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MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

G.O. No. 224	Press Mis.
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Dated 19-1-	1866.

Not to be folded or roughly handled

No. 138 Read the following letter from the Consulting Engineer for Irrigation and Canal Company, to the Secretary to Government, Department Public Works, dated Madras, 8th January 1866, No. 138 :—

1. I have postponed reporting on the inspections made by me in company with the Chief Engineer, Madras Irrigation and Canal Company, in October last, in the hope of being able to submit to Government, in an abstract form, the result of all the investigations hitherto made of Reservoir sites. Mr. Latham had not this information with him, and I therefore asked him to be good enough to have as much as had been obtained exhibited in the following form :—

Statement showing the result of the investigations made up to October 1865, in connection with Reservoir sites, Madras Irrigation and Canal Company.

Name of Reservoir site.	On what river.	Area of drainage basin, square miles.	Width of river at bund site.	Length of bund, yards.	Depth of water at bund, feet.	Area of water-spread, square miles.	Estimated capacity of Reservoir, cubic yards.	Estimated supply during year, cubic yards.	Length of proposed waste weir.	Situation of weir, detached saddle or at bund.	Description of proposed bund, masonry or earthen.	Estimated cost of Reservoir.
1	2	3	4	5	6	7	8	9	10	11	12	13

2. From a copy of correspondence between the Chief Engineer and the Executive Engineer, Bellary Division, which has just been transmitted by the Agent, it would seem, however, that much of the desired information has not been obtained, and the date on which that, which has been collected, will reach me being uncertain, and the report for the quarter ended 31st October last, being long overdue, I will now submit for the information of Government such particulars regarding the sites investigated, as were obtained from inspection or from the Chief Engineer.

3. The Main Canal from Soonkasala to the Water-shed at the 72nd mile must depend for supplemental supplies of water on the Tumbuddra and its affluents, and the first or nearest to the Canal of the latter of any importance is the Hindry, which falls into the Tumbuddra at Kurnool.

4. The best site on the Hindry is at about 10 miles south of Kurnool, and it is the only one below the junction of the principal branches of the river. This site was examined in 1860, and it was ascertained that, with 50 feet of water at the bund, a tank here would hold 153½ millions of cubic yards. The requisite bund would be two miles in length, in two parts, with a detached hill between them, and with its top eight feet above full tank, interior slopes of 3 to 1, and exterior 2 to 1, it

was then estimated to cost 3½ lacs, and perhaps therefore now six lacs would be not too high an estimate, or 290 cubic yards only could be stored for the Rupee. It is very possible, and perhaps probable, that a depth of 100 feet at the bund would greatly decrease the cost of storage per cubic yard, but it is not likely that any modification of arrangements would enable 1,000 cubic yards to be stored for a Rupee and, at present at least, that may be considered the minimum which would pay for the outlay. The area of river basin above the site is square miles 1,000, a very sufficient catchment basin if well situated; but the Hindry is out of the way of both monsoons, and though, at long intervals, liable to heavy freshes, it more usually has but two or three very moderate freshes in a season, and these last but a few hours.

5. The next site is on the Huggry, 20 miles above the point at which this river falls into the Tumbuddra, the line of the bund running a little to the north of the village of Mylapoor. The catchment basin is said to measure 8,489 square miles, and the area of the water-spread of the tank, as contoured, is about 35 square miles. Notwithstanding the small average rain-fall, about 10 inches annually over the catchment basin, there can be little doubt that its large area would afford a sufficient supply of water, and the site is convenient as regards distance from the Kurnool works. On the other hand, the bund would be about three miles in length, and the surplus works to provide for the discharge of extreme floods, like that of 1851, would necessarily be very costly. I did not visit this site, nor had the Chief Engineer seen it, and I do not know what the conclusions arrived at, from the information furnished by the survey, were. The Maury Cunvai site is on the same river, but the basin of the Huggry above the latter site measures only about 1,700 square miles, so that even were that reservoir constructed, as is I believe proposed by the Mysore Government, there would still remain a very sufficient catchment basin for the lower reservoir.

