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 city of Norwich, and the county of the same city / by W. Lee, Superintending Inspector.

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PUBLIC HEALTH ACT

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

14

REPORT

TO THE

GENERAL BOARD OF HEALTH

ON A

PRELIMINARY INQUIRY

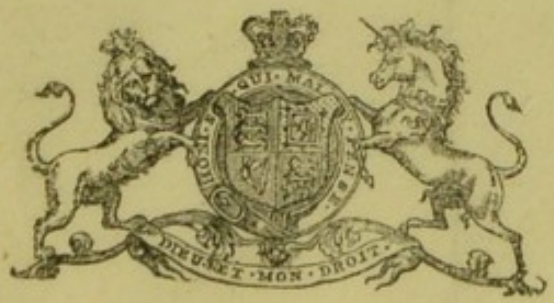
INTO THE SEWERAGE, DRAINAGE, AND SUPPLY OF WATER, AND THE SANITARY CONDITION OF THE INHABITANTS

OF THE CITY OF

NORWICH,

AND THE COUNTY OF THE SAME CITY.

By W. LEE, Esq., C.E.,
SUPERINTENDING INSPECTOR.



LONDON:
PRINTED BY W. CLOWES & SONS, STAMFORD STREET,
FOR HER MAJESTY'S STATIONERY OFFICE.
1851.

NOTIFICATION.

THE General Board of Health hereby give notice, in terms of section 9t of the Public Health Act, that on or before the 18th day of April nex being a period of not less than one month from the date of the publica tion and deposit hereof, written statements may be forwarded to th Board with respect to any matter contained in or omitted from th accompanying Report on the Sewerage, Drainage, and Supply Water, and the Sanitary Condition of the Inhabitants of the Ci of NORWICH, in the County of the same City; or with respect to a amendment to be proposed therein.

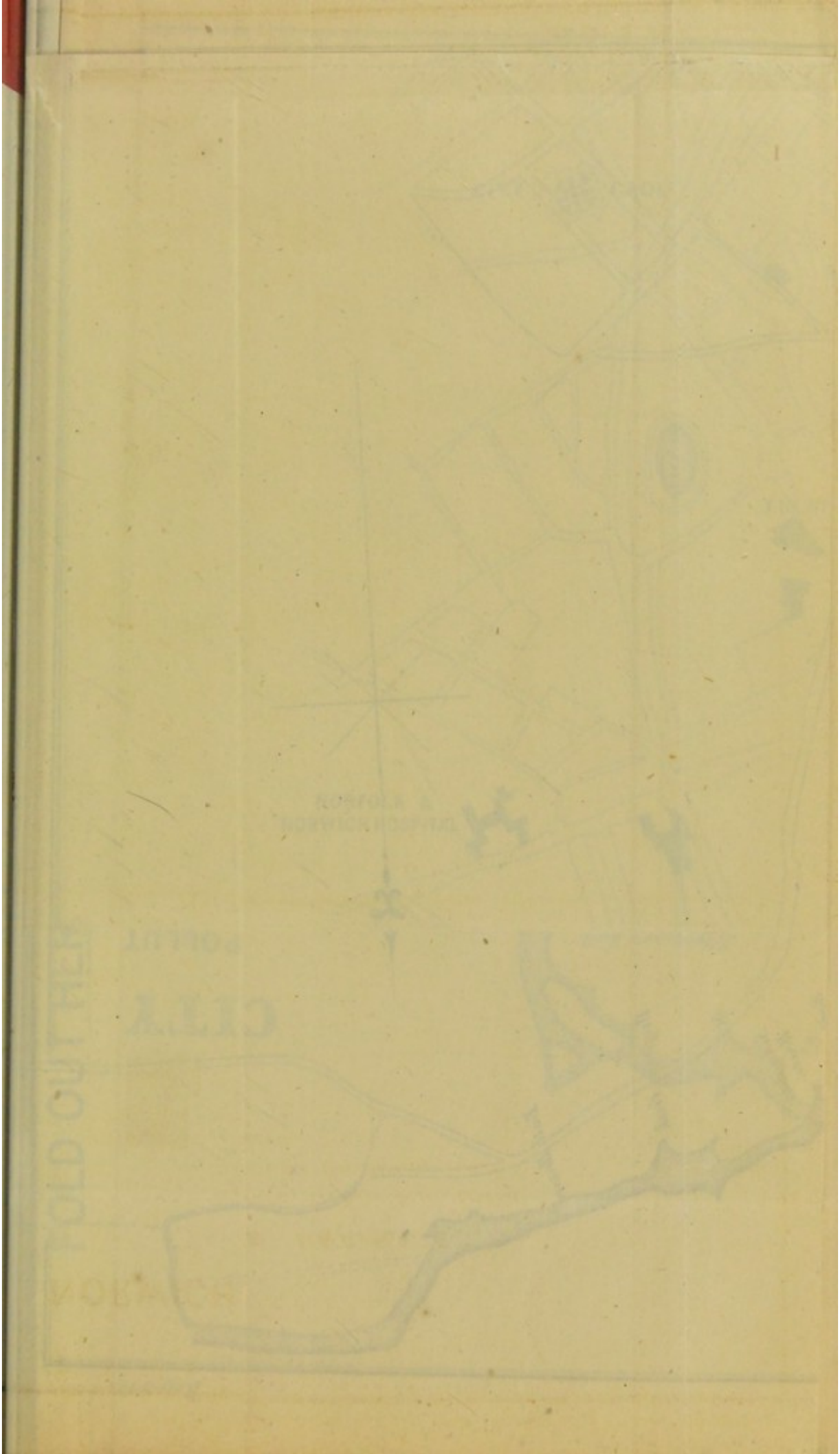
By order of the Board,

HENRY AUSTIN, *Secretary.*

Gwydyr House, Whitehall.
28th February, 1851.


NORWICH.
C O U N T Y O F N O R W I C H
NORWICH
Hellesdon
Heigham
Earlham
Eaton
Cringleford
Lakenham
NORWICH AND YARMOUTH RAILWAY


CITY OF NORWICH.
POLLUTION OF RIVER WENSUM.
Fellmonger's Yard
Fellmonger's Yard
Watering Place
Slaughter House
3 Privies
Bath House
2 Privies
Dye House
Fellmonger's Yard
Fellmonger
Fellmonger's Yard
Fellmonger
Fellmonger's Yard
Fellmonger
CHURCH
PRESENT SOURCE OF SUPPLY
PRESENT WATER WORKS
CITY CAOL
CHURCH
WORKHOUSE
CHURCH
CHURCH
CATHEDRAL
GREAT HOSPITAL
THEATRE
CHURCH
CASTLE
NORFOLK & NORWICH HOSPITAL
CHURCH
CHURCH
WENSUM
RAILWAY STATION
EASTERN UNION RAILWAY
Scale.


OLD OUTLET

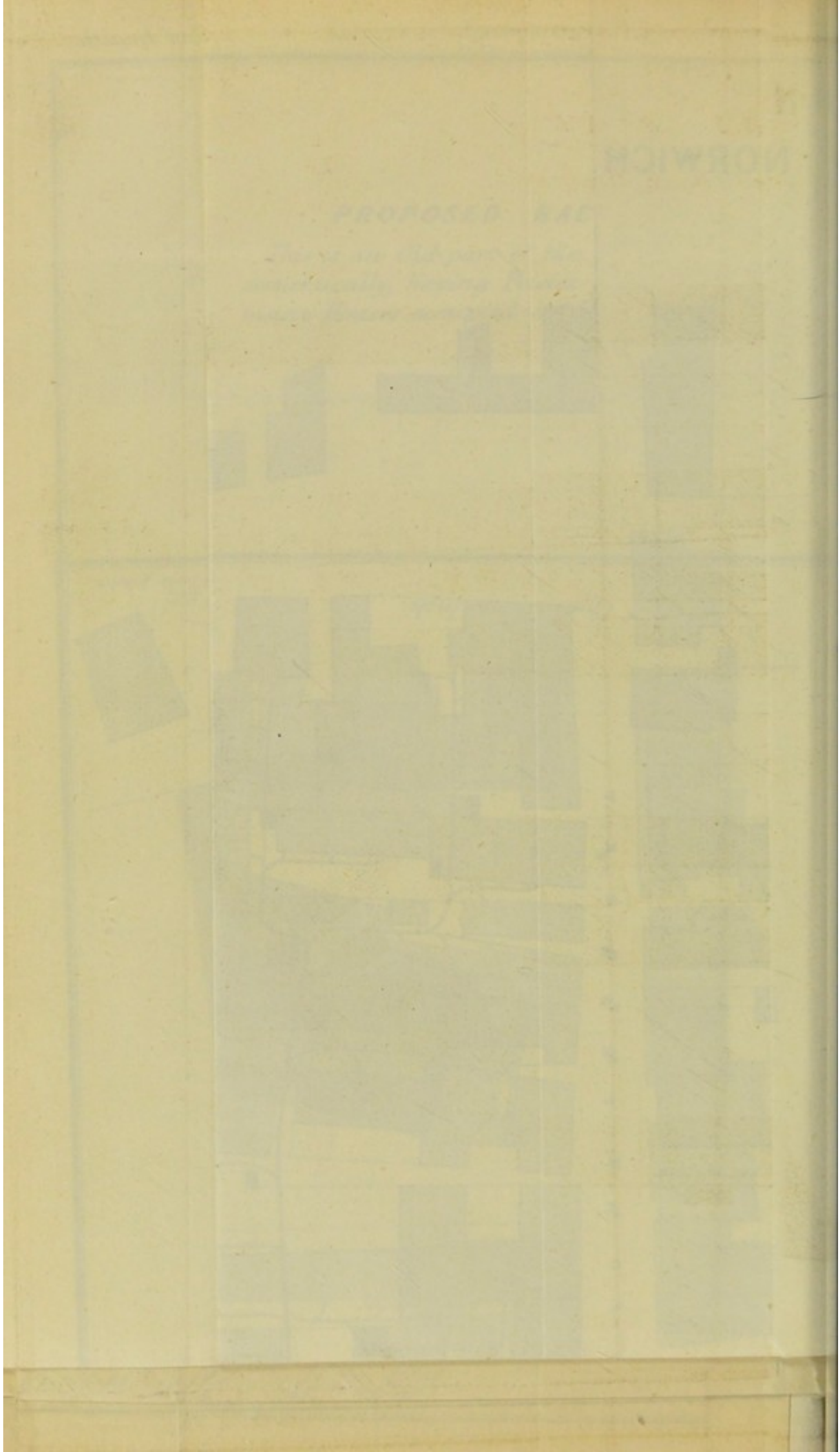
NORWICH.

PROPOSED BACK DRAINAGE.

This is an Old part of the City, difficult to drain economically, having Privies under Dwellings and many Houses occupied in Floors.

Scale 1 Chain to an Inch.

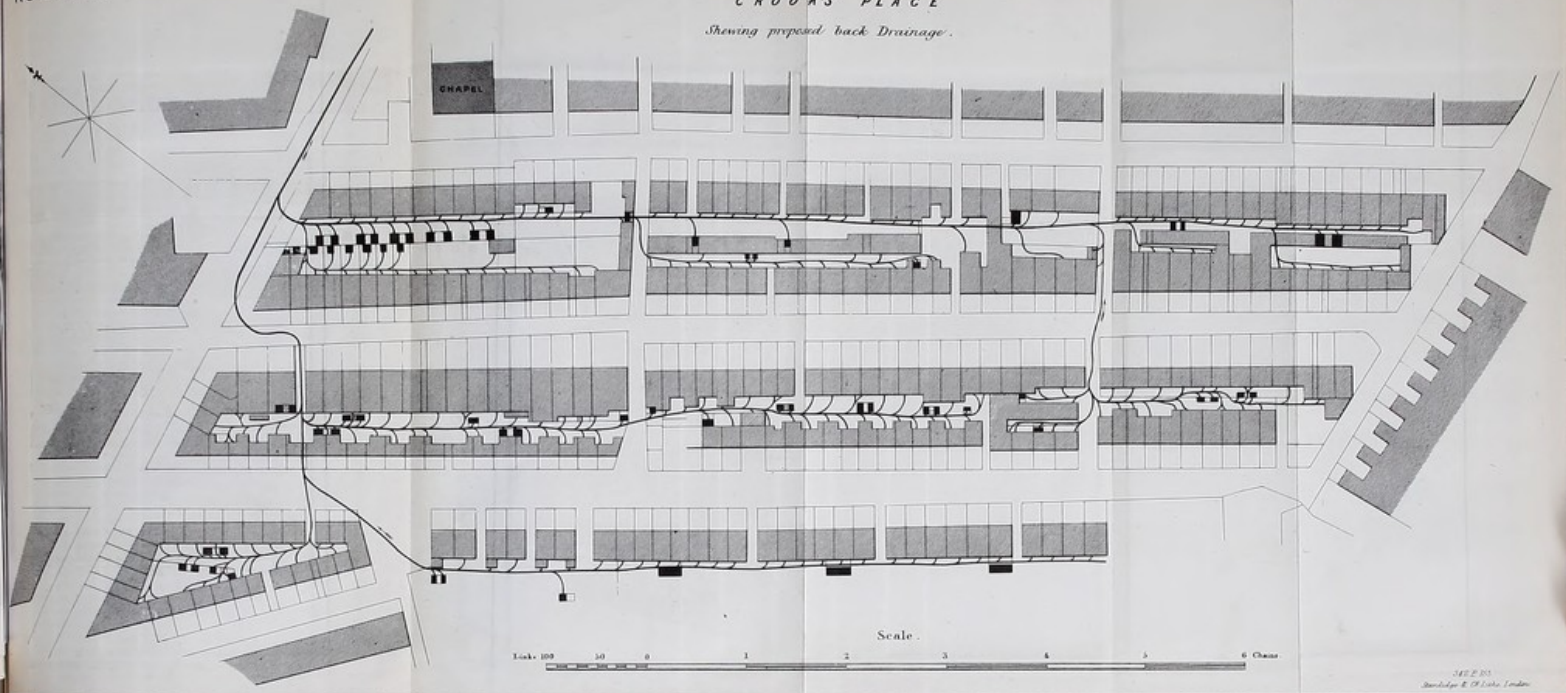
341 P 155.
Standidge & Co Litho London.



