

Report to the General Board of Health on a preliminary inquiry into the sewerage, drainage, and supply of water, and the sanitary condition of the inhabitants of the parish of Edmonton / by William Ranger, Superintending Inspector.

Contributors

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PUBLIC HEALTH ACT,

(11 & 12 Vict., Cap. 63.)

R E P O R T

TO THE

GENERAL BOARD OF HEALTH,

ON A

PRELIMINARY INQUIRY

**INTO THE SEWERAGE, DRAINAGE, AND SUPPLY OF
WATER, AND THE SANITARY CONDITION
OF THE INHABITANTS**

OF THE PARISH OF

EDMONTON.

By **WILLIAM RANGER,**

SUPERINTENDING INSPECTOR.



LONDON:

PRINTED BY W. CLOWES & SONS, STAMFORD STREET,

FOR HER MAJESTY'S STATIONERY OFFICE.

1850.

REPORT

TO THE

GENERAL BOARD OF HEALTH.

NOTIFICATION.

PRELIMINARY INQUIRY

THE General Board of Health hereby give notice, in terms of section 9th of the Public Health Act, that within a period not exceeding one month from the date of the deposit hereof, written statements may be forwarded to the Board with respect to any matter contained in or omitted from the accompanying Report on the Sewerage, Drainage and Supply of Water, and the Sanitary Condition of the Inhabitants of the Parish of EDMONTON, or with respect to any amendment to be proposed therein.

By order of the Board,

HENRY AUSTIN, *Secretary.*

Gwydyr House, Whitehall,
16th February, 1850.

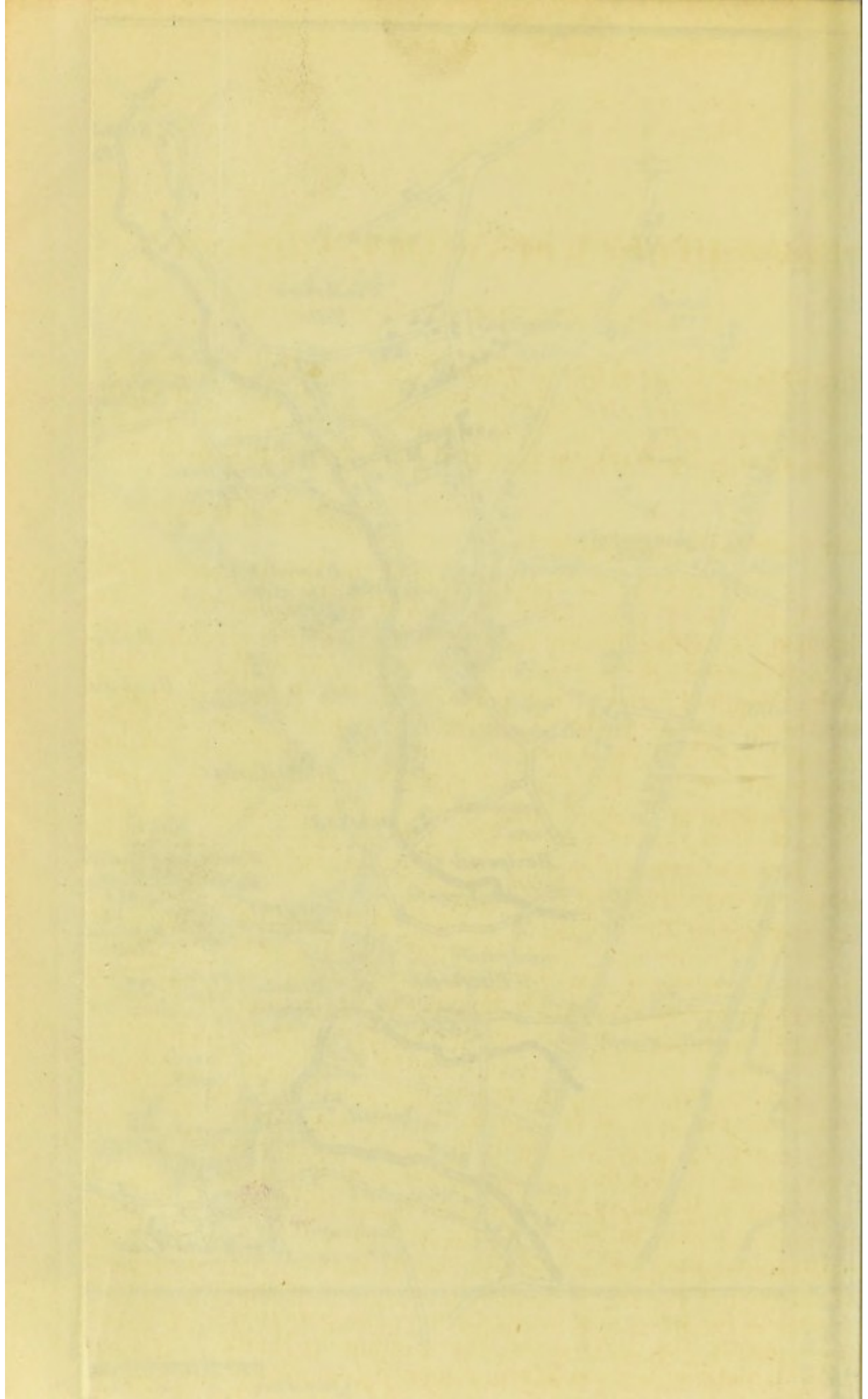


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Report to the General Board of Health.

