13 (1)

Revenue Department

Minutes of Consultations

28th July 1857

Book Number 25-26

ex No 741 dated 25th July 1857

பாதுகாப்பு பிரிவு - 1

செப்பனிடுபவர் பெயர் த. மணி.

செப்பனிடுவதற்காக எடுத்துக் கொள்ளப்பட்ட நாள் 10/06

செப்பனிட்டு முடித்த நாள் 11/07

சரிபார்க்கும் முதல் மு. நி. பா. எ. கையொப்பம்

சரிபார்க்கும் 2ம். நி. பா. எ. கையொப்பம்.

ஆராய்ந்து உத்தியோகர் கையொப்பம்

(2)

Fort Saint George, Revenue Consultation of 28th July 1857.

No. 25. Read the following letter from R. B. CHAPMAN, Esq., Officiating Under Secretary to the Government of India; to H. FORBES, Esq., Acting Secretary to the Government of Fort Saint George, dated Fort William; 5th June 1857, No. 810.

SIR,

With reference to para. 4 of my letter No. 1306 dated the 16th October last, I am directed to forward for the consideration of the Government of Fort Saint George the accompanying copy of a report* from the Deputy Surveyor General on the details of the proposed survey of the Madras Presidency.

* *No. 13 dated 6th May 1857.*

From Major H. L. THUILLIER, Deputy Surveyor General; to CECIL BEADON, Esq., Secretary to the Government of India, Home Department, Fort William; dated Calcutta, 6th May 1857, No. 13.

SIR,

I have the honor to acknowledge the receipt of your letter No. 1505 of the 16th October last, forwarding for my perusal, a volume of printed papers relative to a project for the Survey and settlement of the Madras Presidency, which has been approved generally by the Supreme Government and recommended for the sanction of the Honorable Court of Directors, desiring me to furnish an outline of a plan for organizing a professional Survey Establishment, capable of commencing the professional Survey of that Presidency simultaneously, at not more than four different points in concert and communication with the Revenue authorities under the control of a Surveyor General, and calling for any observations as to the mode of carrying on the Survey, as well as to the distinction of duty between the professional and Revenue officers, which my experience might suggest.

2d. In obedience to the above instructions, I beg to submit the following remarks on the several points alluded to.

3d. From the volume of printed papers relating to the proposed General Revenue Survey of the Madras Presidency received with your letter, and also from the "Selections from the Records of the Madras Government No. IX. on the Revenue Survey," it appears that a minute and accurate detail measurement of holdings, is contemplated to be carried out in the Madras Presidency, with a view to a ryotwarry assessment of the land; and I find that a small establishment has been employed in South Arcot under Captain Priestley since, or prior to 1854, when the Supreme Government authorised a full party at an aggregate cost of 41,790 Rupees as per margin,* for a period of two years, subject to a full report at the expiration of that period. The details of this establishment are specified in the resolution of Government in the Financial Department dated the 8th September 1854, printed with the Madras Selections No. IX.

	Rupees	*A.*	*P.*
* *For survey and measurement.*	39,510	0	0
For classification and assessment.	2,280	0	0
Per annum.	41,790	0	0

4th. In the excellent report dated 27th February 1854, of Captain Priestley's initiatory operations in South Arcot, drawn up by Mr. W. H. Bayley, the Secretary of the Revenue Board, printed in the selections, I gather that the main object of the Revenue Board and of the Surveyor Captain Priestley, is to conduct a Survey of *Fields* or Holdings, on the most approved principles, and that beyond a small amount of professional accuracy in fixing the village boundary, and in making three or four villages join together, no general scientific precautions are deemed either necessary or expedient, for securing professional accuracy over extended areas, either to ensure a congregated map of a Pergunnah, or of a Zillah, which shall have any pretensions to refinement or even ordinary approximation to truth.

5th. Before we can in any way form an idea as to what an Establishment should be for these Madras Surveys, it is absolutely essential that the system of Survey to be adopted, or the requirements of the local Government in respect of such Surveys, should be fully understood. To give the outline of a plan, or any suggestions for organizing a Professional Establishment, it would naturally be in consonance with the system prevailing on this side of India, which is essentially of a professional and scientific character, such as I conceive alone applicable to the delineation of large tracts of country, and sufficient for the formation of Maps which will increase our knowledge of the Geography of India, whilst at the same time the Revenue requirements of the operations are not lost sight of.

6th. The Establishment framed for the conduct of the Survey of South Arcot, is evidently of a mixed character, partly professional and partly for the Native Field Measurement, or what is termed here, the Khusrah, as I have endeavoured to analyze it in the margin.*

		Rs.
Professional.	* 1 Superintendent	575
	2 European Assistants	400
	3 Head Surveyors at 70	210
	6 Deputy at 30	180
	9 Writers, Computers and Draftsmen	195
	129 Measurers and Duffadars	549
	18 Peons	96
	Travelling allowance Tentage and Batta for Head and Deputy Surveyors.	60
	Total..	2,265
Khusrah.	30 Survey Aumeens	562
	30 Do. Gomastas	300
	Travelling allowance Tentage and Batta for Ditto	165
	Classifiers and Gomastas, &c.	190
	Total...	1,217
	Grand Total.....	3,482

With this disposition, the Revenue Board and Captain Priestley contemplated getting over 720 square miles of *Fields* per annum, and with unbroken, waste, jungle, hills, &c., about 800 square miles when the work was in full operation, and the Government of India expressed an opinion that if such an area of Fields could be disposed of annually, that the work would be cheaply purchased in a country like that of Arcot in which the ryotwarry system prevails.

7th. It is evident from the details given in the above scale of Establishment, that its formation has special reference to conducting the Khusrah, or the internal sub-division of Fields, simultaneously, and as a part in fact of the Professional work, and the Board's Report throughout leads to the same inference. The system may be termed, if I apprehend it rightly, nothing more than a scientific Khusrah, or a superior land measurement of fields, somewhat on the principle of the Bombay Revenue survey, only with village boundaries, laid down by Theodolite Professionally, in addition. The fields thus being the primary object and the village unit being almost the apparent limit of accuracy proposed by the surveyor, without any aim at generalization or general Topography, the ingredients composing the establishment proposed by the Madras Revenue Board, are doubtless made applicable and best adapted to that end, and with our imperfect knowledge of the ways and means and local peculiarities of the sister Presidency, it would be inexpedient my attempting to suggest any modifications in the machinery for carrying on a work of this peculiar nature.

8th. The nucleus of a professional establishment may be said to have already been formed by Captain Priestley, and from this, all the other survey parties required for the Madras Presidency, will have to be raised season by season, as every individual learns his duty and instructs others, so may drafts be gradually taken out of the parent establishment for the formation of other parties. All depends on the superintending officer and his administrative ability in training and instructing others, and in making every person useful in his own peculiar line. The best policy in all survey operations, is to begin with a well organised compact Establishment, vigilantly supervised, and then to expand it gradually as success and experience warrant development. If Captain Priestley has had two Covenanted Assistants for two years under him in all probability they are by this time so well versed in the general duties, as to be competent for detached independent employment; and if so, they in their turn must commence with a few hands and feel their way gradually, until by degrees they can teach a sufficient number, and thus complete their effective strength.

9th. On this side of India every survey Establishment, with one or two exceptions, has a Covenanted Superintendent and a Covenanted Assistant, the latter generally selected for his

qualifications as a Mathematician and Draftsman, the preference being given to officers educated at Addiscombe or Sandhurst where an excellent elementary education is afforded, and a practical insight obtained also in the first principles of surveying and the use of Instruments. These Covenanted Assistant Surveyors, serving in a subordinate capacity under able guidance for two or three years, and in a large Establishment perfectly trained to its work, the succession to the charge of surveys is thus well kept up, and departmental experience and merit made the step to promotion.

10th. I would therefore venture strongly to recommend, that great care be observed in the selection of officers for this duty, and that none be admitted, into the Department who are not both physically strong and young, and whose pretensions as Draftsmen are not above mediocrity. Officers of the Ordnance Corps, Engineers and Artillery are obviously by their early training and attainments the best fitted for employment in a scientific profession, and I believe it has been found preferable to employ young officers of not more than 5 or 6 years' service, who are more likely to adopt proper habits of active exertion, and to imbibe a taste for hard and rough work, than those of more mature age and residence in India, with whom it may be irksome to commence learning a new and difficult profession, and whose tastes do not harmonize with the style of life; above all I believe a strong partiality and taste for such description of work as well as artistical talent as a Draftsman to be a sinê quâ non, on the part of the candidate.

11th. Many of the Bengal surveys were originally organised, without any experienced hands. Raw recruits both European and East Indian, as well as Native, had to be taken, and thoroughly instructed in every part of their duty, almost every officer has had to make his own party and according to the ingenuity, tact, and perseverance of the officer in charge so will an Establishment be rendered effective in more or less time. To teach and guide others, all new to the work, the Surveyor himself must be a competent officer fully acquainted with the theoretical part of his duty, if he has not had the advantage of any great amount of experience in the field.

12. The subordinate grades of Assistants and Sub-Assistants must be recruited in the same way. It is in vain to look for, or expect ready made Surveyors any where, wherefore if promising youths of good education and possessing a fair elementary knowledge of Mathematics, with some signs of a taste for drawing can be found in the Educational Establishments at Madras, they may prove the proper description of persons to join the Department, and receive their further education in practical matters afterwards. The test of qualification for such Sub-Assistants is laid down in the enclosure marked A, and we find no difficulty in obtaining very promising young men, both for the great Trigonometrical and Revenue surveys; possessing these qualifications, who are willing to join on the usual salary,* of either 107 or 75 Rupees as the case may be, giving the undertaking to serve 3 years, an important clause in the agreement, since it takes about 2 years to render an Assistant fully competent in all the duties expected of him, and before which time he in reality makes but little return for his salary, and the time and labor bestowed on him.

Appendix A.

	Rs.
* *Great Trigonometrical survey*	107.
Revenue Ditto	75.

13th. As I conclude Captain Priestley's establishment is still employed in South Arcot, it appears to me that the object to be obtained of raising four full parties will best be consulted, by a certain number of both Covenanted and Uncovenanted Assistants being at once appointed and posted as supernumeraries to learn their duties under this experienced officer. Whether in Cantonment or the field at this season of the year there is much to learn, and into which a practical insight can alone be obtained in a Surveyor's office. These additions doubtless will not in any way aid or assist the work Captain Priestley may now have in hand, but on the contrary, his time and attention will be much occupied in teaching; consequently, the expense of the new hands might be kept separate, and not debited to this Surveyor's work to swell his average cost. It will however be true economy to the State to give both officers and subordinates this advantage, if it can possibly be managed.

14th. In proportion as the European agency is obtained and perfected, so can the Native Agency be cared for, entertained and trained up; and according to the employment of Native Agency under a proper system of check and supervision, the cost of the work will be affected.

* 1 *European Revenue Surveyor.* } *Mily. Officers.*
1 *ditto. Covenanted Assistant.* }
1 *ditto. full Assistant Surveyor.* } *Uncovenanted.*
5 *ditto. Sub-Assistants.* }
30 *Native Surveyors or Mootsuddees.*
250 *Measurers, or Tindals and Classies.*
19 *Guard* (18 *Burkundazes and* 1 *Jemadar*).

In the Bengal Presidency the relative proportion of European and Native Agency for professional Survey alone may be estimated as per margin,* and as more fully detailed in the copy of one of the existing establishment's pay abstract for a month of the field season (Appendix B.)

15th. The Native Surveyors of the first class, salary varying from 20 to 60 Rupees per mensem, are competent to survey with the theodolite and chain, to keep field book and protract work, they as well as the 2nd class men, whose remuneration is from 10 to 25 Rupees can also use prismatic compass or circumferenter, and make field map of the interior details of cultivation, waste, and other topographical features. The former are employed in the boundary work, and having taken the horizontal angles round a village, and measured the lines of the polygonal figure, and taken the offsets to the boundary as marked off by mud pillars by the demarcation (or Civil) department, send their field book in to the European Assistant in charge of the camp or division, who after applying the proper bearing to the leading line, as deduced by astronomical observation, and carried on successively through each main, or grand circuit, computes the traverse of the village, and thus tests daily, the work of every Native Surveyor. The several duties of the component parts of a Bengal Establishment will however be found fully explained in the manual of surveying for India. Copies of which, I am informed by your letter under acknowledgment, have been supplied to the Madras Government.

16th. In the Bengal Presidency where the duties of the revenue surveyor are now universally confined to the Professional survey alone, an establishment of the above description may be considered to be the most appropriate and the most economical. The expenses are regulated under the monthly audit of this office by a fixed annual maximum grant, as authorized by Government, the amount of which is now fixed at 37,524 Rupees, and the larger expenditure of the 6 or 7 months of the field season, is balanced by corresponding reductions during the recess; when the survey party returns to contonments or a civil station, and all superfluous measurers are discharged, and many of the Native surveyors permitted to go to their homes on half pay. The recess can never be reckoned less than 5 months, and is generally of even longer duration in lower Bengal, and this period of cessation from actual survey is absolutely necessary to enable the surveyor to complete all his maps and computations, and to lodge them in this office in a satisfactory manner before he embarks in a new campaign.

17th. The above establishment and expenditure only provides for a complete village survey including a separation and record of all the usual details of "land under cultivation," "fallow" "fit for cultivation," "waste, jungle, jheel &c," together with a regular delineation of all the Topographical features of the country on the large scale of 20 chains or $\frac{1}{4}$ mile to the Inch; no separate measurment of *fields* (khusrah) or even of small estates comprising portions of village, is included in this estimate. This duty is performed by the civil or settlement establishment, and entirely checked by the officer of that Department, the results of the Professional survey being their guide for the aggregate areas of each description of land, and of the entire village. and consequently this Department is in no ways responsible for, or concerned in the record of the separate fields or minor estates, which is exclusively managed and paid for by the civil branch.

18th. My own views on this question do not accord with those of many of the authorities who have had the control of extensive settlement operations, and very materially differ from the policy of the Revenue Board Lower Provinces during the last 6 or 7 years, in regard to the method of defining and mapping the mehals or small estates in the perpetually settled Provinces, where the specification of fields and of the description of the land is no object, all that is required being the area and position of every separate estate paying revenue to Government. I hold, that all measurements of whatever kind whether professional or khusrah, can best be checked and supervised by a professional Surveyor, and that the two combined operations of survey and measurement of fields, by advancing simultaneously under one head, must have no advantage over separately conducted, and separately superintended, operations. I believe that an active Surveyor who thoroughly understands his work, who is supported by 5 or 6 European Assistants scattered over the District under survey, and whose tenure of office is generally far more permanent than that

of a Civilian, will be found more competent to keep a body of 100 or 150 Native Aumeens, the number usually required in a District, in proper check; my experience tells me that such men as measuring Aumeens require the most constant and vigilant watching, as well as the certain knowledge of the professional survey coming in their steps to keep them within bounds, so far therefore it appears to me that the Madras proposed system is worthy of admiration, for the fields will be laid down pari passu apparently with the village boundary, and with great precision and accuracy and essentially under the control and management of the Surveyor himself.

