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MADRAS RECORD OFFICE.

Government of Madras.

Public works DEPARTMENT.

G.O. No. 3264	Press ~~Mis.~~
437-37.	
Dated 21-10-1867	

Not to be folded or roughly handled

10

Proceedings of the Madras Government, Public Works Department,
21st October 1867.

Read the following papers:—

No. 437. From the Secretary to the Government of India, Public Works Department, (Irrigation,) to the Secretary to the Government of Madras, in the Public Works Department, dated Simla, 18th September 1867, No. 147 I.

1. I am directed to acknowledge the receipt of your communications, Nos. 1,845, dated 20th June, and 2,359, dated 5th August last, submitting a project for the extension of irrigation from the Pennair anicut, in the Nellore District, at an estimated cost of 4,12,100 Rupees.

2. This being the first project of importance received from Madras since the Government has declared its readiness to allow of approved works of irrigation being carried out with money obtained by loan, the Governor General in Council directs me to take the occasion of making a few remarks as to the manner in which projects for works so to be constructed should be sent up for sanction, and as to the views which the Government of India adopts in dealing with those projects.

3. The Government of Madras will be furnished, in a few days, with a full statement of the measures which the Government of India considers it necessary to take in proceeding to give effect to the determination to supply funds by loan for Irrigation Works. For the purposes of the present discussion it will suffice to say that, among the conditions which the Secretary of State has prescribed for determining the character of works which may be assisted by loans, are the following:—That the work should be shown to be satisfactory in an engineering point of view; that its estimated cost should be reasonable; and that there is a fair prospect of its being properly remunerative. Further, the responsibility for seeing that these conditions are complied with, is, by the same high authority, placed on the Governor General in Council.

4. It will be apparent that the Government of India can only approach the examination of the technical and fiscal character of projects sent up for its approval, on which it is bound by its duty to give a judgment, through the medium of its professional advisers. It is also plain that in such matters the only effectual means a Government has by which to protect itself, is to place a full personal responsibility on the officers on whose advice works of importance are undertaken.

5. These considerations have led to the adoption by the Government of India of the practice of requiring the Secretary in this department, or some other superior officer, to review, in a complete manner, every project of importance submitted for sanction, and to record distinctly his conclusions regarding it. In like manner the Government of India

* See more particularly Circular No. 123 of 1862. has, from time to time, prescribed,* to local Governments and Administrations

the necessity for adopting a like course before accepting any project of such magnitude as to require the approval of the Government of India. In the Provinces more immediately under the Government of India this practice has been generally adopted, but the Government of Madras does not seem to appreciate what the Governor General in Council considers an essential security for the due scrutiny of large projects, and for fixing personal responsibility on the professional advisers of the Government.

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6. With reference to Irrigation Works, the newly appointed Inspector General of Irrigation Works, in accordance with the views expressed regarding his functions in Public Works Resolution No. 60, dated 2nd July 1867, will henceforth, as a rule, be required to report on all new projects. He will be held fully responsible to the Government of India for the character of every work which he recommends for their sanction. He must satisfy himself by careful examination into the details of the projects put forward, that the essential requirements before-mentioned are fully met. He will of course receive with proper attention the opinions of the local Engineers by whom the projects are prepared and approved, but such opinions cannot be prescribed to him as authoritative, even if they have been accepted by the local Government. The Government of India cannot assent to the position that in dealing with works to be carried out by borrowed money, it will suffice to be satisfied that there is no very obvious objection to what is proposed by the local Officers, with the approval of the local Governments. The grounds for final sanction in these cases must be positive, and not negative only.

7. There must be complete direct proof in the designs, or in the reports submitting them, that the project is what it is represented to be, in all respects, and the data furnished must have these characteristics, or the Inspector General will be justified in declining to support any scheme, whatever may otherwise be its probable merits.

8. The Governor General in Council believes that in fact, there should be no sort of difficulty in sending up projects in a form which shall meet these demands. It will always be the wish of the Government of India to give its assent to proposals for the extension of irrigation, and it may fairly be presumed that such also will be the desire of the Inspector General. Further, it will be the obvious duty of the Secretary in the Public Works Department to indicate, and of the Governor General in Council to check, any disposition which may appear on the part of the Inspector General to take captious objections, or to require detailed information on points of minor importance, and should occasion require it the Government of India will not hesitate to give its sanction to undertakings on its own judgment alone. The discretion of the Government of India is of course in no degree limited by the advice of the Inspector General or of its professional Secretary, though, as a rule, that advice may be considered sound, and therefore be adopted by the Government.

9. I am, therefore, again to request that the Government of Madras may, for the future, require their Chief Engineer and Secretary in the Public Works Department, to record his opinions in due detail on all the more important elements of any irrigation project sent up for the sanction of the Government of India, so that a complete personal responsibility may be placed on him, for all advice he gives in connexion with any project, in an open and indisputable manner, to which reference may at any time be made. If his opinion is adverse it should be forthcoming, even if it be set aside by the Government. The report of the Chief Engineer on every such project should contain a review of its engineering features, as well as an examination of the probable profits to be derived from it. The necessity for preparing such a report will commonly ensure the submission of the project to the Government of India in a form which shall obviate the necessity

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of any further inquiry on any point. For ready reference a copy of Circular No. 123 of 1862 is annexed.

10. The Government of India has already intimated its readiness to strengthen the Public Works Department at Madras by the appointment of a Special Chief Engineer for Irrigation Works, who shall also become Joint Secretary, in the manner which already obtains under the Governments of Bombay, Bengal, the North-Western Provinces, and the Punjab. The adoption of this arrangement should entirely meet all difficulties arising either from the extension of the Irrigation Works, which the Governor General in Council trusts may soon form a marked feature in the operations of the Public Works Department in all parts of India, or from any increased labor which might otherwise have been put on the head of the Madras Public Works Department, by the requirements which it has been found necessary again to make, and due compliance with which the Government of India must, under present circumstances, especially request for the future.

11. Turning now to the project submitted for present consideration, I am directed to observe that, on a reference to the Inspector General of Irrigation Works, he has stated his opinion that although the designs have obviously been prepared with much care, and the project may very possibly be quite unexceptionable, yet the data on which it is based are so imperfectly explained, that he does not accept the responsibility of recommending it in its present position. On a careful examination of the grounds assigned by Colonel Strachey, the Governor General in Council, with much regret, feels constrained to withhold his sanction to the project till the doubtful points are cleared up. The following remarks will indicate what these are:—

12. The general nature of this project is simple. It is to draw off from the Pennair anicut a portion of the surplus water which now runs off to waste, and to store it in a reservoir which is to be enlarged for the purpose. The existing main supply channel is increased in capacity to admit of the additional volume of water passing down it.

13. The account of the project by the Superintending Engineer, first sent up, is little more than a statement of what is proposed, in which it is assumed that the main features are suitable, instead of giving a proper description of the projected works and explaining the precise grounds on which the details have been arranged. The description of the project by the Executive Engineer who drew it out, was not included among the papers first forwarded. It was asked for, and it throws a little more light on the scheme, but it also is much more a statement of conclusions come to, than of the grounds on which they were arrived at.

14. Taking a general view of the whole subject of the extension of irrigation from the Pennair anicut, the first question which naturally suggests itself, is, does this project deal with the matter in a complete manner, and in the best manner possible? Does this project apply the *whole* of the available water supply now in excess of present wants? If not, why should not the whole be dealt with at once?

15. As there seems to be an excessive fall in the irrigating channels, it is likely that if there be more water at command the proposed new channel could be carried further to the west and made to command more ground.

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16. These questions have no light thrown on them by the papers before the Government at this time, but it is necessary to ask them.