NORWICH.

CROOK'S PLACE

Shewing proposed back Drainage.



CONTENTS OF REPORT.

REMEDIES.

PUBLIC HEALTH ACT (11 & 12 Vic., 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 City of NORWICH *and County of the same City. By* WILLIAM LEE, Esq., Civil Engineer, Superintending Inspector.

WHEREAS, in pursuance of the Public Health Act, 1848, the General Board of Health, appointed for the purposes of that Act, have, upon the petition of not less than one-tenth of the inhabitants rated to the relief of the poor of and within the city of Norwich, and the county of the same city (the number of the said petitioners greatly exceeding thirty in the whole) directed William Lee, a Superintending Inspector, appointed for the purposes of the said Act, to visit the said city and county, and to make public inquiry, and to examine witnesses as to the sewerage, drainage, and supply of water, the state of the burial-grounds, the number and sanitary condition of the inhabitants, and as to any local Acts of Parliament in force within such city and county for paving, lighting, cleansing, watching, regulating, supplying with water, or improving the said city and county, or having relation to the purposes of the said Public Health Act, also as to the natural drainage areas, and the existing local boundaries, and the boundaries which might be most advantageously adopted for the purposes of the said Act.

Now I, the said William Lee, having previously given the notices required by the said Act, proceeded upon the said inquiry in the manner directed by the said Act, and do report in writing to the said General Board upon the several matters with respect to which I was directed to inquire as aforesaid, and upon certain other matters in respect of which I deem it expedient to report for the purposes of the said Act as follows:—

Gwydyr House, 9th September, 1850.

My Lords and Gentlemen,

On the 15th day of May last I proceeded to Norwich, in obedience to your instructions, and commenced the inquiry into the sanitary condition of the city and county of the same on the 16th, at ten o'clock in the morning, at the Guildhall. I adopted the usual course of first taking proof that public notice of the inquiry had been given according to the Act. Copies of the "Norfolk Chronicle," the "Norfolk News," and the "Norwich Mercury," containing the required advertisements, were put in; and Mr. John Hindson Nixon, clerk to the town clerk, proved that the public notices had been duly affixed upon the doors of all churches and chapels, public buildings and places, where public notices are usually affixed. The list of the places put in by him included 43 churches, the synagogue, the Dutch church, the French church, 24 chapels, the public pound, and the barrack gate at Pockthorpe; the toll-bar at Thorpe; the Pine Apple public-house and Mr. Barber's wall, for the hamlets of Trowse Millgate, Carrow, and Bracondale; the gates at the Town Close; and the north and south doors of the Guildhall.

The preliminary proceedings occupied a considerable portion of the first day. The remainder of the 16th and the whole of the 17th and 18th were taken up with an inspection of the city, including the whole of the river course, and the outfalls of the existing drains. Part of the 20th was given to an examination of the water-works and the burial-grounds, and the remainder to the receipt of documentary evidence. On the 21st the evidence of the medical practitioners and others was taken. On the 22nd I examined witnesses respecting the water supply, drainage, lighting, and gas. The 23rd was devoted to an examination of the Superintendent of the existing water-works, to witnesses respecting the water and drainage, and to an inquiry respecting the meteorology of the city. On the evening of the same day I visited the lodging-houses of the town; and on the 24th examined Mr. Lynde, the engineer to the Norwich Water-Works Company, and received various documents relating to the inquiry. The investigation was brought to a conclusion the same evening, and I left Norwich on the 26th, but have since then received many important returns that were promised, but could not be prepared during my stay there.

At different periods of the inspection I was attended by the Honourable and Very Reverend the Dean; Samuel Bignold, Esq.; Augustus Adolphus Hamilton Beckwith, Esq., chairman of the Court of Guardians; John R. Staff, Esq., town-clerk; James Slapp Garthon, Esq., surgeon; Henry R. Edgar, Esq., surgeon; W. Bransby Francis, Esq., surgeon; Thomas Brightwell, Esq.; Frederick Brown, Esq., merchant; Geo. Jay, Esq., merchant; John Sultzer, Esq., manufacturer; J. S. Rump,

Esq., tanner; Horatio Bolingbroke, Esq.; Arthur Dalrymple, Esq., solicitor; J. Skipper, Esq., solicitor; Mr. Edward James Dodd, superintendent of the old water-works; James Lynde, Esq., engineer to the new water-works company; Mr. Robert Kitton, architect; Mr. Granville Sharpe, accountant; Mr. George Taylor; Mr. John Aldridge; Mr. Isaac Williams, surveyor of highways for Heigham; Mr. George Bean; Mr. William Tuck; and Mr. Samuel Clarke, inspector of nuisances.

I received the most cordial assistance from these and other inhabitants, and also from the Corporation and the promoters of the new water-works. Many of the members of both those bodies are included in the above enumeration; and although a great difference of opinion prevailed among them on the subject of the water supply, they all cordially united in furnishing me with such information as was necessary to the inquiry.

J. Skipper, Esq., solicitor, said he was chairman of the Sanitary Committee, consisting of members of four public bodies in the city, and that the committee had come to the conclusion that there were quite sufficient powers in the Nuisances Removal and Diseases Prevention Act to effect all the improvements that Norwich required. He handed in a copy of their resolutions, as follow:—

"*Sanitary Committee,* 15*th May* 1850.

"*It was Resolved,* That the chairman and as many of the members of the committee as choose to accompany him, be requested to attend as a deputation before Mr. Lee, the Inspector appointed by the Board of Health in London to inquire into the sanitary condition of Norwich, and signify that the officers are directed to give any information as to the proceedings which have taken place under the operation of this committee, and otherwise assist him in his inquiry.

"That the chairman be requested to state to Mr. Lee that it is the opinion of this committee that the application of the costly process of the Health of Towns Act is not called for, but that the sanitary requirements of the city may be as effectually met at a much less expense.

"By order of the Committee,

"E. C. Bailey, *Clerk to the Guardians.*"

Mr. Beckwith said that the resolutions which Mr. Skipper had put in had been passed in the Sanitary Committee by a majority consisting of only four persons, only eight members of the committee being present out of sixteen; four voting for the resolutions, two against them, and two remaining neuter.

Thomas Brightwell, Esq., said he had been a member of the committee of inquiry which was instituted here some years ago into the sanitary state of the city; he had also since been a member of the Sanitary Committee to which Mr. Skipper had alluded, and of which that gentleman was chairman; he was a member, too, of the Court of Guardians, and of the Paving Commissioners, and though Mr. Skipper had justly stated that the Sanitary Com-

mittee had made the representation which had been put in, yet he considered that he ought, in fairness to the public, and in justice to himself, to state, that this was the opinion of only three or four of the individuals who were present when the Committee met. That Committee consisted of sixteen members, and only three or four concurred in the views of Mr. Skipper. The Committee appeared almost to stultify themselves by putting such a statement before the Inspector, because they were the representatives of four public bodies, every one of which had, by large majorities, voted in favour of bringing the city under the authority of the Public Health Act.

The following Minute was put in by the Town Clerk.

"Norwich.—At a meeting of the Council of the Body Corporate of the Mayor, Aldermen, and Citizens of the city of Norwich, held on the tenth day of April, one thousand eight hundred and fifty.

"*Resolved.*—On the motion of Mr. Councillor William Manning Kitton, seconded by Mr. Councillor Barber.

"That this Council as the public governing body of the city, and the body to whom will be delegated the powers of the Local Board of Health under the Public Health Act, will aid by every means in their power the obtaining with the least possible delay the application of such Act to the city, and will carry the provisions thereof when applied, or such of them as may be applied, into operation in the most prompt and effectual manner."

At the opening of the inquiry Mr. Beckwith put in the following:—

"Norwich.—At a meeting of the Council of the Body Corporate of the Mayor, Aldermen, and Citizens of the city of Norwich, held on the fourteenth day of May, one thousand eight hundred and fifty.

"*Resolved*—That the following gentlemen be a Committee to attend the inquiry before the Inspector under the Public Health Act, commencing on Thursday next, viz.:—

"Mr. Augustus Adolphus Hamilton Beckwith, Mr. Thomas Banks, Mr. George Kitton, Mr. Richard Coaks, Mr. Charles Winter, Mr. William Manning Kitton, Mr. George William Minns, Mr. Francis John Blake, Mr. John Barber, Mr. Jacob Henry Tillett, Mr. John Bateman."

"And, That the Town Clerk do attend the Inspector under the Public Health Act on the inquiry commencing on Thursday next in order to conduct such inquiry, under the direction of the Committee now formed."

I derived much assistance from the Committee, and before the closing of the inquiry they presented to me a statement to which I shall have to refer in a subsequent part of this Report. It shows the objects of the Corporation in promoting the application of the Public Health Act, and is marked (*Appendix A.*)

DESCRIPTION.—Norwich is a city and county of itself, and is the largest town in the east of England. The river Wensum

passes through the city, and joins the Yare at a short distance to the south. The county of the city comprises an area of about 6,630 acres of land. Within the city there are now 35 parishes, and the county of the city contains five additional parishes, and parts of two others.

Norwich is a port for small sea-borne vessels of 60 to 100 tons burden.

The city and county of the same is divided into eight wards, and is governed by 16 aldermen, and 48 councillors. The castle, however, and its appurtenances, is vested in the Justices of Norfolk, and the cathedral with its precincts had formerly exclusive jurisdiction, but now for municipal purposes forms part of the city.

It would occupy too much space, however interesting, to give even a sketch of the history of Norwich and its institutions, and the endeavour would only divert attention from the proper object of this Report; namely, the present sanitary condition of the city, and the means of remedying its existing defects.

Population and Houses, Number of each, and Rate of Increase.—The great number of parishes and hamlets in the county of the city precludes my stating the necessary information under this head, in so condensed a form as by the use of tables, and I have, therefore, prepared forms showing the number of inhabitants in each, at the several decennial periods from 1801 to 1841 inclusive, and have calculated the probable population at the present time at the rate of the preceding ten years.

I have little doubt that the population will be found at the next census to be 65,000 or 66,000, but it would have been unsafe to make calculations of increase upon conjecture, and the preceding rate was, therefore, the only one I could adopt. The same table shows the increase per centum of the population at each period.

The second table shows the number of houses in each parish, &c., in 1831, 1841, and in March of the present year. I have been unable to obtain the houses previously. Also the average number of inhabitants per house for 1831, 1841, and at the present time, with the population corrected for increase.

For a classification, and the rateable value of the houses, I refer to Appendix C.

Population and Rate of Increase.

