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Government of Madras.

Public Works **DEPARTMENT.**

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Read the following papers :—

No. 615. From the Deputy Secretary to the Government of India, Public Works Department, (Railway,) to the Secretary to the Government of Madras, Public Works Department, (Railway,) dated Simla, 17th September 1870, No. 1,588-R :—

In forwarding for the information and consideration of the Government of Madras, copy of a despatch, No. 48, dated the 4th August 1870, from the Secretary of State, in which the question of the gauge of the Carnatic Railway is re-opened, I am directed by the Governor-General in Council to state that the Government of India will be prepared to give a ready hearing to such renewed representations as the Governor of Madras in Council may think right, under the circumstances, to make in favour of the adoption of the gauge originally recommended for this Railway by His Excellency's Government.

2. There is no doubt much force in the objection to the proposed conversion of the existing 19 miles of this Railway to the standard gauge, and in the event of the retention of the existing narrow gauge the suggestion to lay a third rail on the Madras Railway, between Arcunum and Madras, would meet what is understood to be the desire of the Local Authorities, namely, that the Carnatic Railway should terminate in the Presidency city, while it would not militate against the desire of the French Authorities of Pondicherry that the line should pass through Arcunum.

3. The extension of the sanctioned section of the Carnatic line to join with the Great Southern of India Railway at Tanjore, or elsewhere, may fairly be regarded as a certainty of the future, and it would, therefore, be desirable that the further question of the gauge that should be adopted on the sanctioned extension of the latter Railway to Tuticorin, should also be taken into consideration by the Government of Madras, and reported on at the same time. By laying a third rail on the section of the Great Southern of India Railway, intervening between the junction of its extension and that of the Carnatic Railway, an uninterrupted communication by rail upwards of 450 miles in length would be secured, equally as in the case of its being determined to adhere to the standard gauge.

4. The essential point to be kept in view in dealing with these questions is that the districts traversed by the proposed Railways shall be accommodated sufficiently at the least outlay. If the adoption of a narrow gauge will lead to a material diminution of outlay there would not seem to be any serious objections to its introduction on the score of the disadvantage of breaking bulk, especially if that gauge should be recommended for the entire length of new line to be constructed as far south as Tuticorin. With the same object, namely, that of keeping down first cost, it would seem that some portion of the existing roads might be appropriated for the purposes of these railways, as already done between Arcunum and Conjeeveram, and I am, therefore, directed to request that the views of the Government of Madras on the possibility and expediency of so laying the rails be also reported.

From the Right Honourable the Secretary of State for India, to His Excellency the Right Honourable the Governor-General of India in Council, (Railway), dated India Office, London, 4th August 1870, No. 48.

With reference to recent discussions on the subject of narrow gauge railways, I am desirous that, when the plans and estimates of the Carnatic Railway are before you, you should consider

= convenience of break of gauge at the point

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whether the reasons urged in the 27th paragraph of your Railway Despatch of the 11th March 1869, No. 25, in favour of the adoption on that Railway of the standard Indian gauge are still to be regarded as conclusive.

2. It should be remembered that adoption of the standard gauge will involve relaying of the existing section of narrow gauge between Conjeeveram and Arconum, whereas if the narrow gauge were continued from Conjeeveram to Cuddalore, the inconvenience of break of gauge at the point of junction with the Madras Railway might be minimised by laying a third rail on the miles of that Railway between Arconum and Madras.

No. 646. Letter from the Acting Consulting Engineer for Railways, to the Secretary to Government, Public Works Department, dated Madras, 16th February 1871, No. 78:—

I HAVE the honour to submit a map of the country between Conjeeveram and Cuddalore, with trial surveys and sections for a line through Wallajabad, Chingleput, Caroongooly, Tindivanum and Belpar, or Villupoorum, to Cuddalore, and report from the Chief Engineer of the Carnatic Railway Company. This report is forwarded by the Agent in the hope that sufficient information will have been given to enable the Government to determine on the route to be selected, that is whether the line should run through Chingleput, or, in the more direct course, through Wandivash to Tindivanum. Preference is given to the route by Chingleput; this line was taken up first by the Engineers for surveying, and Mr. Dibblee, who has recently arrived in the country, has continued the same line of survey, and gives only a few remarks on the alternative route, trusting that it may not be necessary to carry out even a trial survey.

The trial surveys for the Chingleput line are not complete, and the aim of the papers now submitted is to obtain a decision from the Government as to the location of the line; a general description of the route being given, but some of the details of alignment, such as the way of passing through Chingleput and crossing the Palar river, the approach to the town of Cuddalore, etc., not being yet determined upon.

2. The trace is described as being through a level country from Conjeeveram to Chingleput, thence the point for crossing the Palar has still to be decided; and for 8 miles there is a straight run to Caroongooly. At Madranticum it is doubtful whether the shorter line should be chosen, occupying less valuable land, and having a favourable approach to the river, but going through the village, or, if it is more advisable, to take the longer line through wet cultivation. Through Acheravak and Tindivanum care is only required to avoid in the best way injuring tanks and villages as far as Villupoorum. At this point the branch from Pondicherry is to join in, and three routes are shown by Mr. Dibblee, each possessing certain advantages, and terminating at different places. A fourth, colored yellow on the map, appeared also at first to be a desirable line; but on further inspection, it is found that there would be an amount of cutting through high ground that would be very expensive. The first line is the shortest, and avoids the crossing of rivers by keeping to the north of them, but stops on the bank of the Panar, about 2 miles from the civil station, Munjacoopum, and some 6 miles from the Native town of Cuddalore. The second line, the one surveyed, crosses the Panar river, and comes into Munjacoopum. The third line takes a different direction from Villupoorum in order to pass through the large villages, Panrooty and Tiruvady, crossing the two branches

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of the Panar, and also the Guddelam river, so as to reach the town of Cuddalore. Mr. Dibblee is in favour of the third line, as it has the advantage of a good terminus near the merchants' godowns, with facilities for the landing of stores, while also this line would cause a saving in distance in the event of the Railway being hereafter extended to the south of Cuddalore. The sharpest curve on the trial survey is of 20 chains radius at Conjeeveram, it being difficult to avoid a sharp curve on account of the buildings; another curve of 25 chains radius will probably be altered; and there are eight curves of 40 chains radius.

For 26 miles the line surveyed is level, and the ruling gradient may be made 1 in 140 or possibly easier, with little increase of cost; over 48½ miles no gradient exceeds 1 in 500. At the Palar river Mr. Dibblee recommends iron screw piles for the bridge piers, with plate or lattice girders in 60 feet spans; the cost is roughly estimated at Rupees 4,70,000. For the other larger bridges on the line the same design is proposed; and for the minor bridges, girders of smaller sizes, instead of arched openings, with the object of reducing the height of embankment, and not thereby diminishing the sectional area of waterway. A list of stations is given for the line surveyed, but subject to alteration to the south of Villupoorum, as Tiruvadi or Panrooty would be substituted necessarily for Nellicoopum. Mr. Dibblee particularly mentions that the estimates he furnishes with his report are only approximate, and not to be taken as binding him to adhere to them when his detailed plans are finished. The average cost of the line is computed at 66,000 Rupees per mile, including Rupees 3,030 for masonry, and Rupees 4,288 for earth work.

3. The Chief Engineer has made a cursory examination only of a line between Conjeeveram and Tindivanum by Wandivash, and considers the nature of the country to be such that there would be but little difference of cost, mile for mile, compared with the route by Chingleput. His opinion is also that engineering facilities should not affect the location of the line, but that a decision should be arrived at from the amount of traffic and number of inhabitants accommodated.

The principal villages on the Wandivash route are stated to contain 10,300 inhabitants, or 240 per mile in length of the line. On the Chingleput route for the larger villages the figures are 21,600 inhabitants, or 3,600 per mile. The returns of traffic obtained show that a greater number of carts pass between Chingleput and Conjeeveram than between Conjeeveram and Wandivash, while the notes of traffic at the Palar river, on the main southern road through Chingleput, show upwards of thirty times the traffic on that road than there is through Wandivash. Mr. Dibblee sums up his arguments in favour of the Chingleput line, that if the Railway is to terminate at Cuddalore its returns will be dependant on the local traffic and local population; while also if the future possible extension of the line to the south of Cuddalore is contemplated, it is of importance to secure the most direct route for heavy through traffic, and to give the most populous parts of the country access to the shipping ports.

4. In 1867 the Government considered that the extension of the Tramway between Arconum and Conjeeveram

G. O., No. 1,482, dated 16th May 1867. might advantageously be undertaken to pass by Wandivash, Tindivanum, and Vicravandy to Cuddalore, leaving it to the

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French Government to negotiate with the Tramway Company for a junction from Pondicherry.

On the 21st December 1869, the Secretary of State forwarded correspondence, that the Carnatic Railway Company had been formed for the construction of a line from Conjeeveram to some point in the neighbourhood of Cuddalore, and the conversion of the Tramway into a Railway of the Indian gauge; the French Government to pay the Company £8,000 a year for twenty years, for the construction of a branch to Pondicherry. Engineers being also sent out from England, the Government directed they should commence the necessary trial surveys with a view to an early decision on the direction of the line, the Deputy Consulting Engineer having recommended a commencement with the route through Wallajabad to Chingleput, and thence by Madranticum and Tindivanum towards Cuddalore. The latter route, as Captain Smith notices, would be about 20 miles longer than the direct line through Wandivash, but passes through a more populous and cultivated country, in which there is already a considerable traffic, and the demand for better and more rapid means of transport. Between Tindivanum and Wandivash the trace would run through rocky land, of which much is uncultivated, the villages are scarce, and there is no appearance of the country being likely at any time to attain the condition of that along the more easterly route. Between Wandivash and Conjeeveram the country is better cultivated than to the south of Wandivash, but the traffic is small in comparison with that going through Chingleput.

Thus a line of Railway through Wandivash would open up a tract of country in which the traffic has to be made, and nothing is adduced to show that there is a prospect of the produce of the country falling in from the west with that line. But along the trunk road, through Tindivanum and Chingleput, there is an established line of communication bearing a considerable amount of traffic; and as Tindivanum, Chingleput, and Conjeeveram are each of them centres of traffic, the inference is that the general trade of the country will be better served by the Railway taking these three points, than if it were run, in the shorter line, though with less cost of construction, through Wandivash, a place that does not compete at all with the other three towns in importance.

5. In looking forward to the future it is not unreasonable to suppose that whether the Carnatic line runs through Chingleput or Wandivash there will eventually be a branch line either from Tindivanum or Chingleput into Madras. The distances to Madras will then be—

	Miles.
Tindivanum by Wandivash to Conjeeveram about	41½
Conjeeveram to Arconum	18½
Arconum to Madras	42½
Total	102½
And from Tindivanum to Chingleput	41½
Chingleput to Madras	35
Total	76½

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On this assumption, too, the lengths of new line to be constructed would be—

	Miles.
Tindivanum by Wandivash to Arconum	60
Tindivanum to Madras	76½
Total	136½
Or by Chingleput, Tindivanum to Madras	76½
Chingleput through Conjeeveram to Arconum	40½
Total	117

Hence, on considering the distance goods coming from the south would have to travel from Tindivanum before reaching Madras, and also considering the mileage of Railway to be constructed, the advantages of taking the line through Chingleput are a shorter distance for through traffic for 26 miles between Madras and the south, a saving in cost of construction of 18½ miles, and the benefits of a Railway to a prosperous tract of country. On the other hand, the advantages of a Railway through Wandivash would consist solely in a saving of distance of 22 miles for the traffic between Tindivanum and Arconum, but with greater length of 26 miles to Madras, and greater general length of line of 18½ miles.

6. From Tindivanum to Villupoorum the line is nearly straight, following the general direction of the high road; and Villupoorum is a fixed point from which the branch is required to run to Pondicherry to meet the wishes of the French Government, and to secure the annual grant of £8,000 for twenty years. To the south of Villupoorum several routes are suggested. The first, the shortest, ends at the north bank of the Panar river, avoiding the necessity of the two rivers intervening along the road to Cuddalore. The second, 22½ miles in length, involves the bridging of the Panar at an approximate cost of 1,80,000 Rupees, and terminates at the civil station, Munjacoopum, this is the line that has been surveyed. Neither of the above lines, however, come into the town of Cuddalore, nor do they reach the coast. Captain Smith shows another feasible line, crossing the Panar, as in No. 2, but thence running on in a straight line to cross the Guddelum river, and enter Cuddalore itself.

Between Villupoorum and Cuddalore there are no villages of any consequence, but a few miles to the west there are the large villages of Panrooty and Tiruvady. Through these the third route is taken, dotted black on the map; it crosses the Panar in its two branches, and turning to the east from Tiruvady comes upon the Guddelum river in the same reach as the straight line described above from Villupoorum, and terminating likewise in the town of Cuddalore.

In the event of the Carnatic Railway being hereafter extended to the south, the third line would effect a saving in distance of some 8 miles; for the junction between Panrooty and Cuddalore, 16 miles in length, would become a branch from the main line, instead of the longer line No. 2 which, if modified to run into the town of Cuddalore, becomes about 24 miles in length. Thus on the three grounds of advantage, of access to Cuddalore and the seashore, of serving the two large villages, and of anticipating the possible extension of the Railway towards the Tanjore District, I think the third route is the one that should be selected.