6. The next site is on the Tumbuddra itself, four miles due west of Hospett, at a point where ranges of hills come close down to the river on either side. Here there are remains of a bund, which are thought to indicate that at some former time the idea of damming the river was entertained; but if so, the magnitude of the project could hardly have been appreciated, as the remains are on a very small scale. The contoured area of the tank here surveyed is about 70 square miles, but what depth at bund this represents I do not at present know. There is not, I should say, the slightest chance of any project for a tank at this spot being ever seriously brought forward, and I was somewhat surprised to find that it had been thought advisable to make even a preliminary investigation.

7. In latitude 14° 22', longitude 75° 28½', the Choardy passes through some hills, which form the boundary of Mysore and Dharwar, and here in former times a very fine reservoir, called the Mudduck Masoor tank, was constructed by the native rulers. When this tank was ruined is not known, I was informed; but tradition asserts that the accident occurred soon after a new sluice had been inserted in one of the bunds. The present water-spread is shown on the map, Atlas Sheet 42. There were three bunds, of which the eastern is about 300 yards long, and is still in excellent order, except where cut through to form a road-way. Here there is a sluice built of very massive undressed stone, with nine monolithic pillars, and

four horizontal circular sluice openings in addition to the front openings. I could find no water-marks on the pillars or revetment. The sill or floor of this sluice is said to be 67 feet above present full tank level. The next or main bund is about 100 feet above present water level. It is in excellent order and enormously massive, its breadth at base being 1,000 feet, and it is only on examination that it is seen to be artificial, for at first it looks like a natural saddle between the hills. In this is the main sluice, the sill of which was 18 feet above present full tank, and recently the Department of Public Works in Dharwar have run a tunnel through the bund under the old work, and have constructed a new sluice with its sill some 23 feet lower than that of the old one, in order to draw off the water which the tank still retains. The stone used for the head works is a very compact unstratified limestone, and makes excellent work. The two bunds already referred to are divided by a hill of moderate elevation, on which there is a fort, chiefly remarkable for having nearly the whole of its defences exposed to view from without. Another hill somewhat more lofty divides the main from the western bund, which is the one that breached. The ends of this bund still exist, but at present there is a chasm some 120 feet deep, and perhaps 150 yards wide, between them, and the waters have scarped the faces of the hills on either side, forming precipices, and showing the soil to be more or less decomposed granite rock. Three or four hundred yards above the line of this bund, the water falls 30 or 40 feet over a reef of quartzite rock, the presence of which has been the means of saving the tank from entire destruction, and it would seem that when the bund was constructed the ground on which it was built was some 40 feet higher than is the case at present. This spot is a remarkably beautiful one. The water-fall, the scarped ravine with many landslips, on which there are numerous trees still growing, the well-wooded slopes of the hills, bright plumaged birds, and honey combs pendent from the rocks here and there, combine to make up a scene which is not frequently equalled in India.

8. An Assistant Engineer was engaged in investigating a project for the restoration of this tank at the time of my visit, but his work had not advanced sufficiently to enable him to give me any information as to its former capacity, &c. The bund and bed are in Mysore, and the latter is for the most part cultivated, and there are several large villages where formerly the tank waters extended. All the lands under the tank are in Dharwar, and the Department of Public Works there have recently taken levels with a view to increase the depth of water by one yard. It seems to be a pity to utilize so fine a site to so small an extent only, and there would be no great difficulty in constructing a new bund just above the water-fall rocks, and though there appears to have been no calingulah to the original tank, there are said to be facilities for getting rid of waste water, and a weir could be placed at the east bund, should the saddles in the western hills, which it is thought might be used, prove too high. The catchment basin of the Choardy measures 540 square miles, and it receives a good share of the south-western monsoon, but not an excessively heavy rain-fall.

