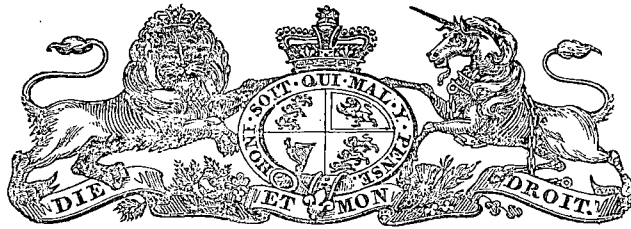


(No. 156.)



1890.

---

PARLIAMENT OF TASMANIA.

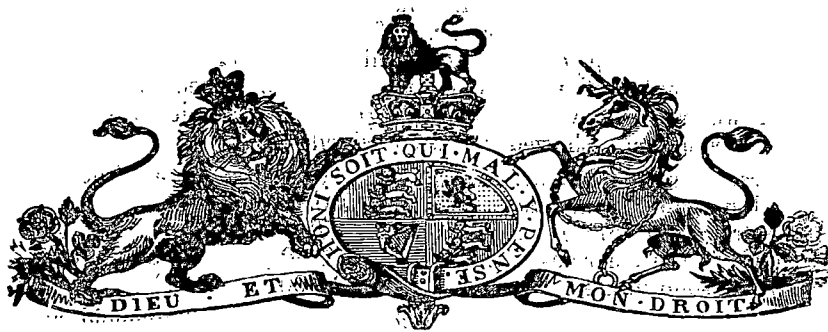
---

WATER SUPPLY OF SWANSEA:

REPORT BY MR. A. MAULT.

---

Presented to both Houses of Parliament by His Excellency's Command.



## REPORT UPON THE WATER SUPPLY OF SWANSEA.

*The Honourable the President and the Members of the Central Board of Health.*

GENTLEMEN,

I HAVE the honour to inform you that, in accordance with your instructions, Minute No. 75, 1890, I have visited Swansea and prepared the following Report upon its Water Supply.

1. Swansea is situated on the western side of Fleurien or Oyster Bay. A large township is laid out upon the undulating surface of the greenstone hills, varying in height from a few feet to about 200 feet above the sea level; but most of the houses are in the streets nearest the jetty, and in this locality the greatest elevation is under 70 feet above sea level. The accompanying plan shews the position of the houses, which are sufficiently near to this principal part of the town to make it worth while to include them in any scheme for supplying water. It will be seen that the other houses are so distant from each other, and from this principal district, that their supply by water mains would entail a great expense in every case. In this district there are 57 houses, inhabited by about 300 persons, and the rateable value for water purposes (that is, taking all houses rated under £10 a year as rated at £10) is £926 a year.

2. The mean yearly rainfall at Swansea for the last five years was 28.38 inches; but this mean was the result of widely divergent extremes,—the rainfall for 1888 having been 16.88 inches, and that of 1889, 45.21 inches. Being thus subject to a very great yearly variation, the rainfall cannot be depended upon for domestic water supply, and in dry years the town's people have to cart water from the Meredith River, where, at the bridge on the Campbell Town Road, the Municipal Authorities have provided means for raising the water. This river water has a good local reputation. I have had no opportunity of having it analysed when the river is in its usual condition, but the following analysis of water taken from it last month, when it was described as being in "quarter flood," shews that at such times it should not be used without proper filtering or boiling. Mr. Ward's report is—

"The sample of water from the Meredith River in 'quarter flood' has been analysed, with the following results:—

"Free ammonia.....	0.03 parts per million.
"Albumenoid ammonia.....	0.17 "
"Nitrogen in nitrates.....	Traces.
"Chlorine in chlorides.....	2.30 grains per gallon.
"Total solid matter.....	10.00 "

The water was only slightly turbid; and yielded, on standing, but little deposit, which, when examined microscopically, showed no special features."