These areas "proper" are of two classes: one having reference to town drainage, the other to water-shed or gathering ground. And it is one main principle of the statute, that "districts" may, if necessary, be formed so as to correspond with the areas of drainage, and co-extensive with the line of water-shed.

PUBLIC HEALTH ACT (11 and 12 Vict., cap. 63).

Report to the General Board of Health on a Preliminary Inquiry into the Sewerage, Drainage, and Supply of Water, and the Sanitary Condition of the Inhabitants of the Parish of EDMONTON. By WILLIAM RANGER, Superintending Inspector.

London, July 10, 1849.

MY LORDS AND GENTLEMEN,

A PETITION for the application of the Public Health Act, 1848, having been presented to the Board, duly signed by one-tenth of the rated inhabitants resident in the parish, in accordance with your instructions, and pursuant to the terms of the Act, I gave the required notice of my proposed visit to Edmonton, and on the 29th day of March commenced a public inquiry. The report I have now the honour of submitting for your consideration is founded on the evidence of the medical practitioners, a personal inspection of Orchard-street, Eaton-place, Claremont-street, Church-lane, Palmer's-green, Dog and Duck-lane, the places in which endemic, epidemic, and contagious diseases have of late been frequent, as well as several other localities.

In conducting the inquiry I received the cordial support of Messrs. Hammond and Biddle, medical men, also of Mr. Whitbread, chairman of the Board of Surveyors of the Highways, Mr. Knight, Mr. Booker, Mr. Solomons, Mr. Bower, Mr. Gossett, Mr. Ellis, Architect and Surveyor, and several other inhabitants.

The parish is bounded on the north by Enfield, on the south by Tottenham, and the east by the Lea Valley, called Essex Marshes; and traversed from north to south by the New River. It is also intersected by numerous roads in various directions and several water-courses; but three principal ones, *i. e.*, Salmon's Brook, the Brook, and Boundary Brook, all enter the parish on the western side, with outfall through a culvert under the New Cut, or Barge River, into the river Lea, which culvert is the boundary between Edmonton and Tottenham, and by no means sufficiently large to carry off the water after heavy rains. The parish is divided into four wards, *viz.* Bury-street Ward, Church Ward, Fore-street Ward, and South-street Ward, comprising an area of 7,480 acres.

The Act contemplates the adoption of extended boundaries for the purpose of obtaining proper areas and outfalls for drainage.

These areas "proper" are of two classes: one having reference to town drainage, the other to water-shed or gathering ground. And it is one main principle of the statute, that "districts" may, if necessary, be formed so as to correspond with the areas of drainage, and co-extensive with the line of water-shed.

The village of Edmonton is contiguous to the valley of the Lea, its river forming the drain of a valley in the great chalk ridge which intersects the county of Hertford, with tributaries, consisting of the Mimeram, Beane, Rib, Ash, and the Stort, whose combined waters are under no general control, but subject to partial and independent or separate jurisdiction, irresponsible for joint action, consisting of—

The Trustees of the Navigation of the Lea, or parts of the
river Lea, from Hertford to London,
Commissioners of the Stort Navigation,
Commissioners of Walthamstow Marshes,
Mill-owners,
Landholders and their tenants.

I refrain from entering upon the historical account of the river and its tributaries, as, in the present state of the proceedings, the question is one that relates to the effect of this divided jurisdiction, which, bearing upon the question of sanitary improvement, consists in the occasional flooding of the lands, impeding thorough drainage of the upper lands and seats of dwellings, and a complete discharge of sewage, and entailing upon those resident within its range the evils consequent thereon.

Upon a careful examination of rivers and their tributaries, two characteristic differences will be found to present themselves; some are subject to sudden floods, while others of equal size, and under similar conditions, are not so.

The low lands at various parts are subject to periodical inundation, whilst the upland drainage is impeded for want of a free discharge of its waters, and the soil as a consequence rendered far less productive.

The cause will, I think, be found to be this: the volume of water precipitated over the catchment or gathering ground, and drained into the river, is at once discharged into its narrow and almost neglected bed in which it rises, although considerable provision is made by the Trustees of the Lea and mill-owners; a provision it is reasonable to assume founded rather for the maintenance of the navigation, and permanent supplies to mills: abstractedly there can be no objection to the course adopted, at least to that extent, but the drainage of the district is dependent on other conditions than those of merely holding up the waters to the heights of the several dams at different parts of the river, and the provisions made for drawing them down. It is to the holding up of the waters the drainer of these marshes must look for the

future prevention of the least inundation of the adjacent lands, and for securing proper outfalls for the drainage of the uplands and villages, as well as to the removal of obstacles to their proper discharge.