19th. In the Madras system in fact the attainment of the separate record of the fields, appears to be the one great and only object aimed at, to the exclusion almost of those general principles of professional practice, which are obviously called for, when projecting extensive surveys of immense areas, embracing zillahs or Districts and even provinces. That the object of this detail measurement, or khusrah, in a country about to come under a Ryotwarree assessment, is most important I am well aware, and of the expectations of Captain Priestley and of the Madras Revenue Board of getting over 700 square miles of *fields*, in this style, with the strength of establishment laid down, and if similar success can be guaranteed in all the four different surveys proposed to be carried on, the results thus obtained will be well worth the money expended.

20th. It would be very interesting to know what may be the actual experience of the working of Captain Priestley's establishment for the last two seasons. Whether he has been able to attain such progress with the allowed means or not. The average size of the fields is said (para. 23 Board's report) to be half an acre, a field of two acres being a rarity; according to the size of the fields of course must be the progress, and it certainly seems, according to the practical experience gained on this side of India, that for 30 Ameens the apparent number of men entertained to accomplish 700 Sq. Miles of fields of such an average equal to 896,000 fields per season, which gives 29,866.6 fields each man, or 2986 fields each man per mensem, or 114 fields per diem, 10 successive months in the year, is an enormous outturn, which when taken in consideration with the improved mode of measurement proposed is the more remarkable. In the Board's Report, page 20, paras. 73 and 74, the estimate is made at 25 Fields per diem for one Aumeen or $2\frac{1}{10}$ Sq. miles per mensem, taking 69 acres to the 25 fields, which however does not correspond with what has been previously stated as the probable average of the size of fields, but on the contrary is more than four times in excess of that average. It is possible that sufficient experience has now been attained by Captain Priestley to warrant a more definite estimate of progress.

21st. Whatever progress however may be gained in this minute delineation of the Revenue requirements of the survey, the laying down of the Fields, it strikes me that no General Survey of the Madras Provinces ought to be permitted to be commenced, and carried on in the present day, without full and ample precautions being taken for making the materials subservient to the general purposes of Geography. It is so evident from the published papers, that a very little more would suffice to secure this object, that it would be a thousand pities to neglect it. The Madras Peninsula already boasts of a Topographical survey on a moderate scale made from 30 to 40 years ago based on Colonel Lambton's Triangulation, and with the exception of a very small gap here and there, an absolute net work of Triangles covers the whole of Southern India, and consequently the utmost facilities exist for connecting the present operations with the old points, which will afford the surest means for adopting the present revenue materials to the same purpose, as we have so successfully done on this side of India.

22nd. The lapse of so many years makes a great difference, in the appearance of the face of any country, and it will naturally be found, that between the old surveys, made for the most part, apparently by plane table sketching, on the scale of one inch to the mile, and the new survey laid down with great minuteness of detail on the vast scale of 16 inches to the mile (or 16 times greater, which must be reduced to a smaller and more tangible scale suitable for general maps,) the detail shewn will be almost entirely different. Hence it cannot in my humble opinion, be urged that the old Topographical maps are sufficient for all purposes of the present day, or that the present very minute and careful survey could be incorporated or dovetailed therein; such a procedure I believe would be impracticable for many reasons which might be urged, and therefore good Topographical Maps should not be rejected, when they can be so easily rendered, and when every day shews the pressing want of them for new Engineering works of practical utility.

Deputy Surveyor

23rd. The first great principle which I look upon as of the most vital importance in subordinate survey operations, is the due and perfect connection and identification of the Topographical features, or stations of the Revenue Survey with the points of the Triangulation, whereby alone, the Maps of the former operations can be amalgamated, and adjusted in the great Atlas of India, or indeed in any general Maps on which lines of Latitude and Longitude are required, with any pretensions to accuracy. If therefore satisfactory Topographical Maps are expected or desired in the Madras Presidency, it will be very essential for the Surveyor to pay much more attention to the above condition than the Madras Revenue Board seem inclined to recommend. In paras. 13 & 14 of their report, allusion is made to this connection of the two Surveys, and the advice of Captain Jacob, the Honorable Company's Astronomer, (himself formerly employed in the Bombay Survey) taken, the result of which appears to be summed up in the very remarkable expression, that "Captain Priestley's method of survey requires no such aid."

24th. It would appear, as I have before remarked, that the proposed system for Madras, ranges no higher in the scale of surveys, than that of a very good Khusrah or Parish measurement of land, which in fact is no survey (properly so called) at all, and therefore if compared with the Bombay similar description of work, (which I have always understood to rank as a mere civil settlement operation,) then the connection with the G. T. Survey of India, may be deemed superfluous. But if the Madras Revenue village Maps are ever to be put together, so as to form a Pergunnah, or even a talook congregation of the entire number of villages composing such subdivisions of the country, and from which again a District or Zillah Geographical Map could alone be constructed, then the insertion of the points of the great Triangulation will be imperative, and if they still exist on the ground, it would be difficult to understand, in what way such an observance, could either impede or obstruct Captain Priestley's work. The record of a known and well fixed point, of which the Latitude and Longitude is known, on the maps of a new survey of the Madras Provinces, can possibly do no harm, or prove inconvenient to fix where every village is surrounded by angular work obtained by a Theodolite; whilst on the other hand, its omission may, and assuredly will, hereafter cause serious trouble, doubt, and perplexity, when Geographical materials have to be compiled, not by the Surveyor himself, but by the Surveyor General or Superintendent of the whole of the surveys.

25th. On the above view of the case therefore, whatever Captain Priestley's method of survey may be, he can in no ways be independent of, or despise such aid, as that which an accurate survey on a Trigonometrical basis affords, and which very fortunately will be found to exist in all parts of the Peninsula of India. Each new District survey, ought to have some fixed, and well known point of departure from which, its operations should emanate and all its calculations be computed. I believe a large chart of the whole of this Triangulation has been already furnished to the Madras Revenue Board, and the numerical data of a great portion of it with Extracts from Colonel Lambton's Memoirs and Papers are now under transcript in this office on the requisition of the Madras Government. There will be nothing wanting therefore to render the Proceedings of as many Surveyors as may be appointed, clear and unmistakable and my earnest recommendation is offered, that the great and lasting importance of this point may not be overlooked or neglected. Indeed, I am glad to perceive that the Government of Madras express a decided opinion on this subject in the Resolution dated 14th August 1855, para. 8.

26th. In the 15th para. of their report, the Madras Revenue Board are in error in stating that in the N. W. Provinces the *Professional* work of the Revenue survey was performed by officers employed in the great Trigonometrical survey, and that they did not extend their labors to village field work. The Revenue Survey Department is essentially distinct and separate from that of the great Trigonometrical survey, the officers of which, are strictly confined to the Principal and secondary *Triangulation*, they have nothing whatever to do with Topography or details of any sort, and their operations are pursued without reference to Districts or any other surveys which may be in progress. The Revenue Surveyors of the N. W. Provinces invariably maintained the measurement of fields (the khusrah) under their own guidance, the only part of the khusrah then performed by the settlement officer, was the insertion of the quality of the soil, or nature of crops, in the Aumeen's Chitta or field Register, the whole of the measurement duties were, as they always should be in my opinion, under the Surveyor. That failures in the khusrah occurred (as pointed out in the Board's 80 to 84th paras.) there can be no doubt; they were caused I apprehend by the inordinate race amongst the N. W. Surveyors of those days for large areas,

when quality gave way to quantity, and when the whole of the operations were under the control of the Agra Revenue Board, instead of under the proper professional check and supervision of a Deputy Surveyor General.

27th. It is equally a fact, that even the results of the professional survey of the N. W. Provinces of those years were much neglected, and the combination of the village survey into proper Pergunnah Maps not carried out in the way it undoubtedly ought to have been, owing to the extraordinary haste, with which the Surveyors were urged to get over the ground for settlement purposes. The records of those surveys, from never having been deposited in the Surveyor General's office, are now incomplete, and many of them not forthcoming at all, and for many years past a series of Zillah Maps on the useful scale of 2 miles to the inch, exhibiting village boundaries, have been under preparation at Agra, and by the assistance of the local Collectors, but with very partial success, and it is estimated that this object which the N. W. Government have long had very much at heart, will still occupy ten years more, such a lamentable result may be attributed entirely to the two causes alluded to above, viz. the absence of direct and special competent superintendence over the whole of the operations, and the imprudent and rash speed of the executive Surveyors, large areas and low rates being the chief thing sought after.

28th. It is a consolation to be able to add that such a system has long since ceased to hold any sway in this Department. With the date of the cessation of the N. W. surveys, large areas and low rates with inferior work to match, have been exploded, and in the present day no Surveyor would risk his professional reputation by following such an example, the ill effects of which I may say are even now constantly felt in this office in the course of our general duties. The mention of these circumstances in this place, will, I hope, prove not entirely without its use as a beacon to the Madras Surveyors.

29th. Next in importance to a proper and complete identification with the points of the great triangulation and a permanent point of departure or first station for the survey, is the nature of the meridian on which the operations are based. The Board remark in their 44th para. that the Surveyor has not laid down a true meridian, but was working entirely from a magnetic one, and that the outline of every village being independently and carefully taken by traverse, a set of several villages will ultimately close "near enough for all practical purposes." They thought however with Captain Priestley that it was desirable to have a check of more accurate nature, but again in para. 47 they did not consider it necessary for the Surveyor "to lay down his Azimuths with that rigorous accuracy that was required in the N. W. Provinces, where the lines were connected with the G. T. Survey;" and the Board therefore left it to him to use such method as might be adapted to the instruments with which he was furnished. From the 48th para. it further appears that nothing beyond a 5 inch Theodolite forms the present equipment of the Surveyor.

30th. From the above it would seem that the Surveyor is at present obliged to adapt his style of Survey to the nature and capability of the instruments with which he is supplied, instead of first determining on a rigorous method, and then providing his instrumental equipment accordingly. In the 48th para. of the Board's Report, the proper and usual system of working from whole to part, and embracing large circuits of a whole talook or Pergunnah in the first instance, the smaller or village circuits being filled in within it afterwards, is hinted at, as having been proposed by Captain Priestley though his other duties would not permit him to carry it out. It is precisely such a course that I would earnestly enjoin, as the first step towards securing faithful maps of a Pergunnah or talook, and hence of a Zillah as the only way of conducting such a Survey, as we have in Bengal. To effect this also, every independent village laid down on a Magnetic meridian will never answer, because, although as the Board anticipate, a few village traverses might join well enough together for all practical purposes, yet the accumulation of error in many hundred village circuits would soon become so large, that the Surveyor would be thrown into inextricable difficulties. Not only must the whole work be based on the *true* meridian, carefully established for the Initial Azimuth, as derived from astronomical observations; but such true meridian must again be frequently checked by corresponding astronomical observations, and the Azimuth as conveyed through the angular work from circuit to circuit constantly tested. Without this is done there will be no prospect of the main circuits closing and proving with the necessary accuracy. The whole of this process to which I will only here briefly

allude, is described at great length in the "Manual of Surveying Chapter XII. Part III.," and will no doubt be familiar to the Madras Surveyor.

31st. Having in view therefore a Professional Survey of the Bengal stamp, as a very necessary ingredient of the Madras proposed operations, I would counsel the strictest observance as to the mode of establishing and laying down the true meridian, and in preserving the true inclination of the Azimuth as conveyed from circuit to circuit. It may be sufficient for all purposes of Revenue, and for the requirements of the Board of Revenue, that a set of a few villages join well together, but generalization and good Topographical Maps cannot be obtained by such a system; and if any thing beyond the isolated village plan is expected, or deemed requisite for the general purposes of Government, a rigorous prosecution of the Professional part of the work must be adopted. In the 10th para. of the Resolution of the Madras Government, I observe, it stated, that talook Maps should be prepared, and permanent boundary marks established, without which two securities, the work would in the opinion of the Government in a few years be lost.

32nd. In the 41st para. of their Report, the Revenue Board remark that they do not consider themselves qualified, in recommending the additional expense that would be incurred in preparing Maps *purely Topographical* and that all nullahs, roads, tanks, &c., being laid down *as fields* and clearly defined in the Khusrah measurement, a little extra coloring would give every Topographical information necessary. The question however appears to me, to be one of scale, and as to the nature and extent, of the Maps to be furnished by the surveyor. This khusrah or measurement of the fields, is to be on 16 inches to the mile, this is most appropriate for such minute detail work, and fields of half an acre average size could scarcely be shewn on a smaller scale, as the multiple of 4 it is also particularly convenient for all subsequent reductions and incorporation as Geographical materials. But I submit, if the duty of the surveyor is to be confined to these village plans on such a large scale, but the survey results will be useful alone to the settlement and village authorities, and that no one else could possibly make use of them, for even three villages joined together on that scale, would produce a sheet of paper altogether prohibitory; neither could such large plans for many Districts be multiplied except at a very heavy cost and with great expenditure of time.

33rd. To prepare *purely Topographical* Maps would perhaps be foreign to the immediate object in view, but if the Revenue measurements are to extend over many talooks, Pergunnahs and Districts, there must be some sort of general or Index Maps, prepared as guides, to a ready comprehension of the village plans and their relative position when congregated together. In fact some sort of generalization, and combination of the materials thus produced by the Revenue measurements seems to me indispensable. The question therefore appears to me to resolve itself into this, should the surveyor furnish Index Maps on a convenient scale, showing all the village jurisdictions comprised in a talook or Pergunnah, or other convenient size block of area, and ought such Map to be a mere outline skeleton of boundaries, or accompanied with the usual general Topographical features of the country which in reality have all been taken up in the field and only require reduction and compilation, to bring them into practical use?

34th. In other words should the labor bestowed in the field, be reaped in the office, and turned to practical account, or be allowed to be dormant, recorded only where a few persons can obtain access to it? or should the results of the Madras surveys be purely of a Revenue character or Revenue and Topographical combined, affording valuable information to the Engineer as well as the Collector? The difference in the expense will I believe be trifling in comparison with the superior advantages gained. It is beyond my competency in the present state of the question, and with the information before me, to predict what would be the relative cost of a purely Revenue or a Revenue and Topographical survey combined, in the Madras territories; this may possibly be estimated more closely by Captain Priestley, and with his experience before him, together with a fair consideration of what I have endeavoured to recommend, the question may be placed on fair grounds for the information and decision of Government.