17. It is said, incidentally, that it is not likely that these canals should ever be used for navigation. No reason is assigned for this, and in the absence of any reason, the expediency of constructing the works so as to prevent the possibility of navigation may be questioned. Considering that the canal projected would have a greater or less volume of water in it for fully five months in the year, the value of navigation could not well be disputed.

18. The project is carefully prepared in its details, and no doubt the Engineer had his reasons for all he proposes. It is unfortunate that he should have given so few of them in his report.

19. The first thing proposed is to increase the head sluices on the south flank of the anicut, and to enlarge the main irrigating channel, so as to admit of a discharge of 255,900 cubic yards per hour, instead of 145,000 cubic yards, the original volume. Why this quantity is fixed on in preference to any other is not alluded to. How the exact nature of the alteration to the head sluices, and the addition to them, have been determined is not referred to.

20. Of the increased volume, amounting to 110,900 cubic yards per hour, 6,373 cubic yards is given to the first branch canal, Jaffer Sahib's, and 8,772 cubic yards to the second, or Kistnapatam canal. Why these particular quantities are fixed is not referred to. Nor is it said whether the water is wanted in those canals, or that it will extend irrigation, or that the canals, as now existing, can carry, in the first case, an increase of one-eighth, and in the second of one-third, as proposed. Nor is it shown how, without increased head or depth, the volume of these branch canals can be increased.

21. But it is further to be asked whether the river will really supply this additional quantity of water. On this essential point not a word is said. There is nothing to show what is the discharge of the river when the water is flush with the crest of the anicut, nor with any greater or less depth. It is shown that on an average of five years the water has risen to the crest of the anicut, or above it, for sixty-one days in the year between May and December. But this of course refers to the anicut as it is, and is based on the existing size of the irrigating channels. If these are enlarged considerably as proposed, the depth of water on the anicut will, of necessity, be reduced in a corresponding degree. Perhaps in calculating the discharge of the channels this has been allowed for, but no reference is made to the point.

22. Again, it not being stated what is the volume discharged when the river is flush with the anicut crest, it is not possible to say whether, with this volume, there is any excess of water not required for the existing irrigation. The whole of the calculations essentially depend on these points, regarding which nothing is said.

23. Following the figures given, it appears that the existing Surrapully canal carries a volume of 69,119 cubic yards per hour, and that the enlarged channel will carry 164,875 cubic yards, or an addition of 95,756 cubic yards. This probably means the absolute maximum volume, with a maximum fresh in the river, which seems to be about five feet on the anicut. The volume, with the water

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level with the crest, is stated to be (for the enlarged channel) 131,125 cubic yards, or an increase of 62,000 cubic yards over the old supply.

24. This increased volume, it is said, will be got by increased depth as well as breadth. It may be supposed that the calculations of discharge are properly made, but none of them are given.

25. Reference may be made to the annexed extracts from the Inspector General's Report, paragraphs 17 to 21, as to the capacity of the reservoir and the probable area of irrigation from it. On the whole, the supply said to be available would seem to be sufficient to irrigate 20,000 acres below the tank, and adding the other 10,000 acres, otherwise provided for, or assumed to be provided for rather, and the 12,000 acres from the other calculation, we have 42,000 acres as the whole area that could be watered. But this, it must be noticed, is not all gain, for we have already a volume of a little over 69,000 cubic yards per hour in the old channel, which at the rate of $2\frac{1}{4}$ yards per acre, would give about 30,000 acres as the present irrigated area. There is nothing to show, however, what the *actual* area is which is irrigated from the channel as it now exists. There is, it is true, a return showing the whole area within reach of these new works, from which it is seen that 16,000 acres are now irrigated from some source or other in this vicinity. If this be taken as the existing irrigated area due to the 69,000 cubic yards present supply (probable maximum and not mean), instead of 30,000 acres as above reckoned, the estimated increase of area irrigated will be 26,000 acres, which is nearly what the Executive Engineer reckons.

26. These conclusions, however, are of necessity exceedingly speculative, and they only show that there is a plausible case to be made out in favor of the project on the data submitted. If 25,000 acres be accepted as the increased irrigated area, it being stated that 47,000 acres are at present available for irrigation, and if the water rate be taken at 4 Rupees per acre, the gross income would be 1,00,000 Rupees yearly. From this must be deducted, however, for maintenance, &c., say 12 Annas per acre, or 18,000 Rupees, leaving 82,000 Rupees net on an estimated outlay of 4,12,000 Rupees, being about 20 per-cent. Considering that this result is obtained by help of the anicut, the cost of which, and of the old channel and other works still utilized, are not reckoned in the capital on which the profit is calculated, it seems no more than is reasonable to expect. It would have been more satisfactory if the whole cost of the entire system of works, with existing and expected income, had been also stated.

27. It may be remarked that no credit is taken for the increase of supply given to the two upper branch canals. Also that the estimate includes head sluices to these two canals, which works are not really parts of the tank supply project. This would somewhat reduce the cost of the separate scheme for the tank supply; but as the accounts of the income of the whole of the works will be kept together, it is not necessary to go into such details, though here again the propriety of taking a general view of the proceeds of the whole system of works is indicated.

28. As to the details of the works, Colonel Strachey has made certain comments which will be found in paragraphs 26 to 34 of his Report, annexed, to which attention is also requested.

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29. There is one other point to which I am to refer in relation to the general system of irrigation in the Pennair delta. It is, whether there is not generally considerable waste of land from the number of *small* reservoirs, and whether a saving could not be got by raising the water level and capacity of a few and suppressing the rest, in the manner proposed for some of the minor tanks below the large reservoir projected.

30. In conclusion, the Governor General in Council observes that the Madras Government has given authority to commence this project, within the sum assigned in the Budget of this year, in anticipation of the sanction of the Government of India. This cannot be approved. If projects are to be sent forward to the Government of India under the assumed conclusion that they must be sanctioned, and on such an assumption if they be begun without regular authority, it is plain that their submission becomes an idle form. If the desire of the Government of Madras is only to permit the preparation of materials for the works, the Government of India has no objection to such an arrangement, within the limits of Budget sanction.

Extracts from a Note by the Inspector General of Irrigation Works, dated the 23rd August 1867.

Paragraph 17. It is said that the supply of water coming down the improved canal will be available for 4,000 acres on the main canal above the tank, for 6,100 acres on a subsidiary channel called the Walluru, and the rest for 19,900 acres below the tank. Allowing $2\frac{1}{4}$ cubic yards per hour per acre the 4,000 acres will require 9,000 cubic yards, and the 6,100 acres 15,700 cubic yards, leaving 108,425 cubic yards per hour for the rest. This is with reference to the volume with the river level with anicut crest. But, for the sixty-one days assumed as the period during which there will be a sufficient supply to rise up to the crest, the water, I find, will average about 9/10 foot above the crest, and the supply will be more than the quantity above given. If we add 1/10 to the volume it will allow say 120,000 cubic yards per hour as the average discharge for the sixty-one days available for the tank, and the irrigation to be supplied from it, which we may call in round numbers 20,000 acres.

18. The 20,000 acres will require at $2\frac{1}{4}$ cubic yards, 45,000 cubic yards per hour. During the sixty-one days, therefore, after supplying this quantity, there will remain 120,000 cubic yards less 45,000 cubic yards, equal 75,000 yards per hour available to be stored in the reservoir.

19. In order to estimate the probable working of the scheme proposed, I have calculated from the data given that the distribution of the sixty-one days of excess discharge will be as follows:—

	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.
Days	1	3	1	9	15	13	11	8

I shall then assume that the irrigation begins in August and lasts till the end of December. We, therefore, have five days' full supply available before the 1st August, and after this there will be for the several months.