That this has not hitherto been provided for, will, I think, be evident upon a review of the powers that have from time to time been delegated to the Trustees by Parliament, and passed in and subsequent to the 13th of Elizabeth, c. 18, for bringing the Lea to the north side of the city of London.

In the 3rd Henry VI., c. 5, 1425, the Commissioners were authorized "to retain persons to reform the river running from Ware to the Thames;" again, 9th Henry VI., c. 9, 1431, "to scour and amend the River Lea in the counties of Essex, Hertford, and Middlesex." Under this last Act, a commission was granted in 1440 to Sir Ralph Cromwel, Knt., and others, to remove all the shelves in the river, and in 1476, 16th Edward IV., Sir Thos. Wisewyke, Knt., and nine others, were directed to view and order the repair of all the banks, &c., upon the Lea. (Dugd. Fens, fol. 81.)

The next legislative enactment affecting this river took place in the 12th of Geo. II., when an Act was obtained "For ascertaining, preserving, and improving the Navigation of the River Lea from the town of Hertford to the town of Ware, and for preserving and improving the said River from the said town of Ware to the New Cut or River made by the Mayor, Commonalty, and Citizens of London, and for enabling the Governor and Company of the New River the better to supply the Cities of London and Westminster and the Liberties and Suburbs thereof with good and wholesome Water." By this statute the navigation was defined, and 60 trustees were appointed by name, exclusive of the Lord Mayor, Aldermen, and Recorder of London, the members for Middlesex and for the city of Westminster, the members for Essex and the borough of Colchester, those for the county of Hertford and the borough of Hertford, and the Mayor of Hertford, all for the time being. And although this Act determined various disputes which had long existed, and defined the draught or quantity of water to be supplied out of the Lea for the use of the New River, it was soon found to be insufficient to answer the purposes for which it was intended; and amongst other matters, that of a divided jurisdiction (the government of the New Cut, vested in the lord mayor, commonalty, and citizens of London, by the Act of Elizabeth, still remained in them exclusively), upon one and the same navigation, was productive of great inconvenience. In 1766 the trustees consulted Messrs. Smeaton and Yeomans, and in the following year, 7th of Geo. III., another Act was obtained, "For improving the Navigation of the River Lea from the town of Hertford to the River Thames, and extending the said Navigation to the Flood-gates belonging to the Town Mill in the said town of Hertford." By this enactment upwards

of 280 trustees were added to those appointed by the last statute. Two other Acts have since been obtained, one in the 19th of Geo. III., and another in the 45th of the same reign, by which the powers of the trustees are enlarged, and some of the provisions of the former Acts amended, amongst others that of regulating the height of water at some of the mills. By the Act of the 7th of Geo. III. powers were granted for making and maintaining new cuts or canals to communicate with the river for navigation; to purchase messuages, weirs, turnpikes, locks, cisterns, tenements, or hereditaments; to sell or exchange land; to make satisfaction for the claims of interested parties, and summon juries to assess damages; and adopt other measures for placing the navigation of the river on the soundest footing.

The Lea rises in Leagrave Marsh, about three miles north-west of Luton in Bedfordshire, a long distance beyond the jurisdiction and control of the Board of Trustees. A similar want of control exists in relation to the several small rivers or streams that disembogue into the Lea. But the want of adequate control for the purposes of preventing future inundations and a complete drainage of the marshes and lands on the confines of the river and its several tributaries, does not stop here.

The appropriation of the waters has, during the last century, been the subject of repeated litigation, and is so at the present time, although Wren, Desaguiliers, Smeaton, and Rennie, have been employed; the object in each case being merely that, I believe, of improving the navigation and allowing of the abstraction of supplies by the New River Company, reserving to mill-owners their respective rights, and not upon the broad basis of these several measures, combined with that of complete drainage, and preventing inundations from the concrescence of the waters. At all events, the present divided jurisdiction is incomplete.

The fact of the land being subject to floods even partially, proves, to the extent that this is so, either that there is an excess of water (falling within the catchments) beyond what is required for existing mills, the navigation, and abstractions by water companies, and that there is a want of provision for insuring an adequate discharge of the surplus waters, or that they are rendered proportionately productive as a motive power, whilst they are, in consequence of inadequate control, damaging the lands in a greater or less degree; and if allowed to remain as at present, they will impede the carrying out of the measures which are essentially necessary for improving the sanitary state of the districts and towns on the borders of the valley.

The obstacles opposed to the natural discharge of the waters produced in the catchments of the Lea and its connected valleys are of two classes, *i. e.*,

Reservation of lockage and
Mill power.

Each of these must necessarily remain unimpaired as vested rights,

and there cannot be any necessity for diminishing their supply. If any interference take place it will consist in giving an increased and uniform supply; but this is a matter of detail rather than of principle.

The second class of obstacles, independent of the tidal waters of the Thames and resistance produced by the roughness and inequalities of the edges and bottom, consist of

- Cores,
- Deposits,
- Sluices.

