrical Survey of India.

To

The Acting Chief Engineer for Irrigation

Do. Do. Do. Do. Do.

Neelgherry Hills

Sir.

In reply to your letter No. 122 dated 15th November, addressed to the Surveyor General and forwarded by him to me, and with reference to order by the Government of India No. 367I dated 8th May 1872, Pt. D, I have the honor to call attention to the despatches from this Office to your address as per

Charts (despatched on 9th instant)

Madras and C. Series, Season 1863-64 - 1 copy

" " " 1864-65 - 1 "

South Series " " 1867 - 1 "

" " " 1868 - 1 "

Great Arc Series Southern Section - 1 "

" Northern Section - 1 "

Under despatch

Levels in the N.W. Provinces Sheet No. 9 - 1 "

Table of Heights - 1863 - 1 "

margin and to explain as follows.

2. The preface to above despatch (8) describes the origin and purpose

of the main lines of spirit levels which it is intended should be run all over India by the G. T. Survey. These lines have

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not as yet been extended sufficiently
south to reach all oceans, but it is obviously
desirable that a record of the reduced
spirit level heights of all reliable levels
throughout India, together with drawings
of detailed descriptions of Bench marks,
should be placed in my hands; the lines
themselves in the first instance ^{must} be connected
with the sea level of this department,
even tho' it happens that in some cases
this datum is only of a provisional
nature, pending the extension of our
main lines; unless this is done, the
different plots or lines of spirit levels,
of which many are disconnected &
in terms of various origins, cannot
be compared even approximately,
while the records themselves are
liable to be lost sight of unless
placed in a recognised depository
for their reception. In the provinces
of India where our main lines of
spirit levels have been established,
considerable contributions have already
been made of spirit levels taken
for various projects, so that at least
12 sheets of compilations based on
our main lines have already been
published, & further editions of these

Sheets are prepared & issued from time to time as additional material becomes available. These remarks in conjunction with a Sample Sheet No. 9 (under despatch (7)) will enable you to follow the objects in view & the methods of definition & publication adopted, and I trust the vast utility of the project will commend itself to your approval & elicit your cooperation in giving it effect.

3. This brings me to the particular lines of spirit levels mentioned in para 2 of your letter under reply to my propositions for connecting them with the C. T. Survey datum. As already remarked, our main lines of spirit levels have not as yet been extended to the Madras Presidency, but pending this extension, there are excellent trigonometrical heights available which also originate from our datum of mean sea level at Karachi, checked at Calcutta by the main line of spirit levels & subsequently along the East Coast by tidal observations: I propose that your lines of spirit levels should be connected with certain trig.

trigonometrical stations, including, that
our main lines of spirit levels, should
eventually be connected with the
same stations, & then admit of final
reduction of your heights simply by
the introduction of a moderate
constant ~~of~~ correction. I may here
mention, that though our trigono-
metrical heights are the very
best of their kind obtainable, still
owing to the uncertainties of terres-
trial refraction, they are liable to
errors, which moderate in them-
selves, are unavoidably far greater
than the results by our main lines
of spirit levels.

4. The lines of spirit levels men-
tioned by you are described as
"in the Godavery, Krishna, & Tanjore
districts; in the Bellary & Trichinopoly
districts & also along the Madras
& Great Southern of India railways";
these lines being I understand in
as many groups, i.e., unconnected
with one another and in terms of
different data. Altho' one group
is not connected with any other

groups

5
I will assume that the lines in each
group are connected with one another,
so that the heights of any one group
are homogeneous, being in terms of one
& the same assumed datum. A con-
nection of this kind, I need hardly
say is an essential element towards
carrying out the project ordered by
the Government of India, and if not
already made, I trust it will be
effected by the local authorities
without loss of time. I will therefore
assume that the heights of, for instance
the Godavery group are all connected
with one another and are in the
same terms, & that similar homo-
geneousness has been established
for each of the other 6 groups. This
being effected, each group should
be connected with any one of the
trigonometrical stations given here -
after group by group. More than
one trigonometrical station is
named for each group, because
occasionally a station of this
kind is found to have been wan-
tonly destroyed notwithstanding
the protective measures adopted,

and should this have been done with any of the stations named, your spirit leveller will have the choice of resorting to another; but it will be unnecessary to connect each group with more than one station.

