

**Sydenham drainage, &c.; Reports and estimates, / by Messrs Donaldson and Gotto, Assistant Surveyors. 2nd June, 1849.**

### **Contributors**

London (England). Metropolitan Commission of Sewers.  
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93  
18.

## Metropolitan Sewers.

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PRINCIPAL OFFICE, GREEK STREET, JUNE 2, 1849.

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### SYDENHAM DRAINAGE, &c.

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REPORTS AND ESTIMATES BY MESSRS DONALDSON & GOTTO,  
ASSISTANT SURVEYORS.

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RESOLVED—"That Mr Donaldson's Report on Sydenham be referred back for the addition of the expense for the complete Sewerage and Drainage of Sydenham, and for particulars as to the means of obtaining a supply of water for flushing; and that Mr Donaldson put himself in communication with some of the inhabitants of Sydenham."

No. 215.  
March 5, 18  
Works Co  
mittee.

RESOLVED—"That Mr Gotto be associated with Mr Donaldson in the Report to be made on the Drainage of Sydenham."

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No. 366  
April 16, 18  
Works Co  
mittee.

In obedience to these orders, we have surveyed and examined the hamlet of Sydenham in reference to house, land, and surface drainage, supply of water for keeping the drains cleansed, &c.

Complete sewerage and drainage, to which our instructions refer, as they involve house drainage, as well as other matters consequent upon the same, and altogether constitute a much larger question than the examination of the open ditches of that neighbourhood (to which Mr Donaldson's former Report was limited), so they render necessary more particular and detailed personal investigation, the result of which we beg to present for the consideration of the Commissioners, embodying, at the same time, the substance of the former Report.



## Description.

Sydenham and its immediate neighbourhood comprise a part of the parish of Lewisham, in the hundred of Blackheath, in the county of Kent, and contains, at present, 649 houses, and a population of about 4,000.

Comprehensive building schemes are now in progress, by which the erection of at least 417 houses of a superior class is contemplated, but without any systematic arrangement of levels for streets and basements with reference to the drainage; and, in the absence of such an arrangement, it is obvious that impediments to a simple, inexpensive, and uniform system of drainage will accumulate.

The area proposed to be included in the Sydenham district forms that part of the drainage area of the Ravensbourne, which is delineated in the accompanying plan, having been defined on the ground with a careful attention to the natural water-shed, and in such a manner that no future arrangement would interfere with these works when completed. Nevertheless, if it should at any time become desirable to extend this district, or to attach another to it, such a course might be adopted without impairing in any way these recommendations; and regard has been had to such a probable contingency.

Sydenham may be regarded as a place but very recently changed from a rural district to a populous town, which, in respect of those important requisites, proper sewerage and water supply, is in its primitive condition, and on this account may be the more easily dealt with—the subject being unencumbered with existing and defective systems of either one or the other.

With the exception of a few houses recently erected, the existing drainage is for the most part into cesspools, with an overflow into the nearest open roadside ditch, or the open brooks which flow through the town.

Very few of the houses have water-closets—those that possess them drain into cesspools. The position of the water-closets and that of the privies is shown in the accompanying plan.\*

In some places the inhabitants complain that the smell from the cesspools of their dwellings, although lately built, is so extremely offensive, and produces such evident effect upon their health, as to compel them to change their place of residence.

The natural undulations of the country, while they present peculiarly eligible building sites, which have been extensively appropriated, at the same time facilitate drainage operations, affording good inclinations for the sewers, and so diminishing the size and consequently reducing the cost of such work.

The natural outfall of the watercourses is into the Poole River at Bell Green, and thence by the Ravensbourne into the Thames.

The main watercourses take their rise in high and springy ground, at Coombe Wood, west of Sydenham, from two heads, forming a tongue of land between; they unite in a lane lower down towards the town, thence flow across Jew's Walk, through a brick culvert under the railway, and along the part called Lower Sydenham to Poole River at Bell Green. Another minor valley watercourse rises north of Wells road, and passes through another very large brick culvert under the railway, a short distance

\* The original draft plan exhibiting these details has been reduced.





Metropolitan Sewers.  
 PLAN OF PROPOSED  
 SEWERAGE DIVISION  
 OF THE  
 RAVENSBOROUGH DISTRICT.  
 TO ACCOMPANY SEWERAGE REPORT.



*W. G. Carter*  
*Surveyor*  
*1880*

Scale.  
 1 inch = 1 mile

south of the Forest-hill station, and so into the Poole River. The watercourses, as well as the almost stagnant roadside ditches, are polluted by the house-sewage from the dwellings of all classes, (which are rapidly increasing in number,) causing very serious injury to the value of property and the sanitary condition of the locality.

The roads are only partially and imperfectly drained, partly by open ditches, and partly by covered drains, portions of the open ditches having been, from time to time, covered in.

In Wells road, which runs across a hill-side of considerable declivity, the houses on the south or lower side drain into cesspools in the back gardens, which overflow into the grounds adjoining. And the houses on the north or upper side drain into the roadside ditches, which being very shallow, unavoidably become at times extremely offensive and unwholesome. This is but a single instance; the same evils exist throughout the district, and imperatively call for remedial measures.