And it is by the removal and adjustment of the latter class of obstacles, combined with the holding up of all surplus waters in properly posited catchment ponds, that not only the future inundations of any portion of the land can be avoided, and productive supplies for mills and navigation practically increased, but also that the general drainage of the several districts about to be formed under the provisions of the "Public Health Act," can alone be accomplished efficiently.

CHARACTER OF THE STRATA.—The surface itself has a gradual descent from west to east of about 40 feet from the base of Winchmore and Bush Hills, towards the marshes. The stratum on the west side of the main road leading through the village, consists of a rich brick earth, varying from 5 to 18 feet in depth, inclining to the north and resting upon a stratum of gravel. Whilst that on the eastern or marsh side consists of a stratum of common earth about two feet in depth, overlaying a stratum of gravel of considerable depth.

POPULATION.—In 1801 the number of inhabitants amounted to 5,092; in 1831 to 8,192; and in 1841,

Bury-street Ward contained	1,472
Church-street	1,940
Fore-street	3,177
South-street	2,438

Making a total of 9,027

Showing an increase of 835 during 10 years, or $9\frac{1}{3}\frac{7}{7}$ per cent.

The number of houses in 1831 amounted to 1,394, and in 1841 to 1,549, giving an increase of 151 houses for the 10 years, and the average number of persons to each house $5\frac{1}{3}\frac{0}{4}\frac{2}{3}$.

The village itself consists of several ranges of good houses, the two principal of which extend for upwards of a mile along the road leading from London to Ware.

The poorer class of the population are chiefly engaged in agricultural labour, and therefore less subject to fluctuation of wages or employment than those of a similar class in the adjoining district of Tottenham.

PREVAILING DISEASE.—Mr. Hammond, to whom I am indebted for much valuable information, stated that the cases attended by him as medical officer of the Union in this, the lower, district alone in the quarter ending 25th March, 1849, were,—

In *Water-lane* :—

Acute inflammatory type	3
Common inflammation, diarrhœa, &c.	11

Orchard-street :—

Acute inflammatory type	3
Diarrhœa, &c.	14

Eaton-place :—

Malignant typhus	2
Acute inflammatory type	2
Diarrhœa, &c.	16

Church-lane :—

Malignant typhus	2
Acute inflammatory type	1
Diarrhœa	4

Claremont-street :—

Malignant typhus	1
Acute inflammatory type	6
Diarrhœa, &c., and other diseases	32

That in *Eaton-place* and *Orchard-street* the common lodging-houses furnished 37 cases of the Irish typhus, all of which were taken into the infirmary, whilst *Claremont-street* generally furnishes a larger amount of disease than any other part of his district, a fact attributed to the want of drainage and cleanliness.

Mr. Adlington, relieving officer, stated :—

“ I have relieved, in the year ending 25th March, no less than 27 families, comprising 94 persons, on account of fever alone, in sums varying from 8s. to 2l. each.”

Mr. Biddle, in confirming the statement of Mr. Hammond, stated, that in addition to other places, *Water-lane* is not only badly drained, but in a disgusting state, calculated to generate disease; that the natural water-courses are fringed with privies.

VENTILATION AND OVERCROWDING.—The arrangements for ventilating and cleansing the dwellings of the poorer class are on the lowest scale. In visiting and examining closely many of these wretched abodes, I was not prepared in a comparative rural district to find so much neglect on the part of the owners in making ordinary provisions for cleanliness on the part of their tenants. *Mr. Hammond*, in speaking of *Fore-street Ward*, said the houses at one end of *Claremont-street* are small and badly ventilated, the inhabitants dirty, and their condition bad.

Eaton-place contains 20 houses, with an average of 10 persons to each house, exclusive of lodgers; and *Dawson's buildings*

consists of 22 houses, the latter not having any outlets at back, and the former only a space four feet wide.

In the course of my inspection I found instances of overcrowding, and where grown-up members of the family, male and female, sleep together. The following cases of this kind are adduced: in *Bury-street Ward* six members of a family sleep in a small room admitting of only 80 cubic feet of air to each person. In *Orchard-street* seven persons occupy one room, the cubic contents of air to each person amounting to about 90 feet only.

INTERNAL CONDITION OF DWELLINGS OCCUPIED BY THE POORER CLASS.—Medical men have shown that disease not only concentrates its force in particular localities, but selects particular rooms, such as are filthiest and most neglected. At the time of my inspection I was led to various houses, particularly those situate in *Orchard-street*, one story in height, with the floors about 18 inches below the surface of the ground outside, and covered with filth, the boards to all appearances never having been washed, and the walls literally black; the air fœtid and most offensive.

PRESENT WATER SUPPLY.—*Mr. Hammond* stated:—

“ I consider the water is of a good quality, and in most cases there is abundant supply procurable either from *artesian bores*, *common wells*, or *dipping places*.”

But on my examination of this district, as in others, I found the poorer class lamentably deficient, either from having to fetch it from a distance of about one-eighth of a mile, or for want of pumps or other proper means for extracting it from the wells; the latter generally at a considerable distance from their dwellings; and, as a result, I invariably found the poor not only dirty in their persons, but their abodes filthy, both alike prejudicial to health and proper self-regard.