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7. In the summary or abstract estimate of the cost of construction per mile, Mr. Dibblee shows the cost to be approximately Rupees 66,263. The cost of earthwork Rupees 4,288 per mile, and that of masonry Rupees 3,030, appear to be low, when compared with other lines; but from the nature of the country, embankments and cuttings are both very moderate; and masonry is reduced by girder openings being provided, and not arched bridges. The estimate in its rough state does not differ much from that put down by Sir C. Fox and Mr. G. Berkley in their report of June 1866, at £ 7,000 per mile.

G. O., No. 529, dated 17th February 1869.

In the notes of traffic that accompanied the same extract of report, the returns from the line are thus estimated:—

Goods as per Pondicherry pamphlet ...	57,898 tons annually.
Passengers as per Captain O'Connell's report to Sir C. Trevelyan ...	400,000 annually.
Goods 57,898 tons, 110 miles, at 16 pies per ton per mile per annum ...	5,30,731
Passengers 400,000, 110 miles, at 4 pies per mile per annum ...	9,16,630
Yearly gross earnings ...	14,47,361
Deduct 45 per cent for working expenses ...	6,51,312
	7,96,049

Leaving net earnings yearly ... or £79,604-18-0 net earnings, on £800,000 outlay, representing £9-17-6 per cent. per annum.

There must be some fallacy in these figures, unless the passenger traffic is to be exceptionally heavy; for, on the other lines, the receipts from goods are considerably in excess of those from passengers. The receipts from passengers however are put down at 4 pies per mile; whereas the third-class rate is now 3 pies, and Rupees 6,87,472 should be substituted for 9,16,630, when the net earnings would give £3-7-6 interest on the capital. The deduction for working expenses is also taken at 45 per cent., but it might perhaps be more correct to assume 53 per cent., which is the rate that has been estimated for the Madras Railway for next year. The length of the line now surveyed is 108 miles; that recommended as the third route will be about 114 miles long, but for comparison with the calculations given above, the outlay may be taken at the same sum, £800,000, and the mileage at 110.

Now, if it be supposed that there is a uniform traffic in both passengers and goods, mile for mile, on the Madras Railway, the returns from 110 miles would be in the proportion of 492 to 110, and taking the actual results for the year 1869 there would be receipts from—

	RS.
Goods 63,549 tons ...	5,34,936
Passengers 370,002 ...	3,31,141
Yearly gross earnings...	8,66,077
Deduct 53 per cent. for working expenses ...	4,59,020
Net earnings...	4,07,057

or £40,705, representing £5-1-8 per cent. per annum on the outlay of £800,000

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The tonnage of goods and number of passengers thus exhibited do not differ much from those taken in the Secretary's Notes on traffic, and if this second estimate of net earnings, at £ 5-1-8 per cent., be considered as a rough estimate for the Carnatic Railway, it will, I think, be the nearer of the two to a fair expectation of the profits to be earned.

If the Madras South-West Line had been constructed for £ 7,000 a mile, it would have paid 5½ to 6½ per cent. in the last five years.

REPORT ON THE LINE PROPOSED FOR THE CARNATIC RAILWAY.

In considering the location of the line under investigation by the Carnatic Railway Company, I have assumed as fixed points Arcotum, (the present junction of the tramway with the Madras Railway,) Villupoorum, or, as shown in the Ordnance Map, Belpar, and the old native town of Cuddalore; but the questions of a future extension to join the Great Southern of India Railway, and of a probable demand for direct communication with Madras should the Carnatic line pass through Chingleput, cannot be lost sight of in determining the best trace between the termini as at present proposed.

2. The features of the country which principally influence the location of the line between Villupoorum and Cuddalore are the two large rivers, the Panar and the Guddelum; and in an examination of the Ordnance Map, five routes suggest themselves.

The first passing through or near Chumaur by Persumbaucum to a station ground near the bridge on the north bank of the Panar, the station would be about two miles from Munjacoopum, and six miles from Cuddalore. This line would be the shortest and cheapest, and save bridging both rivers.

The second route would, after leaving Chumaur, cross the river Panar near Kistnavaram, and run thence into a station ground, near the centre of Munjacoopum, about four miles from Cuddalore. This is the line already surveyed and staked out.

The third route would, after leaving Chumaur and crossing the river Panar at Kistnavaram, cross Guddelum between Pillati and Padreccoopum, and thence round the low hills, through Tirupalayam, to a station ground close to Cuddalore.

The fourth route would pass from Villupoorum with two bridges, one across each branch of the Panar to Panrootty, a flourishing town of some 5,000 inhabitants (including Tiruvadi), and thence pass nearly due east to the crossing of the Guddelum and the station ground suggested at Cuddalore.

The fifth route would, like the fourth, cross the Panar with two bridges, and pass through Panrootty; but would thence, running due south, cross the Guddelum, and skirt its south bank.

3. I think Nos. 1 and 2 routes may be at once set aside as ending at too great a distance, six and four miles respectively, from Cuddalore, while they furnish no facilities for landing stores, or for any demands the trade of the port may hereafter make on the line.

No. 3 route serves Cuddalore and the port; but requires two bridges.

No. 4 route will require three bridges, but probably only the same waterway as No. 3, and as the soil for the foundations is better, the cost of bridging would probably be the same in each case, and though this route would be longer than the last by four miles, the large town of Panrootty would be brought into direct communication.

The advantage of the 5th route, if practicable, is, that its bridge over the Guddelum would save any future extension to meet the Great Southern. In my opinion the choice will be between routes 4 and 5; but, until the surveys are completed, I am not in a position to decide.

4. From Villupoorum, where the Pondicherry line will branch off, the line will pass almost straight to Viceravandy, and thence nearly parallel to the existing road to Tindivanam, a town containing some 5,000 inhabitants I believe, and of considerable commercial importance; thus far, I believe, 1 in 150 will be the ruling gradient, and 40 chains the radius of the ruling curve.

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5. Between Tindivanum and Arconum two routes suggest themselves, one passing through Acherawak Madranticum, Caroongooly, Chingleput, Wallajabad, and Conjeeveram; the other through Wandivash and Pennagur and Conjeeveram. The former is 20 miles the longer of the two, but it would pass through a country thoroughly cultivated and thickly populated; would occupy a line upon which all existing roads converge, and where the country may be said to have somewhat prepared itself for a more certain and rapid means of communication.

The latter route passes for the first 20 miles (between Tindivanum and Wandivash) over a country, of which, to an observer riding along the line, at least half appears uncultivated, principally on account of the rocky hills which there abound. The villages, which are few and far between, are very small, and it appears difficult to believe that, under any circumstances, the area of country served by the more westerly of the two routes can ever be improved to the condition already attained by the country further east, while the belt of land extending for five miles from, and parallel to, the Trunk Road would be equally served by either route.

6. The salt traffic would, I think, be little affected by either route, unless for any reason the salt pans of the South Arcot were to compete favourably with those of Madras for the supply up the North-West Line of the Madras Railway. The supply of rice which, I understand, is drawn from these districts for consumption in, and export from, Madras would, I think, be attracted more to the former (Chingleput) than the latter route (Wandivash), the area of rice cultivation increasing as the coast is approached.

The Madras goods which now form the return loads for the carts carrying rice would no doubt be supplied by the rail, and the demand for them would increase as the line approaches the more highly-populated tracts.

7. The country between Wandivash and Conjeeveram is of a better description than that south of Wandivash; but I feel sure that the statistics now under preparation for submission to Government, with the Chief Engineer's report, will clearly show that whether the present state or future capabilities of the two belts of country be considered, the more easterly of the two is the best for a railway.

8. As regards competition with the coasting trade, which I have heard advanced as an argument in favour of the inland route, I am unable to see how a distance of ten miles can affect the question; the desirability of opening out a new tract of country, I have also heard advanced as an argument against replacing an existing line of communication by one of a better description; but it appears to me that, if the country as a whole is ripe for railways, it must be those parts of it which are most advanced, which should be sought out when locating the lines, assuming that the through traffic, as in this case, is equally affected by the several routes.

As regards facility in construction. On the western route the stone may perhaps have to be carried a less distance, the drainage area to be crossed will be less; but the curves and gradients will be heavier, and the cuttings not improbably more expensive.

9. Should the route *via* Chingleput be adopted, there will arise the important question whether the junction line to Arconum, or a direct line to Madras, should be constructed.

Assuming that Chingleput is 35 miles from Madras, 22 from Conjeeveram, and 10 from Arconum; that the cost of construction would, as far as Saint Thomas' Mount, be approximately the same, and that the cost of altering the existing tramway be about one-fourth the cost of the new line, there would be the cost of $35 - 22 = 13$ miles — less $\frac{1}{4} = 4\frac{1}{4}$ miles (representing the alteration of 18 miles) = $8\frac{1}{4}$ miles of new line, representing the additional cost of direct communication with Madras.

The town of Wallajabad like Wandivash is of more historic than commercial importance, and the advantages of the loop line from Chingleput to Arconum will probably be found quite insignificant when compared with the advantages of the direct line to Madras.

(Signed) C. J. SMITH, Captain, R. E.,
Deputy Consulting Engineer for Railways.

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From the Chief Engineer, to the Agent of the Carnatic Railway Company, dated Chingleput, 12th January 1871.

ADVERTING to my letter of the 2nd December 1870, enclosing plans and surveys, with a map of the line from Conjeeveram to Cuddalore, I now beg to offer the following remarks for the information of Government.

2. The line surveyed has been selected to pass through Chingleput, Madranticum, Tindivanum, and Villupuram, the four centres to which all the surrounding traffic converges, and to follow as near as possible the line which traffic now takes on the main trunk road.

3. I have had an opportunity of examining the country throughout, with the exception of a short distance near Cuddalore, where I propose an alternative line to that shown on the plans. I accompanied Captain Smith, the Deputy Consulting Engineer, during this inspection, and his remarks have doubtless been laid before Government for their consideration.

4. From Conjeeveram to Chingleput, passing through Wallajabad, Shevaram, and Attur, the line runs through an exceedingly level country, and for the greater distance along a ridge with the drainage flowing to either side; the earthwork and masonry will, therefore, be small in quantity and the gradients easy. At one or two points I think an alteration in the line might be advantageous in avoiding tanks, and these shall receive attention when the working surveys are undertaken; with these exceptions I consider the line has been very well selected.

5. Near to Chingleput, from 18th mile to other side of the river Palar, two lines have been surveyed. No. 1 marked in black on the Plan, No. 2 in red. On No. 1 the borings to ascertain the depths of foundations for a bridge have been taken; a tracing showing these is herewith. In some respects line No. 2 is to be preferred to the other. I am not prepared at present, however, to recommend that either should be adopted as I propose to survey another line crossing the river about 4 miles farther down. I also intend to have borings taken at this place, when I shall be in a position to decide upon which line I consider best of the three.

6. From the 28th mile to Caroongooly the line runs within a short distance of the main Madras to Trichinopoly trunk road, and is straight for 8 miles, for this distance there would appear no reason for lengthening the line by detours from the straight direction.

7. Passing Caroongooly and Madranticum there have been two lines surveyed and levelled, one being somewhat shorter than the other, and taking up less valuable land, (wet cultivation 177 chains in length on shorter, and 238 chains on the longer line,) and crossing the river much more favourably. On the other hand, the shorter line goes through the village of Madranticum and destroys four houses; it is a question for consideration as to how far the advantages are balanced by this evil of interference with the town.

8. From this place to Acherawak the line is more tortuous than usual, having been more so for the purpose of avoiding tanks and houses of villages.

9. At Tindivanum, 63rd mile, I am of opinion that the passing the town can be improved by a slight detour from the present line. This shall receive attention when the working surveys are undertaken.

10. From this to Villupooram there is little to call for remark; every point where improvement is possible shall be carefully examined during the final surveys.

11. The line, as surveyed, runs from Villupooram to Cuddalore almost direct, crossing the river Panar and stopping at the village of Munjacoopu (the New Town, Cuddalore). Between these places, Villupooram and Cuddalore, there are three lines practicable and which possess varying advantages, keeping in view the objects that are to be gained, the interests served, and the cost of each. These I have marked on the traced map, herewith; line No. 1, in red, stopping at the public road near to the bridge which crosses the Panar; No. 2, in blue, the present line, stopping at New Cuddalore, where the European portion of the inhabitants reside; No. 3, in black, leaving the direction of the present line from Villupooram, for the purpose of serving the important villages of Punrooty and Tiruvady, crossing the river Panar where it has two branches, and further down crossing also the Guddelum and terminating in the Old Town of Cuddalore, at a place where accommodation for landing stores can be provided. No. 4, in yellow, crosses the river Guddelum near to

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Punrooty and skirts the south bank of the river, arriving at the same terminus with No. 3. I am now having a survey made of No. 3 from Cuddalore and an examination of the country through which No. 4 will pass.