35th. In first establishing large survey parties, their Instrumental equipment is a matter of primary importance. It would appear from the correspondence that the means of providing suitable instruments do not exist at the Madras Presidency, and if such should still be the case, or if proper arrangements have not been made to indent on the Honorable Court for a sufficient supply to meet the probable wants of the entire presidency, I would suggest that applications

be made on the stores of this Presidency, and I have no doubt all the immediate and necessary wants for four distinct surveys, could either be complied with, or procured from the European dealers in Calcutta in good time for the ensuing cold season. Annexed is a list of the instruments in use with a Bengal survey, and which may be said to be essentially necessary for carrying on the Professional operations. The number of Theodolites attached to a party, allows for keeping two or three in reserve to provide against accidents, which in very large establishments and with extensive native agency, must be anticipated. The wear and tear of a Theodolite in a Revenue survey is enormous, exposed for several months to all the changes of atmosphere and the influence of the dust, between sunrise and the sunset, it requires careful surveillance and cleansing on the part of the European Assistant at stated periods.

Appendix C.

36th. As the best and most intelligible way of illustrating my remarks, in respect to the style of Maps which I consider a Revenue Surveyor should produce, I beg to forward the specimens of one of the Bengal surveys as detailed in the margin.* It will be observed that the one Inch Maps, exhibit the unit of the survey the village jurisdiction, and consequently form a complete Index to the Revenue Plans of the villages. This is essentially the Revenue feature of the records, and by possessing a net work of village jurisdictions, the Pergunnah and the District can be divided off into any convenient number of larger jurisdictions such as Thannahs, Moonsiffees, or Deputy Magistracies without its being necessary in any case to deviate from an actually surveyed line, and consequently from a known, and recognisable line in the Field. In addition to this information, the whole of the Topographical details as laid down by the Professional survey by means of the Prismatic or surveying compass and chain, Plane Table or Circumferenter, are well shewn, to the fullest extent of which the scale is susceptible.

APPENDIX D.

* 4. The Baraset Division of the 24 Pergunnahs District, in four uniform Sections scale one mile to the Inch.

2. Separate Pergunnah Plans of the Nuddea District, scale one mile to the Inch.

1. District Map of Nuddea, forming an Index to the Pergunnahs scale 4 miles to the Inch.

1. District Map of 24 Pergunnahs, scale 4 miles to the Inch.

8 Total.

37th. From these materials the District or Zillah Map is compiled, with the aid of the numerical data duly recorded on the original manuscripts of the surveyors, and thence incorporated into the engraved sheets of the Atlas of India, dy the due identification of the points of the great Trigonometrical survey, which are all carefully shewn, and their direct distances as obtained by the Revenue operation, calculated, and then compared with the data of the former survey, from which the error of the work is deducible. By an inspection of these Maps the general features of the country are at once understood, the relative positions of the villages one with another are defined, and if more minute details are sought, or a boundary requires investigation, the village Plan can be referred to. As a combination of the Topographical and Revenue results, I believe these records will be found invaluable.

38th. In the North West Provinces this generalization is carried still further, and the village unit is even shewn on the District Maps, and by thus obtaining the whole of the village jurisdictions at one view great advantages are derived. Here the average size of the village is about 700 or 800 acres (or 1-14th square mile) which admits of their reduction to a scale of 2 miles to the Inch, but in the lower Provinces where the average size does not exceed 350 Acres or half a square mile, the 2 mile to the Inch scale, will not admit of such minute subdivision being shewn, and consequently the one Inch scale is obliged to be resorted to, and as that is too large for a whole Zillah, the Pergunnah Maps are separately published. A good specimen of a District Map shewing village boundaries is likewise forwarded as specified in the margin.†

APPENDIX E.

† *In duplicate.*
District Map of Seealkot 2d Edition.
Punjab Proper.
Scale 2 miles to the Inch District Gooroodaspore.
Scale 2 miles to the Inch.

39th. It is precisely such maps as these that the late Lieutenant Governor, N. W. Provinces, Mr. Thomason, declared were essential to make both Revenue and Judicial officers efficient in the performance of their local duties. I have, during my tenure of office, consulted many Revenue officers, and have heard but one opinion from them as to the superior utility of these maps, and therefore I commend them to the notice of the Madras Authorities.

40th. The above remarks will, I trust, be sufficient to explain my views as to the most desirable mode of carrying on the proposed survey as called for in your 2d para. It is now necessary to advert to the distinction of duty, usually observed between the Professional and Revenue officers.

41st. Allusion has already been made to the conduct of the khusrah or measurement of the fields, this I think has wisely been entrusted to the Surveyor, and he will no doubt do it justice; but although in the 20th para. of their Report the Board of Revenue, are evidently alive to the importance of the village boundaries being traced before the Surveyor commences his work, yet I perceive no distinct provision made in the correspondence before me, for the machinery by which the very important and primary duty of demarcating and adjusting the boundaries prior to, and well ahead of, the survey, is to be performed. On this, the progress and satisfactory results of the survey and measurement, will undoubtedly depend for if the Surveyor proceeds in advance of the settlement of disputes, his work is rendered liable to revision, and unless the field marks are erected before the Surveyor goes on the ground, it will be impossible for him to proceed with that regularity and expedition which is so essential in extensive operations. It is not only necessary therefore to provide for this important point, but to do so in a manner which shall positively prevent all hindrance or detention to the Professional Surveyor.

42nd. For the assessment and settlement it has been wisely determined to have separate and distinct officers (para. 39th of Madras Government Resolution of the 14th August 1855) it having been established in other parts of India, that such duties cannot safely be entrusted to the ordinary district authorities. With a settlement officer therefore for each survey or ziliah, there will be no difficulty, in his providing for the civil duties both preparatory to, and subsequent to survey, as so forcibly enjoined in the "directions to settlement officers in the N. W. Provinces" published by that Government copy of which has been supplied to the Madras Government as stated in your final para. In Bengal the cost of demarcation including villages, and the minor estates contained within them, is very heavy, equal in fact, according to the present system introduced by the Board of Revenue lower provinces, to the expense of the professional survey.

43rd. This demarcation however of the internal or small estates furnishes all that is required of a khusrah, or rather I should say, has been substituted by the Board of Revenue for the khusrah or field by field measurement, as previously conducted by the surveyors, with what advantages time can only prove. But whether in Madras any preparatory definition or demarcation of the fields or ryotwary holdings will be necessary or not, I of course am unable to say, but it appears to me obvious, that at all events the village boundary, which Captain Priestley lays down in a professional manner with the Theodolite, should be properly and authoritatively defined and freed from all disputes, and a sufficiently correct sketch of the same exhibiting the precise position and distance apart, of all the boundary marks (or *Thaks*) as existing on the ground, should be furnished under the settlement officer's signature, for the guidance of the surveyor and for due subsequent comparison with the professional plan. The present method of preparing these demarcation (or Thakbust) maps, is fully described in the Manual of Surveying (page 541 second edition.)

44th. The Madras Board of Revenue in endeavouring to estimate what an establishment should be, (paras. 52nd to 54th of their report) refer to the details given in the Manual for the civil branch of the operations. The estimate given in their 54th para. is that for the demarcation establishment in the lower provinces of Bengal, where, under the perpetual settlement, the duties of the settlement officer are confined simply to the demarcation and adjustment of boundaries including the measurement of the minor estates situated within, and subordinate to, the village, and the preparation of the registers of estates, for lodgment in the Zillah Collectory Office. The object of this survey and measurement being merely, the ascertainment of the total area and position of every estate paying revenue to Government, the definition of the fields composing an estate, as well as the details of cultivation, waste, fallow, &c., are deemed unnecessary, and no enquiries are consequently made on those heads. To keep the Professional Survey establishment in full work, all the energies of the settlement officer and his establishment of Deputy Collectors, Peshkars and Aumeens, are called into play; and if this is the case where no settlement and assessment is in progress, it follows that the undivided attention of a civil functionary will be absolutely required in the Madras surveys. By the Surveyor taking up the measurement of the

Fields, the settlement officer will be enabled to do ample justice to the demarcation and settlement duties.

45th. I believe that the same distinction which existed in the old North West surveys between settlement and survey duties, will be found the most advantageous in Madras. The Surveyor to conduct, and be responsible for, all survey and measurement work, the settlement officer to guide the demarcations and the assessment duties, which latter include the ascertainment of the quality of the soil and crops, and likewise involve a check over the entries of the names of Proprietors, or Ryots, in the Aumeen's Khusrah or field Register. By such a division of labor and responsibility, the agreements by the people of a district are more likely to be readily obtained, and entered into without objections of a serious character. In the Punjab and N. W. Provinces as well as in Bengal in the present day, the Khusrah or Native Revenue measurements are all made under the superintendence of the Settlement officer; I am therefore unable to furnish any information or specimens regarding this portion of the Revenue operations, but I candidly confess that after nearly 20 years experience in the Department, I am no convert to the change, but on the contrary, every day tends to confirm me in the principles which I have endeavoured to lay down on this subject, in the manual of surveying.

46th The objections taken to the results of the old North Western Provinces Khusrah, are, in my humble opinion, not from defects of system, or the principles, on which the system was based, but from absolute neglect of the first and leading steps of the system, whereby proper check and supervision over the combined work, was rendered impossible, by the haste with which the ground was got over as before adverted to. I therefore do not myself see sufficient cause for separating measurements, which should proceed simultaneously, or as nearly so as possible, under one professional head. A clear and unmistakeable distinction between the duties of the Professional and Revenue officers should I think be laid down from the first, and rigidly adhered to.

47th. The subject of permanent field marks is also one of great importance, and if they can be erected as the Board of Revenue propose at all triple junction boundaries of villages, of course, the advantage will be great, but I apprehend that the expense would be very great, and the number of solid or masonry pillars required for each talook or Pergunnah would be so enormous, as to render it altogether prohibitory. Although I have always endeavoured to provide for as many permanent marks as possible, especially such as are more essential for survey purposes, and for the proper connection of the meridian between contiguous surveyors, yet the fixing of the triple junction points or divergence of three boundaries of villages as land marks has been found to be hopeless. With the exterior limits of Pergunnahs and districts even, there has been a difficulty on account of the constant changes occuring in these territorial sub-divisions.

48th. Should it be determined to carry out this plan it will be very necessary to enforce the proper maintenance of the pillars by the village authorities. For this, and other purposes of the survey generally a special enactment will be most advantageous. It appears to me greatly to be regretted that in Bengal where the expense of defining, adjudicating and surveying the village boundaries falls so heavy on the State, the results of the survey are not made more binding on Zemindars. The more stringent the law in this respect the greater will be the attention to proprietary rights at the time of survey, and consequently a more ready attendance and co-operation on the part of Zemindars or ryots, which is so necessary to due progress will be obtained.

49th. During the past four or five years the operations in Bengal have been going on with great speed and vigor, the annual Reports connected with both the Professional and Civil branches have been published by the Board of Revenue, and as there may be many details discussed therein which might be instructive to the Madras executive officers, I beg to append a bound copy as per margin.*

The nature and extent of our operations in the lower provinces will be fully understood by a perusal of these reports.

APPENDIX. E.

* *Bengal Revenue Survey Professional and Civil operation Reports for the seasons* 1851-52, 1854-55 *in Duplicate.*

Deputy Surveyor

50th. A mass of information regarding the old Revenue surveys and settlement of the N. W. Provinces, as well as of the Bombay Presidency has been published in the Parliamentary blue book, 100 copies of which, I have been informed, have already been furnished to the Madras Government, it is not therefore necessary for me to attach copies to this Report, and I would merely suggest a perusal of it to all the survey and settlement officers employed in the Madras Presidency.

51st. It has been stated in the Madras Government Resolution that a detailed Measurement of fields, will not be required of the whole area of the Presidency computed at 138,000 square miles, but only about 60,000 square miles of it, the rest being hilly jungly country of less value and importance, will, I presume, have to be taken up Topographically only; perhaps in some Districts, there will be found both descriptions of area to be dealt with (as is found to be the case in the operations now going on in the Saugor and Nerbudda territories) and which, in order to complete the Zillah map, will have to be provided for. The proper mode of surveying such ground is very elaborately described in the Printed Instructions by Lieutenant Colonel Waugh, Surveyor General of India, as per margin,* two copies of which I have the honor of furnishing for the use of the Madras surveyors, and would earnestly commend a careful study of the invaluable principles therein laid down to the Madras Surveyors. These instructions are likewise to be found in the manual of surveying Appendix page III. London Edition.

APPENDIX. G.

**Instructions for Topographical surveying by Lt. Colonel Waugh, Surveyor General of India, for the use of the survey Department."*

52nd. In the Madras Government resolution (para. 44) it is questioned whether a Surveyor General, or a "Superintendent of revenue surveys" would be able to control more than four parties of the strength laid down. There would I imagine be no difficulty in his efficiently supervising a much larger number. At the present moment, I have no less than 14, all of the full strength with one exception as detailed in the margin, † under my immediate superintendence in addition to other important duties. But as before remarked the survey parties can only advantageously be increased gradually from year to year as each new party grows in strength and capability, and may thus subsequently be able to afford to spare a few well trained hands to form the nucleus of an additional establishment to take up another District. The present establishment, on this side of India have all risen in this manner. During a period of the past ten years four parties have thus expanded into 14. I would however on no account recommend more than four establishments being raised in the first instance.

† *Bengal*.....	5.
N. W. Provinces...	5.
Punjab and Sindh...	4.
Total...	14.

53rd. I observe in the same para. of the Resolution mentioned above, that it is proposed to give the executive officers employed, the appellation of "Deputy Surveyor General." In this Presidency they are styled "Revenue surveyors" which appears more in consonance with their executive duties, and less likely to cause misunderstanding in contradistinction to the general supervising authority, who has long been termed Deputy Surveyor General in Bengal.

54th. In conclusion, I have only to record my earnest desire to afford at all times the most hearty co-operation and assistance, as far as lies in my humble power, towards the object which the Madras Government have in contemplation, and if the Superintendent of the surveys whenever such an officer may be appointed, will place himself in communication with this office, he will find a ready and cheerful response on all points of professional procedure, and I shall feel a pleasure and a pride, if by any means I can be made instrumental towards raising the character of the Madras surveys to that standard of excellence, which should characterise so great a work in the present age.

(True Copy.)

(Signed) R. B. CHAPMAN,
Offg. Under Secy. to the Govt. of India.

8

LIST OF ENCLOSURES.

1. Appendix A. Test of examination for candidates in duplicate, referred to in para. 12.
2. Do. B. Copy of pay abstract referred to in para. 14 in duplicate.
3. Do. C. Scale of Instruments for Bengal survey referred to in para. 35.
4. Do. D. 8 specimens of Bengal survey Maps, referred to in para. 36.
5. Do. E. 4 specimens of Bengal (Punjab) Maps in duplicate, referred to in para. 38.
6. Do. F. Bengal survey operation report in duplicate, referred to in para. 49.
7. Do. G. Colonel Waugh's "Topographical Instructions" in duplicate referred to in para. 51.

REV. SURVEYOR GENL.'S OFFICE, *6th May* 1857.

(Signed) H. L. THUILLIER,
Deputy Surveyor General.