I will take the earliest opportunity of getting, for analysis, a sample of the water in its usual summer condition, in order to ascertain whether the above-mentioned quantity of albumenoid ammonia was due to vegetable matter brought down only in flood-time.

3. The greenstone formation at Swansea precludes any possibility of getting a sufficient water supply by boring or well-sinking. No other stream in the neighbourhood offers a supply equal to that in the Meredith River; but the distance of the Meredith River making the obtaining of water from it a comparatively costly affair, I examined the country, with the help of the Warden, in order to see whether a supply of the winter rain-water could be stored in sufficient quantity to meet the requirements of the whole year. The best place for such a storage reservoir would be the Sawpit Gully, to the west of the township, where the conformation of the ground would make the necessary work easy and inexpensive; where the height above the sea-level would make delivery by gravitation possible; and where a large extent of gathering ground, used only for pastoral purposes, would insure a sufficient quantity of water. The only question was that of its quality. In summer

time the small quantity of water remaining in the water-holes in the gully is known to be bad ; but that could have been excluded from the reservoir. If the water coming off the collecting grounds in winter was good, it might be kept free from contamination ; and circumstances, during my visit, favoured the settlement of the question of its quality. There had been exceptionally heavy rains, and a fine stream of water was flowing down the gully. A sample of it was taken ; and the Government Analyst's report on it showed that it contained—

Free ammonia .....	0·04 parts in a million.
Albumenoid ammonia .....	0·64        "
Nitrogen in nitrates.....	Trace.
Chlorine in chlorides .....	3·30 grains in a gallon.
Total solid matter .....	16·00        "

It will be noticed that this water contained nearly four times more albumenoid ammonia than that of the river. Mr. Ward, after mentioning the large quantity of dissolved vegetable matter in the water, goes on to remark : " The amount of sediment is very small, and resembles that of ordinary creek waters when examined under the microscope. A re-examination of the sample, when cleared by long standing, showed that no appreciable diminution in the substances yielding albumenoid ammonia had taken place." This analysis and report put an end to all thought of obtaining a supply from the Saw-pit Gully

4. The source of supply of water to Swansea is, therefore, practically limited to the Meredith River ; and the object of the rest of this report is to answer the questions,—from what point should the supply be taken ? how should it be conveyed to the town and distributed ? what will probably be the cost to the inhabitants ? and how can that cost be met ? Before answering these questions it is desirable that it should be borne in mind that the answers are based on such information as could be obtained in a few days' examination of the country, and do not pretend to more accuracy than such an examination implies. They are intended to show that, *primâ facie*, it is practically within the means of the people of Swansea to obtain a sufficient water supply, and, consequently, that it is worth while to have proper engineering surveys made. The following are the data upon which the various schemes propounded have been based, and the considerations upon which the character and extent of the various works have been determined :—That there is a population at present of 300 persons to be supplied ; that at least 30 gallons a day should be provided for each person ; that storage should be provided for water sufficient for at least a week's consumption ; that the water should be delivered at a pressure of at least 100 feet of head at the lower part of the township ; and that for work that can be conveniently enlarged or increased at any time, such, for example, as storage capacity, it is not desirable, from motives of economy, to greatly exceed present requirements, but for other descriptions of work all probable increase of population in the near future should be provided for. I should further premise that, if pumping be resorted to, the daily cost of steam-power puts it beyond the capacity of the ratepayers to pay for by means of any reasonable rate, and the cost of installing a water-power, even if a sufficient supply of water for the purpose could be depended upon, would also be too great : I therefore have calculated on using wind force in the following scheme.