9. From the Mudduck Masoor tank the Chief Engineer went with me to the Toonga, above its junction with the Buddra, where two sites, one at Mudaba, latitude 13° 43½', longitude 75° 29', and another 2½ miles higher up at Bagoli (not marked on the map) have been partially examined. The former would do fairly I think, but the

latter appeared to both Mr. Latham and myself to be far less promising. The catchment basin is 700 square miles, and the rain-fall heavy, so that there would be an abundance of water, and, with a high bund at Mudaba, it would be practicable to pass the surplus across a saddle in the hills on the right bank. There is no reliable information apparently about this site, and I understood that the only levels run were at 60 feet above bed, and it would be useless to think of a reservoir of that size, for, in the first place, its capacity would be insignificant, and, in the next, the quantity of water running to waste would be out of all proportion to that retained. The hills on the left bank approach the river two or three hundred yards lower down than those on the right bank, but altogether the bund, needed to dam the river, would not be more than four or five hundred yards in length. A reef of rock (quartzite) crosses the river almost at right angles from the toe of the hills on the right bank, but the dip is so high that were a straight bund constructed, it would be doubtful whether this rock would be found to extend under its line. As however powerful under-slucices would be needed to pass the low freshes during the formation of the bund, advantage might be taken of this mass of rock for their foundation by making a bent bund. The surface soil in this neighbourhood appeared to be good, and should trial pits prove it to be sufficiently abundant, there would be no necessity for anything but an earthen bund.

10. The next and last site visited was that at Luckawally on the Buddra. The river here passes through a range of hills at a gap 150 to 180 yards wide. Its bed is rocky, and probably solid rock would be found for the whole width of the base of the bund. Suitable earth is likewise abundant. The slope of the hills is very steep, so that even the top line of the bund would be but small. As regards the site for the waste weir, the saddle to the south-east, by which the road to Mangalore crosses, would not do, as the whole fall would have to be provided for artificially. Another saddle on the opposite side of the river, north-west of the bund, appeared more favorable, but judging from the surface of all the hills hereabouts, which we walked or rode over, it seemed very doubtful whether rock would be found sufficiently near the surface to receive the over-fall.

The catchment basin of the Buddra above this site is 760 square miles, and the supply of water is abundant. With a depth of 160 feet of water at the bund, the water-spread of the tank would be about 10 square miles, but so much of this area is covered with dense jungle that much of the contour line laid down has been sketched in between points fixed by levels run along a few more accessible lines, and the little information which has as yet been obtained must be considered only preliminary, though I think there can be little doubt that there are *prima facie* grounds to warrant the complete preparation of a project for a reservoir at this site.

11. The only disadvantages of the site are its great distance from the works, the supply of which it is intended that the reservoir should supplement, and, perhaps, a difficulty in providing for the passage of surplus water, though even if a good place for a calingulah be not obtainable, all that is necessary might, I think, be secured by under-slucices. On the other hand, the advantages are: A very short bund; suitable soil for its construction; hard rock for its foundation, a matter of great importance where under-slucices for summer water and low freshes must be constructed; good stone for masonry and revetments, and the greater part of the

ground which would be occupied by the water-spread is dense jungle, and there are only two or three small villages which would have to be removed.

12. The Government are aware that the Board of Directors have had a report on this site submitted to them by the Chief Engineer, but as yet they have not, as far as I am aware, come to any decision on the subject, though about nine months ago they called for additional particulars; *Vide Proceedings Madras Government, No. 2,078, 19th July 1865.*

but as no recent investigations have been made, I doubt whether data exist for more than a provisional approval, subject to the results which a full examination and the estimates founded thereupon may show.

13. In latitude $14^{\circ} 7'$, longitude 76° , is a large existing tank in the Chanagherry Taluq, which has been examined in order to see whether its supply could be improved by a channel from the Buddra, but it was found that the levels were not favorable though, were the Luckawally Reservoir constructed, it would be comparatively easy to feed the Chanagherry Tank therefrom. This latter occupies a very fine site, but its supply is small and uncertain.

14. I will defer, until the tabulated statement referred to in the first paragraph of this letter shall have been received, any remarks that may seem called for with regard to the results of the investigations which have now been in progress since 1862.

Handwritten notes:
 The Government of India
 Madras Irrigation and Canal Co.
 Madras 8th January 1866.