Parish or Place.	Population.						Increase and decrease per centum Population at each Period.				
	1801	1811	1821	1831	1841	1850	1811	1821	1831	1841	18
1. St. Peter of Southgate . .	378	389	530	627	464	464	2·91	36·24	18·30	7·81	
2. St. Etheldred	252	261	273	268	308	353	3·57	4·59	..	14·92	13
3. St. Julian	662	677	932	1,063	1,098	1,130	2·26	37·66	14.05	3·29	2
4. St. Peter per Mountergate	1,350	1,291	1,789	1,975	2,025	2,070	4·57	38·57	10·39	2·53	2
5. St. John Sepulchre . . .	1,144	1,233	1,599	1,832	1,847	1,860	7·77	29·68	14·57	·81	
6. St. Michael at Thorn . .	1,198	1,450	1,750	2,048	1,860	1,860	21·03	20·68	17·00	10·10	
7. St. John of Timberhill .	..	..	1,101	1,055	1,108	1,158	..	..	−4·36	5·02	4
8. All Saints	701	657	741	692	676	676	−6·69	12·78	−7·08	2·36	
9. St. Stephen	2,211	2,198	2,927	4,110	4,212	4,305	−·59	33·16	40·41	2·48	2
10. St. Peter of Mancroft . .	2,120	2,137	2,671	2,901	2,976	3,045	·80	24·98	8·61	2·58	2
11. St. Giles	1,076	1,043	1,422	1,595	1,546	1,546	−3·16	36·33	12·16	3·16	
12. St. Benedict	803	925	1,125	1,424	1,319	1,319	15·19	21·62	26·57	7·96	
13. St. Swithin	503	591	730	870	753	753	17·49	26·96	16·00	15·53	
14. St. Margaret	662	797	938	868	865	865	20·39	17·69	−8·00	..	
15. St. Lawrence	899	992	1,092	1,008	974	974	10·34	10·08	−8·33	3·49	
16. St. Gregory	1,057	1,125	1,244	1,104	1,107	1,109	6·43	10·57	−13·58	·27	
17. St. John of Maddermarket	1,698	827	957	814	731	731	−105·32	15·71	−17·56	11·35	
18. St. Andrew	1,858	1,396	1,518	1,297	1,295	1,295	−33·09	8·73	−9·25	·15	
19. St. Michael at Plea . . .	446	501	389	359	395	430	12·33	−28·79	−8·35	10·02	9
20. St. Peter of Hungate . .	371	398	511	522	428	428	7·27	28·39	2·15	21·96	
21. St. Simon and Jude . . .	333	398	477	446	370	370	19·51	19·84	−6·95	20·54	
22. St. George of Tombland .	750	739	797	710	778	844	−1·48	27·84	−12·25	9·57	8
23. St. Martin at Palace . . .	936	978	1,202	1,227	1,320	1,410	4·48	12·90	2·07	7·58	6
24. St. Helen	393	371	425	521	487	487	−5·92	44·55	22·58	6·97	
25. St. Michael of Coslany . .	1,031	947	1,340	1,202	1,298	1,390	−8·87	1·49	−11·48	7·98	7
26. St. Mary of Coslany . . .	1,018	1,097	1,521	1,361	1,402	1,439	7·76	38·65	−11·75	3·01	2
27. St. Martin at Oak	1,747	1,857	2,477	2,524	2,589	2,648	6·29	33·38	1·89	2·57	2
28. St. Augustine	1,232	1,394	1,627	2,022	2,053	2,079	13·15	16·85	24·27	1·53	1
29. St. George of Colegate . .	1,132	1,379	1,610	1,513	1,440	1,440	21·81	16·75	−6·41	5·06	
30. St. Clement	853	933	2,364	2,767	2,836	2,899	9·39	153·37	17·04	2·49	2
31. St. Edmund	446	492	677	762	727	727	10·31	37·60	12·55	4·81	
32. St. Saviour	984	990	1,266	1,486	1,419	1,419	·60	27·87	17·37	4·72	
33. St. Paul	1,395	1,583	2,160	2,407	2,783	3,174	13·47	36·44	11·43	15·62	14
34. St. James	520	565	1,268	1,299	1,311	1,321	8·65	124·42	2·44	·92	
35. Pockthorpe (Hamlet) . .	979	1,029	1,313	1,669	1,878	2,089	5·10	27·59	27·11	12·52	11
36. Heigham (Ditto) . .	854	842	1,503	5,495	6,050	6,600	−1·42	78·50	32·73	10·10	9
37. Lakenham (Ditto) . .	428	441	1,875	3,810	4,006	4,191	3·03	325·17	103·20	5·14	4
38. Eaton (Ditto) . }	373	378	537	632	728	827	1·34	42·06	17·69	15·18	13
39. Earlham (Ditto) . }											
40. Hellesdon (Ditto) . .	155	184	248	382	324	324	18·70	34·78	54·03	17·90	
41. Thorpe (Ditto) . .	..	..	284	1,211	1,156	1,156	..	..	326·40	4·83	
42. Trowse Millgate, Carrow & Bracondale (Hamlets)	353	345	505	607	788	999	−2·31	17·39	20·19	29·81	26
43. Town Close	..	..	..	14	18	23	..	..	..	28·57	25
44. St. Mary in the Marsh .	616	508	583	611	498	498	−21·25	14·76	4·80	22·69	
45. County Gaol and House of Correction	..	..	..	..	98	98	..	..	..	..	
Total . . .	35,944	36,338	50,318	61,110	62,344	64,823	..	..	..	..	
Mean . . .	..	..	..	..	..	..	·109	38·47	21·44	2·01	3.

Parish or Place.	Houses.			Increase per Centum of Houses at each Period.		Number of Inhabitants per House at each Period.		
	1831	1841	1850	1841	1850	1831	1841	1850
1. St. Peter of Southgate . . .	169	170	168	·59	1·17	3·07	3·97	2·76
2. St. Etheldred	59	71	95	20·32	33·80	4·54	4·33	3·71
3. St. Julian	250	287	321	14·80	11·84	4·25	3·82	3·52
4. St. Peter per Mountergate .	470	529	542	12·55	2·45	4·20	3·82	3·81
5. St. John Sepulchre.	418	456	470	9·09	3·50	4·38	4·05	3·95
6. St. Michael at Thorn . . .	468	472	534	·85	13·13	4·37	3·94	3·48
7. St. John of Timberhill . .	288	273	283	−5·49	3·66	3·66	4·05	4·05
8. All Saints	152	160	183	5·26	14·37	4·55	4·22	3·69
9. St. Stephen	989	991	1,084	·20	9·38	4·15	4·25	3·97
10. St. Peter of Mancroft . . .	590	584	737	−1·01	26·19	4·91	5·09	4·13
11. St. Giles	358	335	393	−6·86	17·31	4·45	4·61	3·93
12. St. Benedict	296	326	364	10·13	11·65	4·81	4·04	3·62
13. St. Swithin	219	185	233	−12·97	25·94	3·97	4·07	3·22
14. St. Margaret	182	206	234	13·18	13·59	4·76	4·19	3·69
15. St. Lawrence	223	222	256	−·44	15·31	4·52	4·38	3·80
16. St. Gregory	232	248	279	6·89	12·50	4·75	4·46	3·97
17. St. John of Maddermarket .	167	178	194	6·58	8·98	4·87	4·10	3·76
18. St. Andrew	219	218	263	·46	20·64	5·92	5·94	4·92
19. St. Michael at Plea	79	84	96	6·32	14·28	4·54	4·43	4·47
20. St. Peter of Hungate. . . .	99	105	129	6·06	22·85	5·27	4·07	3·31
21. St. Simon and Jude	94	90	94	−4·44	4·44	4·74	4·11	3·93
22. St. George of Tombland . .	156	170	187	8·91	10·00	4·55	4·57	4·51
23. St. Martin at Palace	300	331	355	10·30	7·25	4·09	3·98	3·97
24. St. Helen	64	80	82	25·00	2·50	8·14	6·08	5·93
25. St. Michael of Coslany . . .	279	314	358	12·54	14·01	4·30	4·13	3·88
26. St. Mary of Coslany	344	341	393½	−·87	15·24	3·95	4·11	3·66
27. St. Martin at Oak	550	582	720	5·81	23·02	4·58	4·40	3·67
28. St. Augustine	495	511	523	3·23	2·34	4·08	4·01	3·97
29. St. George of Colegate. . .	342	389	409	14·32	5·14	4·42	3·70	3·52
30. St. Clement.	653	667	712	2·14	6·74	4·23	4 25	4·07
31. St. Edmund	185	196	220	5·94	12·24	4·11	3·70	3·30
32. St. Saviour	348	365	336	4·88	−8·63	4·27	3·88	4·22
33. St. Paul	631	654	709	3·64	8·40	3·81	4·25	4·40
34. St. James	362	336	385	7·73	14·52	3·58	3·90	3·43
35. Hamlet of Pockthorpe . . .	385	401	401	4·15	..	4·33	4·68	5·20
36. Hamlet of Heigham	1,324	1,507	1,820	13·81	20·76	4·15	4·01	3·61
37. Hamlet of Lakenham . . .	1,031	1,021	1,095	−·97	7·24	3·69	3·92	3·82
38. Hamlet of Eaton . . . . }	136	132	139	3·03	5·30	4·64	5·51	5·94
39. Hamlet of Earlham . . . }								
40. Hamlet of Hellesdon. . . .	81	80	83	−1·25	3·75	4·71	4·05	3·90
41. Hamlet of Thorpe	257	289	357	12·84	23·52	7·71	4·00	3·23
42. Hamlets of Trowse Millgate, Carrow, and Bracondale	148	195	125	31·75	−56·00	4·10	4·04	7·99
43. The Town Close.	3	3	22	..	633·33	4·66	6·00	1·04
44. St. Mary in the Marsh . . .	101	99	99	2·02	..	6·04	5·03	5·03
45. County Gaol and House of Correction	..	2	2	..	..	..	49·	49·00
Total	14,206	14,855	16,383½	..	..	..	..	..
Mean	..	..	..	4·56	10·28	4·30	4·19	3·95

Trade and Manufactures.—Norwich was celebrated many centuries ago for the manufacture of woollen goods, and in 1791, when the whole amount of British manufactures exported was 14,000,000*l.*; the annual value of goods exported from Norwich was more than 1,000,000*l.* The manufacture of silk and cotton goods, including shawls, paramattas, gauzes, thibet cloths, muslins, mousseline-de-laines, stuffs, lustres, bombazines, camlets, checks, calicoes, nets of all descriptions, &c., has been introduced, and a large business is still carried on. There cannot be a doubt, however, that Norwich has lost its former pre-eminence as a manufacturing city.

As to the number of persons employed in the various trades,

&c., I am indebted for some information to Mr. A. D. Bayne, the very able reporter of the Norfolk Chronicle, who says:—

"In December, 1849, the following returns were obtained of the numbers of operatives engaged in manufactories. Hand-loom weavers 2,500; weavers employed on the power-looms 750; total weavers 3,250. Employed in the mohair and worsted yarn manufacture about 1,000; employed as winders, chiefly children, about 1,200; as warpers, pickers, sewers, dyers, packers, hot-pressers, &c., about 500; total 5,950. Deducting the winders, 1,200 in number, as being children, leaves 4,700. Supposing 3,100, or two-thirds, to be married, with three children employed, on the average, gives a total of 14,050 persons engaged in manufacturing operations.

"In 1849, the lowest earnings in the silk mills were 2*s.* 6*d.*, and the highest 7*s.* 6*d.* weekly. In Mr. Jay's mohair mills the earnings varied from 2*s.* to 7*s.* weekly to spinners, rollers and twisters, but from 18*s.* to 23*s.* to sorters. In Mr. Geary's and Mr. Sultzer's, from 2*s.* for children up to 12*s.* and 14*s.* to men. The hand-loom weavers of fabrics earned about 5*s.* 3*d.* weekly. The fillover-shawl weavers from 8*s.* to 12*s.* weekly.

"Last winter all the operatives were fully employed, and yet could scarcely earn sufficient for the necessaries of life, and of course could only afford to live in rooms, closely packed together in yards, ill-ventilated, undrained, and without any supply of water."

The manufacturing population of Norwich suffer much from the fluctuations of the market. A change in fashions will throw thousands of persons out of employment, and frequently leaves them no resource but the workhouse. It is said that the rate-payers incur a loss frequently of from 15,000*l.* to 20,000*l.* in a year, paid to the poor unemployed artizans as out-door relief. The losses sustained by the reduction in the prices of fancy goods, a short time out of fashion, recoils of necessity upon the artizans, and causes them to suffer great physical deprivations. Many of the rooms examined by me in the factories are capable of great improvements in ventilation, and other matters connected with the health of the workpeople. All these are considerations affecting the comfort, the health, and the lives of a large class of the inhabitants, and, therefore, their avocations should not be omitted in a report on the sanitary condition of the city.

Plans of the City, &c.—Several engraved and lithographed plans were laid before me during the inquiry, but they are all upon a very small scale, except one, and this does not show the divisions of buildings, or the appurtenances of houses: nor does any of them include the whole of the county of the city. I believe there is no survey in existence suitable for sanitary purposes, or that could be adapted to any of the numerous purposes contemplated in the instructions of your honourable Board as to surveys, and shown upon the specimen plan prepared under your directions. The Ordnance Survey of the district about Norwich has not been executed upon a larger scale than an inch to a mile. The Cor-

poration and the promoters of the new water works laid before me several small scale plans prepared for specific purposes, and some of these I shall have to notice under their proper heads.

The Paving Commissioners are in possession of a skeleton map, laid down to one chain in an inch, showing in different colours the paved and the Macadamized roads, and the gas-pipes and public drains. It was made in 1833, and has not been corrected since.

Messrs. Woodrow and Newton, about the year 1822, were employed by the Corporation to make a survey of the boundary of the county of the city of Norwich, and they prepared a plan of the greater part of the county of the city on a scale of 3 inches to a mile, which original plan is now in Mr. Newton's possession. This plan was published on a reduced scale. Subsequently Mr. Wm. Salter Millard, by direction of the Corporation, prepared a plan of the city of Norwich on a scale of one chain to an inch, which original working plan is now in the possession of Messrs. Millard and Son. These gentlemen have also, I am informed, commenced a trigonometrical survey of Norwich.

Contour, Geology and Meteorology.—A careful examination of the whole boundaries of the county of Norwich leads me to the conclusion that they could scarcely have been more suitable for purposes of general drainage, especially when considered in connexion with the jurisdiction of the Corporation over the river above and below the city. With the exception of the east side, including the villages of Thorpe and Trowse Newton, the county boundaries would enclose almost any conceivable extension of the city. The river Wensum enters the county of Norwich at Hellesdon near the church, and flows in a south-eastwardly direction, with a very circuitous course, entirely through the city. The eastern boundary of the county intersects the river again at the point of its confluence with the Yare, below Carrow. It is remarkable that the Wensum forms no part of the boundary, the line crossing it at both points nearly at right angles. From the confluence of the two rivers the boundary follows the course of the Yare south-westwardly, westwardly, and north-westwardly, in a very serpentine form, for about six miles to Earlham, about a quarter of a mile beyond which is its extreme western point. The line then passes over Earlham Hill northwardly to the Wensum, at Hellesdon, already mentioned. From thence it proceeds north-eastwardly to Shepherd's Cottage, which is its most northern point, from thence, turning south-eastwardly by Wren Park, it crosses Mousehold Heath, and takes a southward course, dividing the hamlet of Thorpe from the village of the same name, and terminates at the junction of the two rivers.

Along the valley of the Wensum, in its passage through the city, there is a considerable extent of flat, low land, in ancient times covered with water. It is now covered with buildings.

Above the city, in the direction of Heigham and Hellesdon, the pastures are very marshy, but not of great width. Beyond these, on each side of the river, the ground rises to an altitude of from 100 to 140 feet, and, in some places, with great rapidity. From the river Yare, near Trowse Bridge, to St. Mark's Church at Lakenham, the rise is about 120 feet in less than half a mile. From this promontory a ridge of high land runs westwardly and north-westwardly between the two rivers far beyond the boundary of the county of the city. The watershed is, therefore, on the one side to the Yare, and on the other through the city northwardly to the Wensum. It is a singular circumstance that, although on proceeding westwardly from the confluence of the Wensum and the Yare, their streams would be, on the western side of the city, about 2½ miles apart, yet by continuing along the same road to Earlham, the distance from the Yare there to the Wensum, a little south of Hellesdon Bridge, is not more than a mile. The two rivers nearly surround this portion of the city and county.