ENCLOSURE A.

Memorandum of Test for Examination of Candidates for the Great Trigonometrical and Revenue survey Departments.

1. To write a neat legible hand.
2. A thorough knowledge of Arithmetic, but more especially of Involutio , square and cube roots, Arithmetical and Geometrical progression, Proportion or Rule of three, Vulgar and Decimal fractions, and Logarithmic calculations.
3. Geometry, first 4 books of Euclid.
4. Algebra, as far as Quadratics inclusive.
5. Elements of Plane Trigonometry.
6. Spherical Trigonometry.
7. A knowledge of Plan Drawing, or at least a proof of some degree of taste in Drawing and Printing, so as to warrant the expectation that he may turn out a good Draftsman.
8. A healthy and vigorous constitution, and good eye-sight for observing.

Form of Agreement to be taken from a Candidate prior to his admission into the survey Department.

I, A. B. do hereby agree, that I will not demand my discharge for three years from the date of joining the survey to which I am appointed and never during the field season. I further agree to serve in any one of the surveys to which it may be necessary to remove me.

If against the tenor of this agreement my discharge should at any time be insisted on, I do hereby agree to repay to the Government a sum equal to one half of the whole amount which I may have actually received in the shape of salary or allowance of any kind.

E. F.
C. D. } Witnesses.

Place and date. Signature.

NOTE.—This test is applicable to both Departments, with the exception of Spherical Trigonometry which is not required from the Revenue survey Candidates.

(Signed) H. L. THUILLIER, Captain,
Deputy Surveyor General.

B.

Detailed Statement of Native Establishment attached to the Revenue Survey of Saugor or Western Division for the month of March 1857.

No.	Description.	Monthly pay of each.	Total of each class.	Total professional expense.
1	Native Surveyor Totaram,	42	42	
	,, Bhowaneedeen,	35	35	
	,, Bahareelall,	34	34	
	,, Reazaul Houssein,	33	33	
	,, Sabit Allee,	32	32	
5	,, Doorgapersaud,	30	30	
	,, Fussee Ooldeen,	25	25	
	,, Nuthoo Lall,	23	23	
	,, Koor Sein,	22	22	
	,, Dhowkul Singh,	21	21	
10	,, Sewchurn Lall,	20		
	,, Prauglall,	20	40	
	,, Gungaram,	18		
	,, Hayut Allee,	18		
	,, Khoodabux,	18	54	
15	,, Ghoolaum Hossein,	15	15	
	,, Sewchurn Persaud Sookl,	13		
	,, Debee Dutt,	13	26	
	,, Mindaeelall,	12		
	,, Rampersaud,	12	24	
20	,, Ramchurn on leave 16th Feb. 1857,	12		
	,, Futtuhchund,	12		
	,, Bhugwanchurn,	12	36	
	,, Koor Bahadoor,	10		
	,, Abdool Hameed,	10		
25	,, Jhoomunlall,	10		
	,, Jogulkishore,	10		
	,, Hunwunt Singh,	10		
	,, Ameer Allee,	10	60	
	,, Gunga Singh,	8		
30	,, Rambhujunlall,	7	8	
	,, Mooktapersaud,	7		
	,, Raj Bahadoor,	7		
	,, Huzareelall entertd. 1st March 1857,	25	21	
34	,,		25	606
1	Native Doctor Shaik Abdool Ruheeman,	12	12	
	Measurers.			
1	Jemadar,	7	14	
2	Tindals,	6	132	
22	Do.	5	140	
28	Mates,	4 8	148 8	
33	Classies,	4	712	1,158 8
178	Do.	5	4 6	
	"Broken periods."			
1	Mate for 25 days,	4	6 2	
1	Classie 3 ,,	4	2 1	
1	Do. 16 ,,	4	2 9 3	
1	Do. 20 ,,	4	3 5 8	12 6 7
1	Do. 26 ,,			
	"Non-effective since last muster."			
1	Native Surveyor Ramchunder No. 32 of last muster deserted.			
	Total drawn in Abstract for Native Establishment—Company's Rupees...			1,776 14 7

I do declare upon my honor that the above is a correct Statement of the different classes of Native Surveyors, Measurers &c. attached to my Survey and of their respective pay as due for the month of March 1857.

REVENUE SURVEYOR'S OFFICE, Saugor or Western Division, Saugor, *The 1st of April* 1857.

(Signed) J. W. B. BLAGRAVE, Captain, *74th Regt. N. I., Rev. Survr.*

(Signed) H. L. THUILLIER, *Deputy Surveyor General.*

B.

Abstract of the Salaries and Establishment attached to the Revenue Survey of Saugor or Western Division for the month of March 1857.

No.	Names.	Total of each.	Total of each class.
1	Captain J. W. B. Blagrave, Revenue Surveyor,	526	
	Ditto. Ditto. Contingent allowance,	200	726
1	Lieut. E. H. Willoughby, Asst. Rev. Surveyor,	250	250
2	Mr. W. A. Wilson, Ditto. Ditto.,	250	250
3	Mr. J. J. Burrowes, Sub-Asst. Rev. Survr. 1st Class,	200	200
4	Mr. W. Vyall, Ditto. Ditto. 2d Class,	150	150
5	Mr. A. F. Bonny, Office Assistant,	85	85
6	Mr. G. Bonny, Ditto.	85	85
	Native Establishment,		1,776 14 7
	"Guard."		
19	Burkundazes,	5	95
			95
	Non-effective since last muster.		
1	Mr. C. A. Montgomery, Sub-Assistant Revenue Surveyor 4th Class, Struck off.		
	Grand Total of Company's Rupees three thousand six hundred and seventeen fourteen annas and seven pie.....		3,617 14 7

I do hereby certify that the above Establishment was effective during the month of March 1857, and that the charge above made for the Native Establishment, was actually and necessarily incurred on that head during the said month.

REVENUE SURVEYOR'S OFFICE, Suagor or Western Division, Saugor, *The 1st of April* 1857.

(Signed) J. W. B. BLAGRAVE, Captain, *74th Regt. N. I. Rev. Survr.*

Received Payment.

(Signed) J. W. B. BLAGRAVE, Captain, *74th Regt. N. I., Rev. Survr.*

Passed for Company's Rupees 3,617-14-7.

(Signed) H. L. THUILLIER, *Deputy Surveyor General.*

APPENDIX C.

Estimated scale of Instruments, Camp Equipage, Books, and Office Furniture as in use with the Bengal Revenue Survey Establishments, Full Strength.

Names of Instruments.	No. of each.
Chains Gunter's Iron with Arrows,...	55
Chains Khusrah Iron for Native detail Measurement, ...	100
Compasses Beam Wooden,...	2
Ditto. Proportional brass pairs, ...	4
Ditto. Large with pen and pencil legs brass pairs, ...	18
Ditto. Small brass pairs, ...	30
Ditto. Bow Brass, ...	20
Ditto. Surveying, or Prismatic with Tripod stands, ...	16
Circumferenters,...	6
Cross Staves,...	10
Color Boxes, ...	2
Artificial Horizon, ...	1
Barometer Mountain, ...	1
Bars steel graduated 11 feet engraved and divided into feet, inches and tenths for comparing Gunter's Chains...	4
Drawing Pens, ...	40
Drawing Pins for fastening Maps to Boards, ...	100
Flag staves, ...	50
Gunter's scales 2 feet Brass, ...	2
Hammers for Chainmen, ...	12
Mathematical Instruments including proportional compasses in cases,...	6
Magnet Bars in box, ...	1
Magnifying Glass, ...	2
Pentagraphs, ...	40
Protractors brass rectangular, ...	6
Ditto. Ivory Ditto.	2
Perambulators, Everest or Waugh's pattern, ...	1
Referring lamps with sight vane and plummet,...	200
Rings spare for Chains,...	2
Rules Brass Flat 3½ feet heavy, ...	1
Ditto. ..... ditto 2½ feet, ...	3
Ditto. Ebony Flat 3 feet or 4 feet, ...	4
Ditto. Parallel 18 Inches brass on rollers...	6
Ditto. ditto. 12 Inches brass on rollers, ...	4
Ditto. ditto. 2 feet Ebony with Bars,...	12
Ditto. ditto. 1 foot ditto.	12
Ditto. ditto. 6 Inches ditto...	4
Tapes measuring,...	2
Telescopes reconnoitering, ...	1
Theodolites 12 Inches Diameter. By Troughton and Simms, Colonel Everest's pattern Telescope to range to 40° of altitude. The Telescope should be of 20 Inches, focal length 1·6 inches clear aperture with 2 eye pieces, powers 20 and 40, 2 Colored Glasses, verniers 3 to the Azimuth and 2 to the vertical circle. Levels 2 reading to about 3″ graduation on silver to 10′ and verniers to 10 to pack in 2 Boxes exclusive of Tripod stand, ...	19
Theodolites 7 Inches Diameter Everest's pattern by Troughton and Simms, ...	3
Ditto. 6 Ditto. Ditto. Ditto.	4
Ditto. 5 Ditto. Ditto.	11
Tracing Glass, ...	2
Thermometers, ...	1
Sextant in box,...	1
Drawing Boards and T Rules, ...	25
Heliotropes for Hilly country and Minor Triangulation, ...	4
Plane Tables for Hilly country and Minor Triangulation,...	10

Estimated scale of Instruments, Camp Equipage, Books, and Office Furniture as in use with the Bengal Revenue Survey Establishments, Full Strength. (Continued.)

Names of Instruments.	No. of each.
Camp Equipage.	
Tents Hill or Staff Serjeants Lined with Chinty, ...	4
Ditto. Office double poled large Ditto.	1
Ditto. Ditto single poled Captain's Ditto.	1
Ditto. Sepoy's of 4 Pauls each,...	4
Pawlins waxed cart, ...	8
Books.	
Logarithm (Chamber's, Young's or La Lande's), ...	1
Instructions on Topographical survey by Colonel Waugh, ...	1
Mathematical Tables Hutton's,...	4
Manual of Surveying, ...	1
Nautical Almanac for the current year,..	1
Traverse Tables by Colonel Boileau,...	9
Table of Trigonometrical survey Computations, ...	1
Tables of Land Measure, ...	1
Pay and Audit Regulation Code of 1845,...	1
Multiplication Tables by Major Smith, ...	6
Office Furniture.	
Toon or Teak wood Tables of sizes, ...	6
Chairs,...	12
Large and small Boxes for Office Stationery and Records, ...	8
Office Stamp (brass), ...	1
Chupprases, Belts &c.,...	16
Office Stools, ...	20

REV. SURVEYOR GENL.'s OFFICE,
Calcutta,
6th May 1857.

(Signed) H. L. THUILLIER,
Deputy Surveyor General.

No. 26. ORDER THEREON, No. 741; dated 25th July 1857.

Ordered to be referred to the Board of Revenue for consideration.

(Signed) H. FORBES,
Acting Secretary to Government.

(11)

No. 810

From.

R. B. Chapman Esqre
Offg Under Secy to the Govt. of India.

To.

H. Forbes Esquire
Acting Secy to the Govt. of Fort St. George.
Dated 5th June 1857.

Fort William

Home Dept.
Revenue

Sir,

With reference to para: 4 of my letter No. 1306 dated the 16th October last, I am directed to forward for the consideration of the Government of Fort St. George the accompanying copy of a report from the Deputy Surveyor General on the details of the proposed Survey of the Madras Presidency.

No. 1316 dated 15th May 57.

I have the honor to be
Sir,
Your most obedient Servant.

R B Chapman
Offg Under Secy to the Govt. of India.

Fort William
The 5th June 1857.

Rd 28th April 57 No 7-
" 2d Dec.r 56 - 43-44-
" 26 Augt. - " - 20-21.
" 9th June 57 - " - 30-31.

Copy to the Bank with
Encls. of 12 Sept. Map &c.
14 Augt 57 - No 815.

Copy in a Letter to E.
1st March 1858. No 5

Revenue 1857 Dept.
Dy. to Cons. 28th July.

No 722.

From the Offg. Under Sect.
to the Govt. of India -

Dated 3d June 1857
Recd. 23d -

6 Encls:

1 From Secy. of the Bd. of Rev. 1st Augt.
1857. C. No. 875. in Cons. 18
Extract from Do. 18th Augt. 57 No. 933
in Cons. 18th Sept. 57
2 Do. 1st Oct. 57 No. 1157 in 6
Sept. Cons.

Forwarding Copy
of a report from the Dy.
Surveyor General of Cal-
cutta on the details of the
proposed Survey of the
Madras Presidency.

Copied to Geo.
25th July 1857

Extract from the Proceedings
of the Board of Revenue
in the Office of Secretary
Dated 27th July 1857

No 721.
Ordered to be published -

6th July R10th No 25-V26-

William Sider
Dy. Sy. 25th July

13

Revenue 1857 Deptt.
Dt. to Govt. 28th July.

No 22.

From the Offg. Under
Secretary to the Govt. of
India.

Dt. 5th June 1857
Rec'd 25th
Encls: 6.

Exctt. Pro: Bd. of Rev. dt 1st Augt. /57.
C. No 875. In Cons 18th

Exctt. Dt. dt 15 Augt. /57.
C. No 933. In Cons 8 Sept.

Exctt. Dt. dt 1st Octr. /57 C. No 1157.
in C. 3d.

Forwarding copy of a
report from the Deputy Surveyor
general of Calcutta on the
details of the proposed Survey
of the Madras Presidency.

No. 25 to 26.

No 13.

From.

The Deputy Surveyor General.

To.

Cecil Beadon Esquire
Secretary to the Govt. of India.
Home Department.
Fort William

Enclosures.
7
as per Distribution

Sir,

I have the honor to acknowledge the receipt of your letter No 1505 of the 16th October last, forwarding for my perusal, a Volume of Printed Papers relative to a project for the Survey and Settlement of the Madras Presidency, which has been disapproved generally by the Supreme Government and recommended for the sanction of the Honble Court of Directors, desiring me to furnish an outline of a Plan for organizing a Professional Survey Establishment capable of commencing the Professional Survey of that Presidency simultaneously, at not more than four different points in concert and communication with the Revenue Authorities under the control of a Surveyor General and calling for any observations as to the mode of carrying on the Survey, as well as to the distinction of duty between the Professional and Revenue Officers, which

may

my experience might suggest.

2nd In obedience to the above instructions, I beg to submit the following remarks on the several points alluded to.

3rd From the volume of Printed Papers relating to the Proposed General Revenue Survey of the Madras Presidency received with your letter, and also from the "Selections from the Records of the Madras Government No IX on the Revenue Survey" it appears that a minute and accurate detail measurement of Holdings, is contemplated to be carried out in the Madras Presidency, with a view to a Ryotwarry assessment of the Land. and I find that a small Establishment has been employed in South Arcot under Captain Priestley since, or prior to 1854 when the Supreme Government authorised a field Party at an aggregate cost of 44,790 Rupees as per margin, for a period of three years subject to a full report at the expiration of that period. The details of this Establishment are specified in the Resolution of Government in the Financial Department dated the 2nd September 1854 printed with the Madras Selections No IX.