The soil about Sydenham is a plastic, retentive clay of considerable depth, intersected with veins of sand, and naturally wet, producing during the greater part of the year streams of water, brackish in quality, containing peroxide of iron, and draining into the field and roadside ditches, from which a number of the poorer inhabitants have their supply of water for household purposes, although they complain that the house drainage has of late rendered it hardly fit for use.

Character of the soil.

There is no regular water supply for this neighbourhood. The water obtained from wells of moderate depth is almost unfit for domestic use, and therefore resort has not been had to them. The South Lambeth Water Company have, however, brought up their mains as far as Forest hill, and obtained power to supply Sydenham. The supply would, of course, according to the present practice of the Company, be intermittent; but nothing has yet been done by the Company in Sydenham for affording any supply, and the greatest inconvenience arises from the want of this necessary of life. Failing the supply from the roofs and roadside ditches, water is brought by carts from Poole River, and a deep well at Peake hill, and sold at the rate of 2s. per butt of 125 gallons.

Present water supply.

There is no possibility of obtaining, in the event of fire, a supply of water necessary for its extinction.

Such is the present condition of Sydenham. The value of property will be greatly enhanced by sanitary measures. Being situated at a convenient distance from London, with railway communication, having a good aspect opening southward, and being well sheltered on the north and north-west, it justly stands high in public estimation.

The works we beg to recommend may be generally stated and divided as follows, and will be more particularly elucidated in the body of this Report:—

- 1st. An arrangement for the natural drainage, both immediately *from* the surface, and ultimately *out* of the soil, upon the basis of the present naturally-formed valley lines of watercourses, purified from their present contamination.
- 2nd. The construction of a system of house drainage of tubular earthenware drain pipes, independent of and unconnected with the above arrangement.



3rd. A provision for a self-acting and constant supply of pure water under such a pressure as would carry it to the upper floors of the houses, and in such abundance as would ensure the constant cleansing of the whole of the house and main drains.

4th. An arrangement for the disposal of the house sewage.

### SURFACE DRAINAGE.

As the character of the place is not sufficiently urban to require paved streets and covered conduits for the free passage of rain and storm water, it does not appear expedient to lay out large sums of money to abolish the open streams, which should rather be allowed to flow through the village perfectly clear and pure, the house drainage with which they are at present polluted being carefully diverted from them. We would suffer nothing but land and surface drainage to pass into them; for this purpose they were originally intended, and by this their natural use they would become ornaments to the place, instead of nuisances justly complained of at present.

These remarks refer to the main watercourses of this area. The roadside drains, which are at present used as open sewers, containing rather than conveying away the foulest house drainage, should be so constructed as to form so many main drains for land drainage, and finally outfalls into the main open watercourses; so arranging the road channels as on extraordinary storms to convey the water as far as possible before it falls into the road drains, which otherwise must be of much larger size and greater length than is necessary for ordinary purposes.

The rapid fall of the roads would render it necessary that precautions should be taken for preventing the storm waters from carrying sand, gravel, &c. into the road drains. With a view to this, we recommend the use of gullies with sand traps, admitting of the sand collected therein being readily removed. A drawing of a grate and sand trap proposed by Mr Donaldson is appended, which appears to be adapted to this purpose; from its simplicity of construction it is not likely to get out of order; the cost would be about 1*l.* 5*s.* each.

In Wells road, Forest-hill road, Kirkdale, Dartmouth road, and other roads and streets formed or in progress of formation, tubular road drains are required for the land and road drainage and storm water, and all these might discharge into the open brook, which should be cleared out and straightened, and should have a brick invert constructed in the open parts. The probable cost of this work, with the road drainage and gullies, would be about 1,629*l.*

### SUBSOIL DRAINAGE.

The question of subsoil drainage of land for the foundations of houses has not hitherto received the practical attention due to so important a matter. With soils of a retentive nature serious inconvenience and much damage are occasioned by this inattention. Damp walls and basements are among the evil results, and are frequently the cause of much sickness among that large portion of the community, domestic