That the poorer class may enjoy the advantages of water supply, as well as adopt habits of greater cleanliness, a supply must be carried into their houses.

OBSTRUCTIONS TO NATURAL DRAINAGE.—It is the concurrent opinion of medical men that emanations arising from putrid streams, are invariably a source of disease and mortality. The injurious effects of the following water-courses on the northern and southern sides of the parish, winding their way through the village, extending in a tortuous direction down *Marsh-side*, *Bounces-lane*, *New* and particularly the *Old Sewer*, and *Water-lane*, were forcibly commented on by *Mr. Hammond* at the time of my inspection, as having been in some parts closed over, in others left open, and containing deposits of every kind of filth in several parts to an extent that completely impeded the flow of the drainage waters. There are obstructions caused by poisonous accumulations, the latter extending in various places across the roads; in others in

close proximity to human dwellings. For want of any other means of drainage, or carrying off the sullage, the water-courses, which ought to be kept open and free from every kind of obstruction, above all, from pollution by decaying animal and vegetable matter, are made the receptacles thereof; and the adjustment of the natural water-courses greatly, not to say entirely, overlooked, although it has necessarily been augmented rather than diminished by Barge river, extending through the marshes on the west side of the Lea.

Mr. Bower, a member of the Board of Highways, stated that the Board had taken steps for removing certain overflow drains, but had failed before the magistrates, although the effect, particularly in summer, is most offensive.

A primary condition in all sewerage is, that the flow should be continuous and uniform; whilst in water-courses it cannot be otherwise than variable, from its dependence on the rain-fall. As a consequence, I believe it will be found quite impracticable to render water-courses of the description met with in this district by any engineering arrangements available for the combined purpose of surface-drainage and sewerage. The properties are not the same, and the quantities variable.

Mr. Knight observes:—

“The land under cultivation amounts to about 5,000 acres, and may be divided into four classes. First; marsh-land, forming the lower portion of the parish, and bounded by the old river Lea; this is generally mowed for hay. The second, lying right and left of the highway from London to Ware, is the principal and largest district, consisting chiefly of arable land, and cultivated with potatoes, wheat, and market-garden produce. The third district is meadows and arable, chiefly in the hands of gentlemen, and laid out for parks, pleasure-grounds, and accommodation meadows.”

Mr. Knight adds:—

“The western district is chiefly arable land, it having been enclosed from Enfield Chase between 40 and 50 years, and farmed by men dependent thereon for a living.”

Mr. Ellis observes:—

“Not one-half of the land is sub-drained; that heavy fails of rain produce floods. Where draining has been commenced, the process has been that of tile and bushing. The crops at present obtained average of grass one ton per acre per annum, about four quarters of wheat, and from eight to nine quarters of oats, but rather inferior in quality.”

The vegetable soil is rather above an average; a moiety only, *Mr. Ellis* stated, is at present drained.

SEWERS.—In various parts of the village barrel drains have been constructed, in some cases from single houses, in others extending partly along the streets; but all have their outlets into

open ditches or brooks: they have been constructed piecemeal, and without any regard to a general system or plan.

The total lengths of each class, ascertained by Messrs. Ellis, architect, and Rowley, builders, appear as follows:—

617 feet lineal of 6 inch.
1,936 feet lineal of 9 inch.
2,256 feet lineal of 12 inch.
1,057 feet lineal of 18 inch.
703 feet lineal of 21 inch.
725 feet lineal of 1·6 by 2·0.
133 feet lineal, size not given.

But no information could be obtained showing their fall or state of repair.

Assuming the condition good, these drains, where practicable, may be appropriated to the carrying off surface waters. For this purpose their outlets are favourable, whilst by adopting this arrangement, the proposed sewers may be considerably reduced in size where sub-drains can be made available for the storm waters: hence the works already constructed may be rendered available, but for a purpose different from that for which they are now used.

PRIVIES.—It has been demonstrated in rural as well as in town districts that the presence of decomposing refuse and privy soil is productive of great disease. In this district the privies are almost invariably improperly situated, some being without doors.

In *Eaton-place*, Mr. Hammond stated—

“Twelve privies are placed in front of several houses, and the soil frequently flowing over the foot-path; and in *Barrow-field-lane* several houses have only one privy, with a stagnant ditch in front.”

At *Lower Edmonton* my attention was called to a privy placed in the house, and within 14 inches of the front door, emitting a most intolerable stench. At *Bounces-lane* the soil-pits are open, and the soil is level with the surface of the surrounding ground. In *Chapel-yard* privies are placed within a few feet of the entrance doors to houses, and the lower part of the walls are permeated with the effluvium.

ROADS AND FOOT-PATHS.—The length of carriage-ways in the parish is stated at 30 miles exclusive of the turnpike-road running through the village. The length of foot-paths is 25 miles.