The general character of the district is very favourable to the discharge of surface-water.

The ancient estuary which came up to the site of Norwich has left its traces in deposits of alluvium, containing marine shells. This assumes the various forms of gravel, sand, and warp. The agricultural soil of the higher lands is generally light and porous, and disposed to become arid in a dry season. The subsoil, in some places, especially on the highest ground, is wanting. Where it exists, it consists of diluvial gravel, and sand. Beneath this is the chalk, forming the geological stratum of the whole district, and in some places appearing on the surface.

The climate of any district is much modified by its geological character, and by the drainage of agricultural land. On heavy clay lands, and in the fens, where the air is saturated during the greater part of the year with watery vapour, a cold piercing keenness is experienced, very unfavourable to persons in delicate health, and productive of extensive respiratory diseases. In addition to this, if the opinion be correct, which I do not doubt, that aqueous vapour gives vitality to malaria, then a general dry state of the atmosphere is a consideration of the greatest importance.* In this respect the city and county of Norwich enjoys a great advantage. The soil, subsoil, and geological stratum, are all generally absorbent, and whenever I got out into the more elevated suburbs I found the atmosphere soft, dry, and balmy. The climate is therefore naturally favourable to health, and the rate of mortality should be found very low.

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* On an inquiry held by me at Worksop, in the county of Nottingham, it was proved from accurate observations kept by the head gardener of his Grace the Duke of Portland, that the average temperature of the whole district had been raised one degree in ten years by agricultural land drainage.

With reference to the meteorology of the district, I found on inquiry that William Brooke, Esq., F.R.A.S., had kept some observations. He informed me that he had the daily extremes, and the daily, monthly, and yearly averages of the thermometer; the daily readings of the barometer, with the monthly and annual means; the direction of the wind, registered daily for 14 years; the rainfall for the same period, showing the monthly quantities and averages, and the annual depth for each year, and the hygrometrical condition of the atmosphere from July 1847 to December 1849 inclusive. These returns he has since forwarded to me, and, in appending them to this Report, I need not say they are of great value in connection with the sanitary state of the city. Mr. Brooke has no doubt kept the records from a love of scientific knowledge, but the preparation of these Tables has been attended with very considerable labour, specially undertaken for this inquiry, and he is entitled to the thanks of the community for the ready manner in which he has, for the good of his fellow citizens, condensed into tabular forms the daily observations of many years. (*Appendix B.*)

Disease and Mortality.—It would not be directly within the scope of this inquiry to consider historically the various plagues of sickness with which Norwich has been visited from time to time. Nevertheless I ought not to omit entirely the ravages of disease in former times, especially when it is known that no city in the country, perhaps, has been so severely scourged. In 1348 the plague broke out in Norwich, raging from January to July, when 57,374 persons, besides religious and beggars, are said to have fallen victims. Before this calamity the city contained 70 churches, and 70,000 souls. According to ancient authors, this plague raged throughout the world, and in many places did not leave one-fifth of the people alive. The destruction was so great in Norfolk, that in many monasteries scarcely two out of twenty of the inmates were left alive, and not less than a thousand churches were void of incumbents in the diocese of Norwich. In 1361 was a great dearth, attended by the plague. In 1485 the city was visited by that dreadful disease the sweating sickness, of which many perished. In 1578, soon after the visit of Queen Elizabeth, the plague broke out and raged above a year and three-quarters, when 2,335 natives and 2,482 alien strangers died. In 1583 the pestilence again broke out, and 800 or 900 people perished, chiefly strangers. In 1588, and in 1591, the plague was again prevalent. In 1602 no less than 3,076 persons died in Norwich of the plague; and in 1625 and 1626, 1,431 persons lost their lives from the same dreadful disease.

I would not be understood by these facts to prejudice the present condition of the city. It might have been subsequently improved and secured against the attacks of epidemic disease; but when I find that no advantage has been taken of past ex-

perience, I am constrained to say that the city is still exposed, by the large accumulations of offensive organic matter, and other causes, to the attack of any indigenous or imported malignant disease existing in the country.

In proof of this I shall make a very few brief quotations from the minutes of my inspection, and then give the evidence of the resident medical practitioners upon the same points.

At *Butter-hill,* Bracondale, I found a foul open drain behind a house in which was a woman ill of continued fever.

In the *Half Moon-yard,* in St. Peter's, Southgate, there was a case of cholera. The houses in the yard are 13 or 14 in number. The people get water for all purposes from the river, and the drainage from privies and a slaughter-house fall into the stream at the same point from whence the water is taken.

Bailey's-yard, West Pottergate-street. I examined the water used and found it very bright, but hard. Sixteen houses have only two privies, and they are under the bed-rooms of two houses. The tenants adjoining the privies complained much of the stench. I found that there had been two cases of cholera, one fatal, in a house opposite the privies.

In *Armes'-yard,* St. Benedict's, close to the river, there is an establishment for bones and rags, and Mr. Edgar, surgeon, said, that the bones contained a large quantity of animal matter, and that there had been many cases of scarlet fever in the court, and were some now.

In *St. Martin's-at-Oak* parish many of the people get water from the river and a stagnant ditch; and Mr. Garthon, surgeon, said that there was always typhus fever there.

St. John's Head-yard, in St. Michael's Coslany, is one of the worst places in Norwich. The people live mostly in flats, and there is no drainage except along the surface to the same place in the river from whence they take water, and at that point the nightsoil also goes in when the cesspools from some horrible privies overflow. Water is laid from the works, but not in the houses, and the supply is very inadequate. The houses are crowded with inhabitants, and are very much dilapidated. There is no ventilation. In one instance is a privy under a staircase, common to seven families; and in another, a stable and privy under a house. The pavement is bad, and there are no foot-paths. Of those who happened to be outside their doors in this yard, I noticed six persons with scrofulous affections of the eye-lids, and Mr. Garthon said the court was full of fever continually.*

In *St. Margaret's* parish I found many local causes of disease,

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* Who can estimate the aggregate preventible bodily suffering and mortality in this particular spot since 1844, when it was noticed by the Health of Towns Commission as one of the most unhealthy places in Norwich? And yet no improvement has taken place in its sanitary condition.

and Mr. Garthon said it was the most unhealthy part of Norwich. The cholera was very bad here in 1849, and also in 1832.

Coffin-yard, St. Swithin's. The first cases of cholera in the city last year were in this yard. A mother and son died in one house, and the total deaths in the yard were nine. The people obtain water from the river close by.

Crown Court-yard is a wide place, and has been recently paved, but it contains about 155 persons, when all the houses are filled. There are four privies for the whole, and two of them, situated under a bedroom, empty directly into the river not more than a yard above the place where the people take water. There was cholera here in 1833, but not during the last year.

In *Beckham's-yard,* Cowgate-street, St. James's parish, there is no drainage, nor any water, either by pump or tap. The dwellings are most miserable, and such as to be inevitably productive of great immorality. I examined one of these, consisting of only one room, for which the rent was 1*s.* a week. There was only one wretched bed, and scarcely a vestige of furniture. The occupant, his wife, and eight children had all had scarlet fever within nine weeks of my visit.

In the *Cock-yard* the inhabitants complained that the water of the pump was bad, and contained insects. All the people I saw appeared to be in low health, and had a cadaverous look. The pump is within nine feet of the privy. There was cholera in the neighbourhood last year.

The citizens of Norwich can scarcely over-estimate the importance of the testimony given by those whose professional education and pursuits have made them peculiarly acquainted, not only with the nature of diseases, but with the causes that originate or aggravate such of them as are of a preventible nature. The Corporation and the Court of Guardians were convinced of the importance and weight of such evidence, and very properly secured the attendance of all the medical officers acting under the authority of the latter, as well as that of other general practitioners in the city, to give evidence upon the inquiry. I shall make no apology, therefore, for quoting at considerable length from the testimony of these witnesses.

Charles Drake, Esq., surgeon, examined, said :—

"I am senior medical officer under the Court of Guardians. My district comprises the parishes of St. Stephen's, All Saints, St. John Timberhill, St. Michael-at-Thorn, and St. Peter per Mountergate. I have had the office 14 years, but my district has been changed during that time. The patients that I visit by virtue of my office are of course the poorest of the people, and I have become well acquainted generally with their physical condition. I have noticed that they are exposed to, and susceptible of fever of a low continued kind. *In particular yards it has been endemic.* The cases have generally yielded to treatment. That is a disease that lowers the vital powers very much, undermining the constitution. To a certain extent I think it

a preventible disease, by more cleanliness, and better drainage. I have never had any complaints of want of water. I believe they are supplied by pumps, and by taps from the water-works. I am not aware that any of the pumps and taps are in the houses. St. Peter per Mountergate comes down to the river. I should fancy the poor people use water from the river for domestic purposes. I am not aware that in my district the refuse is poured into the river; if it is so, I believe it is prejudicial to health. Neither of the practices of pouring the refuse into the river, or the taking of water out of it for domestic purposes, ought to be continued. I have not found other diseases peculiar to these localities. I am in general practice as well. I have not at this time any low fever in my general practice, which is among persons in better circumstances and able to pay me for my professional attendance. They live in more healthy localities."

Analysis and Remarks.—Mr. Drake has had great experience, and proves that the poor, especially those dependent on the rate-payers for their support, suffer from a disease that is to some extent preventible by proper sanitary regulations. That there is less of such disease among those of his patients who are above the rank of paupers, and that the practice of pouring refuse into the river, and also that of taking water out of it for domestic purposes, is prejudicial to health. The inference is, that this fever is a great pauperiser, and that much of the pecuniary loss falls on the rate-payers in the shape of increased poor's rates.

George Warren Watts Firth, Esq., surgeon, says:—

"I am one of the medical officers of the Court of Guardians, and also assistant surgeon to the Norfolk and Norwich Hospital. I have had the office of district surgeon 12 years, but my district has been changed during that time. I have had my present district about six years. It comprises eight parishes partly in the city and partly beyond. There are many poor persons in my district. The general character of their dwellings, as compared with those in other towns with which I am acquainted, is not bad. There are no cellar dwellings, and, as a general rule, they are not much crowded. Many of the rooms are large. In some parts large houses of the better class have been degraded as to their occupation, and divided into a number of dwellings of one or two rooms each, with a common stair. Many of these houses are old, and some of them dilapidated. The same rooms are used for living-rooms and sleeping-rooms. Occasionally I have known instances of parents and adult children sleeping in the same rooms. Where I have investigated, I know that the privy accommodation is very bad, and some cottages have no privies at all. The city wall has been built upon almost all round, and the houses being back to back there could be no possible drainage, nor any conveniences. Some of the houses so built look good houses, and some are very bad. The people in the upper floors, not having accommodation, if clean people, carry their excrementitious matters to the nearest bin; but, in some cases, they empty all sorts of abominations out of the windows. A great number of the poor people live above the level of the ground. I think they are generally badly off for water. The labour of getting water from a distance is a main impediment to cleanliness. They have

often to fetch it a considerable distance, and to steal it from the pipes or pumps belonging to other property. The able-bodied men, women, and boys and girls, are employed in various occupations, and the household drudgery, including the fetching and carrying of water, devolves upon the most shiftless, helpless, and weak members of the family, debilitated in health, and frequently afflicted with chronic disease. To that I partly attribute the circumstance that very little water is used. A tap in each dwelling, with the means of removing the water after use, would be attended with the greatest possible good to the health and morals of the people. I think that deficient drainage is the first removable cause of disease. I place it before the supply of water. The surface drainage, especially where the Paving Commissioners have no jurisdiction, is infamously bad, and there is no sewerage in many places where there ought to be. There are parts of this city difficult to drain, particularly the level districts, part of Heigham, St. Michael's Coslany and St. Mary's Coslany, St. George's Colegate, and part of St. Clement's. The existing sewers there are very offensive at all periods of the year. There is one sewer that goes past a churchyard (St. Saviour's): it is always offensive. That arises from organic matter unremoved. I think such districts might be well drained by better constructed drains, and more water. I do not think the city of Norwich is remarkable for fever; there have been epidemic fevers, but the diseases which I have had are chiefly among debilitated people, the very poorest in circumstances. With the exception of the flat space near the river, I consider Norwich naturally a very healthy place. I believe the city would be very healthy indeed if all were done that might be effected in removing the causes of disease. I should say that simple fever, which, I have said, is not very common, is preventible, and that all the eruptive fevers would be mitigated in their malignancy and effects by improved sanitary arrangements. Indeed, I do not know where to stop, because nearly all diseases would be more easily cured. I believe that the want of drainage, &c., predisposes persons to disease more than acts as a direct cause. The epidemics of influenza and cholera would be lessened in their effects upon a population in healthy circumstances. Improvements in water supply, drainage, ventilation, &c., would be very beneficial to Norwich, and nothing less than a compulsory supply of water to the cottages will be of any use in my judgment: people won't take it universally unless compelled.

"With regard to the Hospital, it has only lately had water-closets. I am not sure that they are properly constructed; but I can corroborate Mr. Spark's statement that the want of pure air has been the cause of erysipelas there, because there has been no erysipelas in the town."

Analysis and Remarks.—Mr. Firth proves that though the houses occupied by the very poor are not worse than in other places, very many of them are unhealthy dwellings, the drainage and privy accommodation bad, and some without any privies. That the defective water supply and bad drainage are causes of disease; that improved sanitary arrangements would prevent some diseases, mitigate many others, and render nearly all more easy to cure, but that compulsory powers are absolutely necessary to effect this desirable object. Mr. Firth expresses a conviction in

which I most fully concur, and for which I have given reasons under the head "Geology," that the city of Norwich would be a very healthy place if all were done that might be effected in removing the causes of disease.