#### *Supply by Pumping.*

5. If it be decided to supply water from the Meredith River without filtering it, leaving it to the householders to boil or filter it for themselves, a good site for the pumping station would be at the place near the bridge marked on the plan, where a higher part of the river bank affords a good emplacement for a windmill. One of Booth & M'Donald's 10 feet iron windmills, with 3½ in. double action force pumps, with derrick frame and intake, would cost about £70, including land for site and right of way. From these pumps a delivery main would take the water to a storage tank, to be built on the high land opposite the presbyterian church in Noyes-street. This tank, if of the requisite capacity, and raised on staging of sufficient height, would, with the purchase of the site, cost about £750. The supply mains and the distributory service in the town, including necessary valves, fire-plugs, &c. and the service-pipe from the main to the boundary of each property, would cost £1035. The entire cost of the scheme would therefore be £1855, or, with 10 per cent. added for contingencies, £2040. I cannot recommend that this scheme be adopted, as it is evident that the water sometimes requires filtering, and it would be unsafe to leave to careless people the task of filtering or boiling it.

6. If it be therefore decided to deliver filtered water in connection with a pumping scheme, the water must either be filtered before pumping, or delivered by pumping on a sufficiently elevated site to allow of the construction of filters, which would deliver the water into a reservoir, whence it could be delivered by gravitation at a sufficient pressure. This latter course is preferable, and could be carried out as shown on the plan from a pumping station higher up the river. At this station, the exact position of which, as well as of the filter-beds and reservoir, can only be fixed after proper survey, a mill and pumps, similar to those before described, would be fixed, and at a similar cost except for site and way-leave, the outlay on which would be increased. These pumps would deliver the water into one or other of the two filter beds, the two being constructed to allow one to be in use while the other was being cleansed and the filtering medium more or less renewed. The filtering medium, should it be impracticable to obtain spongy iron at a reasonable cost, might be of

washed sand and gravel, as shown. These filters would cost about £125. From them the water would be delivered into a covered tank capable of holding 10,000 cubic feet, equal to a full week's supply for all purposes, or a month's supply for domestic service only, in case a drought occurs. This reservoir would cost £545; the supply and distributory mains would cost £1143, making provision, as before, for fire-plugs, &c. and for taking a service-pipe to the boundary of the property to be served. It is to be understood that in all cases the cost of works on private property is at the owner's charge. The cost of the works above described (including mill and pumps) is thus shown to be £1873, or, with 10 per cent. for contingencies, £2060.

7. If the Government be enabled to fulfil what I understand to be its intention, of aiding local authorities in the carrying out of useful works by granting loans on reasonable terms for such purposes, the payment of Five Pounds per centum per annum will pay interest on the money required, and also form a sinking fund for paying off the principal sum in less than 35 years. If this be so, the first yearly charge in connexion with the water supply would be, in case of the former scheme, the payment of £102 as interest and sinking fund contribution on £2040. The cost of management, incidental repairs, &c. (based on the experience of New Norfolk) would not exceed at first £50 a year. As time went on this item would increase; but it is more than probable that the rateable value of the town would increase still faster. About £5 a year would be required for stores and stationery. And thus the total yearly charge would be £157. To meet this charge I estimate that the Municipality would pay for its offices and for public conduits for general use £10 a year from the Municipal Funds, and that Government would pay the same amount for the school, post office, &c. Certain large consumers would have to be supplied by meter, and would consequently pay rather more than simply on a rateable value; a small sum would probably be derived from shipping; a small sum would have to be charged to prevent waste in garden watering; and, as unbuilt upon land in the township would be greatly enhanced in value by having watermains laid along its frontage, it would only be fair to make a yearly water rate of, say, a shilling a chain of frontage upon such land: from all these sources I estimate £30 a year more would be derived,—making, with the Municipal and Government contribution, £50 a year. A water rate of two shillings and fourpence a year would be needed to raise the balance. The yearly account would then stand—

CHARGE.	£	s.	d.	DISCHARGE.	£	s.	d.
5 % on £2040 .....	102	0	0	Municipality and Government....	20	0	0
Management, &c. ....	50	0	0	Meters, frontage, &c. ....	30	0	0
Stores, &c. ....	5	0	0	Rate at 2s. 4d. on £926 .....	108	0	0
	<u>£157</u>	<u>0</u>	<u>0</u>		<u>£158</u>	<u>0</u>	<u>0</u>

I think there can be but little doubt that the growth of the town, and of its rateable value after the introduction of a good water supply, would be such as every year to increase the balance in favour of the waterworks.