	Rs.
* For Survey and Measurement	36,511
* For Classification and Assessment	2200
Per Annum	44,790

4th In the excellent report dated 27th February 1854 of Captain Priestley's initiatory operations in South Arcot, drawn up by Mr H. A Bayley the Secretary of the Revenue Board printed in the Selections, I gather that the main object of the Revenue Board and of the Surveyor Capt.

(15) 614

Capt. Priestley, is to conduct a Survey of Fields or Holdings on the most approved principles, and that beyond a small amount of Professional accuracy in fixing the Village Boundary, and in making three or 4 Villages join together, no general Scientific precautions are deemed either necessary or Expedient, for securing Professional accuracy over extensive Areas, either to ensure a Congregated Map of a Pergannah, or of a Zillah, which shall have any pretensions to Requirement or even ordinary approximation to truth.-

5th Before we can in any way form an idea as to what an Establishment should be for these Madras Surveys, it is absolutely essential that the System of Survey to be adopted, or the requirements of the local Government in respect of such Surveys, should be fully understood. To give the outline of a plan, or any suggestions for organizing a Professional Establishment, it would naturally be in consonance with the System prevailing on this side of India. Which is essentially of a Professional and Scientific character, such as I conceive alone applicable to the delineation of large tracts of Country, and sufficient for the formation of Maps which will increase our knowledge of the Geography of India, whilst at the same time the Revenue requirements of the operations are not lost sight of.-

The

Deputy Surveyor General

6.* The Establishment formed for the Conduct of the Survey of South Arcot, is evidently of a mixed character, partly Professional and partly for the Native Field Measurement or what is termed here, the Khusrah, as I have endeavoured to analyze it in the margin.*

With this disposition the Revenue Board and Captain Priestley contemplated getting over 720 Square Miles of Fields per annum, and with unbroken waste, jungle, Hills &c about 800 Sq. Miles when the work was in full operation. and the Government of India expressed an opinion that if such an area of Fields could be disposed of annually, that the work would be cheaply purchased in a Country like that of Arcot in which the Ryotwary System prevails.

		Rs
Professional	1 Superintendent	375.-.-
	2. European Assistants	400.-.-
	3 Head Surveyors @ 70/	210.-.-
	6 Deputy @ 30/	180.-.-
	9 Writers, Computers and Draftsmen	195.-.-
	129 Measurers and Duffadars.	549.-.-
	18. Peons	96.-.-
	Travelling Allowance Tentage and Batta for Head & Deputy Surveyors.	60.-.-
	Total	2265.-.-
Khusrah	30 Survey Ameens	502.-.-
	30 Ditto Comptahs	300.-.-
	Travelling Allowance Tentage and Batta for Ditto.	165.-.-
	Clerks &c and Comptahs pay	190.-.-
	Total	1217.-.-
	Grand Total	3482.-.-

7.* It is evident from the details given in the above Scale of Establishment, that its formation has special reference to conducting the Khusrah, or the internal subdivision of Fields, simultaneously, and as a part in fact of the Professional work, and the Board's Report throughout leads to the same inference. The System may be termed, if I apprehend it rightly, nothing

nothing more than a Scientific Khusrah, or a superior land Measurement of Fields, somewhat on the principle of the Bombay Revenue Survey, only with Village Boundaries, laid down by Theodolite Professionally, in addition. The fields thus being the primary object and the Village unit being almost the apparent limit of accuracy proposed by the Surveyor, without any aim at generalization or general Topography, the ingredients composing the Establishment proposed by the Madras Revenue Board, are doubtless made applicable and best adapted to that end and with our imperfect knowledge of the ways and means and local peculiarities of the Sister Presidency it would be inexpedient my attempting to suggest any modifications in the Machinery for carrying on a work of this peculiar nature.

8.* The Nucleus of a Professional Establishment may be said to have already been formed by Captn Priestley, and from this, all the other Survey Parties required for the Madras Presidency, will have to be raised Season by Season. as every individual learns his duty and instructs others, so may Drafts be gradually taken out of the Parent Establishment for the formation of other Parties. all depends on the Superintending Officer and his administrative ability in training and instructing others, and in making every person useful in his own peculiar line. The best Policy in all Survey operations, is to begin with a well

well organised compact Establishment, vigilantly supervised, and then to expand it gradually as success and experience warrant development. If Captain Priestley has had two Covenanted Assistants for two years under him in all probability they are by this time so well versed in the general duties as to be competent for detached independent employment, and if so, they in their turn must commence with a few hands and feel their way gradually, until by degrees they can teach a sufficient number, and thus complete their effective strength.

9th On this side of India every Survey Establishment, with one or two exceptions, has a Covenanted Superintendent and a Covenanted Assistant. the latter generally selected for his qualifications as a Mathematician and Draftsman, the preference being given to officers educated at Addiscombe or Sandhurst where an excellent elementary education is afforded. and a practical insight obtained also in the first principles of Surveying and the use of Instruments. These Covenanted Assistant Surveyors, serving in a subordinate capacity under able guidance for five or three years, and in a large Establishment perfectly trained to its work, the succession to the charge of Surveys is thus well kept up. & Departmental experience and merit made the step to Promotion.

I

10th I would therefore venture strongly to recommend, that great care be observed in the selection of Officers for this duty, and that none be admitted into the Department who are not both Physically strong and young, and whose pretensions as Draftsmen are not above mediocrity. Officers of the ordnance Corps Engineers and Artillery are obviously by their early training and attainments the best fitted for employment in a Scientific Profession, and I believe it has been found preferable to employ young Officers of not more than 5 or 6 years Service, who are more likely to adopt proper habits of active exertion, and to imbibe a taste for hard and rough work, than those of more mature age and residence in India with whom it may be irksome to commence learning a new and difficult Profession, and whose tastes do not harmonize with the style of life. above all I believe a strong partiality and taste for such description of work as well as artistical talent as a Draftsmen to be a sine qua non, on the part of the Candidate.

11th Many of the Bengal Surveys were originally organised, without any experienced hands. Raw Recruits both European & East Indian, as well as Native, had to be taken, and thoroughly instructed in every part of their duty. almost every officer has had to make his own Party and according to the ingenuity, tact, and perseverance of the Officer

in

in Charge so will an Establishment be reserved effective in more or less time. To teach and guide others, all new to the work the Surveyor himself must be a Competent Officer fully acquainted with the Theoretical part of his duty, if he has not had the advantage of any great amount of experience in the Field.

12th The subordinate grades of Assistants and Sub Assistants must be recruited in the same way. It is in vain to look for, or expect ready made Surveyors any where, wherefore if promising youths of good education and possessing a fair elementary knowledge of Mathematics, with some signs of a taste for Drawing can be found in the Educational Establishments at Madras, they may prove the proper description of persons to join the Department, and receive their further education in practical matters afterwards. The Test of qualification for such Sub Assistants is laid down in the Enclosure marked A and we find no difficulty in obtaining very promising young men, both for the Great Trigonometrical and Revenue Surveys, possessing these qualifications who are willing to join on the usual Salary of either 107 or 75 Rupees as the case may be, giving the undertaking to serve 3 years, an important clause in the agreement, since it takes about 2 years to render an Assistant fully competent in all the duties expected of him - and before

Appendix A

* Great Trigl. Survey } Rs 107.—
Revenue Ditto } 75.—

(18) 1849

before which time he in reality makes but little return for his Salary, and the time and labor bestowed on him.-

13th As I conclude Captn Priestley's Establishment is still employed in South Arcot, it appears to me that the object to be obtained of visiting four full Parties will best be Consulted, by a certain number of both Covenanted & Uncovenanted Assistants being at once appointed and posted as Supernumeraries to learn their duties under this experienced Officer. Whether in Cantonment or the Field at this season of the year there is much to learn, and into which a practical insight can alone be obtained in a Surveyor's Office. These additions doubtless will not in any way aid or assist the work Captain Priestley may now have in hand, but on the Contrary his time and attention will be much occupied in teaching. Consequently the expense of the new hands might be kept separate, and not debited to this Surveyor's work to swell his average Cost. It will however be true economy to the State to give both officers and Subordinates this advantage, if it can possibly be managed.

14th In proportion as the European Agency is obtained and perfected, so can the Native Agency be cared for, entertained and trained up, and according to the employment of Native Agency must a proper System of Check and Supervision, the

Cost

Deputy Surveyor General

in cost of the work will be affected. In the Bengal Presidency
in the relative proportion of European and Native Agency for
wo. Professional Survey alone may be estimated as per
ac* margin, and as more fully
no detailed in the copy of one of
in the existing Establishments Pay
17 Abstract for a month of the Field
Season (Appendix B).

* 1	European Revenue Surveyor	Military Officers.
1	Ditto Covenanted Assistant	
1	Ditto full assistant Surveyor	Uncovenanted
5	Ditto Sub Assistants	
30	Native Surveyors or Moonshees	
250	Hindoostanee or Tindals & Cluskies	
19	Guards (10 Burkundazes and 9 Peons)	

to 15th. The Native Surveyors of the first Class, Salary varying
y from 20 to 60 Rs per month, are competent to survey with
the Theodolite and Chain, to keep Field Book & Abstract
work, they as well as the 2nd Class men, whose remuneration
is from 10 to 25 Rs, can also use Prismatic Compass or
Circumferentor, and make Field Map of the Interior
details of Cultivation, waste, and other Topographical features
The former are employed in the Boundary work, and having
taken the Horizontal Angles round a Village, and measured
the lines of the Polygonal figure, and taken the offsets to the
Boundary as marked off by Mud Pillars by the Demarcation
(or Civil) Department, send their Field Book in to the
European Assistant in Charge of the Camp or Division, who
after applying the proper Bearing to the leading line, as
derived by Astronomical observation, and carries on
successively

(19)

successively through each Main, or Grand Circuit. Completes
the Traverse of the Village, and thus tests daily, the work of
every Native Surveyor. The several duties of the component
parts of a Bengal Establishment will however be found fully
explained in the Manual of Surveying for India. Copies of
which, I am informed by your letter under acknowledgement,
have been supplied to the Madras Government.

16th. In the Bengal Presidency where the duties of the
Revenue Surveyor are now universally confined to the Professional
Survey alone, an Establishment of the above description may be
considered to be the most appropriate and the most economical.
The expenses are regulated under the Monthly audit of this
office by a fixed Annual Maximum Grant, as authorized by
Government, the amount of which is now fixed at 37,524 Rs
and the larger expenditure of the 6 or 7 months of the Field
Season, is balanced by corresponding reductions during the
Recess when the Survey Party returns to Cantonments or a
Civil Station and all superfluous menservers are discharged,
and many of the Native Surveyors permitted to go to their homes
on half Pay. The Recess can never be sanctioned less than 5 months
and is generally of even longer duration in Lower Bengal and
this period of cessation from actual Survey is absolutely
necessary to enable the Surveyor to complete all his Maps and

Computations

Deputy Surveyor General

Computations, and to lodge them in this office in a satisfactory manner before he embarks on a new Campaign.

17th The above Establishment and expenditure only provides for a complete Village Survey including a separation and Record of all the usual details of "land under cultivation" "fallow" "fit for Cultivation," "Waste, Jungle, Sheet yen" together with a regular delineation of all the Topographical features of the Country on the large Scale of 20 Chains or ¼ Mile to the Inch. No separate measurement of Fields (Khusrah) for even of small estates comprising portions of a Village, is included in this Estimate. This duty is performed by the Civil or Settlement Establishment, and entirely Checked by the Officer of that Department, the results of the Professional Survey being their guide for the aggregate Areas of each description of land, and of the entire Village, and Consequently this Department is in no ways responsible for, or Concerned in the Record of the Separate Fields or minor Estates which are exclusively managed and paid for by the Civil Branch.

18th My own views on this question do not accord with those of many of the authorities who have had the Control of extensive Settlement operations, and very materially differ from the policy of the Revenue Board Lower Provinces during the last 6 or 7 years, in regard to the method of defining

(20) 1911

defining and mapping the Hamlets or small Estates in the Perpetually Settled Provinces, where the Specification of Fields and of the description of the land is no object. All that is required being the Area and position of every Separate Estate paying Revenue to Government. I hold, that all measurements of whatever kind whether Professional or Khusrah, can best be checked and supervised by a Professional Surveyor, and that the two Combined operations of Survey & measurement of Fields, by advancing simultaneously under one head, must have an advantage over Separately Conducted, and Separately Superintended, operations. I believe that an active Surveyor who thoroughly understands his work & who is supported by 5 or 6 European Assistants Scattered over the District under Survey, and whose tenure of Office is generally far more permanent than that of a Civilian, will be found more Competent to keep a body of 100 or 150 Native Ameens, the number actually required in a District in proper Check. My experience tells me that such men as pensionary Ameens require the most constant & vigilant watching, as well as the certain Knowledge of the Professional Survey Coming in their steps to keep them within bounds. So for therefore it appears to me that the Madras proposed System is worthy of admiration, for the Fields will be laid down & fairly drawn apparently with the Village Boundary and with great

Deputy Surveyor General

great precision and accuracy and essentially under the control and management of the Surveyor himself.

19th In the Madras System in fact the attainment of the separate record of the Fields, appears to be the one great and only object aimed at, to the exclusion almost of those general principles of Professional practice which are obviously called for, when projecting extensive Surveys of immense Areas embracing Zillahs or Districts and even Provinces. That the object of this detail measurement or Minutiæ, in a Country about to come under a Ryotwarree Assessment, is most important I am well aware, and of the expectations of Capt.n Priestley and of the Madras Revenue Board of getting over 700 Sq: Miles of Fields in this Style, with the strength of Establishment laid down and of similar success can be guaranteed in all the four different Surveys proposed to be carried on, the Results thus obtained will be well worth the money expended.

20th It would be very interesting to know what may be the actual experience of the working of Capt.n Priestleys Establishment for the last two Seasons. Whether he has been able to attain such progress with the allowed means or not. The average size of the Fields is said (Para: 23 Boards Report) to be half an Acre - a field of two Acres being a rarity - according to the size of the Fields of course must

must be the progress and it certainly seems, according to the practical experience gained on this Side of India that for 30 Annees the apparent number of men entertained to accomplish 700 Sq: Miles of fields of such an average equal to 896,000 Fields per Season, which gives 29866. 6. Fields each man, or 2986 Fields each man per Mensem or 114 Fields per diem 10 Successive months in the year, is an enormous outturn, which when taken in Consideration with the improved mode of measurement proposed is the more remarkable In the Boards Report Page 20 Paras: 737 74 the estimate is made at 25 Fields per diem for one Annieen or $2\frac{4}{10}$ Sq: Miles per Mensem taking 60 Acres to the 25 Fields - which however does not correspond with what has been previously stated as the probable average of the size of Fields, but on the Contrary is more than four times in excess of that average - It is possible that sufficient experience has now been attained by Capt.n Priestley to warrant a more definite estimate of progress.