Launcelot Dashwood, Esq., says—

"I am one of the district medical officers, and have held the office some 10 or 12 years, but have been in practice in Norwich about 17 years. I have seven parishes in my district, and there are many poor in them. Most of the rooms are much too small; many of the yards are closely built, and consequently very unhealthy. The drainage is decidedly bad, in a great number of cases. The water supply is worse, if possible. Many of the poor in my district take water out of the river, and go some way for it too; the article is so scarce that many women never have clean dresses from one end of the year to the other. I think these evils tend very much to debilitate the system; and that fevers, and, indeed, all other diseases, are more readily contracted, and prove more malignant than they would be under more favourable circumstances. I most decidedly concur with the last witness so far as his statements are applicable to my district, and I think the remedies are—*a better supply of more pure water, better surface and underground drainage, and better ventilation.* There are large blocks of houses in Norwich, huddled and crowded together, worth little to the owner, and which ought to be removed, in order to give more breathing room. That would secure better street and court ventilation. Many courts have neither proper air nor light, which latter I look upon as secondary only to pure air."

Analysis and Remarks.—Mr. Dashwood's evidence is entirely to the same effect as the preceding. He speaks, however, more emphatically on the subject of better ventilation than the preceding witnesses; and as there can be no doubt that the germs of disease are inhaled, or the predisposition brought on by the respiration of stagnant polluted air, there cannot be a doubt that all public and private arrangements for better ventilation will improve the health of the inhabitants. I fully concur with Mr. Dashwood, that *unrestricted light* would be highly conducive to health. The statement, that for want of water many women had not clean dresses from one end of the year to the other, was corroborated by information from other persons, that poor women generally select dark-coloured prints that will not show dirt. My own observation confirmed this.

William Cooper, Esq., surgeon, says—

"I have been medical officer of the Court of Guardians about four years. There are four parishes in my district; one of them, St. Martin's-at-Oak, abutting upon the river. The poor people use river-water for food. I think it undoubtedly prejudicial to their health. There are very few pumps in my district; they are in most instances difficult to work, and, under certain circumstances, the labour of pumping water is injurious to people. I should think, however, that hernia is not more common in Norwich than in other places. There are water-pipes in two of the parishes only. I cannot say that I have observed the people

better in the places having water from the works. It is deficient in the whole of the district. With regard to St. Clement's Without, I have considered the drainage to be a great cause of disease. It is producing disease at this moment. I concur with all that has been stated by Mr. Firth, and I think that more efficient drainage, a better supply of water, and better ventilation, would improve the health of the inhabitants."

Analysis and Remarks.—It appears that two of the four parishes have no water from the company, and that the whole district is in the most deplorable state as to water. Mr. Cooper agrees with his colleagues as to the causes of disease, and the necessity for public sanitary works.

Henry Robert Edgar, Esq., surgeon, examined, said—

"I am one of the district medical officers. My district comprehends the parishes of St. Peter Mancroft, St. Giles, St. Benedict, and the hamlets of Heigham, Eaton, and Earlham, the population of which is, according to the last census, 12,619 souls; that of Heigham was 6,050 in 1841. The increase has been very great since that time, and it is now believed to be above 7,000. The upper parishes remain much in the same state. I have held office under the Court of Guardians three years. I am a native of Norwich, and have been in practice 22 years, 5 years in Norwich and the remainder in London. I would observe that the parishes of St. Peter Mancroft, St. Giles, and the greater part of St. Benedict, are very well supplied with water, but the drainage might be better with regard to the lower part of St. Benedict's parish, that adjoining the parish of Heigham; it is principally surface drainage, and that of the most imperfect and worst description. Heigham-street, as it is called, which is from 150 to 200 yards in length, has an open central channel, which receives the outpourings of all the yards on the left-hand side of the street, and the refuse which is swept off those yards into that central channel by the inhabitants of the courts, containing very many cottages, remains stagnant. On the right-hand side of the street, there are three or four yards which are drained into the central channel in the same manner. This central channel, through its entire length, has but one reservoir or receptacle, namely, a grating, what is called a cockey, a sort of cesspool for solid matter. The fall of the street is very imperfect, not more than a few feet, and the fall from the cockey to the river is very little, almost level. The offensive matter does not escape; it is putrid at this moment—choked. The present level of the mud and water backs up to the grating, and cannot escape. This also receives another cockey, which has the drainage of all St. Benedict's, or Fountain-lane; that of course increases the evil. There is no possibility of getting rid of this under the present arrangements; the paving commissioners have no jurisdiction.

"The parishes of St. Peter Mancroft, St. Giles, and part of St. Benedict, have water from the public works, and there are a few pumps. The first and second parishes contain many large houses, nearly all of which have private taps. There are poor people who have not, except a tap common to several houses. These taps for the poor are outside the houses, each family having a key. I should think that there would be one tap for 20 dwellings of the poor, on the average, in those parishes,

but it is on three or four times per week, and on a Friday nearly the whole day; but lately, within a few weeks, the supply has not been so regular, nor for so long a period; I do not know the reason why. I know the water is not filtered, and that a film of oxide of iron is produced inside the pipes, and conveyed to the inhabitants. I do not think a minute quantity of iron is injurious to health. For washing of linens the admixture of iron would be injurious. The distance, on the average, would be 20 yards going, and 20 yards returning, to fetch and carry the water. I should not think that injurious; I do not think that weakly persons would be employed to do it. The health of the poor in St. Peter Mancroft, is very good; that of part of St. Giles is equally so, but in St. Giles'-lane, and in the continuation of it, called Duck-lane, in the parish of St. Benedict, where the houses are principally built upon the walls of the city, having a surface drainage only, the lanes being very narrow, the houses imperfectly ventilated, and very badly supplied with privies, the locality is unhealthy. I fear that the owners of property would not voluntarily make the improvements necessary to bring their tenants into as good a state of health as the other parts. These are the poorest of the people, compelled by their poverty to live in such unhealthy places. I know of no insuperable obstacle to making those places as healthy as the others I have mentioned. The diseases are generally eruptive — measles, scarlatina, and so forth. The scarlet fever has been epidemic for the last few months in Heigham. I find it more malignant in bad localities. I have now 13 cases under treatment in the single parish of Heigham, and two others have died within a few days. I cannot say that I have met with any instance in which scarlatina, measles, and typhus fever have spread from an unhealthy to a more healthy locality. In the majority of cases the disease is limited and marked by the filthy district. I attribute the occurrence of these diseases mainly to the want of drainage. A more abundant supply of water would be useless until the drainage was effected; not but that flushing the drains would materially assist in disinfecting those districts. If a perfect system of drainage were constructed, I should think a better supply of water necessary. I think that in Heigham-street there are only four pumps, and two of them are so bad that the water cannot be used for food. I also asked two or three of the inhabitants of Heigham whether they were ever compelled, from the failing of the supply of those pumps, to use the river water for culinary purposes, and they said they were. The water of that river is very much contaminated by drains; and, from what I have seen, is totally unfit for dietary purposes, and a fruitful source of disease, and that in the very worst season of the year, in summer and autumn. The lower parts of the city that are not supplied by the Water Company have an abundant supply of wells and pumps. I know Mr. Fromow the chemist, and the court adjoining. I only know of one public pump in that parish;* it is set in the churchyard wall. That there might be a more abundant and a better supply of water in Norwich, and that it needs it, admits of no question; but that there is never a scarcity of water, especially in Heigham, is also admitted. I do not know any poor person in Norwich with a water-tap in the house. I do not know what is paid for a tap. I have a tap in my house in St. Giles',

* St. Augustine's parish.

rated at 20*l.*, and pay 14*s.* for the tap, and 5*s.* for the water-closet, total 19*s.* It has not been so pure as I could wish, because I live very near the Chapel Field reservoir, where there is a very considerable growth of subaqueous vegetation, and some mud, and fish, &c. My water comes from that reservoir; when the water is first turned on there is always some matter that has been left in the pipes.

"The workhouse is very well supplied with water from a pump; so also is the infirmary and asylum of the workhouse, by means of a pump. There is a bad ditch at more than 100 yards from the buildings; there is no drainage there. In the infirmary the well is sunk into the chalk, about 28 feet. I do not know that there are any wells that are polluted. If 20 grains of common salt were held in solution in a gallon of water the proportion would be injurious to the animal economy.

"I am Registrar of Births and Deaths in the Mancroft District, and I find, from the certificates which the medical officer gives me, that Crooks-place is the frequent locality of eruptive fever and measles, and that the cases are very fatal."

Analysis and Remarks.—I find the testimony of all the medical witnesses concurrent as to all the great improvements which it is the object of the Public Health Act to effect. The varying circumstances in the different districts, however, bring forth in each some new point of consideration. Mr. Edgar shows the very dreadful state of the drainage in Heigham, a suburb of the city containing 7,000 inhabitants. The Acts for paving, lighting, cleansing, &c., do not extend to Heigham or the other hamlets. I differ from him, however, as to the constituents of a good supply of water. I cannot think the workhouse has a good supply from a pump, or that houses *are* supplied by one tap for 20 tenements. These statements, made with all sincerity, only prove to me that the inhabitants of Norwich have not hitherto understood the nature of a good supply of water, certainly not such a supply as is contemplated by the Public Health Act. Mr. Edgar describes the bad sanitary condition of part of St. Benedict's, and knows of no insuperable reason why it should be more unhealthy than other parts, but fears that the owners of property would never voluntarily make the necessary improvements. I have no hesitation in saying that a great responsibility rests upon such owners, and that they ought to be compelled to do their duty.

W. Bransby Francis, Esq., surgeon, says:—

"I am one of the district surgeons in Norwich; I have had that office about three years. I have been in practice about 13 years, seven of which have been in Norwich. My district includes three parishes and a hamlet, St. Saviour, St. Paul, St. James, and Pockthorpe. My official duties take me among the poorest of the people. The cottages are generally dirty and ill-ventilated, and the supply of water is bad. I think the public drainage underground through my district is not generally very deficient. There is a very bad ditch on the outside of Pockthorpe, immediately under the houses, the walls of the houses arising out of it, that receives the refuse of those and other houses; it is

the same ditch that receives the refuse from the barracks, containing, when full, from 200 to 300 persons, and probably 200 horses. The refuse lies stagnant in that ditch for a distance of above a quarter of a mile. I have no doubt as a medical man that that is likely to produce extensive disease. I have tried to get it removed, but have never been able; the authorities seem not to have the power. Pockthorpe is not lighted or supplied with water. There is a drain running through the whole length of it, and passing into the ditch of which I have been speaking. The surface channels in Pockthorpe are generally full and dirty, from the number of court-yards that run into them. I think the foul state of the surface in that district, and of the drains, is from the want of water, there being a defective supply of water in the yards, and the refuse is not removed. The drain in St. Saviour's is more offensive than any in the city, and parts of St. Paul's, especially the part near the Magpie-road is not drained at all; but here is a very bad open ditch. Compared with other parts of the city, the water-supply of my district is bad; at the present time there is scarlet fever prevalent, it is epidemic; we have had measles, erysipelas, and occasionally a low form of fever, and during the prevalence of cholera there were about 13 cases of it in the parish of St. Paul, a single case of it in a yard by Magdalen Gates, and the other cases in two yards in Cowgate-street. In the same yards there has been scarlet fever, low fever, erysipelas, and measles. Those places are in a bad condition as to filth, but something has been done by the Sanitary Committee. I have found an identity between the localities of filth and disease. I think that such diseases are partly preventible, perhaps more in the character than in the number of cases. If such places were clean, and the diseases appeared, they would be in a mild form. I think the means of prevention are a better supply of water, and better drainage of the houses and yards, and those public ways that are not now drained. There are some few that have no drains."

Analysis and Remarks.—Mr. Francis proves not only the existence of the diseases already mentioned by the other medical witnesses, but that the same localities are the seats of all these diseases, and that the filth districts and the disease districts are identical. He concurs with his colleagues as to the remedies for such a lamentable state of things.

Walter Christopher Thurgar, Esq., surgeon, says:—

"I am one of the district medical officers. I have had that office upwards of two years. I have been in practice here five years. I have nine parishes, New Lakenham being one of them. In Lakenham, the inhabitants are hardly at all supplied with water. I think that with very few exceptions the poor are not supplied with pipe water in any of the parishes in my district. Their condition would be much better if they were supplied. Offensive matters are allowed to remain in the vicinity of the dwellings for a considerable time; but I think that in some places they are taken away in night carts. New Lakenham, which is a very large district of about 500 houses, has no underground drain whatever I believe; there are cesspools, and in some places the refuse overflows the surface. Lakenham is beyond the city. The general character of the surface is absorbent. Some of the refuse is evaporated

in hot weather to dryness. I remarked very unpleasant smells before and after the cholera last autumn. I have not perceived it since. The deficiency of water and imperfect sewerage, or rather absolute want of sewerage, is decidedly prejudicial to health; such is the condition of Lakenham. I think that the pauper population of Lakenham is more healthy than in any other part of Norwich. Some of that arises from their elevated position, wider streets, and better constructed dwellings; the houses are more modern than in other parts of Norwich. Notwithstanding this, I think it very likely that if the poor people in Lakenham were well supplied with good water, and the houses, &c., efficiently drained, the inhabitants would enjoy better health than they do. I have had cholera, measles, and scarlatina as epidemic diseases in my district. All the cases of cholera that I attended were in a very small compass, in the parishes of St. Julian and St. Peter Southgate. The yards so infected were very dirty; these yards lead down to the river, and are badly drained. If asked I should have predicted the appearance of the disease in such places. From all that I heard, I concur with the evidence of Mr. Francis so far as the evidence is applicable to my district. I should not expect the same improvement in Lakenham from better water supply and drainage as in the lower parts of the city. I should think that disease would be mitigated both in extent and severity by better water supply, and better drainage; but that the epidemic diseases among the poor generally arise as much from the want of good food and clothing as from the want of good water and sewerage."