8. In the case of the scheme for filtering after pumping, the yearly charge would be slightly more, as about £5 would have to be spent in cleaning the filter-beds, and £2 in providing material; consequently an increased rate would be required. The yearly account would therefore stand—

CHARGE.	£	s.	d.	DISCHARGE.	£	s.	d.
5 % on £2060 .....	103	0	0	Municipality and Government....	20	0	0
Management, &c. ....	55	0	0	Meters, frontage, &c. ....	30	0	0
Stores, &c. ....	7	0	0	Rate at 2s. 6d. on £926 .....	115	15	0
	<u>£165</u>	<u>0</u>	<u>0</u>		<u>£165</u>	<u>15</u>	<u>0</u>

#### *Supply by Gravitation.*

9. Both the above schemes have the great drawback of making the continuity of the water supply depend upon so uncertain a motive power as the wind. When the water was most required a spell of calm weather might render its provision impossible without making expensive temporary arrangements. I therefore strongly advocate the following scheme for supplying the town without using any pumping machinery:—At the place where the reservoir is shown the level of the River Meredith is sufficiently high to supply the town district before described by gravitation. The cost of the weir and outlet works would be about £250. From the reservoir small box fluming laid at a slight fall would take the water along the contours of the ground to the site nearest to the town that could be found suitable for filter-beds. These filter-beds would be as before described, but as the supply would be continuous no further reservoir would be needed than the outlet chamber of the filters. But as it might happen in case of a large fire that an additional quantity of water would be needed, arrangement is made for turning the whole supply from the reservoir away from the filter-beds, and directly upon the town through a silt-box as shown. The fluming and filters would cost about £647, without any allowance for way leave. This allowance has been omitted, as it is con-

sidered that the value of the overflow water from the fluming (which would always be considerable in quantity) would be worth, for irrigation purposes, more than the land taken. The supply and distributory mains from the filter-beds to the town would, with fire-plugs and services as before, cost £987; making the total cost of this scheme £1884, or, with ten per cent. added for contingencies, £2072. The first cost of all the schemes is therefore about equal.

10. The cost of management would be considerably less with a gravitation scheme than with a pumping one, as there would be no necessity for the continual supervision that machinery requires. The yearly account would probably stand:—

CHARGE.	£	s.	d.	DISCHARGE.	£	s.	d.
5% on £2072 .....	103	12	0	Municipality and Government ...	20	0	0
Management, &c. ....	35	0	0	Meters, frontages, &c. ....	30	0	0
Stores .....	3	0	0	Rate at 2s. on £926 .....	92	12	0
	<u>£141</u>	<u>12</u>	<u>0</u>		<u>£142</u>	<u>12</u>	<u>0</u>

I am persuaded that this method of procuring water for the town is not only the cheapest as regards yearly cost, but is the best as regards quantity and continuity of supply.

11. Before I conclude, I wish to remind the Municipal Council that, coincidently with the supplying of the town with an ample supply of water, it will behove them to take measures for carrying the water off after use. The conformation of the town lends itself to the construction of an easily and cheaply made system of drainage: the only difficulty will be in connexion with the choice of an outfall. It is a matter outside my immediate purpose, but I think it right to here mention that one of the gravest circumstances that I have observed connected with the health of the population on the part of the East Coast, of which Swansea is the centre, is the manifest absence of sufficient lime in the water to properly supply the structural wants of the body; and the results of this absence are quite as manifest in the case of the lower animals. I would strongly recommend, in the bringing up of children especially, that this want should be remedied by the daily use of a little lime-water.

12. I have to express my hearty thanks for all the kindness and assistance I received from all I met at Swansea. His Worship the Warden was indefatigable in his attention; and, thanks to him, I was able to do a great deal in a little time. Mr. Meredith, of Cambria, enabled me, by a gift of the map from which most of the accompanying plan is taken, to avoid much survey work. I am sorry for the delay that has occurred in the presentation of this Report; but it arises from circumstances beyond my control.