August,	9 days excess, and 22 days deficient
September,	15 " 15 "
October,	13 " 18 "
November,	11 " 19 "
December,	8 " 23 "
Total...	56 " excess, 97 "

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This will give the following results:—	Cubic yards.
To 1st August 5 days full supply at 120,000 yards per hour, or 2,880,000 yards per day	14,400,000
Add 9 days in August at 75,000 yards per hour, or 1,800,000 per day	16,200,000
	30,600,000
Deduct 22 days at 45,000 yards per hour, or 1,080,000 per day ..	23,760,000
Tank balance, 1st September...	6,840,000
Add 15 days as above September	27,000,000
	33,840,000
Deduct 15 days	16,200,000
Tank balance, 1st October ..	17,640,000
Add 13 days as above October	23,400,000
	41,040,000
Deduct 18 days	19,440,000
Tank balance, 1st November...	21,600,000
Add 11 days for November...	19,800,000
	41,400,000
Deduct 19 days	20,520,000
Tank balance, 1st December...	20,880,000
Add 8 days at 1,800,000 yards per day for December	14,400,000
	35,280,000
Deduct 23 days at 1,080,000 yards	24,840,000
Balance, 1st January ..	10,440,000

Showing a residue of about 10 millions cubic yards, which would suffice to cover waste from evaporation, &c.

20. It will be seen from these figures that the balance at the end of no month exceeds about 20 millions cubic yards, and that the greatest accumulation does not seem likely ever to go to 40 millions cubic yards. The actual capacity given is stated to be 52,600,000 cubic yards, though here too the calculation is not sent forward, nor the grounds for determining the capacity assigned to the enlarged tank.

21. It must be remarked that the above calculation of mine assumes, in the absence of all needful data, that the supply when the water falls below the crest of the anicut is reduced to nothing, which obviously is not the case. If the supply with the water level with the crest is 131,125 cubic yards per hour, it may be fair to regard the average supply when the water is below the crest at half of this quantity, or say 65,000 cubic yards. This supply would be available for about ninety days, and after deducting the quantity required for the 10,000 acres separately provided for, there would be 42,500 cubic yards left, which might be estimated as sufficient for 12,000 acres more.

26. The slope of the canal bed seems to be needlessly irregular, which is objectionable. The velocity seems too high, being over 3 feet per second in some places so far as I can gather. The banks are protected, but the bottom will erode in all probability with such a current. The proposal to leave the water to run loose over the country on one side of the canal is very objectionable, and a suitable bank should be formed on both sides. The bank top in the upper part of the canal should, in my estimation, be made wider, at least 10 or 12 feet, so as to serve for a road. This should any how be done on one bank. The width given to the top of the banks is only 6 feet. I am

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aware that this has been the fashion in these Delta works, but from what I saw at the Godavery, I am satisfied that it is not enough. The extra width may be got by reducing the height a little, and need cause no extra expense worth speaking of.

27. The roads over the masonry works on the canal banks are in like manner all too narrow, and should, I think, be increased to 10 or 12 feet, so as to admit of carts crossing safely.

28. There is nothing to show the data on which the capacities of the various channels have been calculated. This applies to the whole of them. The Walluru canal seems too large if it is only to carry 13,700 cubic yards per hour.

29. The necessity for the iron aqueduct is not shown. Could not the land be irrigated from the left bank of the new canal? The piers for these works seem needlessly heavy, obstructing the waterway greatly.

30. It is presumed that proper consideration has been given to the waterway of the aqueduct under the canal near Kanupurtipadu. Such a point should have been noticed.

31. The reservoir slope pitching seems needlessly costly from the slope being too flat. It might quite safely be reduced to one base to one height, and the thickness at bottom seems needlessly great.

32. There is nothing to show what has determined the height to which the embankment is raised, or the capacity given to the tank, or the extent of the escape weir. There is nothing to show that the tail of the escape weir is secure.

33. No allusion is made to the possible condition of the supply channel when the level in the reservoir is low and a high fresh is admitted into the canal. The necessary result of this would be to increase the surface slope of the water in the canal, and therefore the velocity to what would probably be a dangerous amount, unless the soil is very firm. The point should be noticed. Possibly a masonry work may be needed at the end of the canal to regulate the surface slope.

34. In the Walluru channel the principle that has regulated the excavation within the canal is not apparent, and an economical arrangement of the balance between banks and excavation does not seem to have been adopted.

*Public Works Department Proceedings, November 1862.
General.*

Imperfect manner of submitting Projects.

[No. 52.] Circular from Lieutenant-Colonel R. STRACHEY, R. E., Secretary to the Government of India, Public Works Department, to Local Governments and Administrations, dated 29th November 1862, No. 123.

1. The Government of India having frequent cause to complain of the imperfect manner in which projects for works are submitted for its sanction, requests that greater care may be paid to the subject in future.

2. Every such project should comprise, 1st, a Report on the object and nature of the work; 2nd, the Specification; 3rd, the Estimate; 4th, the Plans. Further, the opinion of the chief professional authority of the Local Government or Administration should be distinctly recorded as to the merits of the design in an engineering point of view, and the letter to the Government of India should give a concise general review of the whole scheme, with a statement of the grounds on which the Local Government or Administration desires to support the proposal.

3. It is chiefly to the first and last of these requirements that the Government of India now desires to direct attention. The necessity for a very full discussion and consideration of the merits of every project of such magnitude as to call for its submission to the Government of India will be obvious; and it is equally clear that, to ensure such a close and searching investigation,

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the simplest and best course to adopt is to insist on the Engineer who prepares any such design submitting it in the most complete form, and giving the most complete account of the basis on which every part of his project has been framed in respect to the various considerations that have guided him in questions of engineering details, of economy of construction, or of the utility or practical working of the project when carried out; as well as to require him to state the reasons for preferring one possible plan rather than another. Besides the points noticed above, the Engineer should also consider by what agency and in what time the work may best be carried into execution, points which very materially affect the practical question of whether any work should be undertaken or not, at any particular moment.

4. The necessity for a distinct record of the opinion of the chief professional Officer of the Public Works Department is equally plain. It is by no means sufficient that the Chief Engineer should imply approval by silence. His avowed participation, so far as he is prepared to accept it, in the responsibility attaching to the proposal, is requisite, alike for the security of the local Government and that of the Government of India. There will always be many points, of local or technical detail, which must be left to the judgment of the Engineers on the spot, and in such matters the Local and Supreme Governments must trust to the professional heads of the Department.

5. The submission of every project to the Government of India with such an explanation, and in such a form as shall at once make it intelligible in all its main features, both as an engineering work, and as a work of public utility, is also very important. A design may be in itself unexceptionable, and to all Officers fully acquainted with local considerations may be obviously so, and yet, from want of attention in the manner of its submission, may fail to command the approval of the Government of India. Where a reference is made to a distant authority it is quite essential that nothing should be left to be taken for granted. The Government of India is bound, in exercising its power of sanction, to satisfy itself that the projects to which it appropriates the public funds are good and satisfactory projects, and its judgment must be formed, not on the authority of those who submit the schemes, but on the ultimate merits of the schemes themselves, as they appear in the explanatory Reports and Estimates. Were any other course adopted, the function of the Government of India in such matters would be altogether illusory.

6. The Government of India desires that it may be understood that in addressing these instructions to local Governments and Administrations, it has no wish to interfere in any way with a complete legitimate freedom of action on the part of the local Officers, whether Engineers or others. On the contrary its intention is to lead to the reduction, as far as possible, of all ground for interference, and there is no more certain way of accomplishing this end, in respect to the matter in hand, than to see that all projects are submitted in a form that shall at once show beyond question that they have been thoroughly considered by the projectors, and that shall at once enable the Government of India to appreciate and weigh the whole of the grounds on which they have been put forward by the local authorities. The number of projects that call for sanction from the Government of India is now so small, and their importance on the other hand is so great, that any additional elaboration required to ensure complete attention to the points that have been adverted to in this Circular, will, it is believed, not be practically onerous; while it most assuredly will lead to great improvement in the project themselves, as well as to the cessation of much criticism, which at present is quite unavoidable on the part of the Government of India, and very distasteful to the local authorities.