Name of group of spirit levels	Suitable trigonometrical stations for connection	Chart in which trigonometrical stations occur
Godavary Delta	Luchimpuram PS Navilmela PS	Coast Series No. 7
Kistna Delta	Bezawada HS Gorantla HS	Coast Series No. 8
Tanjore Delta	There are no trigonometrical stations in this vicinity at present.	
Nellore District	Nishamboli HS Kistanna HS Bandaldinur S	Madras Divisional Series Seasons 1863-64 & 1864-65
Tinnevely District	A main line of G. T. Survey levels runs close to Tinnevely and down to the sea at Tuticorin.	
Madras Railway (South West Section and Great Southern)	Mozur HS Komal Kurrundur S Thittu Malai HS Yelli Malai S	Great Arc Series Southern Section
Madras Railway (North West Section)	Graddakal HS Guti HS Adoni HS	Great Arc Series Northern Section

5. From what has preceded, the tabular information just given will be understood as follows - Suppose

the lines of spirit levels in the Godavary district to be under treatment: I will assume that all the lines of this group have been connected with one another, so that all these heights are expressed in terms of the same assumed datum: the spirit leveller should in the first instance inspect the stations of Luchimpuram PS and Navilmela PS which he will find plotted in Chart of the Coast Series No. 7: of the two stations, supposing both to be in good preservation he will select the one most convenient & nearest to some Bench Mark in the Godavary group of spirit levels, and connect the Bench mark with the trigonometrical station. selected, by means of a line of spirit levels, levelled over twice as a check. He will now have the Godavary group value of height of the trigonometrical station, to compare with the trigonometrical value, and hence will obtain a constant correction to apply to the Godavary group heights, whereby he will obtain the reduced heights for this group. Similarly all the other groups should be connected.

The 6 charts of triangulation I have already forwarded, will enable you to connect 5 of the 7 groups in the manner described; it remains to discuss

Adra Sun 11th December 1872.

No. 95
1570

From

COLONEL J. T. WALKER, R. E.,

Superintendent Great Trigonometrical Survey of India.

To

The Acting Chief Engineer for Irrigation
Care of the Secretary to the Govt. of Madras in the P.W.D.
Madras

Sir,

I have the honor to inform you
that I cannot but think that when
your No. 122 dated 11th July last (from
Colonel Cunningham) was written, you were not
aware of the proposals which I submitted
to the Madras Government
on the subject of the steps to be taken
for connecting together the various
groups of levels in the Presidency and
reducing them to the datum of the
Great Trigonometrical Survey. I rather
think too that my locum tenens Major
Montgomery cannot have been aware
of them, or he would have requested
them in his reply No. 277 dated 22nd
August to your letter.
They will be found together
with the Resolution of the Madras Govern-
ment on the subject, in Proceedings
No. 121 dated 6th June 1868, in the P.W.D.
To these proceedings I now beg leave

From
The Superintendent
G. T. Walker
R. E.

Dated 22nd Aug 72

Recd 18 Jan 73
No. 277
1028

Replies with regard
to the incorporation
of all tested and
reliable lines of
levels taken for the
Irrigation & Railways
Departments.

1872
1313840.

to draw your attention, and to inform you that, while I concur with Major Montgomerie in all his suggestions, I cannot but think that the work to be done properly ought to be put into the hands of an Officer of the Royal Engineers possessing the local knowledge & other qualifications which are specified in the 4th para. of my letter to the Madras Government. As the Governor in Council was then unable to place the services of an Engineer Officer at my disposal for the purpose in question, I obtained the sanction of the Government of India for an addition to the staff of the Trigonometrical Survey to permit of the work being taken in hand, but this sanction was shortly afterwards cancelled in consequence of the financial embarrassments of the Government, and nothing was done in the matter.

3. I have now to request that you will resubmit my proposals for the consideration of the Madras Government, and ascertain whether the Government is now able to provide the services of an Engineer

Officer and of one of the assistants in the D. P. W. and the requisite funds for the prosecution of the work, on the basis of the Estimate in Financial Resolution Government of India No. 16 dated 9th January 1868, a copy of which will be found in the Proceedings.

I have the honor to be

Sir

Your most obed. servant

J. T. Walker. Colonel R.E.

Superintendent G. T. Survey

H.

Pub. Works 1873 Report
Ch. of Govt. for 1873

In Ch. of Govt.
for Migration
to the Secretary
to Govt. of India

N^o 27A

Dated 17th
Sept 23rd Aug 73
Rev. Mr. C. H.

States that in
his opinion it is
at present perfectly
impossible to place
the services of any
officer in the Dept
at the disposal
of the Sup^r of the
Survey of India
for purpose specified
No 647-28 Feb 1873.