The turnpike-road is under the jurisdiction of the metropolitan trust: the remainder of the carriage-roads and all the foot-paths under a Board of Highway Surveyors 20 in number, but managed by an assistant surveyor, at a salary formerly of 140*l.* per annum, since reduced to 120*l.* The clerk and collector's salary amount to 35*l.*, making a total of 155*l.*

The rate levied for the past year was 4*d.* in the pound, and produced about 650*l.* The expenditure for materials was 267*l.*, and

for labour 204*l.*, exclusive of cleaning out watercourses, which is done principally by the farmers; but the surveyors clean out the leak ditch at a cost of 8*l.* to 10*l.* per annum.

A primary condition necessary to insure sound and economical roads is that of efficient drainage, as in all cases where the sub-soil of a road is charged with water, from whatever cause, it is found by workmen quite impracticable to keep material forming the crust of the road *down* in wet weather. The tenacity once disturbed displacement ensues, and this leads to a twofold evil, increase of wear and tear of the road itself, and a loss of power.

It has been stated by persons engaged in agricultural improvements, by means of land drainage, that road-side ditches generally are of no service in carrying out the work; the sides of ditches become plastered and covered with vegetation, excluding the water from entering: the advantages derived from substituting tubular drains has been set forth in the Report of the Metropolitan Sanitary Commission. In allusion to the use of ditches, Mr. Parkes and other experienced drainers attest the fact that a properly covered drain of the same depth as the ditch will drain a greater breadth of land than the ditch can effect.

REMEDIAL MEASURES.

WATER SUPPLY.—Pursuant to the terms of the Public Health Act, the water supplied to towns must be pure and wholesome, free from animal, mineral, and vegetable matter; it must also be sufficient in quantity for all the purposes comprehended in the Public Health Act; allowing 25 gallons per head per diem. The quantity for each day's consumption of the inhabitants of Edmonton is estimated at 225,700 gallons, and three sources present themselves from which this quantity could be abstracted—the New River, deep springs, and the River Lea; the quality of the river waters is very similar, averaging about 17° of hardness, whilst that from the deep springs contains only 7½° of hardness.

The relative altitude of these sources entails a different arrangement for administering the supply. Those of the Lea and deep springs requiring engine power, whilst the New River, from its passing over the higher ground, is, I believe, at a sufficient altitude to admit of a considerable portion of the district being supplied by gravitation. But before finally deciding on the particular source from which to abstract the future supplies, a minute examination of the district will be necessary.

It has been proved upon actual experience, and exemplified before the Health of Towns Commission, that the cost of filtration amounts from one-third to one-sixth of a penny per thousand gallons, contingent on the expense of procuring sand and the quantity of sedimentary matter held in suspension.

It is estimated that the expense for ensuring the purity of a

supply to a labourer's cottage will not amount to much more than 1s. per annum, or less than one farthing per week for filtration.

In order to insure completeness, all the service-pipes, waste and return-pipes, should be laid down under regulations as a part of one system, to be paid for by annual instalments of principal and interest, thus avoiding the necessity of an immediate outlay on the part of owners.

The estimated cost for the entire apparatus to the smaller houses, including service-pipes, waste and return-pipes, with a 2-inch sub-main, a plug for cleansing court and extinguishing fires, a half-inch service-pipe to closets, with a branch and cock to sink and soil-pan, will amount to about 2*l.* 3*s.* per house, or less than 2*s.* 9*d.* per annum by way of improvement rate.

PUBLIC SEWERS.—The configuration of the district and general distribution of the houses are not only well adapted for a complete system of sewerage, but also particularly convenient for applying the sewage to purposes of irrigation. The main sewers may be arranged so as to branch off at the northern and eastern sides into the marshes on the eastern side of the village, a disposition easily accomplished; and with properly arranged collateral sewers, in no case will it require tubular pipes exceeding 12 inches in diameter for the principal mains, and similar tubes from 6 to 9 inches diameter for the collateral sewers. But the exact position, as well as the lengths of each class of tubes, can only be determined upon an accurately made plan, showing the inclination of the ground and fall of Edmonton Cut and the River Lea, properly matters of detail.

APPLICATION OF SEWAGE MANURE.—Chemists have demonstrated the fertilizing powers of sewage as a manure; and experienced agriculturists are of opinion that it may be profitably applied to irrigation and other modes of manuring land, in lieu of being wasted, and not merely wasted, but in this district allowed to remain stagnant in ditches to generate disease of the worst description.

It has been calculated, upon estimates, that sewage is susceptible of producing an income equal to 1*l.* per head of the population per annum; but if only a moiety of that amount be obtained, a very large income is derivable from this one source, after defraying the attendant expenses for the necessary works and distributing apparatus. As regards the engineering part, this district is particularly well adapted for the purpose.

The application of sewer manure has for some time past been the subject of investigation and experiment, not merely on the part of chemists but also on that of the practical farmer, and the experience of the latter has established the fact of its being one of the best known fertilizers; and it has, moreover, been shown that the most profitable mode of applying it is in the liquid form. Mr.