12. Briefly stated, I consider the relative advantages of these four alternative lines to be as follows: No. 1 is the shortest and saves the bridging of the river Panar, while it serves the traffic to be expected from Cuddalore almost quite as well as No. 2. Goods and passengers will require to go one mile and a half further to reach the station; this inconvenience is to be set against the cost of one mile more Railway, and a bridge over the river, which I estimate at about Rupees 1,80,000. No. 3, as compared with No. 2, is 6 miles longer, but it serves the important native town of Punrooty and the neighbouring villages, the number of inhabitants being about 10,000; near to Cuddalore it crosses the river Guddelum for the purpose of reaching the Old Town and having accommodation for landing stores and material at the back-water. It is here that all the merchants' godowns are found, and from which four-fifths of the traffic in goods and third-class passengers is to be expected. Another advantage presents itself in this line, in the event of any extension southward being hereafter contemplated, the branch, as it would in that case become, for serving the traffic of Cuddalore would be only 16 miles long compared with 26 on No. 2.

13. By line No. 4 the crossing of the Guddelum is made near Punrooty, which would be an advantage in saving a bridge for southern connection, as a second bridge would not in that case be required; to set against this, the line will probably be 2 miles longer (than No. 3), and certainly more expensive mile per mile, as the country is much rougher and more difficult. The cost of the bridge which might be saved to an extension line I estimate at Rupees 95,000, while the 2 miles of extra line would cost more.

14. Comparing these lines as above, I would suggest, for the consideration of Government, whether No. 3 does not present superior advantages to any of the others, and I recommend its adoption.

15. I attach a list of curves and straight portions of line, Appendix A. The aggregate length of straight is 92 miles 52 chains, and total curves 15 miles 28 chains. The sharpest curve is one of 20 chains near to Conjeeveram, the necessity for which arises from the difficulty of leaving the present line without interfering with the town of Conjeeveram. It is possible that this curve may be improved upon; the next sharpest to this, one of 25 chains radius, will be altered with a change of line from Villupoorum.

16. A table of gradients is also appended, marked B. The limit of these may be reduced, with very little increase of cost, to 1 in 140, and in the working surveys it may be found to be possible to make it even more easy.

	M. Chs.
There is of level portion ...	26 0
Of curves 1 in 121 ...	6 70
to 1 „ 130 ...	2 0
from 1 „ 130 ...	3 71
to 1 „ 150 ...	15 2
from 1 „ 150 ...	48 52
to 1 „ 200 ...	
from 1 „ 200 ...	
to 1 „ 500 ...	
from 1 „ 500 and upwards ..	
	108 0

17. I have prepared quantities of earthwork from the sections as now taken. A copy of them for each cutting is herewith, G. The average quantity for embankment throughout the whole line is 20,200 cubic yards, and for cutting 1,000. When the final working surveys are completed these will necessarily be a good deal modified and altered.

18. I trust the fact will not be lost sight of that my estimate, as at present prepared, is only approximate. The survey having been made under my predecessor, and connected as I have been with the work for so short a time, I consider that further opportunities of examining the

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line of country, of learning its features and capabilities, as well as a more detailed survey, are necessary before making an estimate to which I am to be irrevocably held.

19. The above remarks apply especially to the quantities I have compiled for bridges and masonry. The nature of the foundations must be examined with more care, the extent of drainage areas and quantities of water to be provided for must be more thoroughly investigated before exact results can be arrived at. A list of drainage openings (C) is appended.

20. For the purpose of my estimate for a bridge I have assumed that the crossing of the river Palar near Chingleput will afford the same facilities for foundations as those shown by the line of borings. In this case I should recommend screw piles in clusters as being the most appropriate form for the piers of a bridge, with girders, either plate or lattice, of 60 feet openings. Such a bridge I estimate will cost Rupees 4,70,000. This will necessarily be modified by the nature of the foundations required on the site finally chosen.

21. In addition to the above, for the line as surveyed, there will be a bridge of fifteen openings over the Panar, one of six openings over the Caroongooly river, one of four openings over the Gingee, three bridges of three openings each, and two of two openings each, all of which I propose should be of the same size and design as the bridge over the Palar. I also propose to have sent from England girders of smaller sizes, varying from 30 feet to 10 feet, as well as some rolled girders of short lengths 7 feet 6 inches and 6 feet, so that I may be enabled to keep the embankments as low as possible without interfering with the headway of drainage openings.

22. A list of the bridges and culverts, with summaries showing quantities of masonry and iron, is attached, D. The average quantity of masonry per mile throughout the line is 202 cubic yards, and the weight of iron distributed in the same manner is 5 tons, exclusive of the bridges over the Palar and Panar.

23. For stations I should propose as follows:—

	Miles.
At Conjeeveram increased accommodation	8
Wallajabad minor station ...	14
Paloor do. ...	22
Chingleput, 2nd-class do. ...	26
Mamadoor, minor station ...	38
Madranticum, do. ...	47
Acherawauk do. ...	56
Welacoor, do. ...	63
Tindivanum, 2nd-class do. ...	71
Chendoor, minor station ..	78
Vicravandi, do. ...	91
Villupoorum, 2nd-class do. ...	101
Nellicoopum, minor station	

Cuddalore terminal works.

24. From the quantities as given in accompanying statements, I estimate that the Railway can be constructed on the line of this survey for a cost of about 66,000 Rupees per mile. Summary attached, marked E.

25. In addition to my examination of the surveyed line, I have also taken an opportunity of exploring the country from Tindivanum via Wandivash to Conjeeveram direct.

26. I find that there are no engineering difficulties on this route; the physical character of the country being very much the same as that from Chingleput to Tindivanum, and I feel myself warranted in stating the cost of construction will be very nearly the same mile for mile by either route.

27. I would submit, however, that the decision on the question of route should rest upon other considerations than that of engineering facilities; and that the amount of traffic that will accrue to the Railway, the number of inhabitants accommodated, and the general direction of the line for future developments should have the greater weight.

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27th March 1871.*

28. I have collected some information with reference to traffic, and also as to the population of the villages on the two routes, with a view to comparing one with the other. I have also written* to the Collectors of North Arcot, South Arcot, and Chingleput, respectively, asking for

* Letters dated 18th November 1870.

some notes of population in all the villages within 4 miles on either side of both lines. I have received the information regarding the portion which lies in South Arcot; but until I have replies from the other districts, I shall not be able to forward a full statement of resources of both lines of country.

29. In the meantime I propose to report upon the comparative merits of the two routes with the information which I myself have been able to collect.

30. The only villages of any size immediately on the Wandivash line are :—

	Population.
Pennagur	1,900
Wandivash	3,500
Thiar	700
Thellar	1,500
Villemode	2,700
	10,300

On the other route the villages are :—

Wallajabad	3,600
Attur and Paloor	2,000
Chingleput	7,000
Caroongooly and Madranticum	5,500
Acheravak	2,000
Welacoor	1,500
	21,600

more than double the number in one case compared with the other; and even taking this amount of population in proportion to the length of line it gives 360 by the Chingleput as against 240 by the other line.

31. The above numbers do not show the number of inhabitants to be served by the Railway, but merely those of the chief villages on the line of road for the purpose of a comparison.

32. The Executive Engineer of Chingleput Range has been good enough to furnish me with copies of notes of traffic passing the river Palar, taken in the year 1867, when the paved causeway was in use. From this it appears that during 15 days in March of that year there was an average of 1,136 laden and 665 empty carts passing over the river daily.

33. The only reliable notes of traffic through the other line of country are taken from a return, which was made by the Tahsildar of Conjeeveram, of carts, etc., on various roads in his talook, when the Municipal Act was being introduced. By this I learn that during a year only 13,870 loaded and 6,059 empty carts passed through by the Conjeeveram and Wandivash road in both directions. This would give an average of less than 40 loaded and 17 empty carts a day.

34. The same return gives the traffic between Conjeeveram and Chingleput for the same time as 18,469 loaded and 4,389 empty carts in the year, proving with tolerable certainty that any local traffic that may be lost by leaving Wandivash out of the circuit will be more than compensated for by that between Conjeeveram and Chingleput.

35. When viewed in this way it appears there is all the local traffic to be derived from the country between Chingleput and Tindivanum with nothing to set against it on the other line, and to this should be added the very important consideration of the Chingleput route being the proper one for through connection if extension should be contemplated in future.

36. The terms of the contract between the Government and the Railway Company contemplate a line in extension of the former Indian Tramway, from Little Conjeeveram to Cuddalore, or

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some other place in the vicinity. If such a line be intended to remain without further extension, I think it is obvious that it must depend entirely upon the local traffic for its remuneration, and every inhabitant that one line of country possesses more than another will give that route the advantage in a comparison.

37. Again, if we are justified in considering the possibility of further extensions being entered in the future, the most important object should be to secure such a route as will give the shortest and most direct journey for heavy through traffic, and at the same time bring the most thickly populated parts of the country into communication with their ports for shipping.

38. The line, *via* Chingleput, is 60 miles between Conjeeveram and Tindivanum, while by the other route it is only 43; but I think I have shown that, both by a consideration of the number of inhabitants and by comparing the amount of traffic now found passing by the various roads, the longer line presents advantages that will justify incurring the cost of the extra length of line.

39. I would here take an opportunity of pointing out, for the consideration of Government, (although perhaps it does not form a part of my subject,) that, in the event of the Chingleput route being selected, and viewing the great probability of an extension to Madras being ultimately entered, it would be a very considerable saving in the cost of construction of the whole line, if the length from Chingleput to Madras could be simultaneously undertaken with the other. As it at present is contemplated to construct the line, all stores and materials for the works that are to be landed at Madras will require to be carried a distance of 83 miles instead of 35, or nearly 50 miles more than there is necessity for. I would suggest that this is of great importance where iron permanent-way and heavy iron bridges are to be used for the works.

Trusting that the above will afford sufficient information to enable the Government to arrive at a decision as to which route should be selected.

Table of Curves.

Nos.		Miles.	Chains.
1.—20 Chains radius	...	0	36.40
1.—25 " "	...	0	16.50
8.—40 " "	...	2	24.55
6.—60 " "	...	1	77.35
1.—70 " "	...	0	46.36
1.—72 " "	...	0	33.20
16.—80 " "	...	6	16.35
2.—84 " "	...	0	77.05
5.—100 " "	...	1	43.65
3.—114 " "	...	0	59.90
Total length of curves		15	28.25
Total length of straight		92	51.75
		108	0.00

Summary of Gradients.

Gradients.	Total length.
	Miles. Chains.
Between 1 in 121 and 1 in 130	0 70
Do. 1 in 130 and 1 in 150	2 0
Do. 1 in 150 and 1 in 200	3 71
Do. 1 in 200 and 1 in 300	11 45
Do. 1 in 300 and 1 in 500	15 2
Do. 1 in 500 and 1 in 800	18 43
Do. 1 in 800 and upwards	30 9
Total length of gradient...	82 0
Total length of level	26 0
	108 0

convenience of break of gauge at the

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Summary of the cost per mile.

Earthwork—	RS.
Bank, 20,200 cubic yards	3,788
Cutting, 1,000 do.	500
Masonry, 202 do.	3,030
Iron work, 5 tons	1,500
Proportion of cost of large bridges per mile throughout the line...	6,019
Terminal works, shops, etc., proportion of cost per mile ..	3,703
Stations	1,100
Ballasting, 4,000 cubic yards	2,000
Permanent-way and laying... ..	20,900
Do. do. (carriage of)... ..	2,500
Telegraph	470
Fencing	1,100
	46,610
Contingencies, 10 per cent. on above	4,661
Superintendence and General Management, say, 15 per cent. ...	6,992
Rolling Stock	8,000
Total cost per mile...	66,263

No. 647.

ORDER THEREON, 27th March 1871, No. 910.

RAILWAY, No. 62.

THE Acting Consulting Engineer for Railways submits, for the consideration and decision of Government, the

questions, firstly, of the direction in which the proposed extension of the Carnatic Railway should be carried between Conjeevaram and Tindivanam, taking these two places as fixed points and assuming that Arcunum shall be the northern terminus, and, secondly, the direction in which the line should be taken from Villupoorum (or Belpar) to Cuddalore.

2. When the general subject of Railway-extension was under consideration, the Government expressed an opinion that any prolongation to the southward of the Arcunum and Conjeevaram line that might be undertaken, should be carried through Wandivash, Tindivanam, and Vicravandy, that being the direct line and one which would open out to the most advantage the interior and at present less accessible portions of the South Arcot District, and place them in direct communication with the sea-board. An examination of the country has however led not only the officers of the Tramway Company (now absorbed into the Carnatic Railway Company) but also the Consulting Engineer, to the opinion that the preferable direction is by the circuitous route of Wallajabad and Chingleput; and accordingly the Engineers sent out by the Carnatic Railway Company to survey the country for the proposed extension have confined their operations almost exclusively to this line, and have completed the trial survey, which the Consulting Engineer has now submitted with the explanations of the Chief Engineer and his own remarks.