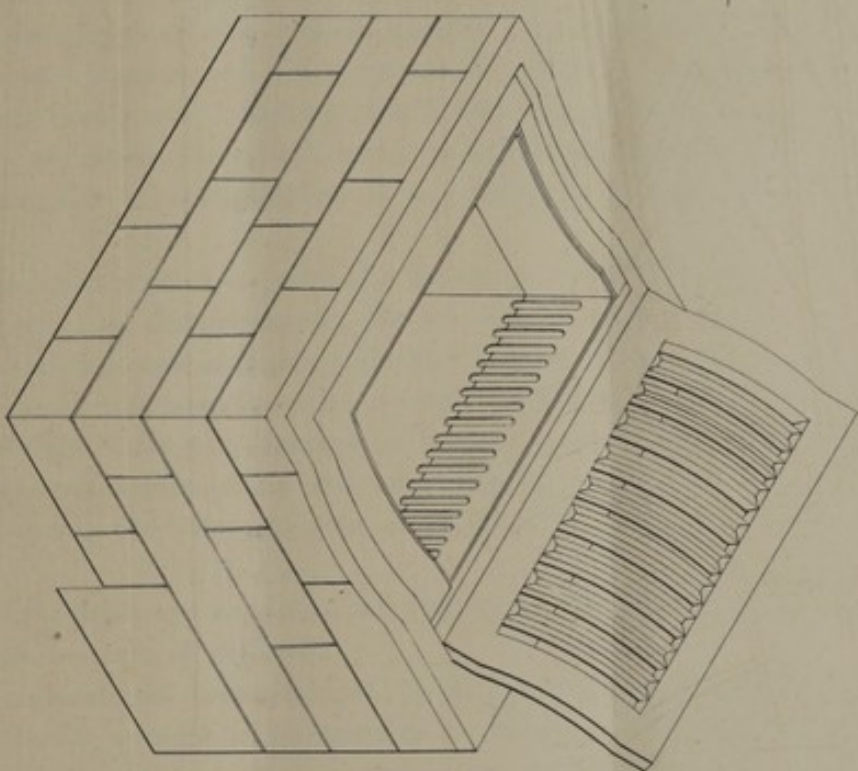


# SYDENHAM SURFACE DRAINAGE.

## IMPROVED GULLY.

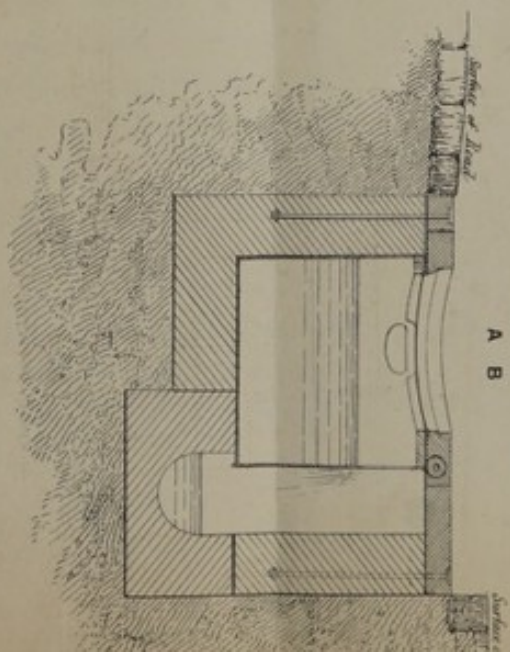
Longitudinal Section.

C D



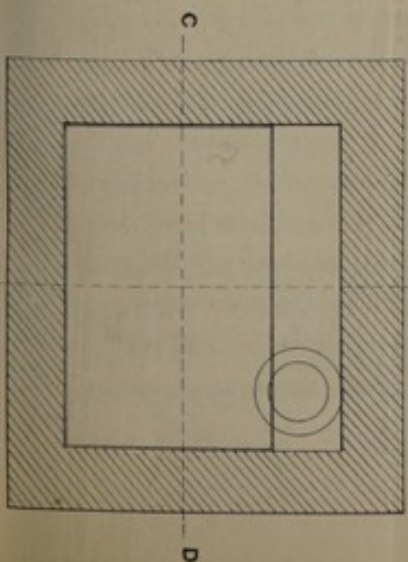
Transverse Section

A B



Plan

B



Scale.







servants; and they further induce premature decay and consequent depreciation of value in house property, for which no ordinary house or surface drainage provides a complete remedy. These remarks refer with particular force to the wet clay soil of Sydenham, which is about to be so extensively covered with dwelling-houses.

Those who have had experience in this neighbourhood have discovered the necessity of such a precaution, although the method adopted is by no means so efficient as, and is very much more expensive than that which we have to propose. A proprietor of some extent has laid under the foundations of the houses he has recently erected, and others he is now building, brick drains of 12 inches diameter for this purpose. It is proposed to afford facilities for effecting such improvements in combination with the arrangement for land drainage already suggested, namely, by the roadside drains. Agricultural land drainage and the subsoil drainage for the sites of houses are the same in principle and practice, and differ only in degree (that is, the sites of houses would be drained more closely and elaborately than lands under culture); and in all suburban land-drainage operations the outfalls and general arrangements should be such as might, by laying extra lines of similar drains in any particular spot, be adapted for a building site.

We do not presume to lay this down as essentially belonging to sanitary improvement, and to be carried out under all circumstances. We are speaking with reference to the soils upon which our attention is now engaged, and which require such works.

It assumes, however, a prominent place in works of improvement, when comprehensive arrangements are contemplated for land drainage in the area under the jurisdiction of the Commissioners, the general nature of the soil requiring it, while, at the same time, the metropolis is extending and encroaching in every direction on the rural parts under that jurisdiction.

We have perambulated the fields and meadows, and find the herbage generally of an inferior quality, owing to the wetness of the land.

We recommend that agricultural drain pipes of  $1\frac{1}{2}$  inches in diameter should be laid down in uncovered lands, the average width apart to be 22 feet, and the average depth 4 feet; and that for the site of a house there should be an intermediate line of such pipes, so as to lessen the distance between, one half.

As nearly the whole area delineated on the plan will certainly in the course of time become building land, this proposed operation of subsoil drainage would, if executed upon the plan before recommended, be so far a preparation for its ultimate use.