No 647

628 Aug 1873

N^o 27A

Endorsement by the Chief Engineer for Migration

Submitted to Government

In the opinion of the Chief Engineer
for Migration it is at the present time per-
fectly impossible to place the services of
any officer in the Department at the
disposal of the Superintendent of the Great
Trigonometrical Survey of India for the pur-
pose specified.

It is with the greatest difficulty that the
current work of the Department can be
carried on, in fact, under the recent or-
ganization how this is to be done may be
said to be as yet unsolved. There can be
no question as to the desirability of the
measure advocated by the Superintendent
Great Trigonometrical Survey of India but
the difficulty experienced in meeting the
demands of even the delta districts and
in securing the efficient maintenance of
works

works already constructed, leaves no room
whatever for hesitation in the matter.
Officers have already been directed to reduce
all recorded levels to mean sea datum &
they will now be called upon to submit
their lists for record in the office of the
Chief Engineer for Irrigation.

Fort St. George. *C. Smith.* Capt. Rb.
17 January 1873 for Chief Engineer for Irrigation.
To The Secretary to Govt. P.W.D.

Railway Department.

CONSULTING ENGINEER'S OFFICE,

No. 651

From

LIEUT.-COLONEL J. H. M. SHAW STEWART, R.E.,

Consulting Engineer for Railways,

To

COLONEL G. W. WALKER, R.E.,

Secretary to Government,

Public Works Department,

Fort Saint George.

SIR,

With reference to the
Order of Government No. 1761 dated
24th July 1872, I have the honour
to submit printed lists showing the
levels taken at stations and prin-
cipal bridges on the Madras and
Great Southern of India Railways.

I have the honour to be

Sir

Your most obedient servant

W. H. M. Shaw Stewart Lieut. Col. R.E.

Cons. Engineer for Railways.

Madras
26th November
1872

works already constructed, leaves no room
whatever for hesitation in the matter.
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all recorded levels to mean sea datum &
they will now be called upon to submit
their lists for record in the office of the
Chief Engineer for Irrigation.

Fort St. George. *C. Smith.* Capt. Rb.
17 January 1873 for Chief Engineer for Irrigation.
To The Secretary to Govt. P.W.D.

Railway Department.

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Cons. Engineer for Railways.

Madras
26th November
1872

Public Works Department
 No. 651
 Proceeding of the Madras Government
 Read the following

From The Consulting Engineer for Railways. } K.H.E. No. 651 of 26th Novr/72
 From The Chief Engineer for Irrigation. } 27 A of 17th Jan 4/73

The Government much regret that the present strength of the Public Works Establishment in this Presidency does not admit of the services of an Engineer officer and of an Assistant in the Public Works Department being made available for the purpose indicated by the Superintendent of the Great Trigonometrical Survey of India. His

MS

Recd 24 July 1872

P. M. 1872

Chief Engineer
 RAILWAY DEPARTMENT.

1872
 From
 The Consulting Engineer
 for Railways,
 No. 5832.

To
 The Secretary to Government,
 P. W. Department,
 Fort Saint George.

Dated 26th
 Recd. 23rd Novr 1872.

Enc. 2.
 No. 651

Submitting.

Proposed route of line to
 Kottar at station and
 line to see on the Madras
 & G. of S. Railway
 No. 651-28 of 27th Novr 1872

No. 651

At. T. James & Co.

At. T. James & Co.

Excellency the Governor
in Council fully recog-
nizes the value of the
work which it is pro-
posed to carry out, and
if Colonel J. S. Walker
can obtain from the
Government of India
an establishment to be
employed under his
own orders, every
assistance will be
afforded by the Public
Works Establishments
of Madras, and all
available information
will be placed at his
disposal. Efforts
will be made to con-
tinue the systematic
record and reduction
to mean sea datum

of existing lines of level,
with a view to their
being placed at the
disposal of any officer
who may hereafter be
made available for
the duty of connecting
them with the Trigono-
metric series.

W.W. C.S.
23/1/23

35-
4

3 To the Depot of the S. I. Survey
of India
9 Cms. Engrs for Reconn.
5 Ch. Engrs for Engrs

Dec 25/23

Apr 4th 1873
5832

Govt. of Madras.
PUBLIC WORKS.

The Superintendent of the
Great Trigonometrical
Survey of India

Date:

Recd.

Encl.

G. O. 28th Feb 1873. No. 647.

Nos. 639 & 641

Levels. Papering orders
on papers on the subject
of the steps to be taken
for connecting together
the various groups of
levels and reducing them
to the datum of the Great
Trigonometrical Survey.