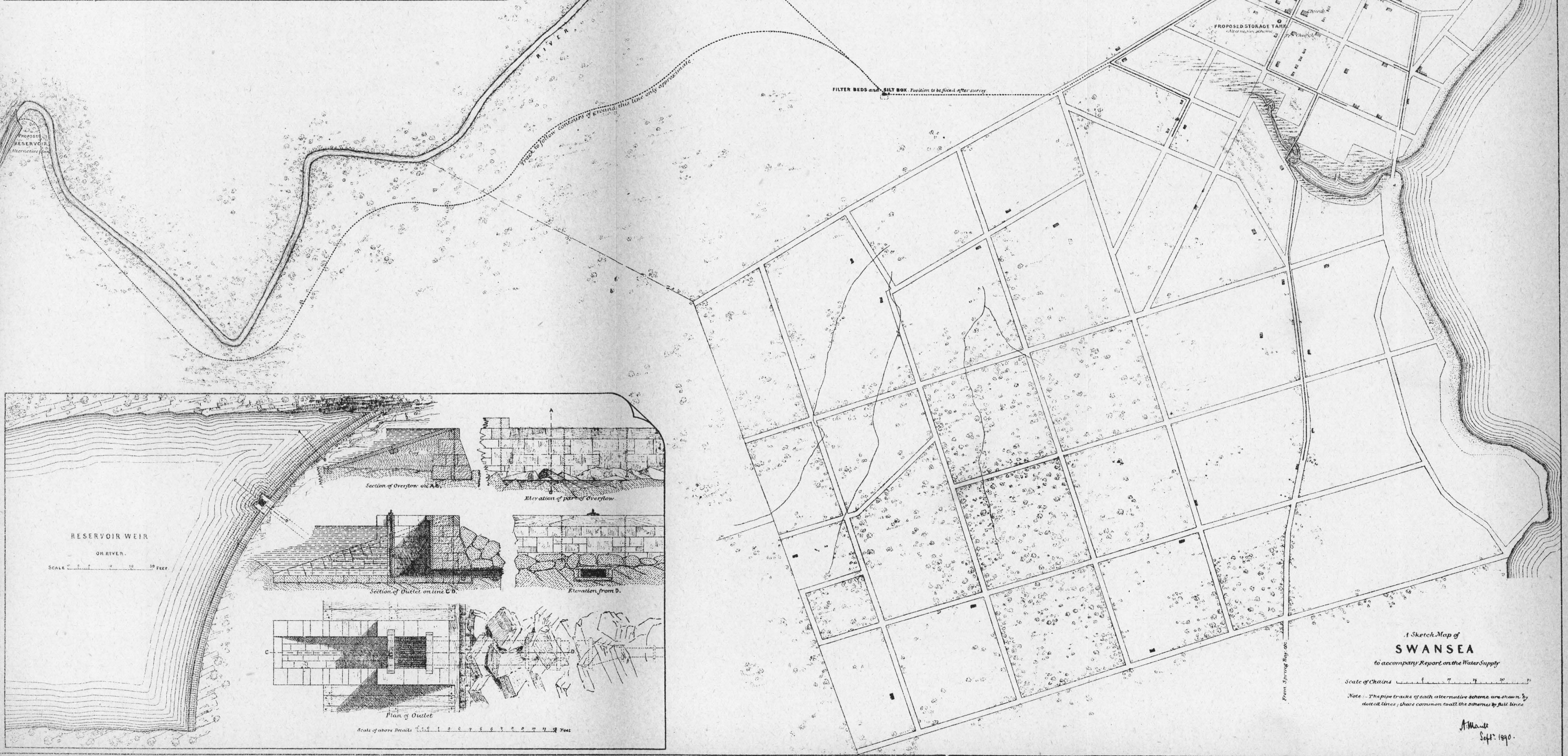
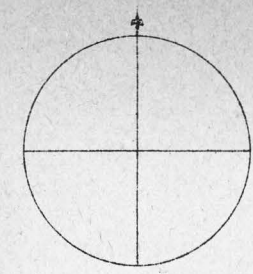