Analysis and Remarks.—The evidence of Mr. Thurgar is very important. Here we have a large population in the most elevated part of the suburbs of the city, residing in houses recently built, with a separate dwelling to every family, and with streets wider than usual, with considerable open spaces affording free ventilation and access to the salubrious atmosphere of the country, and yet, being without pavement, or any drainage whatever, and very inadequately supplied with water, the locality is the seat of malignant epidemic diseases. Mr. Thurgar states, that disease would be mitigated both in extent and severity by better water supply and drainage, but adds, that he thinks epidemic diseases among the poor arise as much from want of good food and clothing as from want of good water and sewerage. Admitting the force of this, no legislative enactment can feed and clothe the people, or prevent fluctuations in trade; but the evils of bad water and drainage are capable of being remedied by those powers which the Public Health Act proposes to confer upon the Corporation.

Thomas Crosse, Esq., surgeon, says:—

"I am one of the district medical officers under the Court of Guardians. I have been in practice 2½ years. My district contains three parishes; the population is about 4,000; St. Mary's, St. George's Colegate, and St. Clement's within the City: part of two of them abut upon the river. The people are supplied with water by pumps, and by pipes. As far as I have observed, I have not seen either a pump or a tap in the house. I should say that the average distance would not be more than 20 yards to fetch the water; I have *no* reason to think that

the people would use more water if they had it in their houses. With some exceptions, I think that the dirty people would, perhaps, be induced to use more if they had less distance to fetch it; the dirty people are the exceptions. I should say that the people do *not* economise water on account of the distance of fetching it. I have *not* found that the condition of the people as to cleanliness or dirt is any indication of their state of health; I cannot say that I should expect to find the people in a filthy house as healthy as those in a clean house. Some diseases are certainly originated by filth, and some are aggravated by it. I should *not* expect in a filthy house to find a disease assuming a malignant form, which in a clean house would be of mild character. I am scarcely able to answer the question as to whether disease originated or aggravated in a filthy house might be communicated to a clean house. I am aware that many members of my profession are of opinion that fever is almost entirely preventible; but *I do not wish to give an opinion on the subject.* I should scarcely think that water could be fetched, drawn, and carried 20 yards each way at the expenditure of so little as one pennyworth of physical energy per week; I should think it would cost in Norwich one penny per week in shoe leather."

Analysis and Remarks.—Mr. Crosse differs materially from his more experienced brethren. His evidence is confined to the effect of water supply upon health, and the pecuniary cost of fetching and carrying it. As to the former, his opinions differ from those of all the other medical men I have met with in nearly fifty similar inquiries, and, as to the latter, he estimates the cost of fetching water at twopence per week, or 8*s.* 8*d.* per annum, irrespective of the value of the time thus occupied.

Frederick Beverley Dixon, Esq., says,—

"I am a surgeon residing in Norwich. However desirable a better supply of water may be to the poor inhabitants of Norwich, I scarcely think, from my experience in their sick rooms, that better ventilation is inferior to it in importance. If some plan could be hit upon, by means of which bad ventilation would be impossible, I think it would be very desirable. Generally the bedrooms of the poor are over-crowded, and all crevices of the windows often pasted and stopped up.

"I have heard the evidence of several of the district medical officers, under the Court of Guardians, and, as far as my practice enables me to judge, I fully concur generally in what they have stated. When we reflect that human beings pass seven or eight hours in their bedrooms, it is very important that they should breathe an atmosphere as pure as possible."

Analysis and Remarks.—Mr. Dixon is not one of the district medical officers, but his experience leads him to concur in their evidence. I can fully corroborate his statement as to the care used to prevent the ingress of pure air in the dwellings of the poor, and have always found that the more heated and polluted the internal atmosphere, the greater was the anxiety to close all the crevices. I attribute this partly to the great contrast felt between the temperature of the external air, and that of the rooms,—to the fear of draughts,—and to a high susceptivity of cold, one

of the consequences of a depressed state of vital energy. Thus the same evil acts and reacts as cause and effect; the poor people inhale vitiated air until they shrink from contact with that which is pure, and necessary to healthy existence. The remedy for such evils is in the province of the enlightened "Officer of Health."

James Slapp Garthon, Esq., surgeon, says,—

"I have been practising in Norwich 16 years. I was here in 1833 when the cholera was prevalent. I was at that time assistant to Dr. Lubbock, and was much engaged among the sick poor. The principal localities were in St. Margaret's, Paul's Close, King-street, Elm Hill, and the Pea-field. I had great experience in the influenza that followed in 1835 or 1836, when I was surgeon for the Norwich district of the Aylsham Union, including the whole city. The mortality from influenza was principally confined to elderly people. I observed that it was more severe in Magdalen-street, in Pockthorpe, and at the back of St. Stephen's, than in other places. That is as far as my experience extends. The mortality of the place was greatly increased by the disease. Low typhoid fever prevailed in 1838, principally in Heigham, and the Pea-field. That was more remarkable for the number of cases than for the number of deaths, more died at Heigham than at Pea-field. This is a disease that makes great inroads on the constitution. Taking an average, the patients would be about 21 days before they were restored to convalescence. It was most severe among the persons from 18 to 25 years of age. Scarlet fever attacks the town epidemically about once in six years. In 1835 it was very prevalent. In St. Peter Mancroft, and St. Stephen's, Crooks-place, and the Pea-field, it destroyed many children. The same disease was again prevalent in 1843 or 1844, but it was not then so severe. *The localities were the same.* It is epidemic at the present time in a most severe form, and with great mortality. It appears always to follow on the train of hooping-cough. It is now in St. John's Head Yard, St. Michael's Coslany, St. Martin's, at Oak, Pockthorpe, also at Crooks Place, and Pea-field. Norwich is naturally a healthy place, but if a bad type of fever prevails in one low locality it follows with the same symptoms in another similar locality, however wide apart. Rheumatism is a very prevalent disease in Norwich, and we are also noted more than in any place in England for calculus diseases; a larger quantity of specimens of calculi being in our hospital than in any similar institution in England. Cholera was not so fatal in 1849 as in 1833. It was principally confined to St. Margaret's and St. James. *The localities are mainly the same whatever the epidemic may be.* The Pea-field is always diseased. There is no drainage there, and a very bad supply of water. That and Crooks-place are built on brick earth, and the sewage water cannot permeate the soil. I have observed a very curious effect of mercury in various parts of this city. If given at Heigham, which lays nearly on the level of the river, very minute doses will produce salivation, but you may give the usual doses in the higher parts of the city with impunity. *I have also noticed that where the supply of water is most defective, filth and sickness, and, consequently, vice and immorality are most prevalent.*

"The pipe water is exceedingly bad, especially after rains. The source from whence the water is derived is now excessively impure.

The sewerage and drainage throughout the city is extremely defective. Norwich, compared with some other localities, has a low rate of mortality, and, *with proper and comprehensive measures, it would become one of the most healthy cities in the kingdom.* Not only is the water defective in quality but it is irregularly supplied, and I also consider the ventilation of the houses occupied by the poor as being very bad. There are scarcely any public urinals in Norwich. The privy arrangements are as defective as they can be. The greatest scenes of indecency are witnessed from their bad construction, and I have also observed that where a good supply of water is introduced into any court it immediately produces habits of cleanliness, in some one or two, who are followed by the other inhabitants. All these evils that I have enumerated are sufficient to account for the excessive mortality. *To a great extent the diseases mentioned are preventible.* Better water supply, drainage, ventilation, and arrangements for the comforts and decencies of life are the remedies for these evils."

Analysis and Remarks.—Mr. Garthon is enabled from long experience as a general practitioner to track the course of the various epidemic diseases that have visited the city during the last 16 years, including the first attack of cholera. I cannot give sufficient emphasis to the words with which he sums up that experience; "THE LOCALITIES ARE MAINLY THE SAME, WHATEVER THE EPIDEMIC MAY BE." This is the experience of medical men who have been long practising in all large towns with which I am acquainted. I only need to couple this with another fact that has fallen under Mr. Garthon's observation and which is of equal importance to the citizens:—"I HAVE ALSO NOTICED THAT WHERE THE SUPPLY OF WATER IS MOST DEFECTIVE, FILTH AND SICKNESS, AND, CONSEQUENTLY, VICE AND IMMORALITY ARE MOST PREVALENT." Turning from this sad spectacle Mr. Garthon says,—"TO A GREAT EXTENT THE DISEASES MENTIONED ARE PREVENTIBLE," and states,—I believe most truly:—"WITH PROPER AND COMPREHENSIVE MEASURES NORWICH WOULD BECOME ONE OF THE MOST HEALTHY CITIES IN THE KINGDOM."

The singular effects of mercury in Heigham, which place is in a low situation, and in a very bad sanitary condition, is worthy of serious consideration. I think it clearly corroborates what I have already stated, that the inhalation of malaria creates a susceptivity of any disease, natural or artificial, by depressing the vital energy that should resist and throw off the attack. Persons in such a state are like a city without walls or garrison,—defenceless and powerless;—under the assault of a fierce, relentless enemy.

Since my visit to Norwich I have received many communications from persons anxious for the application of the Public Health Act: I only quote shortly from one of them, dated 14th July, 1850:—

"We are in Norwich anxiously looking for your report respecting this city, having no doubt that it will cause the application of the Act, and enable us to get into a better sanitary state. At the present time in

Heigham the scarlet fever is raging throughout the entire hamlet. Children are ill, dying, or dead, in every second house. Opposite my residence, Mr. Carver, foreman at the Chronicle Office, has four children ill, and one dead. At the back of my house two children are very ill, and not expected to live. In Distillery-street a number of parties have lost children within a short time. You will remember that there are no drains of any kind in this hamlet, that it is studded with cesspools in every direction, that many new streets have been lately built in it, and that the public bodies have no jurisdiction for any sanitary purposes."

I have obtained from F. J. Blake, Esq., Superintendent Registrar, a return of the births and deaths in Norwich, including the county of the city, for the years 1847, 1848, and 1849. From this I have calculated the rates of mortality under various heads, and have formed a table which shows some remarkable results. In commenting briefly upon the columns of this table I would not be understood that the rates of mortality are high when compared with those of some other large towns, destitute of sanitary works. It has been already several times stated that Norwich is *naturally* a very healthy place, but it is also fully proved to contain a large amount of preventible disease. If the mortality of a *naturally unhealthy* district in a bad sanitary condition, is therefore 28 to a thousand of the population, while that of Norwich is only 23 to a thousand, the preventible disease in the two may still be equal, and if it be possible by public and private improvements to reduce the mortality of the naturally unhealthy district to 18 per thousand, similar improvements may reduce the mortality of Norwich, with all its natural advantages, to 13 in a thousand. It is a fact that there are whole registration districts in the county with a mortality of only 13, 14, and 15 to a thousand, and yet no sanitary improvements have been effected in them. It is the opinion of eminent men who have paid great attention to the subject that the *inevitable* mortality of the country is not greater than 11 to a thousand, and if it be urged that cities and towns can never expect to enjoy the same immunity from disease as the thinly populated country districts, I reply, that the greater density of population in the former ought to afford facilities for more perfect drainage, better supplies of water, and more prompt medical assistance than can be had in any mere country village. *In the comparison of town with country, almost every cause of disease that can be conceived to exist in the former, and to be absent in the latter, is of a removable nature, while the town possesses advantages with respect to health unattainable by the country.* For want of water, drainage, ventilation, and proper arrangements of work-rooms, living-rooms, and bed-rooms, the air (differing in degree in different parts of the town) is rendered unfit to support a vigorous existence. Purify the air by such complete and systematic drainage, water supply, and ventilation, as can only be effected in the midst of a large population, and I know of no valid reason why a city so favourably placed as

Norwich should be more unhealthy than the most salubrious spot in this country.

My chief object, however, at present is to point out the rapid deterioration that has been going on during the last three years. In doing this I have, for several reasons, made no exception of the last year, when cholera was prevalent. The natural advantages of the city availed the inhabitants, and the dispensation of cholera passed lightly over, so as to leave little impression upon the aggregate mortality of the year. Besides this, it is now a clearly ascertained fact, that few diseases are more properly termed *preventible* than cholera, and it was stated to me that not a death from it occurred in Norwich, in 1849, except in localities in a bad sanitary condition.

I have used the population return of 1841 because the preceding 10 years shows the number of inhabitants to have been nearly stationary, and the increase during that period was the only datum upon which I could have corrected for ascertaining the present number. But even if the population is larger now, the error will in no way invalidate the comparative rates of mortality in three consecutive years. The *relative proportions* of those years remain the same whether the population has increased or decreased since 1841.

The facts are then, that in 1847 the deaths were 1 in 47, or 21·2 to a thousand, of the population. In 1848 they had increased to 1 in 42, or 23 in a thousand; and in 1849, 1 in 38, or 26·3 to a thousand.

I have invariably found the truth of the following sentence from a publication of the Health of Towns Association in 1846.

"It has been demonstrated as a general law in the Sanitary Report, that amidst large masses of people, the ravages created by an excessive mortality, are more than made up by an excess of births, and that pestilence, instead of diminishing, rather increases the numbers of the population."