3. The questions, as now submitted, come before the Government under very different conditions from those which attended them when they were last under consideration. The Government were then led to suppose that, by the terms of

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27th March 1871.*

the contract which had been entered into between the Secretary of State and the Carnatic Railway Company, the Indian standard, or broad gauge had been fixed upon as that on which the Company should construct the extension of their line to Cuddalore, and that the Government of Pondicherry made it an absolutely essential condition of their making a branch to that place that a junction should be formed with the Madras Railway at Arcunum.

4. The despatch from the Secretary of State of the 4th August 1870, No. 48, as well as the letter of the Government of India under date the 17th September 1870, No. 1,588-R, with which that Despatch was communicated to this Government, shows, however, that the question of gauge is still open, and that, in the interests of economy, it is not too late to consider whether the districts to be traversed by the proposed extension cannot be accommodated at a less outlay than is involved in the construction of the line as a first-class railway on the broad gauge. This being the case, the Government gladly fall back upon the views which they from the first have entertained that the circumstances of the Chingleput and South Arcot Districts are not such as to require the accommodation of the more expensive form of railway, and that a simple extension of the line which unites Arcunum with Conjeevaram on the narrow gauge system would amply suffice for all the requirements of the country. After the fullest consideration the Government see no reason to change those views, and as they are called upon again to express an opinion on the question, they have no hesitation in deciding in favour of a narrow gauge, which, His Excellency the Governor in Council is satisfied, will be fully capable of affording all the facilities to traffic that the country is in need of, and which, not only cheaper as regards first cost but also in working outlay, is likely to yield returns which could in vain be looked for from a first-class broad gauge line.

5. As regards the direction in which the extension should be carried, the Government observe that it seems to be conclusively shown that the route from Conjeevaram by Wandivash to Tindivanam, though the most direct and the one most likely from its inland position to open out new sources of traffic, does not offer such favourable prospects from a traffic point of view as the more circuitous route by Wallajabad, Chingleput, and Caruogooly. It is evident that the traffic of the districts to the south of Madras flows towards the Presidency in the direction of the Southern Trunk Road, and it is manifestly desirable that the tendency of that traffic should determine the alignment of the Railway. This is so obvious as to make it questionable whether the line, instead of taking the circuitous route by Conjeevaram and Arcunum, should not be carried straight from Chingleput into Madras.

6. To take the Railway round by Arcunum would appear to be a needless and an unprofitable outlay of money. The intermediate country is poor, and the detour would offer no facility to the traffic from the south to the capital, the direct distance from Chingleput to Madras being 35 miles, while by Arcunum it will be 82½ miles. It will clearly be cheaper to cart produce from Chingleput and from places within a certain distance from it to Madras, than to send it round by rail by Arcunum and encounter the expense at Madras of transporting it from the Railway station to the merchants' warehouses, to which the cart would take it at once.

7. For these reasons the Government are of opinion that, adopting the direction of the Great Southern Trunk Road as the line in all respects most advantageously situated for affording the fullest accommodation to the wants of the country, the Carnatic Railway should follow the general alignment of that road, starting from Madras instead of Arconum, and running by or through Chingleput, Caroon-gooly, Vicravandy, Villupoorum, and Panrooty, from whence it should be carried to Cuddalore by the route indicated in yellow on the map and described as No. 4 in Mr. Diblees' report. By following this somewhat indirect route from Villupoorum instead of one of the shorter lines that have been surveyed to Cuddalore, additional bridge-work will be necessary, but this will be no disadvantage, as the bridging of the Pooniar and Guddelum will serve the prolongation of the line which will be required to form a junction with the Great Southern of India Railway. This extension cannot, in the opinion of the Government, be long delayed, and opportunities should not be neglected of examining the country with a view of selecting for it the most favourable route through the rich and populous country to the south.

8. As regards the effect which the change of gauge and of the direction of the Railway may have on the action of the Government of Pondicherry with respect to the construction of a branch to that place from Villupoorum, His Excellency the Governor in Council observes that, even if these points had not to be determined solely with a view to local interests and the benefit of the British territories, circumstances have greatly altered since the French Government stipulated for the broad gauge being adopted by the Carnatic Company and for an inland terminus at Arconum. His Excellency in Council has moreover reason to believe that, with reference to gauge, the French Government will not raise any such objections as will materially interfere with the negotiations of the Company with that Government for the construction of a junction-line to Pondicherry upon mutually favourable terms. The question of direction is one on which greater difficulty will probably occur. This Government has treated the question from an English point of view, it remains for the Government of India and the Secretary of State to determine whether the interests and wishes of the Government of France would justify a second connection with the Madras Railway at Arconum.

9. The trial survey should be completed with all speed from Chingleput to some convenient central spot for a terminal station in Madras, and should be laid before Government without loss of time in order that the sanction of the Government of India to the proposed alteration of the location may be obtained. This alteration will leave the existing short length of Railway from Arconum to Conjeevaram at first a detached line, but the Government do not think that it should be abandoned, as they see no objection to its being maintained so long, at least, as it can be made to pay its working expenses.

(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R.E.,
Secretary to Government.

To the Acting Consulting Engineer for Railways.

Exd. S. T. Augustin.

India Office
Railway London, 4th August 1870
No. 48

*His Excellency the Right Honorable
The Governor General of India in Council*

My Lord

*With reference to recent
discussions on the subject of narrow gauge
railways, I am desirous that, when the plans
and estimates of the Carnatic Railway
are before you, you should consider
whether the reasons urged in the 27th para-
graph of your Railway Despatch of the 11th March
1869, No. 25, in favor of the adoption on that
Railway of the standard Indian gauge are
still to be regarded as conclusive.*

*2. It should be remembered that adoption
of the standard gauge will involve re-
-laying of the existing section of narrow
gauge between Conjeevaram and Arconum
whereas if the narrow gauge were continued
from Conjeevaram to Cuddalore, the in-
-convenience of break of gauge at the point*

of junction with the Madras Railway
might be minimised by laying a third
rail on the miles of that Railway between
Arcunum and Madras. —

Shave & Co

Signed Argyle

Good

Mr 3839/10

26/9

All communications
should be addressed
to the Secretary.

No. 1588 R.
GOVERNMENT OF INDIA.
PUBLIC WORKS DEPARTMENT.
RAILWAY.

To The Secretary to the Govt. of Madras,
Public Works Department (Railway).

Simla, 17th September 1870.

Sir,

In forwarding for the information
and consideration of the Govt. of Madras,
copy of a despatch p. 48 dated the 11th August
1870 from the Secretary of State, in which
the question of the gauge of the Equatorial
Railway is reopened, I am directed by the
Governor General in Council to state that
the Govt. of India will be prepared to
give a ready hearing to such renewed
representations as the Governor of Madras
in Council may think right, under the

circumstances, to make in favor of the adoption of the gauge originally recommended for this railway by His Excellency's Government.

2. There is no doubt much force in the objection to the proposed conversion of the existing 19 miles of this railway to the standard gauge, and in the event of the retention of the existing narrow gauge the suggestion to lay a third rail on the Madras Railway between Arcotum and Madras would meet what is understood to be the desire of the local authorities, viz. - that the Carnatic Rail. should terminate in the Presidency city, while it would not militate against the desire of the French authorities, that the line should pass through Arcotum.

3. The extension of the sanctioned section of the Carnatic line to join with the Great Southern of India Railway at Tanjore, or elsewhere, may fairly be regarded as a certainty of the future, and it would, therefore, be desirable that the further question of the gauge that

21
should be adopted on the sanctioned extension of the latter railway to Tuticorin should also be taken into consideration by the Government of Madras, and reported on at the same time. By laying a third rail on the section of the Great Southern of India Railway intervening between the junction of its extension and that of the Carnatic Railway, an interrupted communication by rail upwards of 450 miles in length would be secured, equally as in the case of its being determined to adhere to the standard gauge.

4. The essential point to be kept in view in dealing with these questions is that the districts traversed by the proposed railways shall be accommodated sufficiently at the least outlay. If the adoption of a narrow gauge will lead to a material diminution of outlay, there would not seem to be any serious objections to its

its introduction on the score of the disadvantage
of breaking bulk: especially if that gauge
should be recommended for the entire length
of new line to be constructed as far south
as Tuticorin. With the same object, viz:
that of keeping down first cost, it would seem
that some portion of the existing roads
might be appropriated for the purposes of
these railways, as already done between
Arcotum and Conjeevaram, and Law,
therefore, directed to request that the
views of the Govt of Madras on the
probability and expediency of so laying
the rails, be also reported.

I have the honor to be,
Sir,

Yours most obedt servt.

J. Milnes Major, R.E.

Deputy Secretary

to H. R. The President.

32
19

1870 Dept
No 3839

From.

Govt of India

Dated 17.

Recd: 28. { Sept 30

En: 1 ✓ No 1588

Forwarding
with remarks for
consideration a copy
of a Despatch from
the Secretary of
State on the question
of the gauge to be
adopted for the
Karnatic Railway.

No 910. 27. March 71

Cl 645

RC 17 March 71
615 March 71 R-16
612 Oct 70

25
This question came before the
committee? Differed from the
which attended to it.
was lost and delayed. Then they
reported that it had been
finally determined that a
broad gauge line should be
constructed from Calcutta
to the delta in the branch
to be discharged and that the
matter was beyond our control.
Now it is heard that the Govt.
have are quite willing to

and let the narrow fringe - and
to a complete articulation of
the corners of the ridge - if shown
to be more distinct layers.

Since the report
has been received a general
Scheme of Railways is being
prepared - of which this line
will be an important & link.

As regards George I
am decidedly of opinion
that the warrens I would be

at 4 P.M. The President.

27
a. 8. 1. 1. - It will be possible
difficult to carry out the
traffic on the line - there will
be a great many of the
structures and a lot of work
in the line - the line
will be a great many of the
pay is as decided - the
it has to be done - the
in the line - the line
the line of the line - the
the line of the line - the
the line of the line - the

when far from the competition.
I believe shipping could be
conducted by the same firm
that W. Line is now doing
and carry all the traffic
next to the Director's
and decide if it is
that the line should be
from London by Chicago but
I understand it will
be used to connect to Japan
and back to London.

at 18. The President.

2/- 2/21 2/21 2/21
at ~~Tientsin~~ it will fall into
the p. s. of India by steam - which
I have already recommended should
also be of the Harrow type be-
tween London & India by 2 or 3 times
the route put between India
& Tientsin can easily be filled
by the introduction of a third
line. ~~London~~ There will then
be three lines running from
London to London without
the use of Japan.
To carry the line by sea.
The main is simple matter of money - the

at 4 P.M. The President.

31

conveying
it from the building to the
the merchant's warehouse &
I think the cost will be
at once. The price is in the
Pan & Cherry has still to be
fixed. That is the only
should, in every decision, be
the for the most time. I have
in the house in yellow.

The second part, it is
 a - paper for a good paper
 line to be concerned - to us to

[illegible]

in the part by them of railway
 communication. The demand
 of the French on this line can
 sufficiently easily be regarded
 as ^{practically} that for a broad gauge line
 from ^{Madrid} to Tangier - in it
 branches to ^{Alger} Pau de Charry &
 Andalous - as against a
 narrow gauge from London
 by Charing Cross to Tangier
 with the ~~XX~~ ^{to Paris & Andalus} branch. The

former line appears to be the
 the latter 100 miles. To bring the
~~the line to the coast of a broad gauge line~~
 with rolling stock at £8000 & that of a narrow
 gauge at £5000.
 additional capital & expended
 if the wish of the French for
 be completed with the width be
 £995,000. The amount
 in track as to which will be
 nearly 50,000. from which the amount
 in track is only £8000.

Minutes of H.R. the President.

Cost of a broad gauge - and let the
percent: as the extra cost is but
~~not a small one~~ ^{valuing subsequent working expenses} ~~of the gauge~~
there is only for 20 years. The ~~through~~
traffic between ~~the~~ ^{the} ~~W. & A. India~~
Cherry will be long term - it will
be far more than can be met
by the cost of the traffic from
places south of Chingapat to
Madras. In fact as we are ~~obliged~~
we are bound to ~~be~~ ^{be} ~~induced~~
most strongly against the concession
by an ~~enormous~~ ^{enormous} ~~weight~~ ^{weight} ~~of~~ ^{of} ~~the~~ ^{the} ~~Government~~ ^{Government}
2088

The question of Railway Extension in the
Districts of Chingleput and South Arcot
towards Bangalore and the great Southern
of India Railway is unhappily
complicated by a Foreign interest.
The interest of this Presidency was
alone concerned I conceive that there
would be little difference of opinion.
The Arcot Junction would be
abandoned, the northern terminus
would be placed at Madras and the
line would be short and
profitably conducted by Chingleput
Tendermum and Bellpur to
Muddalore, the Southern extension
starting either for Muddalore
or for Bellpur. A portion of
such a line that for Chingleput
to Madras would give great
returns. ^{(constructed on the narrow}
gauge it might be a paying line.

The French interest demands, as far as
are informed different conditions. The gist
of the French gut is to place the line of
Pondicherry in connection with the
Madras line at Arcanam in order
to open a direct correspondence with
Bellary and the north and with
Beypoor and the west as well as with
Madras. If Madras was made the
sole northern terminus the benefit
would altogether be for Madras.
If Arcanam or some other inland
point was made a terminus of the
line there would be a distinct
benefit for Pondicherry.