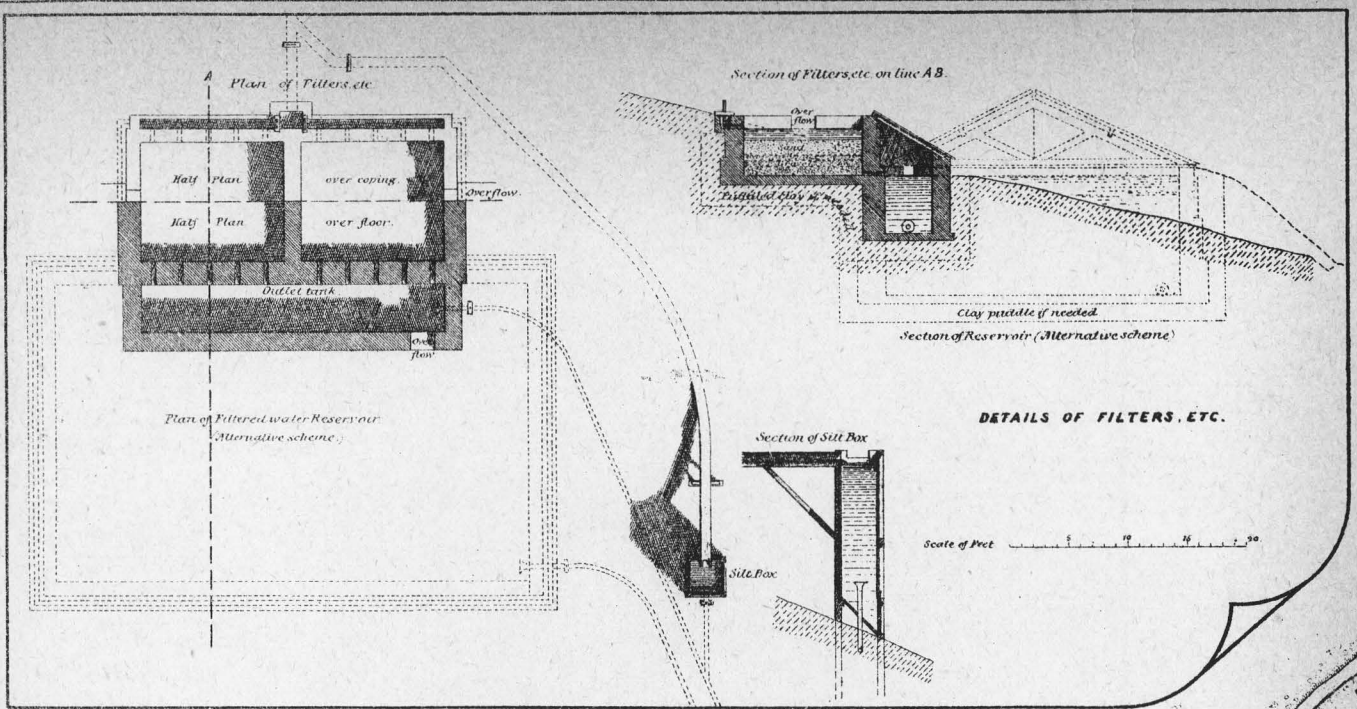
I have the honour to remain,  
Gentlemen,