21st Whatever progress however may be gained in the minute delineation of the Revenue requirements of the Survey the laying down of the Fields it strikes me that no general Survey of the Madras Provinces ought to be permitted to be Commenced, and carried on in the present day, without full and simple precautions being taken for making the materials

subservient to the general purposes of Geography. It is so evident from the published Papers, that a very little more would suffice to secure this object, that it would be a thousand pities to neglect it. The Madras Peninsula already boasts of a Topographical Survey on a moderate scale made from 30 to 40 years ago based on Colonel Lambton's Triangulation, and with the exception of a very small gap here and there, an absolute net work of Triangles covers the whole of Southern India and consequently the utmost facilities exist for connecting the present operations with the old Points, which will afford the surest means for adapting the present Revenue materials to the same purpose, as we have so successfully done on this side of India.

22nd. The lapse of so many years makes a great difference in the appearance of the face of any Country, and it will naturally be found, that between the old Surveys, made for the most part, apparently by Plane Table Sketching, on the scale of one Inch to the mile, and the new Survey laid down with great minuteness of detail on the vast scale of 16 Inches to the mile (or 16 times greater) (which must be reduced to a smaller and more Congenial scale suitable for general Maps,) the detail shewn will be almost entirely different. Hence it cannot in my humble opinion, be urged that the old Topographical Maps are sufficient for all purposes of the present day, or that the present very minute and careful Survey could be incorporated or dovetailed therein. Such a procedure I believe would be impracticable for many reasons which might be urged. And therefore good Topographical Maps should not be rejected, when they can be so easily rendered, and to them every day shews the pressing want of them for new Engineering works of practical utility.

23rd. The first great principle which I look upon as of the most vital importance in subordinate Survey operations is the due and perfect connection and identification of the Topographical features, or Stations of the Revenue Survey with the points of the Triangulation, whereby alone, the Maps of the former operations can be amalgamated, and adjusted in the Great Atlas of India, or indeed in any general Map, on which lines of Latitude and Longitude are required, with any pretensions to accuracy. If therefore satisfactory Topographical Maps are expected or desired in the Madras Presidency, it will be very essential for the Surveyor to pay much more attention to the above Condition than the Madras Revenue Board seem inclined to recommend. In Paras. 13 & 14 of their Report, allusion is made to this Connection of the two Surveys, and the advice of Captain Jacob the Honble Company's Astronomer (himself formerly employed

Deputy Surveyor General

employed in the Bombay Survey, taken, the result of which appears to be summed up in the very remarkable expression that Captain Priestley's method of Survey requires no such aid.

24th. It would appear, as I have before remarked, that the proposed system for Madras, ranges no higher in the scale of Surveys, than that of a very good Revenue, or Parish measurement of land, which in fact is no Survey (properly so called) at all, and therefore if compared with the Bombay similar description of work, (which I have always understood to rank as a mere Civil Settlement operation,) then the connexion with the G. T. Survey of India, may be deemed superfluous. But if the Madras Revenue Village Maps are ever to be put together, so as to form a Pergunnah or even a Taloork Compilation of the entire number of Villages composing such sub Divisions of the Country, and from which again a District or Zillah Geographical Map could alone be constructed, then the insertion of the points of the Great Triangulation will be important, and if they still exist on the ground it would be difficult to understand, in what way such an observance, could either impede or obstruct Capt. Priestley's work. The record of a known and well fixed Point, of which the Latitude and Longitude is known, on the Maps of a new Survey of the Madras Provinces, can perfectly do

do no harm, or prove inconvenient to fix where every Village is surrounded by angular work obtained by a Theodolite; whilst on the other hand, its omission may, and assuredly will, hereafter cause serious trouble, doubt, and perplexity, when Geographical Materials have to be compiled, not by the Surveyor himself, but by the Surveyor General or Superintendent of the whole of the Surveys.

25th. On the above views of the case therefore, whatever Capt. Priestley's Method of Survey may be, he can in no ways be independent of, or despise such aid, as that which an accurate Survey on a Trigonometrical Basis affords, and which very fortunately will be found to exist in all parts of the Peninsula of India. Each new District Survey, ought to have some fixed, and well known point of departure from which, its operations should emanate and all its calculations be computed. I believe a large Chart of the whole of this Triangulation has been already furnished to the Madras Revenue Board, and the numerical data of a great portion of it, with Extracts from Colonel Lambton's Memoirs and Papers are now under transcript in this Office on the requisition of the Madras Government. There will be nothing wanting therefore to render the proceedings of as many Surveyors as may be appointed, clear and unmistakeable, and any earnest recommendation is offered, that the great and lasting importance

of this point may not be overlooked or neglected. Indeed I am glad to perceive that the Government of Madras expresses a decided opinion on this subject in the Resolution dated 11th August 1855 Para: 8.

26th. In the 15th Para of their Report the Madras Revenue Board are in error in stating that in the N.W. Provinces the Professional work of the Revenue Survey was performed by officers employed in the Great Trigonometrical Survey, and that they did not extend their labors to Village Field work. The Revenue Survey Department is essentially distinct and separate from that of the Great Trigonometrical Survey, the Officers of which, are strictly confined to the Principal and Secondary Triangulation, they have nothing whatever to do with Topography or details of any sort, and their Operations are pursued without reference to Districts or any other Surveys which may be in progress. The Revenue Surveyors of the N.W. Provinces invariably maintained the measurement of Circles (the Khusrah) under their own guidance the only part of the Khusrah then performed by the Settlement Officer, was the insertion of the quantity of the soil, or nature of Crops, in the Revenue Chitta or Field Register the whole of the measurement duties were, as they always should be in my opinion, under the Surveyor. That failures in the Khusrah occurred (as pointed out in the Board's 80 to

84 Paras:) there can be no doubt, they were caused & apprehended by the inordinate race amongst the N.W. Surveyors of those days for large Areas, when quality gave way to quantity, and when the whole of the operations were under the Control of the Agra Revenue Board, instead of under the proper Professional Check and Supervision of a Deputy Surveyor General.

27th It is equally a fact, that even the results of the Professional Survey of the N.W. Provinces of those years were much neglected, and the Combination of the Village Survey into proper Pergunnah Maps not carried out in the way it undoubtedly ought to have been, owing to the extraordinary haste, with which the Surveyors were urged to get over the ground for Settlement purposes. The records of those Surveys, from never having been deposited in the Surveyor Generals Office, are now incomplete, and many of them not forthcoming at all, and for many years past a Series of Zillah Maps on the useful Scale of 2 miles to the Inch, exhibiting Village Boundaries, have been under preparation at Agra, and by the Assistance of the local Collectors, but with very partial Success, and it is estimated that this object which the N.W. Government have long had very much at heart, will still occupy ten years more. Such a lamentable result may be attributed entirely to the two causes alluded to above viz the absence of direct and special Competent Superintendence over the

whole of the operations and the imprudent and rash Spirit of the executive Surveyors Large Areas and Low Rates being the Chief thing sought after.

28th It is a Consolation to be able to add that such a System has long since Ceased to hold any Sway in this Department. With the date of the Cessation of the N.W. Surveys Large areas and low rates with inferior work to match, have been explored and in the present day no Surveyor would risk his Professional Reputation by following such an example, the ill effects of which I may say are even now constantly felt in this office in the Course of our general duties. The mention of these circumstances in this place, will, I hope, prove not entirely without its use as a beacon to the Madras Surveyors.

29th Next in importance to a proper and Complete identification with the Points of the Great Triangulation and a permanent Point of Departure or first Station for the Survey, is the nature of the Meridian on which the operations are based. The Board remark in their 46th Para: that the Surveyor has not laid it down a True Meridian, but was working entirely from a Magnetic one, and that the outline of every Village being independently and carefully taken by Traverse, a set of Several Villages will ultimately close "near enough for all practical purposes." They thought however with Capt. Boistley that it was desirable to have a check of more accurate nature, but again in Para: 47th they did not a

Consider

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(25)

Consider it necessary for the Surveyor to lay down his Azimuths with that rigorous accuracy that was required in the N.W. Provinces where the lines were connected with the G.T. Survey," and the Board therefore left it to him to use such method as might be adapted to the Instruments with which he was furnished. From the 48th Para: it further appears that nothing beyond a 5 Inch Theodolite forms the present equipment of the Surveyor.

30th From the above it would seem that the Surveyor is at present obliged to adapt his Style of Survey to the nature and Capability of the Instruments with which he is supplied, instead of first determining on a rigorous method and then providing his Instrumental equipment accordingly. In the 48th para: of the Board's Report, the proper and natural System of working from whole to part, and embracing large Circuits of a whole Taluck or Pergunnah in the first instance, the Smaller or Village Circuits being filled in within it afterwards is pointed at, as having been proposed by Capt. Boistley though his other duties would not permit him to carry it out. It is precisely such a Course that I would earnestly enjoin, as the first step towards Securing faithful Maps of a Pergunnah or Taluck, and hence of a Zillah as the only way of Conducting such a Survey, as we have in Bengal. To effect this also, every independent Village laid down on a Magnetic Meridian will never answer, because although as the Board anticipate, a few Village

Deputy Surveyor General

Traverses might join well enough together for all practical purposes, yet the accumulation of error in many hundred Village Circuits would soon become so large, that the Surveyor would be thrown into inextricable difficulties. Not only must the whole work be based on the true Meridian, carefully established for the Initial Azimuth, as derived from Astronomical observations, but such true Meridian must again be frequently checked by corresponding Astronomical observations, and the Azimuth as conveyed through the Angular work from Circuit to Circuit constantly tested. Without this is done there will be no prospect of the Main Circuits closing & proving with the necessary accuracy. The whole of this process to which I will only here briefly allude is described at great length in the "Manual of Surveying Chapter XII Part III" and will no doubt be familiar to the Madras Surveyor.

31st. Having in view therefore a Professional Survey of the Bengal stamp, as a very necessary ingredient of the Madras proposed operations, I would counsel the strictest observance as to the mode of establishing & laying down the true Meridian, and in preserving the true inclination of the Azimuth as conveyed from Circuit to Circuit. It may be sufficient for all purposes of Revenue, and for the requirements of the Board of Revenue, that a set of a few Villages join well together, but generalization

(24) 25

and good Topographical maps cannot be obtained by such a system; and if any thing beyond the isolated Village Plan is expected, or deemed requisite for the general purposes of Government, a rigorous prosecution of the professional part of the work must be adopted. In the 10th Para: of the Resolution of the Madras Government, I observe, it stated, that Talook maps should be prepared, and permanent Boundary marks established without which two securities, the work would in the opinion of the Government in a few years be lost.

32nd. In the 41st Para: of their Report the Revenue Board remark that they do not consider themselves qualified in Recommending the additional expense that would be necessary in preparing Maps purely Topographical and that all detailed Roads, Tanks &c being laid down as fields and clearly defined in the Plan of measurement, a little extra coloring would give every Topographical information necessary. The question however appears to me, to be one of Scale, and as to the nature & extent of the Maps to be furnished by the Surveyor. This Plan of, or measurement of the Fields, is to be on 16 Inches to the mile. this is most appropriate for such minute detail work, and fields of half an acre average size could scarcely be shewn on a smaller Scale as the multiple of 4 it is also particularly convenient for all subsequent reductions and incorporation as

Deputy Surveyor General

topographical materials. But I submit, if the duty of the Surveyor is to be confined to these Village Plans on such a large scale, that the Survey results will be useful alone to the Settlement & Village authorities and that no one else could possibly make use of them, for even three Villages joined together on that scale, would present a sheet of Paper altogether prohibitory. Neither could such large Plans for many Districts be multiplied except at a very heavy cost and with great expenditure of time.

33rd. To prepare purely Topographical Maps would perhaps be foreign to the immediate object in view but if the Revenue measurements are to extend over many Talooks, Perguunahs and Districts, there must be some sort of general or Index Maps, prepared as guides to a ready Comprehension of the Village Plans and their relative position when congregated together. In fact some sort of generalization and combination of the materials thus produced by the Revenue Measurements seems to me indispensable. The question therefore appears to me to resolve itself into this. Should the Surveyor furnish Index Maps on a convenient scale, shewing all the Village jurisdictions comprised in a Talook or Perguunah, or other convenient size Block of Area, and ought such Map to be a mere outline Skeleton of boundaries or accompanied with the usual general Topographical features of the Country which in reality have all been taken up in the Field and only require reduction and compilation, to bring them into practical use?

34th. In other words should the Labor bestowed in the Field, be reaped in the office, and turned to practical account, or be allowed to be dormant, recorded only where a few persons can obtain access to it? or should the results of the Madras Surveys be purely of a Revenue Character or Revenue and Topographical combined, affording valuable information to the Engineer as well as the Collector. The difference in the expence will I believe be trifling in Comparison with the superior advantages gained. It is beyond my Competency in the present state of the question, and with the information before me, to predict what would be the relative cost of a purely Revenue or a Revenue & Topographical Survey combined, in the Madras Territories. This may possibly be estimated more closely by Capt. Priestley, and with his experience before him, together with a fair Consideration of what I have endeavoured to recommend, the question may be placed on fair grounds for the information and decision of Government.

35th. In first establishing large Survey Parties, their Instrumental equipment is a matter of primary importance. It would appear from the Correspondence that the means of providing suitable Instruments do not exist at the Madras

Presy

Deputy Surveyor General

Presidency, and if such should still be the case, or if proper arrangements have not been made to submit to the Honble Court for a sufficient supply to meet the probable wants of the entire Presidency, I would suggest that applications be made on the Stores of this Presidency, where I have no doubt all the immediate and necessary wants for good Instruments & Surveys, could either be complied with, or procured from the European Dealers in Calcutta in good time for the ensuing Cold Season. Annexed is a list of the Instruments in use with a Bengal Survey, and which may be said to be absolutely necessary for carrying on the Professional operations. The number of Theodolites attached to a Party allows for keeping two & three in reserve to provide against accidents, which in very large Establishments and with extensive Native Agency must be anticipated. The wear and tear of a Theodolite in a Revenue Survey is enormous, as proved for several years both the changes of atmosphere and the influence of the dust, & between Sunrise and the Sunset, it requires careful surveillance and cleaning on the part of the European Assistant it states periods.

Appendix

36th. As the last and most intelligible way of illustrating my remarks, in respect to the Style of Maps which I consider a Revenue Surveyor should produce, I beg to forward

* The Burdwan Division of the 24 Pergunnahs 4. District in four uniform Sections Scale one mile to the Inch.

Separate Pergunnah Plans of the Nuddea 2. District Scale one mile to the Inch.

Appendix D

District Map of Burdwan, forming an Index to the Pergunnahs Scale 4 miles to 1 the Inch.