The cost of this work would be about 5*l.* 5*s.* per acre for agricultural land, or 6*s.* 10*d.* per annum, if paid by an improvement rate, for 22 years. When intended to convert it into building ground, the expense would be 4*l.* extra per acre, or 5*s.* 2*d.* per annum, if the outlay were distributed over 22 years.

Land of this description while under cultivation, if it be thus drained, will as such be increased in value at least 15*s.* per acre per annum by the improved quality and the increased quantity of the produce, and would pay nearly 15 per cent. on the outlay.

It does not appear to be necessary to state in this Report the details of cost for this work over the whole district.



We recommend that in all new building projects in this district the levels of the streets should be arranged so as to carry off the rain water by the surface channels; by which plan large sewers will not be required, there being abundant fall in every place to present every opportunity for this economy.

### HOUSE DRAINAGE.

use drain-  
ge.

It will be observed, we propose that the house drainage should be independent of surface and subsoil drainage. Without assuming that the separation could be effected in every place, we recommend it in this instance as a positive economy, and esteem it necessary in order to purify the natural streams, watercourses, and river of the district, which would otherwise be contaminated at an enormous cost for large sewers, besides the waste of the valuable fertilising matter, an unavoidable result of uniting the house sewage with surface and rain water. And further to show the importance of this arrangement in the present instance, it may be noticed that the Lewisham Waterworks Company obtain their supply from the Ravensbourne River, a little below the confluence of the Poole River; so that it is peculiarly desirable that the filth of the drainage area should be excluded from the rivers. We have carefully estimated the expense of both plans, and find the cost of one we have proposed above, if completely carried out, including house drainage, water-closets, &c., to be about one-third the cost of sewers only, under a united system of house and surface drainage.

Indeed, in the present state of Sydenham, we should not feel justified in recommending so expensive a work as the united system to be done, and the cost of it to be laid upon the present limited number of inhabitants. The utmost progress towards such a work which would for many years be at all prudent, would be the preparation of the plan, showing the intended lines of sewers, and the regulation of the levels of new streets and houses accordingly.

But it is evident that the small cost of tubular house drainage brings that important work within the means of present circumstances, although for a very large portion of the distance there would be, of necessity, a dead length of sewer pipe; and this work might be done in any case, and at any time, by itself, without reference to surface and land drainage.

Moreover, on the most essential sanitary principles we consider the plan now proposed preferable for Sydenham, as, besides purifying the streams and river, it would be unnecessary to provide ventilating shafts from the sewers into the middle of the roads or streets, as is the practice in London, where the public are compelled to inhale an atmosphere charged with poisonous gases, freely generated under a high temperature in the sewers, and emitted from these shafts and the gullies into the thoroughfare, causing such perceptible inconvenience as affords just grounds for the daily complaints by private individuals as well as in the public prints;—and rather than suffer this nuisance, private persons readily offer to pay the expense of trapping the gullies. It must be observed, however, that in proportion as gullies are trapped, so the number of ventilating shafts must be increased.



There should be no connexion between the street surfaces and house-drainage pipes ; and it is a forcible reason for our recommendations that the systems of house drainage would require no ventilation, the advantages consequent upon which are evident and numerous.

The gullies would be connected with the pure watercourses, and the apparatus of side entrances (costing 17*l.* each) would be dispensed with.

Separate channels being provided for the storm and rain water, our daily experience shows that with a constant supply of water very small pipes would be sufficient for house drainage.

In determining the size of these pipes, we have made them about three times larger than would be necessary to carry off the house sewage in 12 hours, calculating upon a given average quantity of water being supplied to each house ; because provision should be made for a sudden quantity of sewage to pass off : and further, it would be necessary in premises already built to carry off the roof and yard water.

Provision should also be made in the capacity of the sewer for all possible increase in the number of houses and population. The main sewer pipes as proposed vary from 12 inches to 6 inches in diameter ; the branch drains to houses, 4 inches : the materials to be perfectly formed and well-burnt fire clay.

Particular attention has been paid to some very large building projects, with a view to provide for them deep outfalls for house drainage : in the present arrangement of the surfaces we find there would be no difficulty in conducting the surface drainage into the natural streams.

The basements should in no case be more than 2 feet below the level of the natural surface, so as not to interfere with, and in order that the building may have the full advantage of, subsoil drainage ; and under the 56th section of the Metropolitan Sewers Act fourteen days' notice, with a plan showing the proposed level and the surface inclination, should be required before any new streets are formed.

The direction of the mains and house drains is expressed on the plan. Some private property would be passed through, the probable compensation for which is included in the estimate.

It is proposed that the two existing culverts under the railway should be made available for the main lines of house drainage, without obstructing the separate course of the land drainage.

There are a few houses recently built which have sufficient drainage, which is proposed to be connected with the system here laid down.

Many of the existing privies are at the ends of the gardens, some distance from the house ; and as the inconvenience of this arrangement would be removed by abolishing the cesspools, in some such cases the water-closets would be attached to the houses, and in others constructed inside.

In preparing the details of the following estimates, attention has been given to the inlets to the house drains. We would strongly urge the necessity of having them



securely fixed, and of such construction as to perfectly trap the sewer pipe, and admit of no obstruction to the system.

There would be 5 miles and one-third of main-sewers pipe, and nearly 5 miles in house drains.