No. 138

Consulting Engineers Office,
 Irrigation and Canal Co.
 Madras 8th January 1866.

From: Captain John Mullins R.E.
 Consulting Engineer for I.C.C.
 The Secretary to Government,
 Department of Public Works.

Sir,
 I have postponed reporting on the inspections made by me in company with the Chief Engineer, Madras Irrigation and Canal Company, in October last, in the hope of being able to submit to Government in an abstract form the result of all the investigations hitherto made of Reservoir sites. Mr. Catham had not this information with him, and I therefore asked him to be good enough to have as much as had been obtained exhibited in the form marginally shown.

1	Reservoir site	1
2	on - what River	2
3	Over of drainage	3
4	Level of drainage	4
5	Level of river at	5
6	Level of River	6
7	Level of water at	7
8	Area of water shed	8
9	Level of capacity	9
10	of reservoir. Capacity	10
11	Estimated supply during	11
12	year. Capacity	12
13	Length of proposed work	13
14	Station of water shed	14
15	Estimated cost of	15
16	Reservoir and proposed	16
17	Estimated cost of	17

Statement showing the result of the investigations made up to October 1865 in connection with Reservoir sites Mr. J. & C.C.

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2. From a copy of correspondence between the Chief Engineer and the Executive Engineer Ballary Division which has just been transmitted by the Agent, it would seem however that much of the desired information has not been obtained, and the data on which that, which has been collected, will reach me being uncertain, and the report for the quarter ended 31st October last being long over due, I will now submit for the information of Government such particulars regarding the sites investigated, as were obtained from inspection of from the Chief Engineer.

3. The Main Canal from Doonhasal to the watershed at the 72nd Mile must depend for supplemental supplies of water on the Tumbuddra and its affluents, and the first or nearest to the Canal of the latter of any importance is the Hindry, which falls into the Tumbuddra at Kurnool.

4. The best site on the Hindry is at about 10 miles south of Kurnool, and it is the only one below the junction of the principal branches of the river. This site was examined in 1860, and it was ascertained that, with 50 feet of water at the bund, a tank here would hold $153\frac{1}{2}$ Millions of Cubic yards - The requisite bund would be 2 miles in length, in two parts with a detached hill between them and, with its top 8 feet above

about full tank, interior slopes of 3 to 1, and exterior 2 to 1, it was then estimated to cost 3½ lacs, and perhaps therefore now 6 lacs would be not too high an estimate, or 290 Cubic yards only could be stored for the Rupee. It is very possible, and perhaps probable, that a depth of 100 feet at the bund would greatly decrease the cost of storage per Cubic yard, but it is not likely that any modification of arrangements would enable 1000 Cubic yards to be stored for a Rupee and, at present at least, that may be considered the minimum which would pay for the outlay. The area of river basin above the site is Square Miles 1000, a very sufficient catchment basin if well situated, but the Hindry is out of the way of both Monsoons and though, at long intervals, liable to heavy freshes, it more usually has but 2 or 3 very moderate freshes in a season, and these last but a few hours.

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of the tank, as contoured, is about 35 square miles. Notwithstanding the small average rain-fall about 10 inches annually over the catchment basin, there can be little doubt that its large area would afford a sufficient supply of water, and the site is convenient as regards distance from the Kinnod works. On the other hand the bund would be about 3 miles in length, and the surplus works to provide for the discharge of extreme floods, like that of 1851, would necessarily be very costly. I did not visit this site, nor had the Chief Engineer seen it, and I do not know what the conclusions arrived at, from the information furnished by the Survey, were. The Manry Cuvai site is on the same river, but the basin of the Huggay above the latter site measures only about 1700 square miles, so that even were that reservoir constructed, as is I believe proposed, by the Mysore Government, there would still remain a very sufficient catchment basin for the lower reservoir.