Knight, of Downton, observes "manure can probably be most beneficially given in a pure liquid state:" and, as illustrative of its fertilizing power, Mr. Barber, of Muirdrockwood observes, that he had 27 acres of land before his house; this land was so poor that it scarcely fed originally two cows; he kept 40 cows and 4 horses in stables close to his house; the dung of the cows was diluted with water, and the solution applied to irrigating 22 acres; with the refuse of his house and scullery he irrigated 5 acres. The produce from these 27 acres, fertilized by the liquid manure, now enables him to feed 40 cows and 4 horses in lieu of 2. In allusion to the different modes of applying manure, Mr. Barber further observes, "I have never succeeded in getting more than one and a half fold of produce from the same sort of manure," *i. e.* dung, similar to that procured by the farmers of the district forming the subject of this report from the metropolis and their own homesteads; "whilst," he adds, "I have got four and five-fold crops by the application of the liquid manure."

With reference to the application of manure as top-dressings and in the solid form, as regards its sanitary effect, Mr. James Dean, an agricultural engineer, observes, "much more is given off as emanations injurious to the public health on the one hand, and less left to be absorbed productively on the other, by the land as manure."

In Mr. Holland's experiments with diluted night-soil at Manchester, it was demonstrated that 9 loads of night-soil diluted in 17 of water produced a more fertilizing effect than a top-dressing of 14 loads of stable manure, the weight of the grass on the irrigated land was 50 per cent. greater, and the expense of the distribution of equivalent quantities of manure is stated thus: for—

	£.	s.	d.
15 loads of the solid manure by cart	1	7	0
15 loads of liquid manure by the water-cart, say	0	13	9
15 loads of liquid manure by 800 yards of hose and the jet at 100 feet of pressure	0	1	9

HOUSE-DRAINS AND PRIVIES.—Private drains to houses may be made in two ways, *i. e.* carried through each house, or continued at the back; and these are severally designated front and back drainage. Experience shows that the latter is in every way superior to the former, not only from its affording a considerable increase in fall in the ratio of 3 to 1, but also in point of economy by a saving of length in pipes and the expense of taking up and making good floors. The cost of this drainage, estimated from existing works executed with sub-mains of stone-ware, 4-inch tubular pipes, including a sink, water-closet pan, syphon traps and pipes, a rain-water drop pipe, head and syphon trap to every two houses, will not exceed 2*l.* 5*s.* per house of the smaller class, or, if taken upon an improvement rate, a little less than three farthings per week per house.

In all cases where there is a deficiency in privy accommodation, or where the number is insufficient, it will be necessary to erect them, pursuant to the Act. It seems, the ordinary cost for constructing a new privy, including soil-pit, amounts to 5*l.* and upwards, a sum that too often deters parties from erecting them for smaller class of houses, and therefore the owners omit the provision, or, at most, construct one privy to several houses.

ESTIMATES AND FUTURE CHARGES.—In the absence of the necessary engineering plans of works for bettering the sanitary condition of the district, I must place reliance upon the results of experience in other places as to cost of works established, and the estimated cost of draining. These charges are, to the smaller class tenements, for water supply upon the constant system, 1½*d.* per week per house, with a proportionate increase for larger houses, and public drainage 1*d.* per house of the before-named class. My examination of the district fully assures me there is nothing in its physical character that will lead to difficulties in an engineering point, so as to enhance the charges or estimate already made for similar works.

The expense of the proposed works in all probability would continue to be urged as an objection to the provision, particularly if it were to be done at an immediate outlay. Now the only practical way of meeting the objection effectually is by a reduction and distribution of the cost. In furtherance thereof it has been suggested that the cost of privies, if made of hollow bricks, and constructed in numbers under proper arrangements, may be reduced to 40*s.* each, and with a soil-pan and fittings complete, for 3*l.* each. But instead of calling upon owners to incur an immediate outlay even of this lesser sum, 3*s.* or 4*s.* per annum may be placed upon the particular tenement in the shape of an improvement rate for the term of 20 years, and collected with some one or other of the consolidated rates.

Owners of small tenements take alarm, and are apprehensive of immediate outlay, on many of whom, having only short terms, it would fall unfairly.

To the utmost extent, therefore, the cost of the works should be defrayed by the public (at least so far as the owners of property are willing) from the public rate, and with distributed charges according to their nature, should be payable on each particular tenement by the party deriving the benefit, except where the tenement is let to weekly tenants, or where rents are payable at shorter periods than quarterly; in which case the owner, as the only available person, ought to stand in the place of the occupier, pay the improvement rate, and collect it back from his fluctuating tenantry.

The chief advantage to be derived by the inhabitants from having the whole apparatus, internal as well as external, kept

in order by contract, consists mainly in securing uniformity of proceeding with repairs, saving of time on part of workmen, and consequently expense in the execution, freedom from risks of every kind, uncertain amount of bills, and much inconvenience.

By general contracts it is but reasonable to suppose that the work would be done in a superior manner, as well as at a less cost; for example, if the apparatus for each house requires an expenditure, say of 4*l.* or 5*l.*, from the owner for the several works, instead of enforcing from him an immediate outlay to that or any other extent, the whole might be commuted for an improvement rate, say, 1*d.* or 2*d.* per week, made payable half-yearly by the tenant.