District Map of 24 Pergunnahs, Scale 4 miles to the Inch. 8 Total

(28)

forward the Specimens of one of the Bengal Surveys as detailed in the margin. It will be observed that the one Inch Maps, exhibit the result of the Survey the Village jurisdiction, and consequently form a complete Index to the Revenue Plans of the Villages. This is essentially the Revenue feature of the Records, and by possessing a network of Village jurisdictions, the Pergunnah and the District can be thrown off into any convenient number of larger jurisdictions such as Thannahs, Moonsiffies, or Deputy Magistracies without its being necessary in any case to deviate from an actually Surveyed line, and consequently from a known, and recognizable line in the Field. In addition to this information, the whole of the Topographical details as laid down by the Professional Survey by means of the Prismatic or Surveying Compass and Chain, Plane Table or Circumferentor, are well shewn, to the fullest extent of which the Scale is susceptible.

37th. From these materials the District or Zillah Map is compiled, with the aid of the numerical data duly recorded on the original manuscripts of the Surveyors, and thence incorporated into the engraved Sheets of the Atlas

Deputy Surveyor General

of India, by the due identification of the points of the Great Trigonometrical Survey, which are all carefully shewn, and their direct distances as obtained by the Revenue operation, calculated, and then compared with the data of the former Survey, from which the error of the work is deducible. By an inspection of these Maps the general features of the Country are at once understood, the relative positions of the Villages one with another are defined, and if more minute details are sought, or a Boundary requires investigation, the Village Plan can be referred to as a combination of the Topographical and Revenue results. I believe these records will be found invaluable.

30.th In the North West Provinces this generalization is carried still further, and the Village unit is even shewn on the District Maps, and by thus obtaining the whole of the Village jurisdictions at one view great advantages are derived. Here the average size of the Village is about 900 or 800 Acres (or 1¼ Square Mile) which consists of their reduction to a scale of 2 miles to the Inch, but in the Lower Provinces where the average size does not exceed 350 Acres or half a Square Mile, the 2 Mile to the Inch Scale, will not admit of such minute Subdivision being shewn, and consequently the one Inch Scale is obliged to

to be resorted to, and as that is too large for a whole Zillah, the Pergunnah Maps are separately published.

Copy Appendix B

* In duplicate
District Map of
Seealkot 2nd Edition
Punjab Proper
Scale 2 miles to the Inch
District Goorduspore
Scale 2 miles to the Inch.

A good specimen of a District Map shewing Village Boundaries is likewise forwarded as specified in the * Margin.

39.th It is precisely such Maps as these that the late Lieut.t Governor, N.W. Provinces, Mr. Thomason, declared were essential to make both Revenue & Judicial Officers efficient in the performance of their local duties. I have, during my tenure of Office, consulted many Revenue Officers, and have heard but one opinion from them as to the superior utility of these Maps, and therefore I commend them to the notice of the Madras Authorities.

40.th The above remarks will, I trust, be sufficient to explain my views as to the most desirable mode of carrying on the proposed Survey as called for in your 2nd Para. It is now necessary to advert to the distinction of duty, usually observed between the Professional and Revenue Officers.

41.st Allusion has already been made to the Contract of the Admeasurement or Measurement of the Fields. This I think has wisely been entrusted to the Surveyor, and he will no

doubt

Deputy Surveyor

doubt do it justice, but although in the 20th Para: of their Report the Board of Revenue, are evidently alive to the importance of the Village Boundaries being traced before the Surveyor commences his work, yet I perceive no distinct provision made in the correspondence before me, for the Machinery by which the very important and primary duty of demarcating and adjusting the Boundaries prior to, and well ahead of, the Survey is to be performed. On this, the progress and satisfactory results of the Survey and measurement will undoubtedly depend for if the Surveyor proceeds in advance of the settlement of disputes, his work is renderes liable to revision, and unless the Field marks are erected before the Surveyor goes on the ground, it will be impossible for him to proceed with that regularity and exposition which is so essential in extensive operations. It is not only necessary therefore to provide for this important point, but to do so in a manner which shall positively prevent all hindrance or detention to the Professional Surveyor.

42nd For the assessment and settlement it has been widely determined to have separate and distinct Officers (Para 39th of Madras Government Resolution of the 14th August 1855) it having been established in

(30) 2991

in other parts of India, that such duties cannot safely be entrusted to the ordinary District Authorities. With a Settlement officer therefore for each Survey or Zillah there will be no difficulty, in his providing for the Civil duties both preparatory to, and subsequent to Survey, as so forcibly enjoined in the "Directions to Settlement Officers in the N.W. Provinces" published by that Govt. Copy of which has been supplied to the Madras Govt. as stated in your final Para: In Bengal the cost of Demarkation including Villages, and the minor Estates contained within them, is very heavy, equal in fact, according to the present System introduced by the Board of Revenue Lower Provinces, to the expense of the Professional Survey.

43rd This demarcation however of the internal or small Estates furnishes all that is required of a Khusrah, or rather I should say, has been substituted by the Board of Revenue for the Khusrah or field by field measurement as previously conducted by the Surveyors, with what advantages time can only prove. But whether in Madras any preparatory definition or demarcation of the Fields or Ryotwary Holdings will be necessary or not, I of course am unable to say, but it appears to me obvious,-

Deputy Surveyor General

obvious, that at all events the Village Boundary, which Capt.n Priestley lays down in a Professional manner with the Theodolite, should be properly & authoritatively defined and freed from all disputes, and an sufficiently correct Sketch of the same by substituting the precise position and distance apart, of all the boundary marks (on the Map) as existing on the ground, should be furnished under the Settlement Officer's Signature, for the guidance of the Surveyor and for due subsequent Comparison with the Professional Plan. The present method of preparing these demarcation (or Thakbust) Maps, is fully described in the Manual of Surveying (Page 534 Second Edition) -

44.th The Madras Board of Revenue in endeavouring to estimate what an Establishment should be, (Paras 52.nd to 54.th of their Report) refer to the details given in the Manual for the Civil branch of the operations. The estimate given in their 54.th Para; is that for the demarcation Establishment in the Lower Provinces of Bengal, where, under the Perpetual Settlement, the duties of the Settlement Officer are confined simply to the demarcation and adjustment of Boundaries including the measurement of the Minor Estates situated within, and subordinate to, the village, and the preparation of the Registers of

Estates,

(31)

Estates, for lodgment in the Zillah Collectory Office. The object of this Survey and measurement being merely, the ascertainment of the total Area and position of every Estate paying Revenue to Government the definition of the fields composing an Estate, as well as the details of Cultivation, waste, fallow you are deemed unnecessary, and no enquiries are consequently made on those heads. To keep the Professional Survey Establishment in full work, all the energies of the Settlement Officer and his Establishment of Deputy Collectors, Peshkars and Ameens, are called into play, and if this is the case where no Settlement & assessment is in progress, it follows that the undivided attention of a Civil functionary will be absolutely required in the Madras Surveys. By the Surveyor taking up the measurement of the Fields, the Settlement Officer will be enabled to do ample justice to the Demarcation and Settlement duties.

45.th I believe that the same distinction which existed in the old North West Surveys between Settlement and Survey duties, will be found the most advantageous in Madras. The Surveyor to conduct, and be responsible for, all Survey and Measurement work, the Settlement Officer to guide the demarcations and the assessment duties which latter

include

Deputy Surveyor General

include the ascertainment of the quality of the soil & crops, and likewise involve a check over the entries of the names of Proprietors or Ryots in the Ameens Khusrah or Field Register. By such a division of labor and responsibility, the agreements by the people of a District are more likely to be readily obtained and entered into without objections of a serious character. In the Punjab and N.W. Provinces as well as in Bengal at the present day, the Khusrah or Native Revenue measurements are all made under the superintendence of the Settlement Officer. I am therefore unable to furnish any information or specimens regarding this portion of the Revenue operations, but I candidly confess that after nearly 20 years experience in the Department I am no convert to the change, but on the contrary every day tends to confirm me in the principles which I have endeavoured to lay down on this subject in the Manual of Surveying.

46th The objections taken to the results of the old North Western Provinces Khusrah are in my humble opinion not from defects of System, or the principles on which the System was based, but from absolute neglect of the first and leading steps of the System, wholely proper check and supervision over the Combined work, has rendered impossible, by the haste with which the ground was got over as before adverted to. I therefore do not myself, see sufficient

sufficient cause for separating measurements, which should proceed simultaneously, or as nearly so as possible, under one Professional head. A clear and unmistakeable distinction between the duties of the Professional and Revenue Officers should I think be laid down from the first, and rigidly adhered to.

47th The subject of Permanent Field Marks is also one of great importance, and if they can be erected as the Board of Revenue propose at all Triple junction Boundaries of Villages, of course, the advantage will be great, but I apprehend that the expense would be very great, and the number of Solid or Masonry Pillars required for each Talooka or Pergunnah would be so enormous, as to render it altogether prohibitory. Although I have always endeavoured to provide for as many Permanent marks as possible, especially such as are more essential for survey purposes, and for the proper connection of the Meridian between Contiguous Surveyors, yet the fixing of the Triple junction points or divergence of three boundaries of Villages as land marks has been found to be hopeless. With the exterior limits of Pergunnahs and Districts even, there has been a difficulty on account of the constant changes occurring in these Territorial Subdivisions.

48th Should it be determined to carry out this plan

it

Deputy Surveyor General

It will be very necessary to enforce the proper maintenance of the Pillars by the Village authorities. For this, and other purposes of the Survey generally a Special enactment will be most advantageous. It appears to me greatly to be regretted that in Bengal where the expense of defining, adjudicating and Surveying the Village Boundaries falls so heavy on the State, the results of the Survey are not made more binding on Zemindars. The more stringent the Law in this respect the greater will be the attention to proprietary rights at the time of Survey, and Consequently a more ready attendance and Cooperation on the part of Zemindars or Ryots which is so necessary to due progress will be obtained.

49th During the past four or five years the operations in Bengal have been going on with great speed and vigor. The Annual Reports connected with both the Professional and Civil Branches have been published by the Board of Revenue and as there may be many details discussed therein which might be instructive to the Madras Executive officers, I beg to append a bound copy as per margin. The nature and extent of our operations in the Lower Provinces will be fully understood by a perusal of these Reports.

50th A mass of information regarding the old Revenue Surveys and Settlement of the N.W. Provinces, as well

Appendix E

† Bengal Revenue Survey Professional & Civil operation Reports for the Seasons 1851/52 to 1854/55 In Duplicate.

(33)

well as of the Bombay Presidency has been published in the Parliamentary Blue Book, 100 Copies of which I have been informed, have already been furnished to the Madras Government, it is not therefore necessary for me to attach Copies to this Report and I would merely suggest a perusal of it to all the Survey and Settlement Officers employed in the Madras Presidency.

51st It has been stated in the Madras Government Resolution that a detailed measurement of fields will not be required of the whole Area of the Presidency computed at 138,000 Square Miles, but only about 60,000 Sq. Miles of it, the rest being Hilly Jungly Country of less value and importance, will, I presume, have to be taken up Topographically only, perhaps in some Districts, there will be found both descriptions of Area to be dealt with (as is found to be the case in the operations now going on in the Salem and Nellore territories) and which in order to Complete the Zillah Maps, will have to be provided for. The proper mode of Surveying such ground as very elaborately described in the Printed Instructions by Lieut. Colt. Waugh Surveyor General of India as per margin*, two Copies of which I have the honor of furnishing for the use of the Madras Surveyors and would earnestly Commend a careful Study of the invaluable principles therein laid down to the Madras Surveyors. These

Appendix G

* "Instructions for "Topographical "Surveying by Lieut. "Colt Waugh Surveyor "General of India. "For the use of the "Survey Department"

Instructions

Deputy Surveyor General

Instructions are likewise to be found in the Manual of Surveying Appendix Page III. London Edition.

52nd In the Madras Government Resolution (Para: 44) it is questioned whether a Surveyor General, or a "Superintendent of Revenue Surveys" would be able to control more than four Parties of the strength laid down. There would I imagine be no difficulty in his efficiently superviseing a much larger number. At the present moment I have no less than 14 all of the full strength with one exception as detailed in the margin, under my immediate superintendence in addition to other important duties. But as before remarked the Survey Parties can only advantageously be increased gradually from year to year as each new Party grows in strength & capability and may then subsequently be able to afford to spare a few well trained hands to form the nucleus of an additional establishment to take up another District. The present Establishments on this side of India have all risen in this manner. During a period of the past ten years four Parties have thus expanded into 14. I would however on no account recommend more than four establishments being raised in the first instance.

* Bengal 5
N.W. Provinces ... 5
Bombay and Sind ... 4
Total 14

53rd I observe in the same Para of the Resolution mentioned above, that it is proposed to give the Executive Officers employed the appellation of "Deputy Surveyor General". In this Presidency they are styled "Revenue Surveyors" which appears more in consonance with their Executive duties and less likely to cause misunderstanding in contradistinction to the general supervising authority, who has long been termed Deputy Surveyor General in Bengal.

54th In conclusion I have only to record my earnest desire to afford at all times the most hearty Cooperation and assistance, as far as lies in my humble power, towards the object which the Madras Government have in contemplation, and if the Superintendent of the Survey, whenever such an Officer may be appointed, will place himself in Communication with this Office, he will find a ready & cheerful response on all points of Professional procedure, and I shall feel a pleasure and a pride, if by any means I can be made instrumental, towards raising the character of the Madras Surveys to that Standard of excellence, which should characterise so great a work in the present age.

I have the honor to be
Sir
Your Most Obedt Servt
(Sgd) H. L. Thuillier Major
Deputy Surveyor General

Revd Survr Genl's Office
Calcutta 6th May 1857.

True Copy
D. R. Thuillier
Offg Under Secy to the Govt of India.

Deputy Surveyor General

Copy in a Letter to E.
dft 1st March 1858. No 5

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List of Enclosures.

1 Appendix A Test of Examination for candidates in duplicate, referred to in Para: 12th.

2 Appendix B Copy of Pay Abstract referred to in Para 14th in duplicate.

3 Appendix C Scale of Instruments for Bengal Survey referred to in Para: 35th

4 Appendix D 8 Specimens of Bengal Survey Maps, referred to in Para: 36th

5 Appendix E 4 Specimens of Bengal (Punjab) Maps in duplicate, referred to in Para: 38th

6 Appendix F Bengal Survey Operation Report in duplicate, referred to in Para: 49th.

7 Appendix G Colonel Waughs Topographical Instructions in duplicate, referred to in Para: 57th.

Revd Surveyor Generals
Office
6th May 1857.

Sd/ H. L. Thuillier.
Deputy Surveyor General

Encl

(Signed) H. L. Thuillier, Capt.
Deputy Surveyor General

Copy
21

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(37)

Memorandum of Test for Examination of Candidates for the Great Trigonometrical & Revenue Survey Departments.

To write a neat legible hand.