If both interests, the English interest
and the French interest are to be
considered and as far as possible
harmonized I would propose the
following scheme

82
The present terminus at Arcanam could
be retained. The line could run by Coimbatore
Walloo ~~at~~^{to} Chingleput, Andover
Bellary to Cuddalore with a branch
to Pondicherry. That would be for the
benefit of Pondicherry. The benefit of
Madras would be secured by a branch
line uniting Chingleput with the
Pondicherry line. This plan would
entail the maximum of expense
but would yield the maximum
of satisfaction to all parties concerned.

I advise the circumventive route
by Coimbatore by Walloo at least
to Chingleput in order to bring
the line as near as possible to
Madras for the sake of the
branch which would thus be
only 36 miles in length. —
With reference to the question
of gauge I am quite to understand

by Charles that the Carnatic Company
is disposed to reconsider that question,
that Govt. always desired to have the
narrow gauge on this line and the Great
Govt. I am assured for local lines,
would not reject it. Under these
circumstances this Govt. ought in my
opinion to submit their views in favor of
a narrow gauge more in reference
to all lines constructed in the region
between the Madras and Great Southern
of India Railways by the Agency of
the Carnatic Company. I would
not complicate the proposal by any reference
to laying a third Rail on the Madras and
Great Southern of India lines. I would
regard the Carnatic Co.'s works as
an independent group of narrow gauge
lines heading bulk at the two extremities,
a group of railways for local service.

It appears to me desirable that
the whole question of Railway Extension
should be brought to a decision by discussion
in a special Council at an early date
Govt. House, Madras, 11th Dec 1871

201 21
Report on the line proposed
for
The Carnatic Railway.

In considering the location of
the line under investigation by the
Carnatic Railway Company, I
have assumed as fixed points,
Arcotum / the present junction
of the tramway with the Madras
Railway / Villapuram or as shown
in the Ordnance Map, Belpur,
and the old native town of
Cuddalore, but the questions of
a future extension to join the
Great Southern of India Railway
and of a probable demand for
direct

direct communication with Madras.
should the Carnatic line pass
through Chingleput, cannot be lost
sight of, in determining the best
trace between the termini as at
present proposed.

2 The features of the country
which principally influence the
location of the line between
Villapooram and Cuddalore, are
the two large rivers, the Panar,
and the Guddalaw; and in an
examination of the Ordnance Map
five routes suggest themselves.

The first, passing through
or near Chumaur, by Persumbau-
cum to a station ground, near the
bridge,

32 2/
bridge, on the north bank of the
Panar - the station would be
about two miles from Munjacoopam
and 6 miles from Cuddalore, this
line would be the shortest and
cheapest, and save bridging both
rivers.

The second route would
after leaving Chumaur cross the
river Panar near Kistnaveram,
and run thence into a station
ground, near the centre of Munjee-
coopam, about 4 miles from
Cuddalore.

This is the line already
surveyed and staked out.

The third route would
after

after leaving Chumaur, and crossing the river Panar at Kistnavaram, cross Guddalam between Pillati and Padrecoofam, and thence round the low hills, through Tirupalayam, to a station ground close to Buddalore -

The fourth route would pass from Villapooram with two bridges, one across each branch of the Panar to Panruttu, a flourishing town of some 5,000 inhabitants, (including Tiruvadi) and thence pass nearly due east to the crossing of the Guddalam - and the station ground suggested at Buddalore.

The fifth route would like the

the fourth cross the Panar, with two bridges, and pass through Panruttu, but would thence, running due south, cross the Guddalam and skirt its south bank.

3 I think Nos 1 & 2 routes may be at once set aside, as ending at too great a distance, 6 and 4 miles respectively, from Buddalore - while they furnish no facilities for landing stores, or for any demands the trade of the port may hereafter make on the line.

No 3 route serves Buddalore and the port, but requires two bridges.

No 4 route will require three bridges but probably only the same waterway as No 3, and as the soil for the foundations is better, the cost of bridging would probably be the same in

in each case, and though this route would be longer than the last by four miles, the large town of Parrooty would be brought into direct communication.

The advantage of the 5th route, if practicable, is, that its bridge over the Guddalaw would save any future extension to meet the Great Southern. In my opinion the choice will be between routes 4 and 5, but until the surveys are completed, I am not in a position to decide.

4 From Villapooram, where the Pondicherry line will branch off, the line will pass almost straight to Vicravandy, and thence

nearly

47 21
nearly parallel to the existing road to Tindivanam, a town containing some 5000 inhabitants (I believe) and of considerable commercial importance; thus far, I believe, in 150 will be the ruling gradient, and 40 chains the radius of the ruling curve -

5 Between Tindivanam and Arcotum two routes suggest themselves; One, passing through Acherauak, Madranticum, Carangooly, Chingleput, Wallajabad, and Conjeveram; the other through Wandiwash and Pennagur and Conjeveram. The former is 20 miles the longer of the two, but it would pass through a country thoroughly cultivated and thickly populated.

populated, would occupy a line upon which all existing roads converge, and where the country may be said to have somewhat prepared itself for a more certain and rapid means of communication.

The latter route passes for the first 20 miles (between Tindivanam and Mandiwash) over a country, of which, to an observer riding along the line; at least half appears uncultivated, principally on account of the rocky hills which there abound. The villages, which are few and far between, are very small, and it appears difficult to believe that under any circumstances the area of country served by the more westerly

49 2/11
westerly of the two routes, can ever be improved to the condition already attained by the country further East, while the belt of land extending for five miles from, and parallel to the Trunk Road, would be equally served by either route.

6 The salt traffic, would I think, be little affected by either route, unless for any reason, the salt pans of the South Arcot were to compete favourably with those of Madras, for the supply up the North-West line of the Madras Railway. The supply of rice which I understand, is drawn from these districts for consumption in, and export from Madras, would I think be attracted more to the former Chingleput than the latter route.

51/29/31
route Wandiwash. The area of rice
cultivation increasing as the coast
is approached.

The Madras goods which now
form the return-loads for the carts
carrying rice, would no doubt be
supplied by the rail: and the
demand for them would increase
as the line approaches the more
highly populated tracts.

The country between Wandiwash
and Conjevaram is of a better
description than that south of
Wandiwash, but I feel sure that the
statistics now under preparation for
submission to Government, with the
Chief Engineer's report will clearly shew
that whether the present state or future
capabilities

capabilities of the two belts of
country be considered, the more easterly
of the two is the best for a railway.
8. As regards competition with
the coasting trade, which I have heard
advanced as an argument in favour
of the inland route, I am unable
to see how a distance of ten miles
can affect the question; the desira-
bility of opening out a new tract of
country, I have also heard advanced
as an argument against replacing
an existing line of communication
by one of a better description, but
it appears to me that if the country
as a whole is ripe for railways, it
must be those parts of it which
are most advanced, which should
be

be sought out, when locating the lines—assuming that the through traffic, as in this case, is equally affected by the several routes. As regards facility in construction—On the western route, the stone may perhaps have to be carried a less distance. The drainage area to be crossed will be less, but the curves and gradients will be heavier and the cuttings not improbably more expensive—

9. Should the route via Chingleput be adopted, there will arise the important question whether the junction line to Arcorum, or a direct line to Madras, should be constructed—

Assuming that Chingleput is

32
35 miles from Madras, 22 from Conje-
varam, and 40 from Arcorum; that
the cost of construction would be as
far as St. Thomas's Mount be approxi-
mately the same, and that the cost
of altering the existing tramway, be
about $\frac{1}{4}$ the cost of the new line,
there would be the cost of 35-22-13
miles—less $\frac{18}{4} = 4\frac{1}{2}$ miles (representing
the alteration of 18 miles) = $8\frac{1}{2}$ miles
of new line, representing the addition-
al cost of direct communication
with Madras—

The town of Vellapitad like
Mandivash is of more historic
than commercial importance, and
the advantages of the loop line
from Chingleput to Arcorum
will

will probably be found quite insignificant when compared with the advantages of the direct line to Madras

(Signed) C. I. Smith Capt R.E.
 Dy Cons Engrs for Railways

(True Copy)

Clew Lender at Major R.E.
As Cons Engr for Railways.

8/17/71

Carnatic Railway Comfy (S)
Chief Engineer's Office
Chingleput 12th January 1871

J. T. Fisher Esq.
Agent Carnatic Railway

My dear Sir

My dear Sir
1.- Adverting to my letter
of the 2^d December 1870, enclosing Plans
and Surveys with a Map of the Line
from Gohjiveram to Guddalore, I
now beg to offer the following remarks
for the information of Government.
The line surveyed has been

2. The line surveyed has been selected to pass through Chingleput, Madranticum, Tindertunum and Villapooram the four centers to which all the surrounding traffic converges, and to follow as near as possible the line which traffic now takes on the main trunk road. I have had an opportunity

3. I have had an opportunity of examining the Country throughout, with the exception of a short distance, near Gaddalore, where I propose an alternative line to that shown on the plan. I accompanied Capt. Smith the Deputy Consulting Engineer during this inspection and his remarks have doubtless been laid before Government for their consideration.

Consideration.
4.- From Conjeeveram to
Chingleput

Chingleput passing through Mallajallu, Sherarum, and Attur, the line runs through an exceedingly level country and for the greater distance along a ridge with the drainage flowing to either side. The earthwork and masonry will, therefore, be small in quantity and the gradient easy. At one or two points I think an alteration in the line might be advantageous in avoiding tanks, and these shall receive attention when the Working Surveys are undertaken; with these exceptions, I consider the line has been very well selected.

5.- Near to Chingleput, from 18th mile to other side of the River Talar, two lines have been surveyed. N^o 1 marked in black on the plan. N^o 2 in red. On N^o 1 the borings to ascertain the depths of foundations for a bridge have been taken; A tracing showing these is herewith. In some respects line N^o 2 is to be preferred to the other, I am not prepared at present, however, to recommend that either should be adopted as I propose to survey another line crossing the river about four miles further down. I also intend to have borings taken at this place, when I shall be in a position to decide upon which line I consider best of the three.

6.- From the 28th mile to Pangooly the line runs within a short distance of the main Madras to Trin-
chinopoly

3
27-51-35

chinopoly Junk Road, and is straight
for 8 Miles, for this distance there would
appear no reason for lengthening the line
by detours from the straight direction.
8.- Passing Gorangoorly and
Machramicum there have been two lines
surveyed and levelled, one being somewhat
shorter than the other and taking up less
valuable land (pret cultivation 177 Cks on
length on shorter, and 238 Cks on the longer
line) and cropping the river much more
favorably. On the other hand the shorter
line goes through the village of Machramicum
and destroys four houses: it is a question
for consideration as to how far the advantages
are balanced by this evil of interference with
the Town.

8.- From this place to Acherawant
the line is more tortuous than usual, having
been more so for the purpose of avoiding tanks
and houses of villages.

9.- At Trinoleum, 63rd Mile. I
am of opinion that the passing the Town
can be improved by a slight detour from
the present line. This shall receive attention
when the working surveys are undertaken.

10.- From this to Villapoorum there
is little to call for remark. every point where
improvement is possible shall be carefully
examined during the final survey.

11.- The line as surveyed runs
from Villapoorum to Quddalore almost
direct, cropping the River Panar and

Stopping

Stopping at the Village of Kunjathurum
 (the New Town Guddalore). Between these
 places, Villapoorum and Guddalore, there
 are three lines practicable and which possess
 varying advantages keeping in view the
 objects that are to be gained, the interests to
 be served, and the cost of each. These I have
 marked on the traced Map, herewith: Line
 No. 1, in red, stopping at the Public Road near
 to the Bridge which crosses the Panar; No. 2,
 in blue, the present line, stopping at New
 Guddalore where the European portion of the
 inhabitants reside; No. 3, in black, leaving the
 direction of the present line from Villapoorum
 for the purpose of serving the important
 Villages of Purnuthy and Piruvady, crossing
 the River Panar where it has two branches,
 and further down crossing also the Gudalur
 and terminating in the Old Town of Gudda-
 lore at a place where accommodation for
 Landing Stores can be provided. No. 4, in
 yellow, crosses the River Gudalur near to
 Purnuthy and strikes the South bank of the
 River arriving at the same terminus with
 No. 3. I am now having a Survey made of
 No. 3 from Guddalore and an examination
 of the Country through which No. 4 will pass.
 12.- Briefly stated, I consider
 the relative advantages of these four alter-
 native lines to be as follows: No. 1 is the
 shortest and saves the bridging of the River
 Panar while it serves the traffic to be ex-
 pected from Guddalore almost quite as
 well

5 13
well as No. 2. Goods and Passengers will require to go one mile and a half further to reach the Station. This inconvenience is to be set against the cost of one mile more Railway, and a Bridge over the River, which I estimate at about Rs. 1,80,000. No. 3 as compared with No. 2 is 4 miles longer, but it serves the important native town of Purnetty and the neighbouring villages, the number of inhabitants being about 10,000, near to Gnd. dalore it crosses the River Gudalur for the purpose of reaching the Old Town and having accommodation for landing stores and material at the Backwater. It is here that all the Merchants' Godowns are found and from which four fifths of the traffic in Goods and 3/4 of Passengers is to be expected. Another advantage presents itself in this line, in the event of any extension Southward being hereafter contemplated, the branch, as it would in that case become, for serving the traffic of Gudalur would be only 14 miles long compared with 26 on No. 2.