6. The next site is on the Loombuddra itself 4 miles due west of Hospett, at a point where ranges of hills come close down to the river on either side. Here there are remains of a bund which are thought to indicate that at some former time the idea of damming the river was

was entertained, but if so the magnitude of the project could hardly have been appreciated, as the remains are on a very small scale. The contoured area of the tank here surveyed is about 70 square miles, but what depth at bund this represents I do not at present know. There is not, I should say, the slightest chance of any project for a tank at this spot being ever seriously brought forward, and I was somewhat surprised to find that it had been thought advisable to make even a preliminary investigation. In Latitude $14^{\circ} 22'$, Longitude $75^{\circ} 28\frac{1}{2}'$, the Choardy passes through some hills which form the boundary of Mysore and Sharwar, and here in former times a very fine reservoir called the Maddurh Mysore tank was constructed by the Native Rulers. When this tank was ruined is not known, I was informed, but tradition asserts that the accident occurred soon after a new sluice had been inserted in one of the bunds. The present water spread is shown on the map - Atlas sheet #2 - There were 3 bunds, of which the eastern is about 300 yards long, and is still in excellent order, except where cut through to form a roadway. Here there is a sluice built of very massive undressed stone with 9 monolithic pillars

pillars, and 4 horizontal circular sluice openings in addition to the front openings. I could find no watermarks on the pillars or revetment. The sill or floor of this sluice is said to be 67 feet above present full tank level. The next or main bund is about 100 feet above present water level. It is in excellent order and enormously massive, its breadth at base being 1000 feet and it is only on examination that it is seen to be artificial, for at first it looks like a natural saddle between the hills. In this is the main sluice, the sill of which was 18 feet above present full tank, and recently the Department of Public Works in Bharwar have run a tunnel through the bund under the old work, and have constructed a new sluice with its sill some 23 feet lower than that of the old one, in order to draw off the water which the tank still retains. The stone used for the head works is a very compact unstratified limestone, and makes excellent work. The two bunds already referred to are divided by a hill of moderate elevation on which there is a fort, chiefly remarkable for having nearly the whole of its defences exposed to view from without. Another hill somewhat more lofty divides the main from the western bund, which is the one that breached. The ends of this bund still exist, but at present there is a chasm some 120 feet deep, and perhaps 150 yards wide, between them, and the waters have

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have scarped the faces of the hills on either side, forming precipices, and shewing the soil to be more or less decomposed granite rock. Three or four hundred yards above ~~the~~ the line of this bund, the water falls 30 or 40 feet over a reef of quartzite rock, the presence of which has been the means of saving the tank from entire destruction, and it would seem that when the bund was constructed the ground on which it was built was some 40 feet higher than is the case at present. This spot is a remarkably beautiful one. The waterfall, the scarped ravine with many landslips on which there are numerous trees still growing, the well wooded slopes of the hills, bright plumaged birds, and honeycombs pendant from the rocks here and there, combine to make up a scene which is not frequently equalled in India.

8. An Assistant Engineer was engaged in investigating a project for the restoration of this tank at the time of my visit, but his work had not advanced sufficiently to enable him to give me any information as to its former capacity, &c. The bund and bed are in Mysore, and the latter is for the most part cultivated, and there are several large villages where formerly the

the Tankwaters extended. All the lands under the Tank are in Sharewar, and the Depart-
-ment of Public Works there have recently taken levels with a view to increase the depth of water by one yard. It seems to be a pity to utilize so fine a site to so small an extent only, and there would be no great difficulty in constructing a new bund just above the waterfall rocks, and though there appears to have been no calculations to the original Tank, there are said to be facilities for getting rid of waste water, and a weir could be placed at the east bund, should the saddles in the Western hills, which it is thought might be used, prove too high. The catchment basin of the Choardy measures 540 Square Miles, and it receives a good share of the South Western Monsoon, but not an excessively heavy rainfall.