446 cesspools to be abolished.

505 water-closets to be constructed.

The estimate for the main-sewer pipes and compensation for damage to land, &c. is 3,553*l*.

The cost of the house drainage would be 2,948*l*.

The average cost for draining a house, including the drains for house sewage, yard, and roof water, water-closet apparatus, and laying on the water to the same (the main pipes of both sewage and water supply being in the street) would be about 4*l*. 18*s*.—which, distributed over 22 years, with interest at 5 per cent., would be reduced to 6*s*. 4½*d*. per annum, or 1½*d*. per week.

Existing houses of the lower class have privies: the first outlay for the cesspools and seat is about 2*l*. 5*s*., and the annual expense of maintaining the same in repair and emptying the cesspool is about 1*l*. 2*s*. 6*d*. per house per annum, perpetually.

The proposed arrangement requires no first outlay, and an annual expense of only 8*s*. 6½*d*. which would cease in 22 years. This estimate includes destroying the cesspool, substituting a water-closet pan and fitting up the same, laying proper drains, as well as the proportion of the expense for main sewers, road drainage, and other general sanitary improvements, except laying on the water.

But the present more expensive system involves open and overflowing cesspools, with filthy ditches, which make it indispensable that the privy should be removed as far as possible and at a very inconvenient distance from the dwelling-house.

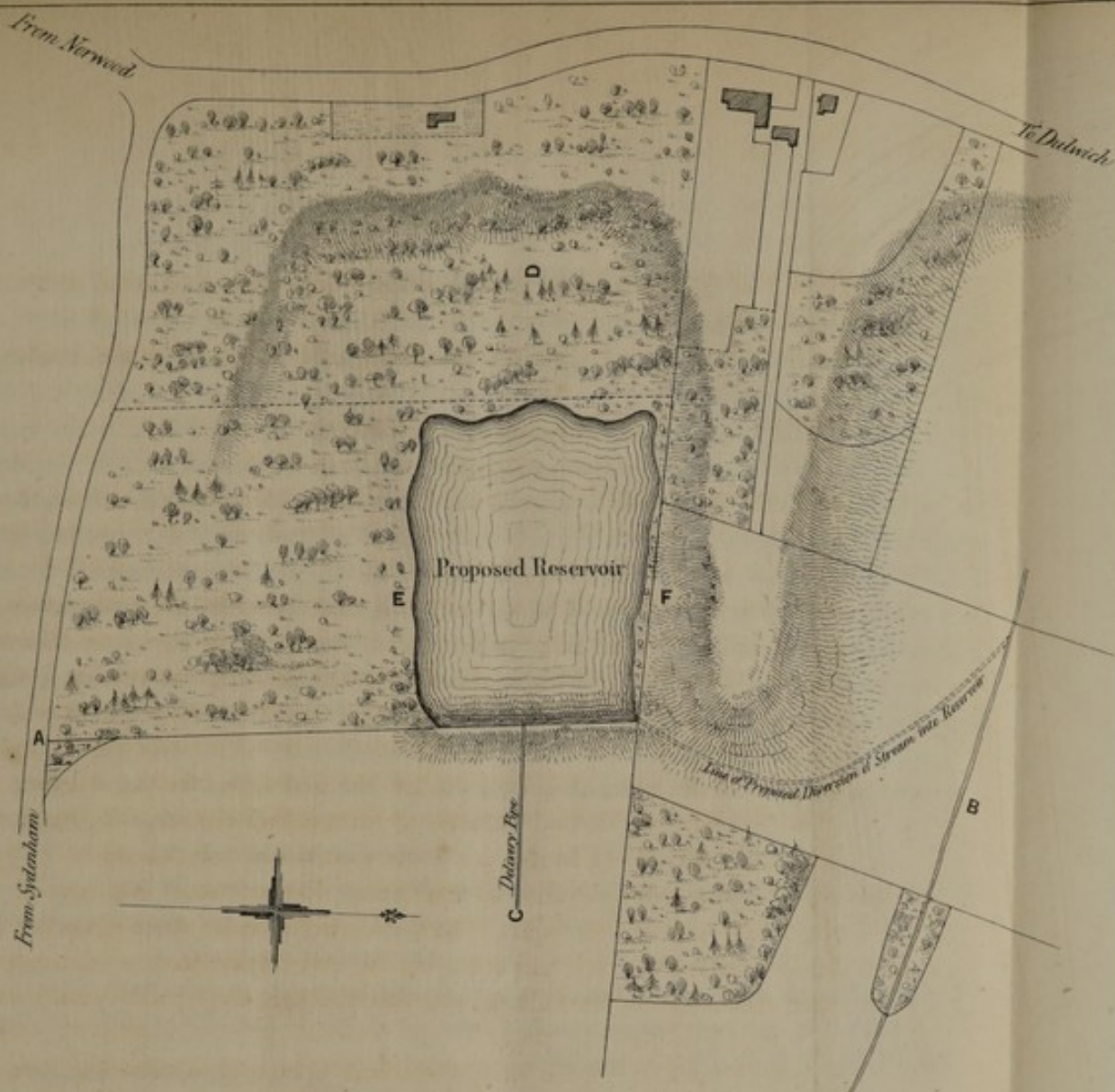
Again, in the larger houses, the more wealthy inhabitants have substituted the water-closet for the common privy. This is done, of course, at an increased expense for the water-closet apparatus and overflow brick drain, the whole cost of which is about 15*l*. 2*s*. as a first and immediate outlay, besides a constant and annual expense for emptying the cesspool and repairs of about 1*l*. 12*s*. 6*d*.