No. 438. Circular from the Secretary to the Government of India.
(Here enter No. 91, dated 18th September 1867)

No. 439. ORDER THEREON, 21st October 1867, No. 3,264.

IRRIGATION, No. 17.

1. Ordered that the foregoing letter from the Government of India, together with its enclosures, be communicated to the Superintending Engineers for their information and guidance in continuation of the Order of the 15th instant, No. 3,189.

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2. The Superintending Engineer of the 2nd Division will be requested to re-submit the project for the extension of irrigation from the Pennair anicut, accompanied with fuller information than is afforded in his letters of the 3rd May and 23rd July 1867, and with a proper description of the works proposed, and explanations of the precise grounds on which the details have been arranged. He will also be careful to notice in detail the various points to which allusion is made in paragraphs 14 to 29 of the letter above recorded, and in paragraphs 26 to 34 of the Memorandum by the Inspector General of Irrigation Works.

3. As in paragraphs 11 and 18 the Government of India express themselves satisfied with the careful way in which the project has been prepared, and in a subsequent paragraph give it as their opinion that the proposed works are likely to prove highly remunerative, the Government would be sorry to see the progress of operations abruptly suspended, and, pending a reply to the reference which will be made to the Government of India, they resolve to direct the works to be proceeded with.

4. In hereafter submitting plans and estimates for large irrigational works, the Governor in Council expects that, bearing in mind the remarks of the Government of India, the Superintending Engineers will be careful to furnish the fullest information on all matters connected therewith, and to send up the projects in such a manner as will enable this Government without further enquiry to arrive at a correct opinion of the works proposed in all their bearings, and permit of the schemes being submitted to the Government of India in a thoroughly complete and practical form, accompanied with precise and detailed explanations of the nature indicated in the papers above recorded. The preparation of projects in this detailed shape, and the collection of the information which is now required to be furnished with them, will involve considerable labor and occupy time, but as it is absolutely necessary that the orders of the Government of India should be closely followed, His Excellency in Council desires it to be distinctly understood that no project will be received which fails to meet the requirements of that Government in every particular.

5. Colonel Strachey's Memorandum will show the nature of some part of the information which the Government of India will look for in all projects submitted for their sanction, and each officer will see that it is furnished in the most copious detail.

6. It will be the duty of the Secretary in this Department thoroughly to scrutinize each project as it is received, and, in bringing it under the consideration of Government, to accompany it with such a full review of it by himself in all its details as is required by the Government of India, and as will assist this Government in forming a judgment of its character both in a professional and fiscal point of view.

7. In accordance with the views expressed by the Government of India, His Excellency in Council resolves to appoint Lieutenant Colonel J. C. Anderson, of the Royal Engineers, to be Chief Engineer for Irrigation Works and Joint Secretary to Government in the Public Works Department, with the rank of Chief Engineer of the second class, subject to the approval by Her Majesty's Government of the creation of the post, and as, under this arrangement, the duties of the Under

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Secretary will be considerably lightened, His Excellency directs that the staff salary of that appointment be fixed at Rupees 400 per mensem on its being vacated by the present incumbent and another officer selected for the duty.

(True Extract.)

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

To the Superintending Engineers.
To Captain Kennedy.
To the Revenue Department.
,, Controller of Public Works Accounts.

Exd. S. T. Augustin.

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CIRCULAR No. 91 PUBLIC WORKS.
GOVERNMENT OF INDIA.
PUBLIC WORKS DEPARTMENT.
IRRIGATION.

SIMLA, SEPTEMBER 18, 1867.

Manner in which projects for Irrigation Works, to be carried out with money obtained by loan, should be prepared and submitted to the Government of India.

Read the following :—

Extract paras 2 to 9 from Public Works Department letter No. 147 I, dated 18th September 1867.

Para. 2. This being the first project of importance received from
* * * * * since the Government has declared its readiness to allow of approved works of Irrigation being carried out with money obtained by loan, the Governor General in Council directs me to take the occasion of making a few remarks as to the manner in which projects for works so to be constructed should be sent up for sanction, and as to the views which the Government of India adopts in dealing with those projects.

3. The Government of * * * * * will be furnished, in a few days, with a full statement of the measures which the Government of India considers it necessary to take in proceeding to give effect to the determination to supply funds by loan for Irrigation Works. For the purposes of the present discussion, it will suffice to say that, among the conditions which the Secretary of State has prescribed for determining the character of works which may be assisted by loans, are the following : that the work should be shown to be satisfactory in an Engineering point of view; that its estimated cost should be reasonable; and that there is a fair prospect of its being properly remunerative. Further, the responsibility for seeing that these conditions are complied with, is, by the same high authority, placed on the Governor General in Council.

4. It will be apparent that the Government of India can only approach the examination of the technical and fiscal character of projects sent up for its approval, on which it is bound, by its duty, to give a judgment, through the medium of its professional advisers. It is also plain that in such matters the only effectual means a Government has, by which to protect itself, is to place a full personal responsibility on the Officers on whose advice works of importance are undertaken.

5. These considerations have led to the adoption by the Government of India of the practice of requiring the Secretary in this Department, or some other superior officer, to review, in a complete manner, every project of importance submitted for sanction, and to record distinctly his conclusions regarding it. In like manner

* See more particularly Circular No 123, of 1862 the Government of India has, from time to time, prescribed* to Local Governments and Administrations the necessity for adopting a like course before

To The Secy to the Govt of Madras
P.W. Department

(2)

accepting any project of such magnitude as to require the approval of the Government of India. In the provinces more immediately under the Government of India, this practice has been generally adopted, but the Government of * * * * * does not seem to appreciate what the Governor General in Council considers an essential security for the due scrutiny of large projects, and for fixing personal responsibility on the professional advisers of the Government.

6. With reference to Irrigation Works, the newly appointed Inspector General of Irrigation Works, in accordance with the views expressed regarding his functions, in Public Works Resolution No. 60, dated 2nd July 1867, will henceforth, as a rule, be required to report on all new projects. He will be held fully responsible to the Government of India for the character of every work which he recommends for their sanction. He must satisfy himself by careful examination into the details of the projects put forward, that the essential requirements before mentioned, are fully met. He will of course receive with proper attention the opinions of the local Engineers by whom the projects are prepared and approved, but such opinions cannot be prescribed to him as authoritative, even if they have been accepted by the Local Government. The Government of India cannot assent to the position that, in dealing with works to be carried out by borrowed money, it will suffice to be satisfied that there is no very obvious objection to what is proposed by the local Officers, with the approval of the Local Government. The grounds for final sanction in these cases must be positive, and not negative only.

7. There must be complete direct proof in the designs, or in the reports submitting them, that the project is what it is represented to be, in all respects, and the data furnished must have these characteristics, or the Inspector General will be justified in declining to support any scheme, whatever may otherwise be its probable merits.

8. The Governor General in Council believes that, in fact, there should be no sort of difficulty in sending up projects in a form which shall meet these demands. It will always be the wish of the Government of India to give its assent to proposals for the extension of irrigation, and it may fairly be presumed that such also will be the desire of the Inspector General. Further, it will be the obvious duty of the Secretary, in the Public Works Department, to indicate, and of the Governor General in Council to check, any disposition which may appear on the part of the Inspector General to take captious objections, or to require detailed information on points of minor importance, and should occasion require it, the Government of India will not hesitate to give its sanction to undertakings on its own judgment alone. This discretion of the Government of India is of course in no degree limited by the advice of the Inspector General, or of its professional Secretary, though, as a rule, that advice may be considered sound, and therefore be adopted by the Government.