In Norwich the births were one in 35 to the population in 1847. In 1848 one in 32, and in 1849 one in 30. Notwithstanding this increase of births, however, I find that the proportion of deaths of infants under one year old to the total births has risen from one in six to one in five. The rates of infantile mortality are considered one of the most certain tests of differently conditioned districts, or of the same district at different periods, because they are less affected by migration and immigration, and not at all affected, as the adult classes are, by the physical circumstances attendant on their occupations. Under this view I would direct the most serious attention of your honourable Board, and of the Corporation and citizens of Norwich, to the columns showing the proportion per cent. of deaths at each interval of death to the total deaths in the county of the city. You will perceive that the point of 40 years of age is an *axis* upon which the rates turn. In

1847 all the proportions up to that point are less than in 1848 and 1849; while the proportions above 40 years are greater in 1847 than in the two following years. With a rapidly increasing rate of general mortality the proportion of deaths under 40 years of age, in 1847, was 48 per cent.; in 1848 it had risen to 57 per cent., and in 1849 to 60 per cent. The reciprocal view of these proportions is that of those who died in 1847. 52 per cent. had lived more than 40 years. In 1848 the per centage was only 43 per cent., and in 1849 only 40 per cent.

TABLE of MORTALITY in the CITY and COUNTY of NORWICH.

Year.	Place.	Rate of Mortality to 1000 of the Population.	Total Number of Deaths in the District during the Year.	Total Number of Births in the District during the Year.	Proportion of Deaths to the Population in the District.	Proportion of Births to the Population in the District.	Proportion of the Deaths of Infants under 1 Year to the Births.
					One in	One in	One in
1847	Norwich . .	21·2	1,310	1,749	47	35	6
1848	,, . .	23·0	1,424	1,876	42	32	5
1849	,, . .	26·3	1,626	2,007	38	30	5

Year.	Place.	Proportion per Cent. of Deaths at each interval of Deaths to Total Deaths in the District.											
		Under				Between							90 and upwards.
		1 Year.	5 Years.	15 Years.	20 Years.	20 and 30.	30 and 40.	40 and 50.	50 and 60.	60 and 70.	70 and 80.	80 and 90.	
1847	Norwich .	21·0	28·4	33·4	36·4	6·1	5·5	8·0	8·7	11·4	14·7	8·1	·8
1848	,, .	26·4	35·6	40·5	43·3	7·3	6·6	6·9	7·0	9·2	10·9	7·6	·9
1849	,, .	24·3	36·8	42·6	46·4	6·7	6·6	6·9	6·7	8·0	11·6	6·2	·6

Hitherto the argument has assumed that the annual mortality in Norwich does not exceed the proportion of 23 to a thousand of the population: a proportion, which, in the opinion of the legislature, at the time of passing the Public Health Act, was so much in excess, as to induce them to impose upon the General Board of Health the responsibility of instituting preliminary inquiries without any petition, or local movement whatever.

The following table, however, shows that the actual mortality in Norwich is much higher than I have assumed above. It is, in the terms of the Public Health Act, "the last return for the time being made up by the Registrar General of Births, Marriages, and Deaths, from the deaths registered in a period of not less than seven years;" and is calculated upon the population at the census of 1841 as being a clearly "ascertained," datum. The seven

years from 1838 to 1844 places the year, 1841, in the centre of the period, and the population at that time is, therefore the average of the whole period. The total deaths in those seven years, in a population of 61,846 were 10,758 according to the table, which is equal to very nearly an average of 25 to a thousand per annum.

In the previous table, calculated from the Returns of the Superintendent Registrar of Norwich, the deaths at different ages in each year were calculated in proportion to the *total deaths* during the same years respectively; but in the Registrar-General's Return the mortality per centum is calculated according to the number of *persons living* at each of the ages given respectively. A careful examination of this table will show that it bears out fully all that I have shown from the previous table as to the excessive infantile mortality of the city, and consequently the preventible nature of the causes of disease now existing.

AGES.	Population, June 6th and 7th, 1841.		Deaths in the Seven Years, 1838-44.		Annual Mortality per Cent.	
	Males.	Females.	Males.	Females.	Males.	Females.
0 to 1	673	710	1,359	1,098	28·829	22·114
1 „ 2	702	721	366	299	7·443	5·930
2 „ 3	649	656	245	254	5·389	5·537
3 „ 4	618	668	161	173	3·719	3·703
4 „ 5	664	667	128	121	2·752	2·594
0 „ 5	3,306	3,422	2,259	1,945	9·755	8·128
5 „ 10	3,202	3,273	300	266	1·338	1·162
10 „ 15	3,246	3,311	129	152	·567	·656
15 „ 25	5,337	7,382	324	411	·867	·796
25 „ 35	3,749	4,889	265	340	1·009	·994
35 „ 45	3,459	4,223	320	357	1·321	1·209
45 „ 55	2,646	3,073	324	306	1·748	1·424
55 „ 65	1,584	2,014	362	363	3·263	2·577
65 „ 75	994	1,456	476	553	6·837	5·431
75 „ 85	404	674	377	539	13·322	11·435
85 „ 95	62	97	134	222	30·855	32·726
95 and upwards . .	4	4	8	16	28,553	..
Ages not stated . .	24	11	2	8	..	..
All ages .	28,017	33,829	5,280	5,478	2·692	2·313

General Register Office,
4th October, 1850.

(Signed) GEORGE GRAHAM,
Registrar General.

DRAINAGE, SEWAGE, &c., OF THE CITY AND SUBURBS.—At the opening of the inquiry two papers were put in complaining of want of drainage.

The following are copies.

"SIR, *Norwich, May* 15, 1850.

As you are the gentleman appointed to inspect the sanitary condition of our city, we most respectfully beg leave to call your attention to the foul and impure ditch or ground known as Reynolds

Nursery, in the hamlet of Lakenham, which ditch receives the flush of water caused by heavy rains, snows, &c., from off the Buckenham turnpike, and other roads and streets. Some few years ago, at the entrance of this ditch, there was a large pit or pond capable of receiving much of these flushes of water, and when full the remaining overplus water passed by the ditch into an old field of brick ground, and thus a complete riddance of the water was obtained, and the cottages, stables, &c., abutting on the ditch were left in a comfortable and healthy state, but the case is reversed; the pond has been gradually filled up, the brick-ground converted into a gentleman's garden, and a total stop has been put to the water running as heretofore on to the brick-ground. The ditch on the nursery-ground is now generally full of water, to that degree, as to undermine and destroy our property, forcing its way through the walls, and from under the ground-cills, a fact now to be seen by inspecting the stables of Mr. Barker, of the King's Arms.

"We, therefore, respectfully request that the parties who have so stopped up, and destroyed the usual water-course, may be compelled, at their own expense, to restore the same, or that the said ditch may be filled up to prevent any further injury to the health and property of the complainants.

"We are, Sir,
"Your obedient Servants,
(Signed) "Richard Meen,
"William Hall,
"Henry Brooks,
"John Amies."

"*Heigham, May* 15, 1850.

"From a Return given me by the Property Tax Officer, there were in 1842, 15 streets in Heigham. The houses rated were 407, cottages 1,117, total 1,524. Taking them at four persons to each house will be a population of 6,096. Now there is erected, since 1842, in Heigham, seven streets, and 346 houses and cottages, which will considerably increase the want of drainage and sewerage, which over a large area has no means, from the impediments of the Paving Commissioners, as the sewers must pass through Heigham-street, which has only a fall of 2½ feet to the river, at the head of the mill, and by passing through the city sewers a fall of 11 feet could be obtained. Heigham-street has about 900 inhabitants living in yards, and the surface drainage is so disgraceful that the inhabitants of Heigham did contemplate applying for a Local Act, to drain effectually this large hamlet; but upon the introduction of Lord Morpeth's Bill it was held in abeyance. The inhabitants in general consider it would be perfectly useless to increase the supply of water before a perfect system of sewerage was carried out in Heigham, and fully coincide with the scientific gentleman that a source of profit could be made of the sewerage.

"Many of the wells which used to supply good and wholesome water are contaminated from the cesspools.

"In Heigham-street, there are 20 yards, containing 150 houses; in Tinkler's-lane, 36 houses; in Eagleton's-buildings, 29 houses; in Sayer's-buildings 28 houses; in Cope's-buildings 10 houses, without drainage, except into Heigham-street, and which discharges itself into

the ditch by Mr. Blake's, from whence the present water works are supplied, and the above houses have *only five pumps*, and no water from the water company.

(Signed) "J. S. Rump,
"*Heigham.*"

I now proceed to give a few extracts from the Minutes of my inspection:—

In the Little Butchery, and the Fish-market, the drainage is along the surface, and the smell at the cockeys where it enters is very disagreeable.

Hudson's buildings, in Coburg-street, are close, ill-ventilated, and without any drainage. There are cesspools which are emptied occasionally. The privies are in boxes, emptied once a-week, and the houses pay each one halfpenny per week for the emptying. One of these privies is under a bed-room, and Mr. Clarke, the Inspector of Nuisances, says, the woman in the house is always sick.

In *Victoria-street* there are some new houses of about 20*l.* rental with only cesspools.

Pea-field, in New Lakenham, is a suburb of modern cottages, beyond the jurisdiction of the Paving, &c., Act. There are upwards of 500 houses, and about 2,000 inhabitants, without either pavements, gas, water supply, or drainage. The refuse is on the surface, and such of it as gets away goes into some open land near the Ipswich railway, and forms the stagnant ditch complained of in the memorial, of which I have given a copy. This ditch is about 600 yards long, and at the time of my visit was giving off large quantities of noxious gases. In Cherry-street, in the same neighbourhood, there are 90 houses with only one pump, and neither drain nor cesspool. There is another place here called Hudson's-buildings. The owner is a well sinker, and his premises being entirely destitute of drainage, and in a most filthy state, he was, at the time of my inspection, sinking five cesspools, at a cost of 3*s.* 6*d.* per foot, or about 125*l.*, for 27 houses.

City-road, the surface channels are very foul, and there is no under drain. The nearest drain is in Bracondale Hill, and it is said to be half stopped up with solid refuse, and empties out on the surface of the road again below.

There are many large houses in Bracondale from 20*l.* to 100*l.* rental, without any drainage.

At the gullies, in such of the streets as have drains, there are large receptacles for solid refuse, called cockeys, these are emptied occasionally, but are generally very offensive.

St. John's Sepulchre parish, Ber-street is wide, and one of the oldest streets in the city, but has no underdrain. At the time of my inspection the blood was just being washed from Mr. Richard Fussey's slaughter-house, and was flowing for about 40 yards along the rough surface channel of the street.

Wellington-square contains a large number of cottages, which have a comfortable appearance in front from the fact that the houses are so set back as to give each house a small garden in front, with a road up the centre of the whole. The consequence of this is, that the back premises of the houses are not more than three or four feet wide, and those I inspected hemmed in with high buildings. I examined the privy cesspools, and found them very offensive. There is no drainage whatever, and, as the ground is inclined, the houses on the lower side of the square suffer.

Edward Gosling is the tenant of one, and his wife said :—

"We have lived seven years in this house. We owe some rent and dare not complain. My husband was ill 12 months of rheumatic fever. The back premises are very much confined, and when I come down in a morning the house is almost fit to suffocate me. My health is very bad. I have nowhere to put a drop of waste water, but make a hole in the front and pour it in. Water comes through the house when it rains, and then the smell is very faint and bad. We pay 1*s.* 9*d.* rent. We have no children. My husband is a tailor. We used to live in Crooks-place, and I had much better health than I have here."

In *Hopson's property*, in the same place, the privies all run into a drain that passes under one of the houses, and into a cesspool in front. The inhabitants complain of the water from the works. One tap supplies about 50 houses, and the extreme distance from it is 40 yards. In West Pottergate-street, in Heigham, I saw the first instance I have met with of public drainage by cesspools. The refuse flows out of the courts along the surface to cokey grates, and the liquid from thence passes into a cesspool within a few feet.

William-street is a new street, where much building is going on. There is no drainage. Cesspools are being constructed about 4 feet diameter and 6 feet deep. I examined some unfinished houses of about 10*l.* rental, with the privies, cesspool, and pump-well all within a space of nine feet. The drainage is superficial, and very bad in St. Giles's-hill, in St. Benedict's-lane, in Barn-road, and in Lower Heigham-street. The last, and also Tinkler's-lane and Sayer's-buildings, are mentioned in the communication by Mr. Rump. It would be almost impossible to exaggerate their bad sanitary condition.

St. Martin's-at-Oak-street contains many long, narrow courts filled with houses that drain along the surface into the adjacent river at the same places as the people take water from. In Castle-court there is a pump supplied by filtration from the river. The cesspool of about 16 houses is within five yards of it. There is no under-drain in the street, nor in the courts.

A foul ditch behind *Pockthorpe-street* was named by the medical officer of that hamlet as a cause of disease. I examined it, and found one of the most horrible places I have ever seen. It lies

parallel with the houses, perfectly stagnant, about 9 feet wide and 600 feet long, and receives the refuse from the houses and from the barracks.

St. Anne's-terrace and buildings are nearly new. They all drain to cesspools which empty below into an open ditch about 3 feet 6 inches wide, and of great length, without any outlet. The inhabitants complain that it is so unpleasant that they can scarcely come out of their doors. *Magpie-road*, St. Paul's parish, has a very foul ditch that receives the drainage from the street and houses, and also from the infirmary belonging to the Court of Guardians. It is very offensive, and Mr. Dalrymple, solicitor, one of the Sanitary Committee, said that the Committee had had much trouble, and could not find a remedy. It was beyond their jurisdiction.

In *Cowgate* there is no sewer, and the semifluid refuse is almost stagnant in the rough pebble side-channels of the street, for its whole length.