13.- By line No. 4 the crossing of the Gudalur is made near Purnetty which would be an advantage in saving a Bridge for Southern connection, as a second Bridge would not in that case be required, to set against this the line will probably be 2 miles longer (than No. 3) and certainly more expensive mile per mile as the country is much rougher and more difficult. The

cost

cost of the bridge which might be saved to an extension line I estimate at \$95,000 while the 2 miles of extra line would cost more.

14.- Comparing these lines as above, I would suggest for the consideration of Government whether it does not present superior advantages to any of the others, and I recommend its adoption.

15.- I attach a list of curves and straight portions of line. Appendix A. The aggregate length of straight is 92 miles 52 chs. and total curves 15 miles 28 chs. The sharpest curve is one of 20 chains near to Conjeeveram, the necessity for which arises from the difficulty of leaving the present line without interfering with the town of Conjeeveram. It is probable that this curve may be improved upon. The next sharpest to this, one of 25 chains Rad., will be altered with a change of line from Villapuram.

16.- A Table of Gradients is also appended marked B. The limit of these may be reduced with very little increase of cost to \$140 and in the working surveys it may be found to be possible to make it even more easy.

there is of level portion	m. Chs
of Curves 1 in 121	26-0
to 1 in 130 }	6-70
from 1 in 130 }	
to 1 in 150 }	2-0
	34-70

7 65 39

m. che
34 - 70

from 1 in 150	}	3 - 71
to 1 .. 200		
from 1 .. 200	}	15 - 2
to 1 .. 500		
1 .. 500 and upwards		48 - 52
		108 - 0

17. I have prepared quantities of Earthwork from the Sections as now taken. A copy of them for each Cutting is herewith. G. The average quantity for Embankment throughout the whole line is 24200 Cuyards and for Cutting 1000. When the final working Surveys are completed these will necessarily be a good deal modified and altered.

18. I trust the fact will not be lost sight of that my Estimate, as at present prepared, is only Approximate. The Survey having been made under my predecessor, and connected as I have been with the work for so short a time, I consider that further opportunities of examining the line of Country, of learning its features and capabilities, as well as a more detailed Survey are necessary before making an Estimate to which I am to be irrevocably held.

19. The above remarks apply especially to the quantities I have compiled for Bridges and Masonry. The nature of the foundations must be examined with more care, the extent of drainage areas and

and quantities of water to be provided for must be more thoroughly investigated before exact results can be arrived at. A list of drainage openings is appended.

20.- For the purpose of my Esti.

mate for a Bridge I have assumed that the crossing of the River Palar near Elum-glepunt will afford the same facilities for foundations as those shown by the line of borings. In this case I should recommend Screw Piles in Clusters as being the most appropriate form for the Piers of a Bridge, with Girders, either plate or lattice, of box or openings. Such a Bridge I estimate will cost Rs. 4,70,000. This will necessarily be modified by the nature of the foundations required on the site finally chosen.

21.- In addition to the above, for the line as surveyed, there will be a Bridge

of 15 openings over the Pennar - one of 6 openings over the Parangudy River - one of 4 openings over the Gingee - three Bridges of 3 openings each, and 2 of 2 openings each, all of which I propose should be of the same size and design as the Bridge over the Palar. I also propose to have sent from England, Girders of smaller sizes, varying from 3 ft to 10 ft as well as some rolled girders of short lengths 7'6" & 6 ft, so that I may be enabled to keep the embankments as low as possible without interfering with the headway of drainage openings.

22.- A list of the Bridges and Culverts with Summaries showing quantities of Masonry and Iron is attached. D. The average quantity of Masonry per mile throughout the line is 202 Cords and the weight of Iron distributed in the same manner is 5 tons exclusive of the Bridges over the Palar and Pennar.

23.- For Stations I should propose as follows:-

at Conjeevaram increased accommodation		Miles
Wallaajahbad - minor station		8
Paloor	do	14
Chingaleput	2 ^d class	22
Mamadoor	Minor	26
Madrantheim	do	38
Acheramank	do	47
Mellacoor	do	56
Indiranum	2 ^d class	63
Chendoor	Minor	71
Vicravandi	do	78
Villapuram	2 ^d class	91
Mellicoopam	Minor	101
Madallore	Terminal Works	

24.- From the quantities as given in accompanying Statements, I estimate that the Railway can be constructed on the line of this Survey for a cost of about 64,000 Rupees per mile. Summary attached. marked E.

25.- In addition to my examination of the Surveyed line, I have also taken an opportunity of exploring the country from

Vindavanam

Tindivanam via Wandiwash to Conjevaram direct.

26.- I find that there are no Engineering difficulties on this route; the physical character of the Country being very much the same as that from Chingleput to Tindivanam, and I feel myself warranted in stating the cost of Construction will be very nearly the same mile for mile by either route.

27.- I would submit however that the decision on the question of route should rest upon other considerations than that of Engineering facilities; and that the Amount of Traffic that will accrue to the Railway, the number of inhabitants accommodated and the general direction of the line for future developments should have the greater weight.

28.- I have collected some information with reference to traffic, and also as to the population of the Villages on the two routes, with a view to comparing one with the other. I have also written to the Collectors of North Arcot, South Arcot, and Chingleput respectively, asking for some notes of Population in all the Villages within 4 miles on either side of both lines. I have received the information regarding the portion which lies in South Arcot, but until I have replies from the other Districts I shall not be able to forward a full statement of resources of both lines of Country.

* Letters dated
18th Nov: 1870

29. In the meantime I propose to report upon the comparative merits of the two routes with the information which I myself have been able to collect.

30. The only villages of any size immediately on the Wandewash line are:-

	Population 1900
Pennagar	3,500
Wandewash	700
Thiruv	1,500
Thellur	2,700
Villemode	10,300

On the other route the villages are:-

Wallojahbad	3,600
Attur & Teloor	2,000
Chingleput	7,000
Parangoor, & Madramanam	5,500
Acheravank	2,000
Melacoor	1,500
	21,600

more than double the number in one case compared with the other; and even taking this amount of population in proportion to the length of line it gives 360 by the Chingleput as against 250 by the other line.

31. The above numbers do not show the number of inhabitants to be served by the Railway, but merely those of the chief villages on the line of road for the purpose of a comparison.

32. The District Engineer of Chingleput Range has been good enough to furnish me with copies of notes of traffic passing

passing the River Palar, taken in the year 1867 when the paved causeway was in use. From this it appears that during 15 days in March of that year there was an average of 1,136 laden and 665 empty carts passing over the river daily.

33.- The only reliable notes of traffic through the other line of Country are taken from a return, which was made by the Sahildar of Conjeeveram, of carts & on various roads in his Sahat, when the Municipal Act was being introduced. By this I learn that during a year only 18,870 loaded & 6,059 empty carts passed through by the Conjeeveram and Mandewash road in both directions. This would give an average of less than 40 loaded and 17 empty carts a day.

34.- The same return gives the traffic between Conjeeveram and Chingleput for the same time as 18,469 loaded and 6,380 empty carts in the year, proving with tolerable certainty that any local traffic that may be lost by leaving Mandewash out of the circuit will be more than compensated for by that between Conjeeveram and Chingleput.

35.- When viewed in this way it appears there is all the local traffic to be derived from the country between Chingleput and Tindivanam with nothing to set against it on the other line, and to this should be added the very important consideration of the

the Chingleput route being the proper one for through connection if extension should be contemplated in future.

36.- The Terms of the Contract between the Government and the Railway Company contemplates a line in extension of the former Indian Railway from Little Conjeeveram to Gundlupet or some other place in the vicinity. If such a line be intended to remain without further extension I think it is obvious that it must depend entirely upon the local traffic for its remuneration and every inhabitant that on line of country proposes more than another will give that route the advantage in a comparison.

37.- Again if we are justified in considering the possibility of further extensions being entertained in the future the most important object should be to secure such a route as will give the shortest and most direct journey for heavy through traffic and at the same time bring the most thickly populated parts of the Country into communication with their ports for shipping.

38.- The line via Chingleput is 60 miles between Conjeeveram and Pondicherry while by the other route it is only 43 but I think I have shown that both by a consideration of the number of inhabitants and by comparing the amount of traffic now found passing by the various

44 1/2 7/26
roads, the longer line presents advantages that will justify incurring the cost of the extra length of line.

39.- I would here take an opportunity of pointing out for the consideration of Government (although perhaps it does not form a part of my subject) that in the event of the Shingleput route being selected and viewing the great probability of an extension to Madras being ultimately entertained, it would be a very considerable saving in the cost of construction of the whole line if the length from Shingleput to Madras could be simultaneously undertaken with the other. As it at present is contemplated to construct the line, all stores and materials for the works that are to be landed at Madras will require to be carried a distance of 83 miles instead of 35. or nearly 50 miles more than there is necessity for. I would suggest that this is of great importance where iron permanent way and heavy iron bridges are to be used for the works.

Trusting that the above will afford sufficient information to enable the Government to arrive at a decision as to which route should be selected.

I remain,
My dear Sir,
Yours truly

Fredk Dibblee
Chief Engineer

Table of Curves.

No.	Chains	Radius	Miles	Ch.
1	20			36.40
1	25	"		16.50
8	40	"	2	24.55
6	60	"	1	77.35
1	71	"		46.36
1	72	"		33.20
16	80	"	6	16.35
2	84	"		77.05
5	100	"	1	43.65
3	114	"		59.90
Total Length of Curves 15				28.25

Total Length of Straights 92 57.75

108. 0.00

Continued by

Robert St

Schmidt

14/1/71

Larnate Railway Summary of Gradients

Gradients
Between

1 in 121 & 1 in 130

1 in 130 & 1 in 150

1 in 150 & 1 in 200

1 in 200 & 1 in 300

1 in 300 & 1 in 500

1 in 500 & 1 in 800

1 in 800 & upwards

Total length of gradient

Total length of level

Total length
miles

70

2

3 71

11 45

15 2

18 43

30 9

82 0

26 0

108 0

B
 Estimates of Railway
 Costs of Expenditure

Garnatic Railway

Summary of the cost per mile

Earthwork		Rs
Bank — 20,200 c. yds —	3,788	
Cutting — 1,000 — do —	500	
Masonry — 202 — do —	3,000	
Iron works — 5 Tons —	1,500	
Proportion of cost of large Bridges	6,019	
per mile throughout the line		
Terminal works, above & —	3,113	
Proportion of cost per mile	1,100	
Stations —	2,000	
Rolling stock 4000 Cycles —	20,900	
Permanent way & laying —	2,500	
do do (Carriage of) —	170	
Telegraph —	1,100	
Fencing —	46,610	
Contingencies 10% on above —	4,661	
Superintendence & General Management say 5% —	6,992	
Rolling Stock —	8,000	
Total cost per mile	Rs 66,263	

Summary of
cost per mile.

10/751/71.

Railway Department

Consulting Engineer's Office

No 78.

From:

Major H. L. Prendergast, R.E.

Aq. Cons. Eng. for Railways

To Colonel C. A. Dyer R.E.

Secretary to Government

Public Works Department

Fort Saint George

Sir,

I have the honour to submit a map of the country between Cojensam and Cuddalore, with trial surveys and sections for a line through Wallajahod, Chingleput, Cuddalore, Tindivanam and Belpur, or Villapuram, to Cuddalore; and report from the Chief Engineer of the Carnatic Railway Company. This report is forwarded by the Agent in the hope that sufficient information

will

will have been given, to enable the Government to determine on the route to be selected; that is, whether the line should run through Chingleput, or in the more direct course, through Wandawash to Tindivanam. Preference is given to the route by Chingleput; this line was taken up first by the Engineers for surveying, and Mr. Dibbler who has recently arrived in the country, has continued the same line of survey, and gives only a few remarks on the alternative route, trusting that it may not be necessary to carry out even a trial survey.

The

489.12
The trial surveys for the Chingleput line are not complete, and the aim of the papers now submitted, is to obtain a decision from the Government, as to the location of the line; a general description of the route being given, but omitting the details of alignment, such as the way of passing through Chingleput and crossing the Palat river, the approach to the town of Cuddalore, &c., not being yet determined upon.