In such a case, more efficient works, as now proposed, will cost only 15*s*. 5*d*. per house per annum for 22 years, including, as before, the expense of the main public sewers, the abolition of the open offensive ditches, and other improvements of a general nature.

In some instances a very large cesspool has been constructed in connexion with each house. These do not require emptying every year, but the first expense is very heavy, and however superior in point of convenience to the more common sort, they effect no economy, and as means of accumulating the elements of disease, are in all cases dangerous appendages to houses, and constant sources of discomfort.

The attention of persons about to enter into large building projects cannot be too strongly drawn to this subject.





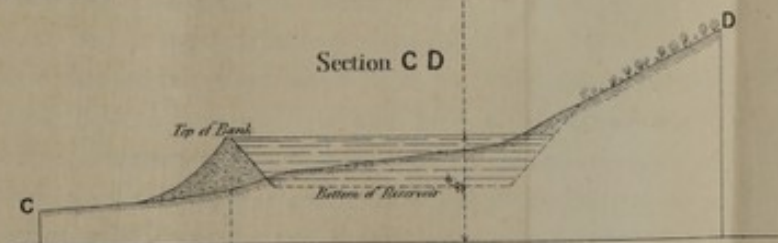
# SYDENHAM.

## PLAN AND SECTIONS for PROPOSED RESERVOIR

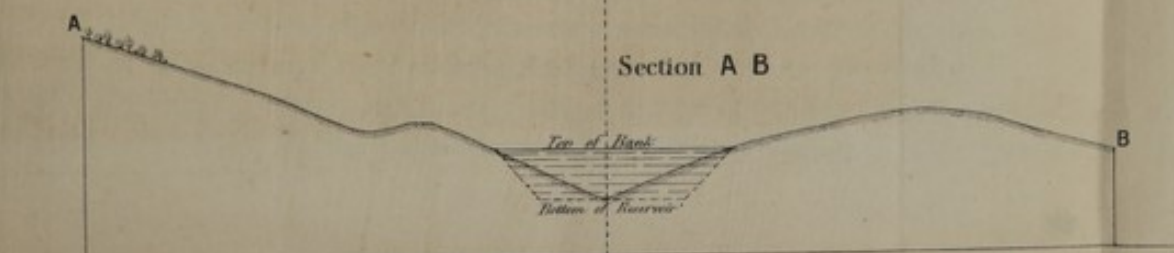
Section E F



Section C D



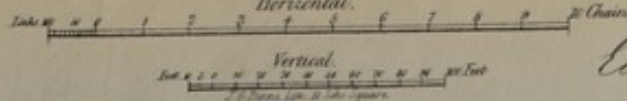
Section A B



Scales.

Horizontal.

Vertical.



Donaldson

Edward G. H.





## WATER SUPPLY.

The foregoing improvements have been recommended upon the assumption of an abundant and constant supply of water for cleansing the sewers and drains, in accordance with the 66th section of the Metropolitan Sewers Act, being procurable. And as the proper action of the sewers depends upon a supply of the water being laid on to the water-closet and sink, it became an important part of our inquiry to ascertain whence this could be obtained. With this view, we traced the streams to their source at the head of the valleys which reach up to Coombe Wood, where there is a natural bay of land full of spring water at a height sufficient to supply the houses. We propose that a reservoir and filters should be constructed according to the accompanying drawing, by casting up an embankment across the mouth of this bay of land, affording a storage sufficient for several months' supply, and forming a beautiful lake in the heart of the wood. This water has been analysed by Dr Lyon Playfair; and it appears to be the softest that has yet been examined, and peculiarly adapted for domestic use. Subjoined is a copy of his communication.

"No. 1 was marked—Specimen of Water from Lambeth Water Works, as supplied at Forest Hill, June 5th, 1849.

"Hardness of this water . . . . . 10°

"No. 2 was marked—Specimen of Water from Spring near Coombe Wood, near proposed Reservoir, June 5th, 1849.

"Hardness of this water . . . . . 2°

"Both these waters were clear, free from deposit, and unobjectionable in their physical properties; but the hardness of the former was five times greater than that of the latter.

(Signed) "LYON PLAYFAIR.

"Museum of Practical Geology,  
"7th June, 1849."

We also append Dr Lyon Playfair's statement of the saving effected by the use of the soft water which we propose to be used at Sydenham. (See Appendix A.)

The construction of this lake would, in our opinion, be a very desirable improvement to this property, which in an agricultural point of view is of little value; for by draining the hill-side above it, it would be converted from a swampy bog into most eligible building sites on the banks of the water, with southern aspect, commanding Sydenham and a very extensive range of country beyond, and sheltered from the north; or if it should be retained as pleasure-ground, it would be not the less improved in value.