9. I am, therefore, again to request that the Government of * * * * * may, for the future, require their Chief Engineer and Secretary, in the Public Works Department, to record his opinions in due detail on all the more important elements of any irrigation project sent up for the sanction of the Government of India, so that a complete personal responsibility may be placed on him, for all advice he gives in connexion with any project, in an open and indisputable manner, to which reference may at any time be made. If his opinion is adverse it should be forthcoming, even if it be set aside by the Government. The report of the Chief Engineer on every such project should contain a review of its engineering features, as well as an examination of the probable

(3)

profits to be derived from it. The necessity for preparing such a report will commonly ensure the submission of the project to the Government of India in a form which shall obviate the necessity of any further enquiry on any point.

ORDER.—Ordered, that copies of this Extract be forwarded to all Local Governments and Administrations for information and guidance.

(Signed) C. H. DICKENS, Colonel, R. A.,
Secy. to the Govt. of India.

William Molyneux C. E.,
Offg. Asstt. Secy. to the Govt. of India.

Extracts from a Note by the Inspector
General of Irrigation Works, dated the 23rd
August 1867.

Para: 17. It is said that the supply
of water coming down the improved Canal
will be available for 4000 Acres on the main
Canal above the Tank, for 6500 Acres on a
subsidiary Channel called the Wallurn, and
the rest for 19900 Acres below the Tank.
Allowing $2\frac{1}{2}$ Cubic yards per hour per Acre
the 4000 Acres will require 9000 Cubic yards and
the 6500 Acres 13,700 Cubic yards, leaving
108,425 Cubic yards per hour for the rest. This
is with reference to the volume with the River
level with Anicut crest. But for the 65 days
assumed as the period during which there
will be a sufficient supply to rise up to the
crest, the water I find will average about $9/10$ foot
above the crest, and the supply will be more
than the quantity above given. If we add $1/10$ to the
volume it will allow say 120,000 Cubic yards
per hour as the average discharge for the 65 days
available

7th Oct 1867
W. G. D. 10
12000
12000

GOVERNMENT OF INDIA
PUBLIC WORKS DEPARTMENT.
IRRIGATION.

DIRECTOR No. 91 PUBLIC WORKS.

Dated SIMLA, September 18, 1867.

Received 12000/5/87.

Manner in which projects for Irrigation Works,
to be carried out with money obtained by loan,
should be prepared and submitted to the Govern-
ment of India.

MS. 3264-21.5.67/67

MS. 4038

available for the Tank, and the irrigation to be supplied from it, which we may call in round numbers 20,000 Acres.

18. The 20,000 Acres will require at $2\frac{1}{2}$ Cubic yards, 45,000 Cubic yards per hour. During the 61 days therefore after supplying this quantity, there will remain 120,000 Cubic yards less 45,000 Cubic yards, equal 75,000 yards per hour available to be stored in the Reservoir.

19. In order to estimate the probable working of the scheme proposed I have calculated from the data given that the distribution of the 61 days of excess discharge will be as follows.

	May	June	July	Aug	Sept	Oct	Nov	Dec
Days	1	3	1	9	15	13	11	3

I shall then assume that the irrigation begins in August and lasts till the end of December. We therefore have 5 days full supply available before the 1st August, and after this will be for the several months

August

August 9 days excess + 22 days deficient.
 September 15 - " " " " 15 - " " " " " "
 October 13 - " " " " 18 - " " " " " "
 November 11 - " " " " 19 - " " " " " "
 December 8 - " " " " 23 - " " " " " "

Total 56 22 excess 77 - " deficient
 This will give the following results.

To 1st August 5 days full supply } Cub. yds.
 @ 120,000 yds per hour or 2880,000 yds } 14,400,000
 per day

Add 9 days in August @ 75,000 yds }
 per hour or 1800,000 per day } 16,200,000
 30,600,000

Deduct 22 days @ 45,000 yds per hour }
 or 1080,000 per day } 23,760,000

Tank Balance 1st Sept 6840,000

Add 15 days as above September } 27,000,000
 33840,000

Deduct 15 days } 16,200,000

Tank Balance 1st Oct 17,640,000

Add 13 days as above October } 23,400,000
 41,040,000

Deduct 18 days } 19,640,000
 Tank Balance 1st Nov 21,400,000

Add 11 days for November } 19,800,000
 41,400,000

Deduct 19 days } 20,520,000

Tank Balance 1st Dec 20,880,000

Tank Balance 1st December - ^{Cub. yds.} 29,880,000.
 Add 8 days @ 1,800,000 yds per day }
 for December } 14,400,000.
 35,280,000
 Deduct 23 days @ 1,080,000 yards - 24,840,000
 Balance 1st January - 10,440,000

showing a residue of about 10 million Cubic
 yards which would suffice to cover waste from
 evaporation &c.

20. It will be seen from these figures
 that the Balance at the end of no month exceeds
 about 20 millions Cubic yards, and that the
 greatest accumulation does not seem likely
 ever to go to 40 millions Cubic yards. The
 actual capacity given is stated to be 52,600,000
 Cubic yards - though here too the Calculation is
 not sent forward, nor the grounds for determining
 the capacity assigned to the enlarged Tank.

21. It must be remarked that the
 above calculation of mine assumes, in the
 absence of all needful data, that the supply
 when the water falls below the crest of the
 Anicut is reduced to nothing, which obviously
 is not the case. If the supply with the water
 level with the crest is 13,125 Cubic yards per
 hour

hour it may be fair to regard the average
 supply when the water is below the crest at
 half of this quantity, or say 65,000 Cubic yards.
 This supply would be available for about
 90 days, and after deducting the quantity required
 for the 10,000 Acres separately provided for,
 there would be 42,500 Cubic yards left, which
 might be estimated as sufficient for 12,000
 Acres more.

26. The slope of the Canal bed seems
 to be needlessly irregular which is objectionable.
 The velocity seems too high being over 3 ft per second
 in some places so far as I can gather. The
 banks are protected but the bottom will erode
 in all probability with such a current. The
 proposal to leave the water to run loose over
 the country on one side of the Canal is very
 objectionable and a suitable bank should be
 formed on both sides. The bank top in the
 upper part of the Canal should in my estimation
 be made wider, at least 10 or 12 feet, so as to
 serve for a Road. This should any how be done
 on one bank. The width given to the top of the
 banks

banks is only 6 feet. I am aware that this has been the fashion in these Delta works, but from what I saw at the Godavery I am satisfied that it is not enough. The extra width may be got by reducing the height a little and need cause no extra expense worth speaking of.

27. The roads over the masonry works on the Canal banks are in like manner all too narrow and should I think be increased to 11 or 12 feet, so as to admit of carts crossing safely.

28. There is nothing to show the data on which the Capacities of the various Channels have been calculated. This applies to the whole of them. The Wallurn Canal seems too large if it is only to carry 13,700 Cubic yards per hour.

29. The necessity for the Iron Aqueducts is not shown. Could not the lands be irrigated from the left bank of the new Canal? The piers for these works seem needlessly heavy obstructing the waterway greatly.

30. It is presumed that proper consideration has been given to the waterway of the Aqueduct under the Canal near Kaunibutt.

Such a point should have been noticed. 31. The Reservoir's slope pitching seems needlessly costly from the slope being too flat. It might quite safely be reduced to 1 base to 8 height, and the thickness at bottom seems needlessly great.