Your faithful Servant,

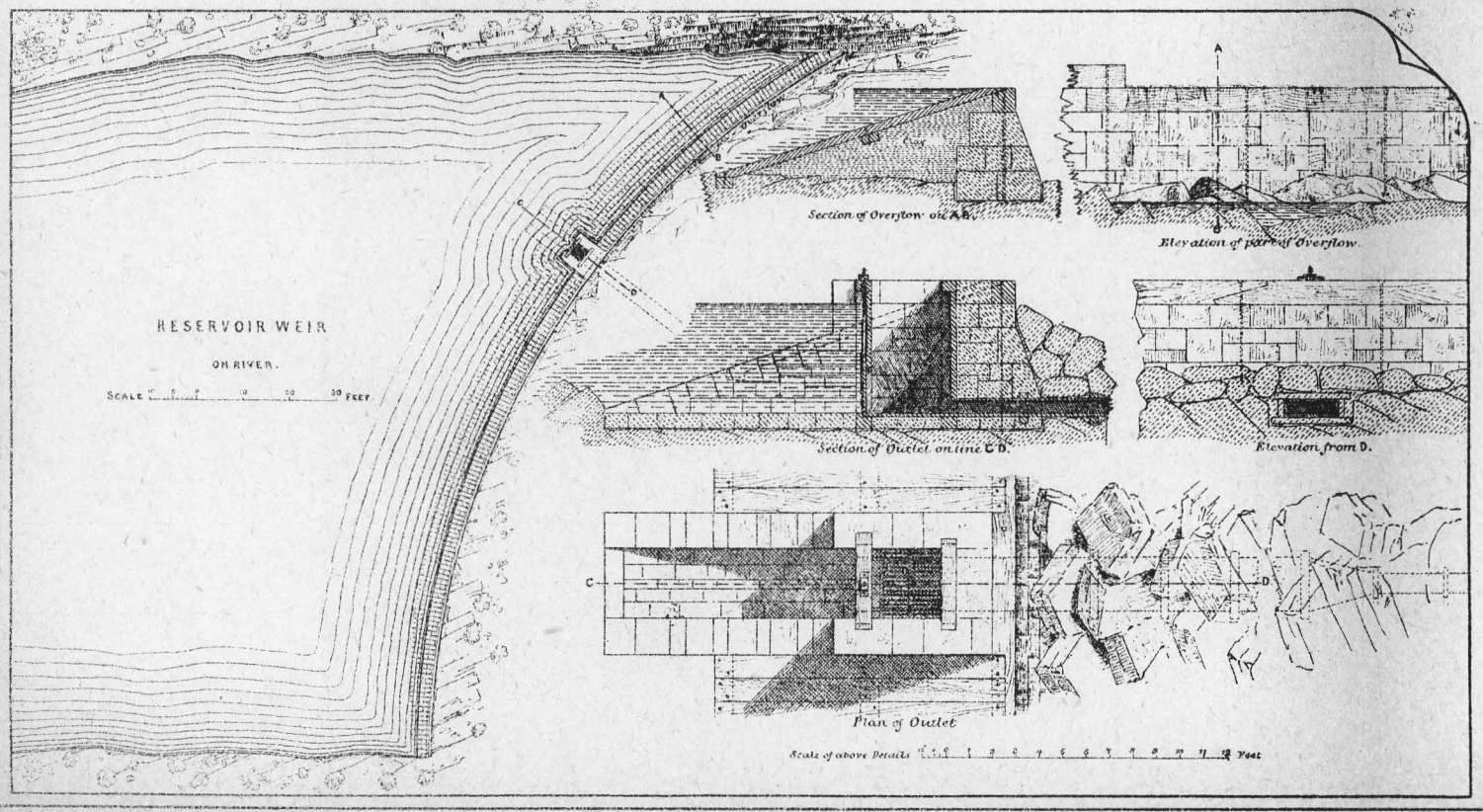
A. MAULT, *Engineering Inspector.*

Hobart, 29th September, 1890.





FLEURIEN or  
O V S T E R B A Y



A Sketch Map of  
**SWANSEA**  
to accompany Report on the Water Supply

Scale of Chains 0 10 20 30

Note: The pipe tracks of each alternative scheme are shown by dotted lines; those common to all the schemes by full lines

A. Maule  
Sept. 1890.