From this reservoir we propose that earthenware water pipes be laid in the trenches opened for the main and house drains; and as these works should be done simultaneously, one expense of digging would in most cases answer both purposes; and we should recommend that the distributary pipes to the houses should also be of well-burnt and glazed clay, with a stopcock to each house at the junction with the main, and proper valve taps in the house.

It is plain that the water supply we propose would be self-acting and constant.

We may perhaps observe, though the points are not within our instructions, that means would be thus provided for extinguishing fire; and that if every house were supplied with water for domestic purposes, the average annual charge of 5s. per annum per house would pay 5 per cent. for the capital expended. This calculation is made upon the



present number of houses; but in a few years, when the houses are increased in number, this charge might be very much reduced.

As this supply would be constant, it would be unnecessary to provide cisterns, and thus the expense of laying on the water would be materially reduced, and the chief obstacle to its introduction to the houses of the poorer classes removed.

The smallest quantity of water required for a family we calculate to be about 12 gallons per day, which would cost, at the present rate of payment,  $2\frac{1}{2}d.$ ; so that the supply of water for little more than three weeks now costs them as much as under the proposed arrangement would give them four times the daily quantity for a year.

Of the inconvenience and privation experienced by the poor, who depend upon the roofs and ditches for their water supply, we are unable to form any adequate estimate.

There are, however, in some houses, wells, whence the supply is obtained by the common windlass and bucket. The water procured in this way is scarcely fit for domestic use, and there is but little more facility afforded by this means than in that last described.

The cost for wells, windlass, buckets, chains, &c., would be about 6*l.* 11*s.* 6*d.* immediate outlay, and a constant expense for repairs, &c. of about 5*s.* per annum; while under the proposed water supply there would be an unlimited quantity at an annual charge of about 10*s.* per annum per house, for 22 years, including the cost of laying on the water, as well as for the water itself.

Houses of a still superior class have wells with force-pumps to supply the water-closet, cisterns, &c.

This apparatus (consisting of well, slate cistern, force-pump, suction, supply, service and waste pipes) costs about 26*l.* 8*s.*, and would necessitate an annual outlay for repairs, &c., of about 1*l.*, and for labour in periodical pumping of about 2*l.*; making together an annual and perpetual payment of 3*l.* for an indifferent supply and very inferior quality of water.

Whereas the plan now proposed would give an unlimited and constant supply, including the expense of laying on the water, for about 15*s.* per annum for 22 years.

By the terms of the 66th section of the Metropolitan Sewers Act, the Commissioners may either supply themselves or contract with any company or person for the supply of water for cleansing the sewers and drains; but we recommend that the Commissioners should avail themselves of the power conferred upon them under that section to execute the works themselves.

#### DISPOSAL OF REFUSE.

In directing our attention to this part of the subject, the necessity and advantage of separating the house drainage from the rain water again present themselves. Storm waters and land drainage are variable in quantity, and if applied together with house sewage for irrigation, the quantity would be uncertain and always in the greatest excess when least wanted on the land, the expense of its application increased, and its value diminished by extreme dilution; and then there would of necessity be an overflow of the surplus into the stream or river, an evil which we cannot too much insist upon the necessity of avoiding.



But with the house drainage alone (including of course some portion of surface water from roofs and yards which contains foul matter) the quantity for which a means of conveyance and application to the land has to be provided would be nearly constant, and consequently easily managed and under control, while the quality would, of course, be many times more concentrated and generally uniform.

The surface of the lands adjacent is favourable for the application of the sewage water to fields on a lower level along the valley of the Ravensbourne by gravitation; but unfortunately these lands are all so wet, that until they have been thoroughly drained the sewage water could not profitably be applied to them.

In this state of matters, we beg to recommend the adoption of means for extracting the solid fertilising matter chemically or by precipitation from the sewage water; the quantity of sewage not being sufficiently great to justify the erection of machinery for pumping it to any other locality. As, however, similar works would be executed in adjacent places, it would be found desirable to carry down the sides of the streams and rivers culverts to intercept and collect the sewage of such places; and these recommendations have been proposed with this view. In the mean time, recourse has been had to the following alternative:—

We are given to understand that an offer will be made to pay for the sewage after the rate of 2s. 6d. per ton of solid matter extracted, which we calculate would produce an income, with even the present number of houses, of 150*l.* per annum at the least, and no outlay by the Commissioners would be required, as the parties would erect at their own expense the necessary works.

In conclusion, we recommend that the whole area draining into the Ravensbourne River be declared, under the 34th section of the Metropolitan Sewers Act, a separate sewerage district, and called the "*Ravensbourne District*;" and that the more limited drainage area which comprehends Sydenham be declared, under the 35th section of the Act, a subdivision, and called the Sydenham Division.

That a special sewers rate be made, under the 81st section of the Act, upon the Sydenham Division of that district, to defray the expenses of the surface drainage and main sewerage.

That an improvement rate be made, under the 82nd section of the Act, for house drainage, &c.

That the requisite amount of money be borrowed, under the 106th section of the Act, upon the credit of these rates.