9. From the Muddach Maroor Lake the Chief Engineer went with me to the Soonga, above its junction with the Buddra, where two sites, one at Madaba Latitude $13^{\circ} 43'$ Longitude $75^{\circ} 29'$, and another $2\frac{1}{2}$ miles higher up at Bagali (not marked on the map) have been partially examined. The former would do fairly I think, but the latter

latter appeared to both Mr. Latham and myself to be far less promising. The catchment basin is 700 Square Miles, and the rainfall heavy, so that there would be an abundance of water, and, with a high bund at Madaba, it would be practicable to pass the surplus across a saddle in the hills on the right bank. There is no reliable information apparently about this site, and it is understood that the only level run were at 60 feet above bed, and it would be useless to think of a reservoir of that size for in the first place its capacity would be insignificant, and in the next the quantity of water running to waste would be out of all proportion to that retained. The hills on the left bank approach the river 2 or 3 hundred yards lower down than those on the right bank, but altogether the bund, needed to dam the river, would not be more than 4 or 5 hundred yards in length. A reef of rock (quartzite) crosses the river almost at right angles from the toe of the hills on the right bank, but the slip is so high that were a straight bund constructed it would be doubtful whether this rock would be found to extend under its line. It is however

however powerful under sluices would be needed to pass the low-freshes during the formation of the bund, advantage might be taken of this mass of rock for their foundation by making a bent bund. The surface soil in this neighborhood appeared to be good, and should trial pits prove it to be sufficiently abundant, there would be no necessity for anything but an earthen bund.

10. The next and last site visited was that at Chikmagally on the Budra. The river here passes through a range of hills at a gap 150 to 180 yards wide. Its bed is rocky, and probably solid rock would be found for the whole width of the base of the bund. Suitable earth is likewise abundant. The slope of the hills is very steep, so that even the top line of the bund would be but small. As regards the site for the waste weir, the saddle to the South East, by which the road to Mangalore crosses, would not do, as the whole fall would have to be provided for artificially. Another saddle on the opposite side of the river, North West of the bund, appeared more favorable, but judging from the surface of all the hills hereabouts, which we walked or rode over, it seemed very doubtful whether rock would be found sufficiently near

11 near the surface to receive the overfall. The catchment basin of the Budra above this site is 760 square miles, and the supply of water is abundant. With a depth of 160 feet of water at the bund the water spread of the tank would be about 10 square miles, but so much of this area is covered with dense jungle that much of the contour line laid down has been sketched in between points fixed by levels run along a few more accessible lines, and the little information which has as yet been obtained must be considered only preliminary, though I think there can be little doubt that there are prima facie grounds to warrant the complete preparation of a project for a reservoir at this site.

11. The only disadvantages of the site are its great distance from the works, the supply of which it is intended that the reservoir should supplement, and, perhaps, a difficulty in providing for the passage of surplus water, though even if a good place for a Calingulah be not obtainable, all that is necessary might, I think, be secured by under sluices.

On the other hand the advantages are—

A very short bund; suitable soil for its construction; hard rock for its foundation - a matter of great importance where under-slucers for summer water and low freshes must be constructed; good stone for masonry and the rivetments, and the greater part of the ground which would be occupied by the water spread is dense jungle, and there are only two or three small villages which would have to be removed.

12. The Government are aware that the Board of Directors have had a report of this site submitted to them by the late Chief Engineer, but as yet they have not, as far as I am aware, come to any decision on the subject, though about 9 months ago they called for additional particulars, but as no recent investigations have been made, I doubt whether data exist for more than a provisional approval, subject to the results which a full examination and the estimates founded thereupon may show.

13. In Latitude 14-7, Longitude 76- is a large existing tank in the Chandgherry Taluk, which has been examined in order to see whether its supply could be improved by

Vide I.M.F. No. 2078
19 July 1865

by a channel from the Budra, but it was found that the levels were not favorable though, were the functionally reservoir constructed, it would be comparatively easy to feed the Chandgherry tank therefrom - This latter occupies a very fine site, but its supply is small and uncertain.

14. I will defer, until the tabulated Statement referred to in the first para of this letter shall have been received, any remarks that may seem called for with regard to the results of the investigations which have now been in progress since 1862.

I have the honor to be,
Sir,
Your Most Obedt. Servant

John Lubbock
Consulting Engineer for I.C.C.

J. M. Lubbock

Copy in a letter to me?
19th January 1877 of 1866.

19th Jan 1866
Copy in a letter to me?
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