32. There is nothing to show what has determined the height to which the embankment is raised, or the capacity given to the Tank, or the extent of the escape weir. There is nothing to show that the tail of the escape weir is secure.

33. No allusion is made to the possible condition of the supply Channel when the level in the Reservoir is low and a high fresh is admitted into the Canal. The necessary result of this would be to increase the surface slope of the water in the Canal and therefore the velocity to what would probably be a dangerous amount unless the soil is very firm. The point should be noticed. Possibly a masonry work may be needed at the end of the Canal to regulate the surface slope.

34. In the Wallurn Channel the principle

principle that has regulated the excavation within the Canal is not apparent, and an economical arrangement of the balance between banks and excavation does not seem to have been adopted.

The first of these is the fact that the
 number of people who are in the
 country is increasing. This is due to
 the fact that the country is becoming
 more and more attractive to people
 who are looking for a better life.
 The second of these is the fact that
 the country is becoming more and more
 developed. This is due to the fact
 that the country is becoming more
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 are looking for a better life.

10/11/72

150

Public Works Dept. Proceedings, November, 1862.

General.

Imperfect manner of submitting Projects.

No. 123, dated 29th November 1862.

[No. 52.] Circular,—From Lieut. Col. R. Strachey, R. E., Secy. to Govt. of India, P. W. Dept, to Local Govts. and Administrations.

11
10/11/72

The Government of India having frequent cause to complain of the imperfect manner in which projects for works are submitted for its sanction, requests that greater care may be paid to the subject in future.

2. Every such project should comprise, 1st, a Report on the object and nature of the work; 2nd, the Specification; 3rd, the Estimate; 4th, the Plans. Further, the opinion of the chief professional authority of the Local Government or Administration should be distinctly recorded as to the merits of the design in an engineering point of view, and the letter to the Government of India should give a concise general review of the whole scheme, with a statement of the grounds on which the Local Government or Administration desires to support the proposal.

3. It is chiefly to the first and last of these requirements that the Government of India now desires to direct attention. The necessity for a very full discussion and consideration of the merits of every project of such magnitude as to call for its submission to the Government of India will be obvious; and it is equally clear that, to ensure such a close and searching investigation, the simplest and best course to adopt is to insist on the Engineer who prepares any such design submitting it in the most complete form, and giving the most complete account of the basis on which every part of his project has been framed in respect to the various considerations that have guided him in questions of engineering details, of economy of construction, or of the utility or practical working of the project when carried out; as well as to require him to state the reasons for preferring one possible plan rather than another. Besides the points noticed above, the Engineer should also consider by what agency and in what time the work may best be carried into execution, points which very materially affect the practical question of whether any work should be undertaken or not, at any particular moment.

4. The necessity for a distinct record of the opinion of the chief professional Officer of the Public Works Department is equally plain. It is by no means sufficient that the Chief Engineer should imply approval by silence. His avowed participation, so far as he is prepared to accept

it, in the responsibility attaching to the proposal, is requisite, alike for the security of the Local Government and that of the Government of India. There will always be many points, of local or technical detail, which must be left to the judgment of the Engineers on the spot, and in such matters the Local and Supreme Governments must trust to the professional heads of the Department.

5. The submission of every project to the Government of India with such an explanation, and in such a form as shall at once make it intelligible in all its main features, both as an engineering work, and as a work of public utility, is also very important. A design may be in itself unexceptionable, and to all Officers fully acquainted with local considerations may be obviously so, and yet, from want of attention in the manner of its submission, may fail to command the approval of the Government of India. Where a reference is made to a distant authority it is quite essential that nothing should be left to be taken for granted. The Government of India is bound, in exercising its power of sanction, to satisfy itself that the projects to which it appropriates the public funds are good and satisfactory projects, and its judgment must be formed, not on the authority of those who submit the schemes, but on the ultimate merits of the schemes themselves, as they appear in the explanatory Reports and Estimates. Were any other course adopted, the function of the Government of India in such matters, would be altogether illusory.

6. The Government of India desires that it may be understood that in addressing these instructions to Local Governments and Administrations, it has no wish to interfere in any way with a complete legitimate freedom of action on the part of the local Officers, whether Engineers or others. On the contrary its intention is to lead to the reduction, as far as possible, of all ground for interference, and there is no more certain way of accomplishing this end, in respect to the matter in hand, than to see that all projects are submitted in a form that shall at once show beyond question that they have been thoroughly considered by the projectors, and that shall at once enable the Government of India to appreciate and weigh the whole of the grounds on which they have been put forward by the local authorities. The number of projects that call for sanction from the Government of India is now so small, and their importance on the other hand is so great, that any additional elaboration required to ensure complete attention to the points that have been adverted to in this Circular, will, it is believed, not be practically onerous; while it most assuredly will lead to great improvement in the projects themselves, as well as to the cessation of much criticism, which at present is quite unavoidable on the part of the Government of India, and very distasteful to the local authorities.

No. 147. I.
Government of India.
Public Works Department.
Irrigation.

To
The Secretary to the Govt of Madras.
in the Public Works Department.

Simla, 18th September 1867.

Sir,

I am directed to acknowledge the receipt of your communication, No. 1845 dated 20th June and 2359 dated 5th August last, submitting a Project for the extension of Irrigation from the Pennair Aicut, in the Nellore District, at an estimated cost of Rs. 4,12,100 Rupees—

2. This being the first project of importance received from Madras since the Government has declared its readiness to allow of approved works of Irrigation being carried out with money obtained by loan, the Governor General in Council directs me to take

take the occasion of making a few remarks as to the manner in which projects for works so to be constructed should be sent up for sanction, and as to the views which the Government of India adopts in dealing with those projects.

3. The Government of Madras will be furnished, in a few days, with a full statement of the measures which the Government of India considers it necessary to take in proceeding to give effect to the determination to supply funds by loan for Irrigation works. For the purposes of the present discussion it will suffice to say that among the conditions which the Secretary of State has prescribed for determining the character of works which may be assisted by loans, are the following: that the work should be shown to be satisfactory in an Engineering point of view; that its estimated cost should be reasonable; and that there is a fair prospect of its being properly remunerative. Further, the responsibility for seeing that these conditions are complied with, is, by the same high authority, placed

placed on the Governor General in Council.
4. It will be apparent that the Government of India can only approach the examination of the technical and fiscal character of projects sent up for its approval, on which it is bound by its duty to give a judgment, through the medium of its professional advisers. It is also plain that in such matters the only effectual means a Government has by which to protect itself, is to place a full personal responsibility on the officers on whose advice works of importance are undertaken.

5. These considerations have led to the adoption by the Government of India of the practice of requiring the Secretary in this Department, or some other Superior Officer, to review, in a complete manner, every project of importance submitted for sanction, and to record distinctly his conclusions regarding it. In like manner the Govt. of India has, from time to time, prescribed to local Govts. and Administrations the necessity for adopting a like course before accepting any project of such

* See more particularly
early Circular
No. 123 of 1862.

such magnitude as to require the approval of the Government of India. In the provinces more immediately under the Government of India this practice has been generally adopted, but the Government of Madras does not seem to appreciate what the Governor General in Council considers an essential security for the due scrutiny of large projects, and for fixing personal responsibility on the professional advisers of the Government.

6. With reference to Irrigation Works, the newly appointed Inspector General of Irrigation Works, in accordance with the views expressed regarding his functions in Public Works Resolution No 80 dated 2^d July 1867, will henceforth, as a rule, be required to report on all new projects. He will be held fully responsible to the Govt of India for the character of every work which he recommends for their sanction. He must satisfy himself by careful examination into the details of the Projects put forward, that the essential requirements before mentioned are fully met. He will of course receive with proper attention the opinions of the local Engineers by whom

the projects are prepared and approved, but such opinions cannot be prescribed to him as authoritative, even if they have been accepted by the Local Government. The Government of India cannot assent to the position that in dealing with works to be carried out by borrowed money it will suffice to be satisfied that there is no very obvious objection to what is proposed by the local officers, with the approval of the local Government. The grounds for final sanction in these cases must be positive, and not negative only.