### SUMMARY OF EXPENSES.

#### SPECIAL SEWERS RATE.

Estimate for road and land drainage	-	-	-	-	£1,629	0	0
Estimate for main sewer pipes, &c.	-	-	-	-	3,553	0	0
					£5,182	0	0
<hr/>							
It will require to pay off this amount in 22 years, with 5 per cent. interest	-			-	£336	16	7
Deduct income from sewage manure	-	-	-	-	150	0	0
Amount of annual rate required	-	-	-	-	£186	16	7



But, of course, the income from the disposal of refuse would increase every year, as houses were built along the dead lengths of sewer, so as, in a short time, nearly to cover the required amount of annual rate.

And it is our opinion that the special sewers rate, improvement rate, and charge for water, would not average, in the first instance, more than—

For a house 100l. per ann.	£2	6	5	per ann.
„ 50l. „	1	5	11	„
„ 10l. „	0	8	7	„

and would diminish in amount every year in the manner shown above.

An approximate estimate can only be given of the proportion, as it is apparent that in some instances a small house would cost for house drainage as much as a large one.

Notices must be served (under section 91) of the special sewers rate, and the private improvement rate, hereinbefore recommended.

And a further notice (under section 60) of fourteen days, with deposit of plans and sections, would be required before commencing the works.

And finally we beg to report, in accordance with the 65th section of the Metropolitan Sewers Act, that there would probably be for several years no annual expense of repairing these works, if they were executed properly in the first instance, and that the most advantageous mode of contracting would be by tender, for executing the work and maintaining the same in repair for a term of five years.

#### *Recapitulation of the Recommendations of this Report.*

1st. That the Court declare that part of the area under their jurisdiction which drains into the Ravensbourne River to be a separate sewerage district, called the “Ravensbourne District.” (Sec. 34.)

And part of the Ravensbourne District, comprehending Sydenham, to be a subdivision, called the Sydenham Division. (Sec. 35.)

2nd. That a *Special Sewers Rate* be prospectively made upon the “Sydenham Division,” of such an amount as would be sufficient to discharge the cost of land, surface, and main sewer drains, with interest thereon, in twenty-two years. (Sec. 81.)

3rd. That an *Improvement Rate* be made, sufficient to discharge the cost of house drains, water-closets, &c. &c., with interest, in twenty-two years. (Sec. 68.)

4th. That the amount of money necessary for the execution of the works herein proposed be borrowed on the credit of the above rates. (Sec. 106.)

5th. That a system of tubular pipes be laid down, as shown in the accompanying plan, for the road, surface, and land drainage; and that the open watercourses be straightened, and an invert laid in the bottom.

6th. That another and distinct system of tubular pipes be laid down according to the plan for house drainage.



7th. That a reservoir be constructed in the hill-side of Coombe Wood, and pipes laid down from the same for a water supply necessary to keep the sewers and house drains clean and in proper action.

8th. That as it is not at present expedient to use the sewage manure in a liquid state, the alternative of disposing of the same to be precipitated or treated chemically be resorted to.

G. DONALDSON,  
*Assistant Surveyor.*

E. GOTTO,  
*Assistant Surveyor.*

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APPENDIX A.

Gentlemen,—In compliance with your letter of the 19th on the relative quantity of soap which would be consumed by the Lambeth and Sydenham Waters; the one being  $10^{\circ}\frac{3}{4}$ , the other  $2^{\circ}$  of hardness. The question is somewhat difficult to answer; but, after mature consideration, I have to draw your attention to the following facts:—

Before 100 gallons of the Lambeth Water could have proper detergent properties, it would exhaust and render useless 25 ounces of curd soap. The Sydenham Water, of  $2^{\circ}$ , would render useless, for every 100 gallons, 6 oz. of soap; therefore, the difference would be 19 oz. in favour of the latter.

These are not, however, the actual quantities which would be used practically. The consumers of a hard water in washing their persons only saturate with soap a portion of water taken out of the basin, and use the main body of the water for rinsing off the detergent lather. In washing clothes, however, the whole quantity of water is saturated with soap until it becomes detergent. Allowing, therefore, for a diminished quantity of soap in the first instance, and supposing that each person is allowed a quart at a time for personal ablution, I find that the total quantity of soap used by a family of five persons, with a water of  $10^{\circ}$  (taking round numbers), is 50lbs per annum, or 10lbs per head, while the consumption of the family enjoying a water of  $2^{\circ}$  will be 28lbs per annum, or  $5\frac{1}{2}$ lbs, say  $5\frac{1}{2}$ lbs. per head. Thus, the actual saving will be 22lbs. of soap to the family having the soft water.

But this saving is far from representing the true economy of the soft water. In the first place, the ablution actually received is much greater in the case of the soft-soap water than could be given by the hard. Secondly. The wear and tear is very much less in the first instance than in the second.

The economy in tea and in various culinary operations is also very considerable, and contributes very materially to increase the advantages to be derived from the softer water. You will, therefore, see that the mere saving in soap is only a small part of the economy to be derived.

I am, &c. &c.,  
(Signed) LYON PLAYFAIR.

To Messrs Donaldson and Gotto.



Metropolitan Sewers.

SYDENHAM DRAINAGE,

&c.

REPORTS AND ESTIMATES,

BY

MESSRS DONALDSON AND GOTTO,

ASSISTANT SURVEYORS.

2ND JUNE, 1849.

1 am, do. do.  
(Signed) JYON PLAYFAIR.