A thorough knowledge of Arithmetic, but more especially of Involution, Square and Cube Roots, Arithmetical and Geometrical Progression, Proportion or Rule of Three, Vulgar & Decimal Fractions, and Logarithmic Calculations.

Geometry, First 6 Books of Euclid.

Algebra, as far as Quadratics inclusive.

Elements of Plane Trigonometry

Spherical Trigonometry

A knowledge of Plan Drawing, or at least a proof of some degree of taste in Drawing and Painting, so as to warrant the expectation that he may turn out a good Draftsman

A healthy and vigorous constitution, and good eye sight for observing.

Form of Agreement to be taken from a Candidate prior to his admission into the Survey Department.

I, A.B. do hereby agree that I will not demand my discharge for three years from the date of joining the Survey to which I am appointed and never during the Field Season. I further agree to serve in any one of the Surveys to which it may be necessary to remove me.

If against the tenor of this agreement my discharge should at any time be insisted on, I do hereby agree to repay to the Government a sum equal to one half of the whole amount which I may have actually received in the shape of Salary or Allowance of any kind.

E.F. } Witnesses.
C.D. }

Place and Date. Signature.

Note. This test is applicable to both Departments, with the exception of Spherical Trigonometry, which is not required from the Revenue Survey Candidates.

(Signed) H. L. Thuillier Capt.n
Deputy Surveyor General

Enclosure A.

(78)

Memorandum of Test for Examination of Candidat
for the Great Trigonometrical & Revenue Survey Departme

1. To write a neat legible hand.
2. A thorough knowledge of Arithmetic, but more especially of Involution, Square and
Roots, Arithmetical and Geometrical Progression, Proportion or Rule of Three, Vulg
Decimal Fractions, and Logarithmic Calculations.
3. Geometry, First 6 Books of Euclid.
4. Algebra, as far as Quadratics inclusive.
5. Elements of Plane Trigonometry.
6. Spherical Trigonometry.
7. A knowledge of Plan Drawing; or at least a proof of some degree of taste in D
and Printing, so as to warrant the expectation that he may turn out a good Draf
8. A healthy and vigorous constitution, and good eye-sight for observing.

Form of Agreement to be taken from a Candidate prior t
his admission into the Survey Department

I A.B. do hereby agree that I will not demand my discharge for three
from the date of joining the Survey to which I am appointed and never during the
Season. I further agree to serve in any one of the Surveys to which it may be neces
to remove me.

If against the tenor of this agreement my discharge should at any time be a
on, I do hereby agree to repay to the Government a sum equal to one half of the whole
which I may have actually received in the shape of Salary or Allowance of any k

E.F. } Witnesses.
C.D. }

Place and Date. Signature.

Note. This test is applicable to both Departments, with the exception of Sp
Trigonometry, which is not required from the Revenue Survey Candidates.

(Signed) H. L. Thuillier
Deputy Surveyor Genera

Appendix C

Estimated Scale of Instruments, Camp Equipage, Books, and Office Furniture as in use with the Bengal Revenue Survey Establishments - Full Strength -

Names of Instruments.		No of each
Chains Gunters 33 feet with Arrows		55
Chains - Khusrah 33 feet for Native detail Measurement		100
Compasses	Pillar Wooden	2
Ditto	Proportional brass pins	4
Ditto	Large with pen and pencil legs brass pins	18
Ditto	Small brass pins	30
Ditto	Bow Brass	20
Ditto	Surveying or Prismatic with Tripod Stands	16
Circumferenters		6
Cross Staves		10
Color Boxes		2
Artificial Horizon		1
Barometer Mountain		1
Bars Iron graduated 11 feet engraved & divided into feet, inches & tenths for comparing Gunters Chains		4
Drawing Pens		40
Drawing Pins for fastening Maps to Boards		100
Flag Staves		50
Gunters Scales 2 feet Brass		2
Hammers for Chainmen		12
Mathematical Instruments including Proportional Compasses in Cases		6
Magnet Bars in box		1
Magnifying Glass		2
Pentographs		2
Protractors brass Rectangular		40
Ditto Semy Ditto		6
Scrambulators, Everest or Waughs Pattern		2
Referring lamps with sight vane and plummet		1
Rings spare for Chains		200
Rules Brass Flat 3½ feet heavy		2
Ditto Ditto 2½ feet		1
Ditto Ebony Flat 3 feet or 4 feet		3
Ditto Parallel 18 Inches brass on Rollers		4

Names of Instruments	No. of each	
Rules Parallel 12 Inches brass on Rollers	6	
Ditto Ditto 2 feet Ebony with Bars	4	
Ditto Ditto 1 foot Ditto	12	
Ditto Ditto 6 Inches Ditto	12	
Tapes Measuring	4	
Telescopes Reconnoitering	2	
Theodolite 10 Inches Diameter By Troughton and Simms, Colonel Everest pattern Telescope to Range to 45 of Altitude the Telescope should be of 20 Inches, focal length 16 inches clear aperture with 2 eye pieces, powers 20 and 30, 2 Colored Glasses, vernier 3 to the Minute and 2 to the vertical circle, Levels 2, reading to about 3" graduation on silver to 15. and vernier 5 to 10 to Each in 2 Boxes exclusive of Tripod stands	1	19
Theodolites 7 Inches Diameter Everest Pattern by Troughton and Simms	3	
Ditto 6 Ditto Ditto Ditto Ditto	4	
Ditto 5 Ditto Ditto Ditto Ditto	11	
Tracing Glass	2	1
Thermometers	1	
Sextant in box	1	
Drawing Boards 1 7 Rules	25	
Heliotropes for Hilly Country and Minor Triangulation	4	
Plane Tables for Hilly Country and Minor Triangulation	10	

Camp Equipage

Tents Hill or Staff Serjeant Lined with Chintz	4
Ditto Office double poled large Ditto	1
Ditto Ditto Single poled Captains Ditto	1
Ditto Flysp 4 Yards each	4
Pawlins waxed cart	8

Books

Logarithms Chambers, Youngs or La Landes	1
Instructions on Topographical Survey by Colonel Waugh	1
Mathematical Tables Hattons	4
Manual of Surveying	1
Nautical Almanac for the Current year	1
Traverse Tables by Colonel Boileau	1
Table of Trigonometrical Survey Computations	1
Tables of Land Measure	1
Pay and Audit Regulation Code of 1845	1
Multiplication Tables by Major Smyth	6

(40)

Names of Instruments	No. of each
Office Furniture	
Iron & Teak wood Tables of Sizes	6
Chairs	12
Large and small Boxes for Office Stationery and Records	8
Office Stamp (brass)	1
Chupprasses, Belts &c	16
Office Stools	20

Revenue Survey
General Office
Calcutta
6th May
1857.

H. Elwes
Deputy Surveyor General

Surveyor General

Detailed Statement of Native Establishment attached to the Revenue Survey of Saugor or Western Division for the month of March 1857

No.	Description	Monthly Pay of each	Total of each Class	Total Professional Expense
24	Native Surveyor Telegram	2 77 - -	77 - -	
	" Bhowgneedeen	35 - -	35 - -	
	" Baharee Lall	34 - -	34 - -	
	" Reazaul Reaussein	33 - -	33 - -	
5	" Sabit alias	32 - -	32 - -	
	" Doorgaprosaud	30 - -	30 - -	
	" Fyzee oolleen	25 - -	25 - -	
	" Mythoo Lall	23 - -	23 - -	
	" Heer Sein	22 - -	22 - -	
10	" Dheerbyl Singh	21 - -	21 - -	
	" Seochurn Lall	20 - -		
	" Sraug Lall	20 - -	40 - -	
	" Gungaram	18 - -		
	" Kagut alias	18 - -		
15	" Khodabux	18 - -		
	" Gheolguin Hoseyn	15 - -	54 - -	
	" Hurzpurgh Persaud Sookl	15 - -	15 - -	
	" Debee Dutt	13 - -		
	" Mindaee Lall	12 - -	25 - -	
20	" Beniperseaud	12 - -		
	" Ranchurn on leave 1st July 57			
	" Jattahchund	12 - -		
	" Bhugwanchurn	12 - -		
	" Koer Bahadoor	12 - -		
25	" Abdool Hameed	10 - -	36 - -	
	" Jhoomun Lall	10 - -		
	" Jogal Kishore	10 - -		
	" Kunwunt Singh	10 - -		
	" Ameer Alias	10 - -		
30	" Ganga Singh	10 - -		
	" Ramchujun Lall	8 - -	60 - -	
	" Mooktapersaud	7 - -	8 - -	
	" Raj Bahadoor	7 - -		
34	" Hemraz Lall entered 2nd March 57	7 - -		
1	Native Doctor Mr. Ob. Sl. Rubeemont	25 - -	21 - -	
			25 - -	600 - -
	Measurers			
4	Jemadar	12 - -	12 - -	
2	Sindar	7 - -	14 - -	
22	"	6 - -	132 - -	
28	Mates	5 - -	140 - -	
33	Clapies	4 8 -	148 8 -	
178	"	4 - -	712 - -	1158 8 -
		Carried forward Co.s Rupees		1758 8 -

No	Description	Monthly Pay of each			Total of each Class			Total Professional Expense		
	22/2-1856 Brought forward Rs				2	1	1	1764	8	1
	"Measurers continued" Bratton parish"									
1	Mate for 25 days	5	-	-	4	6				
1	Coolie 3 " 2 "	4	-	-	2	6	2			
1	" 3 " 1 "	4	-	-	2	1				
1	" 3 "	4	-	-	2	4	3			
1	" 26 "	4	-	-	3	5	8	12	6	7
	Non effective since last Muster									
1	Native Surveyor Ram chunder Rs 20 " Last Muster deserted									
	Total drawn in Abstract for Native Establishment Co Rs							1776	14	7

I do declare upon my honor that the above is a correct Statement of the different classes of Native Surveyors Measurers &c attached to my Survey and of their respective pay as due for the month of March 1857

Revenue Surveyor's Office
Saugor or Western Division
The 1st of April 1857

Comp[d] D.S.

(Sd) J. W. B. Blagrave Captain
Revenue Surveyor

(Signed) H. L. Thuillier
Deputy Surv[r] General

Abstract of the Salaries & Establishment attached to the Revenue Survey of Saugor or Western Division for the Month of March 1857

No	Names		Total of each			Total of each Class		
		2	1	1	2	1	1	8	1	1
1	Captain J. W. B. Blagrave Revenue Surveyor	520	-	-						
	Ditto Ditto Contingent Allowance	200	-	-	720	-	-	720	-	-
1	Lieut E. H. Willoughby Assist Revenue Surveyor	250	-	-	250	-	-			
2	Mr W. A. Wilson Ditto Ditto	250	-	-	250	-	-			
3	Mr F. J. Burrows Sub Assist Revenue Surveyor 1st Class	200	-	-	200	-	-			
4	Mr W. Veall Ditto Ditto 2nd Class	150	-	-	150	-	-			
5	Mr A. F. Bonny Office Assistant	85	-	-	85	-	-	1020	-	-
6	Mr G. Bonny Ditto									
								1776	14	7
	Native Establishment "Guard"									
14	Burkundazes	6	-	-	95	-	-	95	-	-
	Non effective since last Muster									
1	Mr C. A. Montgomery Sub Assistant Revenue Surveyor 4th Class Struck off									
	Grand Total of Co Rs Three thousand six hundred & fourteen Rupees & Seven Re							3617	14	7

I do hereby Certify that the above Establishment was effective during the month of March 1857 and that the charge above made for the Native Establishment was actually and necessarily incurred on that head during the said month

(Sd) J. W. B. Blagrave Captain 74th Regiment N.I.
Revenue Surveyor

Received Payment
(Sd) J. W. B. Blagrave Captain 74th Regiment N.I.
Revenue Surveyor

Revenue Surveyor's Office
Saugor or Western Division
The 1st of April 1857

Comp[d] D.S.

(Signed) H. L. Thuillier
Deputy Surv[r] General

No.	Description (13)	Monthly Pay of each	Total of each Class	Total Professional Expense
	Brought forward C.R.s			1764 8 -
	"Measurers continued"			
	"Broken periods"			
1	Mate for 25 days	5 - -	4 - 6	
1	Clapsie 3 "	4 - -	- 6 2	
1	" 16 "	4 - -	2 1 -	
1	" 20 "	4 - -	2 9 3	
1	" 26 "	4 - -	3 5 8	12 6 7
	"Non effective since last Muster"			
1	Native Surveyor Ramchaunder No. 32 of last Muster deserted			
	Total drawn in Abstract for Native Establishment C.R.s			1776 14 7

I do declare upon my honor that the above is a correct Statement of the different classes of Native Surveyors, Measurers &c attached to my Survey and of their respective pay as due for the month of March 1857

Revenue Surveyors Office,
Saugor or Western Division
The 1st of April 1857

(Sd) J.W.B. Belgrave Capt 74 Regt N.I.
Revenue Surveyor

Sd/

(Signd) H.L. Thuillier
Deputy Surv.r General

Abstract of the Salaries & Establishment attached to the Revenue Survey of Saugor or Western Divisions for the month of March 1857

No.	Names (14)		Total of each	Total of each Class
1	Captain J.W.B. Belgrave Superintendent	526 - -		
	Ditto Ditto Contingent Allowance	200 - -	726 - -	
1	Lieut.t & A. Willoughby Assist.t Superintendent	250 - -	250 - -	
2	Mr W.H. Wilson Ditto Ditto	250 - -	200 - -	
3	Mr F.J. Bauvens Sub Assist.t Superintendent	200 - -	200 - -	
4	Mr W. Lyall Ditto Ditto 2d Class	150 - -	150 - -	
5	Mr A.F. Bonny Office Assistant	85 - -	85 - -	
6	Mr G. Bonny Ditto	85 - -	85 - -	1020 - -
	Native Establishment			756 14 7
	"Guard"			
19	Burkundazes	5 - -	95 - -	95 - -
	"Non effective since last Muster"			
1	Mr C.A. Montgomery Sub Assistant Revenue Surveyor 4th Class Struck off			
	Grand Total of C.R.s Three Thousand Six hundred & Seventeen Rupees Annas and Seven Pies		3617	14 7

We do hereby Certify that the above Establishment was effective during the month of and that the charge above made for the Native Establishment was actually and necessarily incurred on that head during the said month.

Revenue Surveyors Office,
Saugor or Western Division
The 1st of April 1857

Sd/

(Sd) J.W.B. Belgrave Capt
74 Regt N.I.
Revenue Surveyor

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Copy of Letter to C.
dated 1st June 1858 No. 5

Appendix.

B

Letter No. 13 Dated 6th May 1857.
From the Dep.y Surv.r Genl. of India.

Abstract of the Salaries & Establishment — of the — Saugor or Western Division Revenue Survey for the Month of March — 1857.

Lith.d by H.M. Smith at the Surv.r Genl's Office Calcutta Nov.r 1855.

R722/5.