The track is described as being through a level country from Conjeveram to Chingleput, thence the point for crossing the Palat

Palas has still to be decided; and
for 8 miles there is a straight run
to Carungooly. At Madrauticum,
it is doubtful whether the shorter
line should be chosen, occupying
less valuable land, and having a
favourable approach to the river,
but going through the village; or,
if it is more advisable, to take the
longer line through wet cultivation.
Through Acheravak and Indevanum,
care is only required to avoid in the
best way, injuring tanks and villages,
as far as Villapuram. At this
point, the branch from Pondicherry
is to join in, and three routes are
shown by Mr. Dilliber, each proposing
certain

13
certain advantages, and terminating
at different places. A fourth,
colored yellow on the map, appeared
also at first, to be a desirable
line; but on further inspection,
it is found that there would be
an amount of cutting through high
ground, that would be very ex-
pensive. The first line, is the
shortest, and avoids the crossing
of rivers by keeping to the north
of them; but stops on the bank
of the Panar, about 2 miles from
the civil station, Munjacopuram,
and

and some 6 miles from the native
town of Cuddalore. The second
line, the one surveyed, crosses the
Pauar river, and comes into
Munjacoppum. The third line,
takes a different direction from
Villapuran, in order to pass through
the large villages, Pursutty, and
Sirivady, crossing the two branches
of the Pauar, and also the Cuddalore
river, so as to reach the town of
Cuddalore. Mr. Dilliber is
in favour of the third line, as
it has the advantage of a good
terminus

8/10/4
terminus, near the Merchant's
Godown, with facilities for the
loading of stores, while also this
line would cause a saving in
distance, in the event of the railway
being hereafter extended to the
south of Cuddalore. The
sharpest curve on the trial survey
is of 20 chains radius at Cou-
jeveram, it being difficult to avoid
a sharp curve on account of the
buildings; another curve of 25 chains
radius will probably be altered: and
there are 8 curves of 40 chains radius.

For 26 miles the line surveyed is level; and the ruling gradient may be made 1 in 140 or possibly easier, with little increase of cost: over 48 $\frac{1}{2}$ miles, no gradient exceeds 1 in 500. At the Palor river, Mr. Dibble recommends iron screw piles for the bridge piers, with plate or lattice girders in 60 feet spans: the cost is roughly estimated at Rupees 4,70,000. For the other larger bridges on the line, the same design is proposed; and for the minor bridges, girders of smaller sizes, instead of arched openings, with the object of reducing the height of embankment, and not thereby diminishing the sectional area of waterway. A list of stations

is given, for the line surveyed: but subject to alteration to the south of Villaputram, as Tiruvadi or Panurully would be substituted more easily, for Vollicoopum. Mr. Dibble particularly mentions that the estimates he furnishes with his report, are only approximate, and not to be taken as binding him to adhere to them, when his detailed plans are finished. The average cost of the line is computed at 66,000 Rupees per mile, including Rupees 3000 for masonry, and Rupees 4,288 for earthwork.

3. The Chief Engineer has made a cursory examination only, of a line between Conjoraram and Tiruvannam by Wandimash, and

and considers the nature of the country to be such, that there would be but little difference of cost, mile for mile, compared with the route by Chingleput. His opinion is also, that Engineering facilities should not affect the location of the line, but that a decision should be arrived at, from the amount of traffic, and number of inhabitants accommodated.

The principal villages on the Wandimash route are stated to contain 10,300 inhabitants, or 240 per mile in length of the line. On the Chingleput route, for the larger villages the figures are 21,600 inhabitants, or 3,600 per mile. The returns of

of traffic obtained, shows that a greater number of carts pass between Chingleput, and Conjeversam, than between Conjeversam and Wandimash, while the notes of traffic at the Palas river on the main southern road through Chingleput, show upwards of 30 times the traffic on that road, that there is through Wandimash. Mr. Dibbles sums up his arguments in favour of the Chingleput line, that if the Railway is to terminate at Cuddalore, its returns will be dependant on the local traffic and local population: while also if the future possible extension of the line to the south of Cuddalore

It is contemplated, it is of importance
to secure the most direct route for
heavy through traffic, and to give the
most populous parts of the country
access to the shipping ports.

4. In 1867, the Government G.O. 1482
considered that the extension of the dated 16th 1103
1867.
tramway between Arcorum and
Conjeveram might advantageously be
undertaken, to pass by Wandimash,
Sindavanam and Virasandy to
Cuddalore, leaving it to the French
Government to negotiate with the
Tramway Company, for a junction
from Pondicherry.

On the 28th December
1869, the Secretary of State forwarded G.O. 1413
dated 9th February
1870.

Correspondence

5/17
correspondence; that the Carnatic
Railway Company had been formed, for
the construction of a line from
Conjeveram to some point in the
neighbourhood of Cuddalore, and
the conversion of the tramway into
a railway of the Indian gauge; the
French Government to pay the Company
8,000^{fr} a year for twenty years, for the
construction of a branch to Pondicherry.
Engineers being also sent out from
England, the Government directed
they should commence the necessary
trial surveys, with a view to an
early decision on the direction of
the line; the Deputy Consulting
Engineer having recommended a
commencement.

commencement with the route through
Wallaajahad to Chingleput, and
thence by Madrauticurn and Sindivanam
towards Cuddalore. The latter route,
as Captain Smith notices, would
be about 20 miles longer than the
direct line through Wandiwash,
but passes through a more populous
and cultivated country, in which
there is already a considerable traffic,
and the demand for better and
more rapid means of transport.

Between Sindivanam and
Wandiwash, the track would run
through rocky land, of which
much is uncultivated; the villages

are

53/10/18
are scarce, and there is no appearance
of the country being likely at any
time to attain the condition of that
along the more easterly route.
Between Wandiwash and Cuddalore,
the country is better cultivated, than
to the South of Wandiwash; but the
traffic is small in comparison
with that going through Chingleput.
Thus a line of Railway
through Wandiwash would open up
a tract of country, in which the
traffic has to be made, and nothing
is adduced to show that there is
a prospect of the produce of the
country falling in from the West
with

with that line. But along the
trunk road through Sindivanam,
and Chingleput, there is an es-
tablished line of communication
bearing a considerable amount of
traffic; and as Sindivanam,
Chingleput, and Conjeram are
each of them centres of traffic;
the inference is, that the general
trade of the country will be better
served, by the Railway taking these
three points, than if it were run,
in the shorter line, though with
less cost of construction, through
Wandiwash a place that does not
compete at all with the other
three towns in importance.

8/10/19
Looking forward to
the future, it is not unreasonable to
suppose, that whether the Carnatic line
runs through Chingleput or Wandiwash,
there will eventually be a branch line
either from Sindivanam or Chingleput
into Madras. The distances to Madras
will then be

Sindivanam by Wandiwash to Conjeram	about 41½ miles
Conjeram to Arcot	18½
Arcot to Madras	42½
Total	102½

and from Sindivanam to Chingleput	41½
Chingleput to Madras	35
Total	76½

On this assumption too, the length of
new line to be constructed would be

Sindivanam by Wandiwash to Arcotum — ^{miles} 60

Sindivanam to Madras — $76\frac{1}{2}$

Total $136\frac{1}{2}$

or by Chingleput.

Sindivanam to Madras — $76\frac{1}{2}$

Chingleput through Cujesaram to Arcotum $40\frac{1}{2}$

Total — 117

Hence on considering the distances goods coming from the South would have to travel from Sindivanam, before reaching Madras; and also considering the mileage of Railway to be constructed; the advantages of taking the line through Chingleput; are, a shorter distance for through traffic of 26 miles between Madras and the South: a saving in cost of construction of $18\frac{1}{2}$ miles: and the

the benefits of a Railway, to a prosperous tract of country. On the other hand, the advantages of a Railway through Wandiwash would consist solely in a saving of distance of 22 miles for the traffic between Sindivanam and Arcotum, but with greater length of 26 miles to Madras, and greater general length of line of $18\frac{1}{2}$ miles.

From Sindivanam to Villaputram, the line is nearly straight, following the general direction of the high road; and Villaputram is a fixed point from which the branch is required to run to Pondicherry, to meet the wishes of the French Government and to secure the annual grant.

of Rs 8,000 for twenty years. To the South of Villupuram, several routes are suggested. The first, the shortest, ends at the North bank of the Panar river, avoiding the necessity of the two rivers intervening along the road to Cuddalore. The second, $22\frac{1}{2}$ miles in length, involves the bridging of the Panar, at an approximate cost of 1,80,000 Rupees, and terminates at the Civil station Munjacoopuram; this is the line that has been surveyed. Neither of the above lines however, come into the town of Cuddalore, nor do they reach the coast. (Captain Smith shows another feasible line, crossing the Panar, as in No. 2, but thence

56/121
thence running on, in a straight line to cross the Guddalam river, and enter Cuddalore itself. Between Villupuram and Cuddalore, there are no villages of any consequence, but a few miles to the West, there are the large villages of Panruthi and Tiruvady. Through these the 3rd route, is taken, dotted black on the map; it crosses the Panar in its two branches, and turning to the East from Tiruvady comes upon the Guddalam river, in the same reach as the straight line described above from Villupuram, and terminating likewise, in the town of Cuddalore.

In the event of the
Carnatic Railway being hereafter
extended to the South, the third line
would effect a saving in distance
of some 8 miles for the junction
between Pururuthy and Cuddalore 16
miles in length, would become a branch
from the main line, instead of the
longer line No 2 which if modified
to run into the town of Cuddalore becomes about
24 miles in length. Thus on the three
grounds of advantage, of access to
Cuddalore and the sea shore, of
serving the 2 larger villages, and of
anticipating the possible extension
of the Railway towards the Tanjore
District.

571-22
District, I think the 3rd route, is
the one that should be selected.

In the Summary of
1. Abstract estimate of the cost of
construction, per mile, Mr. Dibbler
shows the cost to be approximately
Rupees 66,263. The cost of earthwork
Rupees 4,288 per mile, and that of
masonry Rs 2030, appear to be low,
when compared with other lines;
but from the nature of the country,
embankments and cuttings are both
very moderate; and masonry is
reduced by girder openings being
provided, and not arched bridges.
The estimate in its rough state, does
not differ much, from that put
down

down by Messrs Sir C. Fox and G.
Wesley in their report of June 1866
at £7,000 per mile.

G.O. No 529
dated 17th Febry
1869.

In the notes of traffic,
that accompanied the same extract
of report, the returns from the same
are thus estimated

Goods as per Pondicherry pamphlet
57,898 tons annually,

Passengers as per Captain Connell's
report to Sir C. Trevelyan 4,00,000
annually

Goods 57,898 tons, 110 miles at 16 pie
per ton per mile per annum — 5,20,731

Passengers 4,00,000, 110 miles at
4 pie per mile, per annum — 8,16,630.

Yearly gross earnings 14,47,361

56 11 26
Deduct 4.5 percent for working expenses — 651,312

Leaving net earnings yearly — 7,96,049
or £ 79,604-18s net earnings on £
800,000 outlay, representing £ 9-17-6
per cent. per annum.

There must be some
fallacy in these figures, unless the
passenger traffic is to be exceptionally
heavy; for on the other lines, the receipts
from goods are considerably in excess
of those from passengers. The receipts
from passengers however are put down
at 4 pie per mile: whereas the third
class rate is now 3 pie: and the 687,472 should be substituted for
9,16,630, when the net earnings would
give £ 8-7-6 interest on the Capital.

The

The deduction for working expenses is also taken at 45 percent: but it might perhaps be more correct to assume 53 percent, which is the rate that has been estimated for the Madras Railway for next year. The length of the Line now surveyed is 10.8 miles: that recommended, as the third route, will be about 11.4 miles long: but for comparison with the calculations given above, the outlay may be taken at the same sum, £800,000, and the mileage at 110.

Now if it be supposed that there is a uniform traffic, in both passengers and goods, mile for mile,

on the Madras Railway: the returns from 110 miles, would be in the proportion of 492 to 110: and taking the actual results for the year 1869, these would be receipts from

Goods 63,547 tons	534,936
Passengers 3,70,002	331,141
Yearly gross earnings—	866,077

Deduct 53 percent for

working expenses—	459,020
net earnings	407,057

or £49,705: representing £5-1-8 per cent per annum on the outlay of £800,000.

The tonnage of goods and number of passengers, thus exhibited,

do

P.W. 1871 Dept
 Proposed for March
 From No 751
 The Ag. Commr. Engineer
 for Railways

To The Secretary to Govt
 P. W. Dept
 St. George

Dated 16th February 1871
 Recd 18th

No 78.
 Enclosure 2. 9/13 Plans.

Submitting a
 map of the country between
 Conjeram and Cuddalore
 with trial surveys and
 sections and a report from
 the Chief Engineer of the
 Carnatic Railway Company.
 No 910-27 March 17

No 646

Recd 17th March 1871
 615 March 17

Letter from the Government of India
 dated 17th September 1870 No 1588.

I am decidedly
 in favor of the
 narrow gauge &
 connection of the
 line with the Madras

I am sure
 that the Company
 will yield if it
 be shown to them
 that by adopting
 the narrow gauge
 their profits will
 be very much less
 than those of the

Circulated for orders
 with previous correspondence
 and with the Carnatic
 Railway Company's
 contract.

It will be observed
 that the alteration of the
 existing line from a 5-6"
 to a 5-6" gauge between
 Conjeram and Conjeram
 is stipulated, and that
 the contract therefore pro-
 vides for a Railway
 of the Indian gauge.
 No contract appears to

V. Chandrasekhar

W Dept
No 910

Proceedings of the Madras Government
Under date the 27th March 1871
Read the following

From the Government of India / S. E. No 1538 of 27th Sept 1870
From the Ag. Engr. for Railways / do " 78 " 16th Feb 1871.