There must be complete direct proof in the designs, or in the reports submitted, that the project is what it is represented to be, in all respects, and the data furnished must have these characteristics, or the Inspector General will be justified in declining to support any scheme, whatever may otherwise be its probable merits.

8. The Governor General in Council believes that in fact there should be no sort of difficulty in sending up projects in a form which shall meet these demands. It will always

always be the wish of the Govt. of India to give its assent to proposals for the extension of irrigation, and it may fairly be presumed that such also will be the desire of the Inspector General. Further, it will be the obvious duty of the Secretary in the Public Works Department to indicate, and of the Governor General in Council to check, any disposition which may appear on the part of the Inspector General to take captious objections, or to require detailed information on points of minor importance; and should occasion require it the Government of India will not hesitate to give its sanction to undertakings on its own judgment alone. The discretion of the Government of India is of course in no degree limited by the advice of the Inspector General or of its Professional Secretary, though, as a rule, that advice may be considered sound, and therefore be adopted by the Govt.

9. I am, therefore, again to request that the Government of Madras may for the future require their Chief Engineer and Secretary in the Public Works Department to record his opinions.

in due detail on all the more important elements of any irrigation Project sent up for the sanction of the Government of India, so that a complete personal responsibility may be placed on him; for all advice he gives in connexion with any project, in an open and indisputable manner, to which reference may at any time be made. If his opinion is adverse it should be forthcoming, even if it be set aside by the Govt. The Report of the Chief Engineer on every such Project should contain a review of its engineering features, as well as an examination of the probable profits to be derived from it. The necessity for preparing such a Report will commonly insure the submission of the project to the Govt. of India in a form which shall obviate the necessity of any further enquiry on any point. For ready reference a copy of Circular No. 123 of 1862 is annexed.

10. The Government of India has already intimated its readiness to strengthen the Public Works Department at Madras by the appointment of a special Chief Engineer for Irrigation Works.

Works, who shall also be come Joint Secretary, in the manner which already obtains under the Governments of Bombay, Bengal, the North Western Provinces, and the Punjab. The adoption of this arrangement should entirely meet all difficulties arising either from the extension of the Irrigation Works which the Governor General in Council trusts may soon form a marked feature in the operations of the Public Works Department in all parts of India, or from any increased labor which might otherwise have been put on the head of the Madras Public Works Department by the requirements which it has been found necessary again to make, and due compliance with which the Government of India must, under present circumstances, especially request for the future.

11. Turning now to the Project submitted for present consideration, I am directed to observe that, on a reference to the Inspector General of Irrigation Works, he has stated his opinion that although the designs have obviously been prepared with much care, and the project may very possibly be quite unexceptionable, yet

the data on which it is based are so imperfectly explained, that he does not accept the responsibility of recommending it in its present position. On a careful examination of the grounds assigned by Colonel Strachey, the Governor General in Council, with much regret, feels constrained to withhold his sanction to the project till the doubtful points are cleared up. The following remarks will indicate what these are. —

12. The general nature of this Project is simple. It is to draw off from the Pen-
nair a portion of the surplus water which now runs off to waste, and to store it in a Reservoir which is to be enlarged for the purpose. The existing main supply Channel is increased in capacity to admit of the additional volume of water passing down it. —

13. The account of the Project by the Superintending Engineer, first sent up, is little more than a statement of what is proposed, in which it is assumed that the main features are suitable, instead of giving

giving a proper description of the projected works and explaining the precise grounds on which the details have been arranged. The description of the Project by the Executive Engineer who drew it out, was not included among the papers first forwarded. It was asked for, and it throws a little more light on the scheme, but it also is much more a statement of conclusions come to, than of the grounds on which they were arrived at.

14. Taking a general view of the whole subject of the extension of irrigation from the Pennair Ancient, the first question which naturally suggests itself, is, does this Project deal with the matter in a complete manner, and in the best manner possible? Does this Project apply the whole of the available water supply now in excess of present wants? If not, why should not the whole be dealt with at once?

15. As there seems to be an excessive fall in the irrigating Channels, it is likely that if there be more water at command the proposed new Channel could be carried further to the west and made to command more ground.

ground. 16. These questions have no light thrown on them by the papers before the Government at this time, but it is necessary to ask them.

17. It is said, incidentally, that it is not likely that these Canals should ever be used for Navigation. No reason is assigned for this, and in the absence of any reason, the expediency of constructing the works so as to prevent the possibility of Navigation may be questioned. Considering that the Canal projected would have a greater or less volume of water in it for fully 5 months in the year the value of Navigation could not well be disputed.

18. The Project is carefully prepared in its details, and no doubt the Engineer had his reasons for all he proposes. It is unfortunate that he should have given so few of them in his report.

19. The first thing proposed is to increase the head sluices on the South flank of the Ancient.

Stnicut, and to enlarge the main irrigating Channel so as to admit of a discharge of 255,900 Cubic yards per hour instead of 145,000 Cubic yards, the original volume. Why this quantity is fixed on in preference to any other is not alluded to. Now the exact nature of the alteration to the head sluices and the addition to them, have been determined is not referred to. —

20. Of the increased volume, amounting to 110,900 Cubic yards per hour, 6373 Cubic yards is given to the first branch Canal, Jaffer Sahib's, and 8,772 Cubic yards to the second, or Kistnapatam Canal. Why these particular quantities are fixed is not referred to. Nor is it said whether the water is wanted in those Canals, or that it will extend irrigation, or that the Canals, as now existing, can carry, in the first case, an increase of $1/8$ " and in the second of $1/3$ ", as proposed. Nor is it shown how, without increased head or depth, the volume of these branch Canals can be increased. —

21. But it is further to be asked whether the

the River will really supply this additional quantity of water. On this essential point not a word is said. There is nothing to show what is the discharge of the River when the water is flush with the crest of the Stnicut, nor with any greater or less depth. It is shown that on an average of 5 years the water has risen to the crest of the Stnicut, or above it, for 61 days in the year between May and December. But this of course refers to the Stnicut as it is, and is based on the existing size of the irrigating Channels. If these are enlarged considerably as proposed, the depth of water on the Stnicut will, of necessity, be reduced in a corresponding degree. Perhaps in calculating the discharge of the Channels this has been allowed for, but no reference is made to the point. —

22. Again, it not being stated what is the volume discharged when the River is flush with the Stnicut crest, it is not possible to say whether, with this volume, there is any excess of water not required for

for the existing irrigation. The whole of the calculations essentially depend on these points, regarding which nothing is said.

23. Following the figures given, it appears that the existing Surbafully Canal carries a volume of 69,119 Cubic yards per hour, and that the enlarged Channel will carry 164,875 Cubic yards, or an addition of 95,756 Cubic yards. This probably means the absolute maximum volume, with a maximum fresh in the River, which seems to be about 5 feet in the Aricut. The volume, with the water level with the Crest, is stated to be (for the enlarged Channel) 131,125 Cubic yards, or an increase of 62,000 Cubic yards over the old supply.

24. This increased volume it is said will be got by increased depth as well as breadth. It may be supposed that the calculations of discharge are properly made, but none of them are given.