The Act empowers the Local Board, with the consent of the General Board, to borrow any money required for the execution of works of a permanent nature, a sum not exceeding the amount of assessment for one year of the premises assessable under the Act within the district or part of the district in respect of which the money shall be borrowed. The money so borrowed for defraying expenses in respect of a part of a district is to be charged, as far as practicable, upon the credit of any separate rates made, or to be made, for the purposes of such part. And where the expenses apply to two or more of such parts, the money borrowed in respect of the same is to be equitably apportioned upon any rates made for the purposes of such parts respectively.

From the nature of the works necessary for sanitary improvements, a large portion of the expense, amounting to about five-sevenths of the entire or aggregate sum, will have to be expended for labour only; hence a means of employment will be afforded to numerous local artificers and labourers.

CONCLUSIONS.—Having considered the facts stated at the inquiry, as well as the representations made by the poorer classes in the course of my inspection, I am of opinion that a considerable amount of sickness and consequent expenses may be greatly alleviated, and additional comforts secured by the application of the provisions of the Public Health Act to the parish of Edmonton. In furtherance I recommend,—

First. That the drainage area included within the water shed be adopted for the district, in which case it will not be necessary to enlarge existing boundaries.

Second. That powers be taken for carrying out the following correlative measures:—

1. For securing an abundant supply of water upon the constant system, filtered and carried into every tenement for domestic use and household purposes.
2. For filling up cesspools, and fitting to existing privies, where proper privies exist, soil-pans and service-pipes for

- flushing with water; and where no proper privies exist, for erecting them pursuant to the terms of the Act.
3. For draining houses, areas, courts, yards, and streets by means of tubular drains.
 4. For rendering the sewerage manure productive, by excluding it from the natural watercourses, and applying it to purposes of irrigation.
 5. For ventilating schools, public rooms, and lodging-houses, and for preventing overcrowding by regulating the number of persons sleeping in the smalle class rooms according to the size of said rooms.
 6. For placing fire-plugs and securing supplies of water, kept on night and day for the extinction of fires.
 7. Assuming the works eventually adopted to be such as in the opinion of the General Board will warrant a distribution of charges over periods of time, I am of opinion that this would be a case in which it is desirable that the Board should exercise its power to save immediate outlays by owners and occupiers, by recommending advances of loans from the Commissioners of Public Works, to be repaid by annual instalments of principal and interest.
 8. I am of opinion that the different measures set forth in this Report may, under proper management, be carried out at a saving to the inhabitants, having regard to the various circumstances and charges to which they are at present liable.

WHEREUPON I RECOMMEND,—

First. That the Public Health Act, 1848, except the sections numbered 50 and 96 in the copies of that Act, printed by Her Majesty's printers, shall be applied to the parish of Edmonton, county of Middlesex.

Second. That the Local Board of Health to be elected under the Public Health Act shall consist of fifteen persons, and that the entire number shall be elected for the whole of the said district.

Third. That every person at the time of his election as member of the Local Board, and so long as he shall continue in office by virtue of such election, be resident, as in the said Public Health Act, 1848, is required, and be seized and possessed of real or personal estate, or both, to the value of not less than 1,000*l.*, or shall be resident and rated to the relief of the poor of some parish, township, or place, of which some part is within the said district, upon an annual value of not less than 30*l.*

Fourth. That the fourteen days' notice of qualification required by the Public Health Act, 1848, to be given by owners

of property, in order to entitle them to vote at the said first election, shall be given to the persons to be appointed to conduct the first election.

I have the honour to be,
My Lords and Gentlemen,
Your most humble and obedient Servant,

WILLIAM RANGER,
Superintending Inspector.

To the General Board of Health,
&c. &c. &c.

6. For placing fire-plugs and securing supplies of water, kept on night and day for the extinction of fires.
7. Assuming the works eventually adopted to be such as in the opinion of the General Board will warrant a distribution of charges over periods of time; I am of opinion that this would be a case in which it is desirable that the Board should exercise its power to save immediate outlays by owners and occupiers by recommending advances of loans from the Commissioners of Public Works, to be repaid by annual instalments of principal and interest.
8. I am of opinion that the different measures set forth in this report may, under proper management, be carried out at a saving to the inhabitants, having regard to the various circumstances and charges to which they are at present liable.

Whereas I recommend that the Public Health Act, 1848, except the sections numbered 50 and 56 in the copies of that Act printed by Her Majesty's printers, shall be applied to the parish of Edlington, County of Middlesex.

Second. That the Local Board of Health to be elected under the Public Health Act shall consist of fifteen persons, and that the entire number shall be elected for the whole of the said district.

Third. That every person at the time of his election as member of the Local Board, and so long as he shall continue in office by virtue of such election, be resident, as in the said Public Health Act, 1848, is required, and be seized and possessed of real or personal estate, or both, to the value of not less than 1,000*l.*, or shall be resident and rated to the relief of the poor of some parish, township, or place, of which some part is within the said district, upon an annual value of not less than 30*l.*

Fourth. That the fourteenth day's notice of qualification required by the Public Health Act, 1848, to be given by owners