N.
A. A.
I. O. S.

The Acting Commr.
- Acting Engr. for Railways
submits, for the consideration
and decision of Government,
the questions, firstly, of
the direction in which the
proposed extension of the
Carnatic Railway should
be carried, between Conjee-
-varam and Tindivanam,
taking these two places

as fixed points and assuming
that Arcunum shall be the
northern terminus, and secondly
the direction in which the
line should be taken
from Villupoorum (or Beloor)
to Cuddalore.

2 When the general
subject of railway exten-
sion was under conside-
ration, the Govt. expressed
an opinion that any
prolongation to the
southward of the Arcunum
and Conjeevaram line
that might be undertaken
should be carried through
Kandivach, Pindivannam
and Viceravandy, that

being the direct line and one
which would open out to the
most advantage the interior
and at present lies across the
portions of the South Arc
District, and place them in
direct communication with
the sea board. An exami-
-nation of the country has
however led not only the
officers of the Tramway Com-
pany (now absorbed into
the Carnatic Railway Company)
but also the Consulting
Engineer, to the opinion that
the preferable direction
is by the circuitous route
of Wallajahabad and Chinn-
gipat, and accordingly

the Engineers sent out by the
Carnatic Railway Company
to survey the country for the
proposed extension have
confined their operations
almost exclusively to this
line, and have completed
the trial survey, which
the Consulting Engineer
has now submitted with
the explanations of the Chief
Engineer and his own re-
marks.

3 The questions as
now submitted come before
the Government under very
different conditions from
those which attended them
when they were last under
consideration.

52
consideration. The Govt.
were then led to suppose that,
by the terms of the contract
which had been entered into
between the Secretary of State
and the Carnatic Railway Compa-
ny, the Indian standard,
or broad gauge had been
fixed upon as that on
which the Company should
construct the extension of
their line to Suddalore, and
that the Govt. of Pondi-
cherry made it an abso-
lutely essential con-
dition of their making
a branch to that place
that a junction should
be formed with the Madras

the Railway at Arcunum.

C 4 The Despatch from
to the Secretary of State of
for the 4th August 1870 at 48,
C as well as the letter of the
a Govt. of India under date
for the 17th September 70
at 1588 R, with which that
Despatch was communicated
to this Govt., shows however
that the question of gauge
is still open, and that,
in the interests of econo-
m-
in-
to
the
a
to
cannot be accommodated

53
at a less outlay than is
involved in the construction
of the line as a first class
railway on the broad gauge.
This being the case, the Govt.
gladly fall back upon
the views which they from
the first have entertained
that the circumstances of
the Shingleput and Santh
Arcot Districts are not
such as to require the
accommodation of the
more expensive form
of railway, and that a
simple extension of the
line which unites Arcu-
-num with Conjeevaram

on the narrow gauge system
would amply suffice for
all the requirements of
the country. After the
fullest consideration
the Govt. see no reason
to change their views,
and as they are called
upon again to express
an opinion on the question,
they have no hesitation
in deciding in favor
of a narrow gauge,
which, His Excellency,
the Govt. in Council is
satisfied, will be
fully capable of
affording all the facilities

to traffic that the country
is in need of, and which,
not only cheaper as
regards first cost, but
also in working on clay,
is likely to yield returns
which could in vain be
looked for from a first
class broad gauge line.
As regards the
direction in which the
extension should be
carried the Govt. observe
that it seems to be con-
clusively shown that
the route from Conjevaram
by Pandivach to Ludi-
vanam, though the most

direct and the one most
(likely), from its inland
position, to open out
new sources of traffic,
does not offer such favorable
prospects from a traffic
point of view as the more
circuitous route by Walla-
jabad, Chingleput and
Caroongoorly. It is evident
that the traffic of the
Districts to the south of
Madras flows towards
the Presidency in the direction
of the Southern Trunk Road,
and it is manifestly
desirable that the ten-
dency of that traffic

would offer no facility
to the traffic from
the south to the
capital

85
would determine the
alignment of the Railway.
This is so obvious as to
make it questionable
whether the line, instead
of taking the circuitous
route by Conjevaram
and Arcunum, should
not be carried straight
from Chingleput into Madras.
To take the Railway
round by Arcunum would
appear to be a needless
and an unprofitable out-
lay of money. The inter-
mediate country is poor,
and the detour will cut
off all the traffic from
the south; the direct

distance from Chingleput
 to Madras being 35 miles,
 while by Arcoum it
 will be 82 1/2 miles. It will
 clearly be cheaper to
 cart produce from Chin-
 gleput, and from all
 places to the south of
 it to Madras than to
 send it round by rail
 by Arcoum and en-
 counter the expense at
 Madras of transporting
 it from the Railway
 station to the mer-
 chants' warehouses,
 to which the cart
 would take it at
 once

I doubt this & would
 write "I".
 A. V.

I would say - "from
 places within a cer-
 tain distance from
 it ~~to the south of it~~"

S. D. S.

once.

For these reasons the
 Govt are of opinion that,
 adopting the direction of
 the Great Southern Trunk
 Road as the line in all
 respects most advantage-
 ously situated for
 affording the fullest
 accommodation to the
 wants of the country, the
 Carnatic Railway should
 follow the general align-
 ment of that road,
 starting from Madras
 instead of Arcoum
 and running by or through
 Chingleput, Caroorgooly,
 Vervandy, Villupuram
 and

and Pannooty, from whence
 it should be carried
 to Suddalore by the route
 indicated in yellow on
 the map and described
 as route in Mr. Dible's
 report. By following this
 somewhat indirect route
 from Villupuram, instead
 of one of the shorter lines
 that have been surveyed
 to Suddalore, ~ addi-
 tional bridgework will be
 necessary, but this
 will be no disadvantage
 as the bridging of the
 Ponnai and Guddelem
 will serve the prolongation
 of the line which will be
 required to form a

junction with the Great
Southern of India Railway.
This extension cannot, in
the opinion of the Govt., be
long delayed, and op-
portunities should not
be neglected of exami-
ning the country with a
view of selecting for it
the most favorable route
through the rich and po-
pulous country to the
South.

As regards the effect
the change of gauge and
of the direction of the
Railway may have on the
action of the Govt of Pon-
dicherry with respect to
the construction of a branch

d
to that place from Villu-
-poorum, His Excellency the
Gov^r in Council observes
that, even if these points
had not to be deter-
-mined solely with a
view to local interests
and the benefit of Her
Majesty's Territories,
circumstances have greatly
altered since the French
Gov^t stipulated for
the broad gauge being
adopted by the Carnatic
Company and for an
inland terminus at
Arcorum. His Excellency
in Council has moreover
reason

(This is too far)

with reference to
gauge the French
Government will not
raise

question of direction is
one much greater
difficulty will ^{probably}
occur. This Gov^t has
heated the question by
an English point of view
it remains for the Gov^t of
India and the Secretary
of State to determine
whether the interests
of the Gov^t of
France would justify
a ~~connection~~ ^{a short}
~~independent~~ connection
with the Madras Railway
at Arcorum. N.

to believe that ^{neither}
as to gauge nor as to the
direction in which the
line may be carried
with the French Gov^t ^{France}
any such objections as will
materially interfere with
the negotiations of the
Company with that Gov^t
for the construction of a
junction-line ^{to Pondicherry} upon mutu-
-ally favorable terms. 9
The trial survey
should be completed with
all speed from Chingleput
to some convenient central
spot for a terminal sta-
-tion in Madras, and
should be laid before
Gov^t without loss of

time in order that the
sanction of the Govt of
India to the proposed
alteration of the loca-
tion may be obtained.

This alteration will leave
the existing short length
of Railway from Arcunum
to Conjeevaram, a detached
line, but the Govt do not
think that it should be
abandoned. ^{as they are of}
^{opinion that it should}
be maintained so long
at least as it can be

made to pay its working
expenses, and it is ~~not~~ ^{improbable}
(~~improbable~~) that ~~some~~
~~future time~~ it may be
found

at first

omit

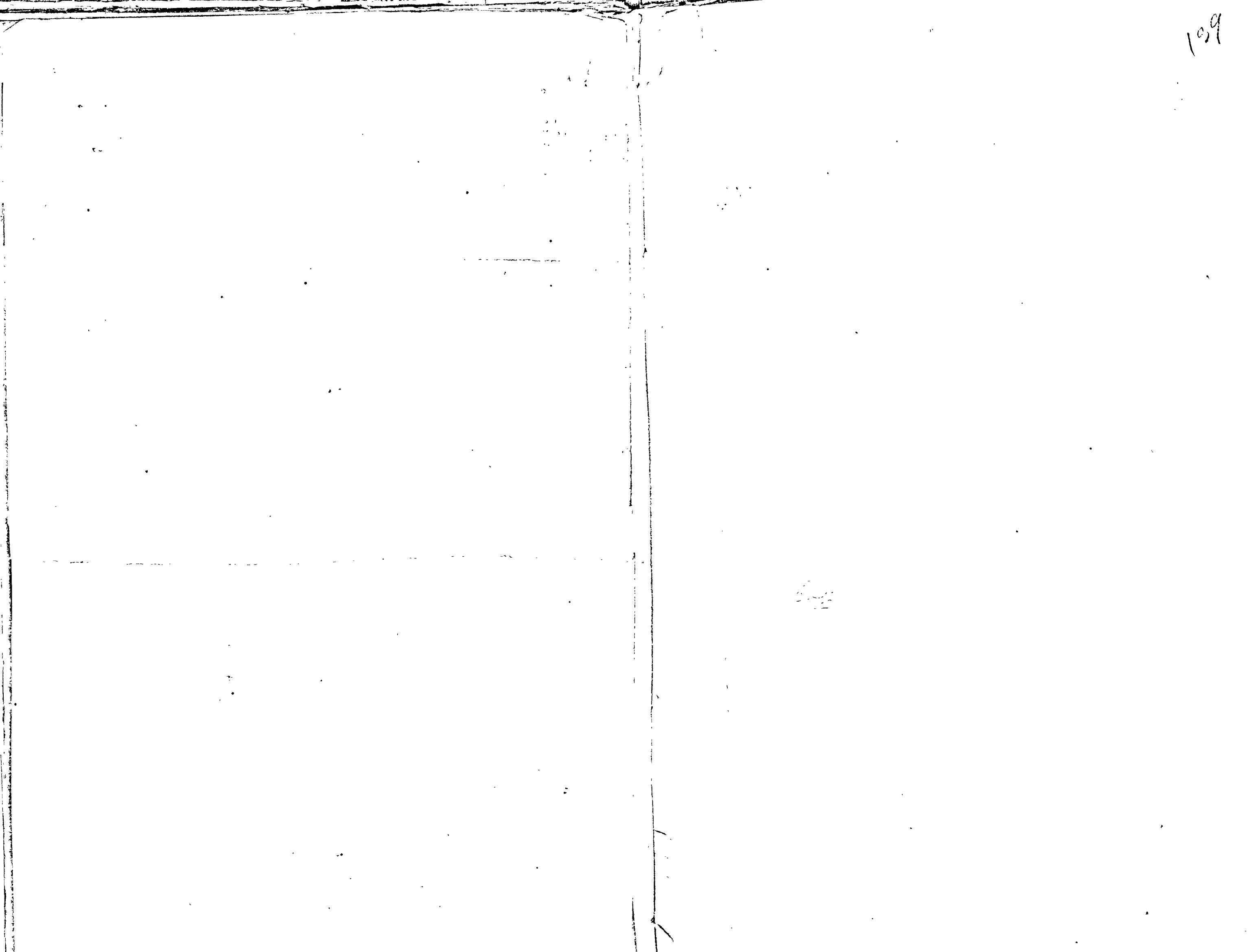
(in deference to the
desire of the Govt of
France)

I would not hold
out any inducement
to make this project
being satisfied that
it never can long be
in line to grow as
the cost has ^{steadily}
I feel very strongly
that we ought not
to burden our subjects
unnecessarily by the
the French Govt

To the Govt Engineer
for Railways with
12 plans

found advisable ^{Engineer} to
connect it with the main line
at Chingleput via Wallajah
or at Tindivanam via
Kandivash. The Govt must
also admit that a head
line in this direction would
be ^{most} ~~very~~ ^{advantageous}
to the interests of British
territory ^{as it would}
open up a direct
communication between
the South Arcot District
and the North Arcot
District without making
the detour by Madras.

Sd/-y C. J. de Silva 27/3/71
Sd/-y C. J. de Silva 28/3/71



Pao 16 May 1879 No 385-386
 " 17 Feb 1879 — 471-472
 " 9 Feb 1879 — 169-171

38392751

Gold of 1871 Madras.

73/1

73/1

PUBLIC WORKS.

The Ag Consulting Engrs
for Railways

Further Pao No 939-940 of 20.3.79
 " 1235 — 4-5-79
 " 1415 — 23-5-79
 " 1772 — 27-3-79

Date

Recd.

No. 3

G. O. 27 March 1879 No. 910.

Nos. 646 & 647

Carnatic Railway. Papers
 orders in papers relating to the
 direction in which the pro-
 posed extension of the Carnatic
 Railway is to be carried to
 Chaddalore.