25. Reference may be made to the annexed extracts from the Inspector General's Report Paras. 17 to 21, as to the Capacity of the

61,000 of the
main canal
small - 10,000

the Reservoir and the probable area of irrigation from it. On the whole the supply said to be available would seem to be sufficient to irrigate 20,000 Acres below the Tank, and adding the other 10,000 Acres, otherwise provided for, or assumed to be provided for rather, and the 12,000 Acres from the other calculation, we have 42,000 Acres as the whole area that could be watered. But this, it must be noticed, is not all gain, for we have already a volume of a little over 69,000 Cubic yards per hour in the old Channel, which at the rate of $2\frac{1}{4}$ yards per Acre, would give about 30,000 Acres as the present irrigated area. There is nothing to show, however, what the actual area is which is irrigated from the Channel as it now exists. There is, it is true, a return showing the whole area within reach of these new works from which it is seen that 16,000 Acres are now irrigated from some source or other in this vicinity. If this be taken as the existing irrigated area due to the 69,000 Cubic yards present supply (probably maximum and not mean), instead of 30,000 Acres, as above reckoned, the estimated

for the
calculations -
same as above

estimated increase of area irrigated will be 26,000 Acres, which is nearly what the Executive Engineer reckons.

26. These conclusions, however, are of necessity exceedingly speculative, and they only show that there is a plausible case to be made out in favor of the project on the data submitted. If 25,000 Acres be accepted as the increased irrigated Area, it being stated that 47,000 Acres are at present available for irrigation, and if the water rate be taken at 4 Rupees per Acre, the gross income would be 100,000 Rupees yearly. From this must be deducted, however, for maintenance &c., say 12 annas per Acre or 18,000 Rupees, leaving 82,000 Rupees net on an estimated outlay of 4,12,000 Rupees, being about 20 per cent. Considering that this result is obtained by help of the Ancient, the cost of which, and of the old Channel and other works still utilized, are not reckoned in the Capital on which the profit is calculated, it seems no more than is reasonable to expect. It would have been more satisfactory if the whole cost of the entire system of works with existing and expected Income had been also stated.

It

27. It may be remarked that no credit is taken for the increase of supply given to the two upper branch Canals. Also that the estimate includes head sluices to these two Canals, which works are not really parts of the Tank supply project. This would somewhat reduce the cost of the repairs scheme for the tank supply; but as the accounts of the income of the whole of the works will be kept together it is not necessary to go into such details though here again the propriety of taking a general view of the proceeds of the whole system of works is indicated.

28. As to the details of the works, Colonel Strachey has made certain comments which will be found in Paras 26 to 34 of his Report, annexed, to which attention is also requested.

29. There is one other point to which I am to refer in relation to the general system of irrigation in the Pennair delta. It is whether there is not generally considerable waste of land from the number of small Reservoirs, and whether a saving could not be got by raising the water level and capacity of a few and suppressing the rest, in the manner proposed for some of the

15
the minor tanks below the large reservoir & projected.

36. In conclusion, the Governor General in Council observes that the Madras Government has given authority to commence this project, within the sum assigned in the Budget of this year, in anticipation of the sanction of the Govt of India. This cannot be approved. If projects are to be sent forward to the Govt of India under the assumed conclusion that they must be sanctioned, and on such an assumption if they be begun without regular authority, it is plain that their submission becomes an idle form. If the desire of the Government of Madras is only to permit the preparation of materials for the works, the Government of India has no objection to such an arrangement, within the limits of Budget sanction. —

I have the honor to be,
Your most ^{obedient} Servant,
(W. Dickson) Colonel R. A.
Secretary to the Govt of India

1867
No. of Govt. for letter
3759

From
Secretary to the
Govt of India

21st 18th Sept 1867
22nd 4th Oct 1867
Ex. 21/11. No 1472

Preparing orders
on the project for the
extension of irrigation
from the Pennair au-
cument in the Madras
Presidency

3264-21st Oct/67

Ch. L. 37

Public Works Department.

3264

PROCEEDINGS of the MADRAS GOVERNMENT.

Under date the 21st Oct/67 -

From the Secretary to the Government of India - (H. E. No. 147. I of 18th Sept 1867. -
Do - Do. Do - (Here enter No. 91 dated 18th Do -

Ordered that the foregoing letter from the Govt. of India, together with its enclosures, be communicated to the Super. Engineers for their information and guidance in continuation of the order of the 15th Instant, No. 3189

H.
JP
WON

2. The Super. Engineer of the 2nd Division will be requested to re-submit the project for the extension of irrigation from the Pennair Aicut, accompanied with fuller information than is afforded

afforded in his letters of the 3rd May and 23rd July 1867, and with a proper description of the works proposed, and explanations of the precise grounds on which the details have been arranged. He will also be careful to notice in detail the various points to which allusion is made in paras 14 to 29 of the letter above recorded, and in paras 26 to 34 of the memorandum by the Inspector General of Irrigation Works.

3. As in paras 11 and 18 the Govt. of India express themselves satisfied with the careful way in which the project has been prepared, and in a subsequent paragraph give it as their opinion that the proposed works are likely to prove

27
prove highly remunerative, the Government would be sorry to see the progress of operations abruptly suspended, and pending a reply to the reference which will be made to the Govt. of India, they resolve to direct the works to be proceeded with.

4. In hereafter submitting plans and estimates for large irrigational works, the Governor-in-Council expects that, bearing in mind the remarks of the Govt. of India, the Superintendents will be careful to furnish the fullest information on all matters connected therewith, and to send up the projects in such a

manner

manner as will enable
this Govt. without fur-
ther enquiry to arrive
at a correct opinion of
the works proposed in
all their bearings, and
permit of the schemes be-
ing submitted to the
Govt. of India in a
thoroughly complete
and practical form,
accompanied with pre-
cise and detailed ex-
planations of the na-
ture indicated in the
papers above recorded.

The preparation of
projects in this detailed
shape, and the collection
of the information which
is now required to be
furnished with them,
will involve considerable
labor and occupy time,

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but as it is absolutely
necessary that the orders
of the Government of
India should be closely
followed, His Excellency
in Council desires it to
be distinctly understood
that no project will be
received which fails to
meet the requirements
of that Govt. in every
particular.

5 Colonel Strachey's
Memo. will show the na-
ture of some part of the
information which the
Govt. of India will look
for in all projects sub-
mitted for their sanction,
and each Officer will see
that it is furnished in
the most copious detail.

6 It will be the
duty of the Secretary in
this

this Dept. thoroughly
to scrutinize each
project as it is received,
and bringing it under
the consideration of
Govt., to accompany
it with such a full re-
view of it by himself
in all its details as is
required by the Govt.
of India, and as will
assist this Govt. in form-
ing a judgment of its
character both in a
professional and
fiscal point of view.

In accordance
with the views expressed
by the Government of
India, His Excellency in
Council resolves to ap-
point Lieut. Col. J. C.
Anderson, of the Royal
Engineers, to be Chief
Engineer for Irrigation
works.

11/20 To the Superintendents.
4/ Capt. Kennedy.
21 Rev. Dept.
" Controller of P.W. Works
Decr. 25/19/67

18 29
Works and Joint Secretary
to Government in the
Public Works Department,
with the rank of Chief
Engineer of the second class,
subject to the approval
by Her Majesty's Govern-
ment of the creation of
the post, and as under
this arrangement, the
duties of the Under Secretary
will be considerably
lightened, His Excellency
directs that the Staff
salary of that appoint-
ment be fixed at Rs.
400 per mensem on its
being vacated by the
present incumbent, and
another Officer selected
for the duty.

170

11

W. B.

21-2-20

Pub: Memo 1867 Depart^o

Pro: of Govt for October

No 3264

Pro: of the Madras Govt

D^y 21st October 1867

Putting orders on Pro:
of the Govt of India on the
Project for the extension
of irrigation from Pennair
canal in the Nellore
District

No 39 @ 439