In *World's End-lane* there are no footpaths, and a surface channel down the centre to a cockey at the farther end. It is partly stopped, and there is a great accumulation of filth. The inhabitants complain bitterly, and say that there is filth there that has remained for years,—that it is enough to breed cholera, and they are flooded in their houses with it at times. They have no water, and many of the houses are without privies. The owners disagree as to any improvements, and the Paving Commissioners deny their liability to repair the road. I found a large open place enclosed with wooden palings, about 4 feet high and 8 or 9 feet diameter, into which the people are compelled to throw their nightsoil and refuse.

At the sitting in Court to receive the evidence on drainage, Mr. George Bean presented the state of Mariner's-lane, Thorn-lane, and Horn's-lane. In each of them there is an offensive sewer breaking out and running along the surface.

George Jay, Esq., complained of the same nuisances, and said that the refuse runs into the river from whence people draw water.

Mr. *W. Baxter* put in the following memorial on the same subject. It had been addressed to the Sanitary Committee, but had not resulted in the removal of the nuisance :—

"To the Gentlemen of the Sanitary Committee of the City of Norwich.

"We, the undersigned, being owners and occupiers of house and land property in Horn's-lane, Thorn-lane, and its immediate neighbourhood.

"Sheweth,

"That in consequence of certain offal-houses, tripe-shops, &c., the filth arising from which is excessive, a great nuisance is allowed, whereby the health of those residing in the above-mentioned places is

liable to suffer exceedingly from the stench which arises from the drains carrying off the blood and offal from the said houses and shops. They therefore humbly pray—

> "That your Committee will be pleased to take the matter into your most careful consideration, and give such directions as may in your discretion be deemed expedient for the removal of the nuisance above complained of.
>
> "And your memorialists will ever pray, &c."

Signed by 30 respectable inhabitants of the three parishes.

Daniel Sharpe, Esq., solicitor, made a statement to the following effect:—

"I reside on Lakenham-terrace, in almost the most elevated position in Norwich, but the ground is so flat that the water accumulates after every shower; and after heavy rain people are prevented from reaching the houses on one road. This is a case of the want of drainage where it might be obtained with the utmost facility, and at a small expense, as the road is within 150 yards of a very steep declivity towards the river. We are just without the walls, and the drainage should be carried into the city, and perhaps 200 or 300 yards to the river. That I believe there is no power to do, although there is a sewer constructed in Ber-street, near St. John Sepulchre's church, that would carry it down Mariner's-lane, and the mouth of that drain is open at the top of the lane."

Mr. *William Sussams* said:—

"I reside in the parish of St. Benedict, in Heigham-street. We are often flooded with water. The cockey near to my place is quite a nuisance. The refuse comes into my house when there is rain."

James Smith Rump, Esq., examined, says:—

"I am a tanner in Heigham-street, and have been an occupier there more than 20 years. I have known the street frequently flooded, as much as three times in a summer, and have had frequent complaints from my tenants solely arising from the defects in the drainage and sewerage. The street is in two parishes, and the liability to repair was under litigation. The late Recorder ordered an indictment to be preferred against the inhabitants of the two parishes. There is do dispute now; the parishes have agreed to run a barrel arch from Mr. Blake's corner at the end of the street, where there is an offensive ditch receiving the refuse from sewers and other buildings. The street falls two ways towards the ditch from whence the Company takes the supply of water. On the Heigham side of the street there are 12 yards having 70 houses, besides three tan-yards, and only one pump, and no taps. The drainage is along the surface. The refuse from the yards must come into the street. On the St. Benedict's side there are seven yards and 80 tenements, with three pumps, and surface drainage to the street. No water from the works. The drainage from a considerable area, amounting to one-ninth of the city, has to fall eventually into the drain at Heigham-street, which would have 11 feet fall if below the New Mills, and only 2½ feet fall if allowed to go in at the head of the mill, and which is close by the trunk from whence the water-works are

supplied. I wish to draw your attention to the necessity of some material alteration in the drainage. We want the powers that the Public Health Act would give to enable the drainage of Heigham to be effected. It was found that the Sanitary Committee had not powers to carry it out. On the part of the parish we therefore apply to have the Public Health Act applied."

Mr. *George Blake,* brickmaker, of Heigham, says:—

"I represent my father at his request; he is an owner and occupier of property in Heigham-street. From the drainage of the street being permitted to enter the river adjacent to his property the water in the river has become so filthy that all vegetable and animal life has ceased. *That is just above where the water-works draw the water to supply the city.* The well on his premises has become perfectly useless, and the water disgustingly offensive; and after 40 years' struggling to remove these nuisances, he has found it impossible to succeed, owing sometimes to the prejudices, and at other times to the apparent inability of the Paving Commissioners to grant the making a drain through their jurisdiction from the hamlet of Heigham. It is my conviction that unless we are placed under the operation of the Public Health Act, we, the hamlets, will never have the slightest chance of removing our nuisances. And as an owner of property in the hamlet of Lakenham, even with the assistance of all our local bodies, as much as the law would permit them to give, I could not succeed in removing the greatest nuisance existing in the vicinity of the city only at a loss of nearly 50*l.* out of my own pocket.

"I therefore conclude that we have no better chance in Lakenham than in Heigham of getting rid of the nuisances except by being placed under the Public Health Act.

"I think we spent in Heigham five times as much in litigation as would have removed the nuisance; and in Lakenham, besides the 50*l.* loss to me, it has cost different private individuals, in attempts to remove it, I believe a sum of not less than 600*l.*

"The effluvium from the ditch or river above the New Mills, and communicating with the suction-pipe of the Water Company, is so bad, that a few evenings since we could not admit air into my father's house, although there is sickness in it at the present time."

Mr. *George Bean* gave some evidence upon the subject matters of the memorial respecting Mariner's-lane, showing very forcibly the necessity of more adequate powers for drainage. He says:—

"I live in Mariner's-lane. There is a local drain brought from other parts of the city and discharged on the surface at the top of the lane. There are slaughter-houses, and the blood is very offensive. The refuse lodges in the holes made by the channel, and sometimes the stench is horrible. In July last I was very unwell, and was ordered by Dr. Hull to remove from the neighbourhood. I did so for a time. I made application to the Sanitary Committee in September last, and they referred me to the Tonnage Committee of the Corporation. That Committee ordered the City Surveyor to examine it, and report, which he did, but nothing was done. I then went before the magistrates and asked them for an order under the Highway Act, but I did not get one, and, therefore, went before the Sanitary Committee again, and received a promise

that it should be brought before the Paving Commissioners. I failed, however, in obtaining any redress from them.

"In consequence of the unpleasantness and inconvenience to which I had been put, and the suffering I had experienced, I have exerted myself in procuring signatures to the petition to the General Board of Health for this inquiry. I am afraid, however, that unless there is a sufficient controlling power above we shall never have it efficiently carried out."

Mr. *William Delph* said, in evidence:—

"The sewerage in Sussex-street wants looking to. There is an underground sewer in the street for the whole length, but it is choked up. *It fell in about* 10 *years since, and has never been opened.* Sussex-street is in the city, but it is not repaired by the Paving Commissioners. The foul water that ought to go away in a drain flows into the wells and pollutes six or seven of them, so that the water cannot be used for a month or six weeks after heavy rain. The people have to go into St. Augustine's-street for water, a distance of 50 to 100 yards. The houses in Sussex-street are above the average as to respectability."

Mr. John Athow, the Surveyor to the Paving Commissioners, is unable from age to perform his duties, and Mr. Canuel Darkins, who is a gentleman of considerable practical experience in constructive works, at present acts for him. I received some important evidence from him as to the several departments of public service under the jurisdiction of the commissioners, and on other matters with which his experience had made him conversant. With respect to the drainage of the city, your Honourable Board will bear in mind that the Commissioners have no control over the hamlets that form a considerable part of Norwich. Mr. *Darkins* says:—

"I have resided in Norwich near 33 years, and am an alderman of the city. I produce a skeleton map of Norwich, laid down at one chain to an inch, showing, in different tints, the paved and the macadamized roads, and the gas pipes and public drains, nearly as they exist now. It shows the positions and directions of the drains. It does not show the depths from the surface, or the dimensions of the drains. I believe that, with one exception, it shows accurately the junctions of the drains with each other. It does not show the cockeys and grates. *We have no record in the office of the Commissioners showing the depths, sizes, &c., of the drains.* I know them all. I am not aware that any one else does, unless Mr. Athow does. In some places it shows the diameters of the gas pipes. The plan was made in 1833. *It has not been corrected, to the best of my knowledge, nor altered since that time. The drains are not now in the same state as they were in then. They have been very much improved.* Existing drains have been enlarged from 18 inches to 3 feet 6 inches, and laid deeper. That has been done under my management. I never made any calculation at all to ascertain the size of drain required. I only took care to make the new one large enough and deep enough. I took no means of avoiding the making of them too large. The contract for the last one made was for 18 inch barrel drain, single ring, in lime and sand, is 5*s.* per yard run complete. The 3 feet 6 inches and 3 feet drains cost about 1*l.* per yard,

9-inch work. The length was 374 yards of 3 feet, and 88 yards of 3 feet 6 inches. I think it would drain about a mile in length of road. I cannot say how many miles of road there are in the city of Norwich. I cannot say how many miles of road there are under the jurisdiction of the Paving Commissioners. I think the new sewer I have named would serve for 2,000 inhabitants, or about 400 houses. *The crown of the arch is* 18 *inches from the surface of the pavement, but in some places it is* 3 *feet* 6 *inches.* Then the depth from the surface to the water-way would be from 5 feet 9 inches to 7 feet 9 inches. There were floods before when the 18-inch barrel drain was put in. This drain cost four times as much as the barrel drain. There are no floods now. I have examined the condition of that sewer after heavy rain and have found it perfectly clean. *I had once occasion to have it opened in the lower part during heavy rain, and found that the water was then about 2 feet deep, I put my rule into it. That was during a very heavy rain.* It did not occur to me that the drain must be twice too large. I think that the total length was about 600 yards. A drain of half the capacity would have cost about two-thirds of the money. Some of the cockeys are trapped with a stone box, and slab in it. Some have got Bunnett's patent trap. I think there are about 20 such traps, and perhaps from 400 to 500 cockeys and grates in the city. *I cannot tell the length of the public sewers.* The 3 feet 6 inch drain was put down in the latter part of 1848. We have laid down from 300 to 400 yards of 3 feet. That was also in substitution of an 18-inch barrel drain. I have acted for Mr. Athow about a year, but have assisted him two and a-half years. My former experience as a builder has given me experience and knowledge as to the drains. I am, therefore, not responsible for the forms and positions of the existing drains. *Most of the junctions are at right angles. I consider right angles very objectionable.* I believe that the whole of the public drains empty into the river within the city. I should say they pollute the stream. My impression is that the drains in the upper part of the city are efficient. In the lower part they are sluggish. A very large proportion of the total length of the highways is underdrained. I should say that the drainage of Norwich is inadequate. *I do not think that the sewers lay low enough for the ground floors of the houses to be drained into them. Few houses have underground drains.*"

I received a note the following day from Mr. Darkins in which he says:—

"I forgot to give you last evening an improvement in the sewerage of London-street, from the corner of Castle-street, by the Mercury Office, to the top of Wild Man Hill, a distance of 113 yards. The Commissioners have taken up an 18-inch barrel drain which laid very near the surface of the street, and have put down a cone drain 3 feet by 2 feet, and 8 feet below the surface,—quite low enough to drain the basement floor of the new building now being erected in London-street.

"In many instances both the water and gas mains pass quite through the common sewers.

"I am, Sir, yours obediently,

"Canuel Darkins,

"23*rd May*, 1850."

"*W. Lee, Esq.*"

ANALYSIS AND REMARKS.—From this and the preceding evidence, and from the written statements, and the minutes of my inspection, there can be no doubt that the existing public sewers are very inadequate as to extent, and exceedingly defective in construction. There is no drainage of houses or other buildings, and in fact there is no systematic drainage of the city, much less of the hamlets. In many places, where drains are imperatively needed, none exist, and in other localities the inhabitants would be much better without sewers than such as they have. I shall not be understood as imputing blame to the Commissioners, or to Mr. Darkins in these remarks. Their powers are utterly insufficient for the drainage of Norwich, even within their limits, and Mr. Darkins has been too short a time connected with them to be responsible for the malconstruction of the existing sewers. According to his evidence, the plan, in its present state, could only mislead any one but himself, or Mr. Athow; and I recommended him strongly to prepare some record of the depths, sizes, &c., of the drains, and of the alterations made since 1833, when the plan was prepared. It will be evident from the depth of the new sewer mentioned, that it would not drain cellars efficiently, and it would consequently be useless as a sanitary drain. Although I inquired as to the method of determining the capacity of the new sewer, I did not expect the requisite engineering knowledge for adjusting the size and inclination to the rainfall, and domestic water supply of the area to be drained, with a proportionate increase in the lower portion, as that area became larger. I was not, therefore, surprised to learn that, in a *very heavy rain*, the flow in a sewer 3 feet 6 inches diameter was only 2 feet deep, which, from the law of the increase of velocity with the depth of the flow, proves the sewer to be more than twice the capacity necessary. The Corporation and Commissioners of Norwich will see, however, from this, the great comparative economy of properly constructed works, for if "a drain of half the capacity would have cost about two thirds of the money," the saving upon this sewer would have been 200*l.*, according to the evidence, with greater efficiency of action. The fact of most of the junctions being at right angles is, in itself, quite sufficient to cause large deposits of solid feculent matter, and it is well for the health of the inhabitants that, with such sewers, "few houses have underground drains."

SUBURBAN LAND DRAINAGE, AND NATURE OF TILLAGE, AS AFFECTING THE SANITARY CONDITION OF THE CITY.—On this important subject, as affecting not only the fertility of the land in the county of the city, but also the aqueous condition of the atmosphere, and the proper discharge of flood waters, I obtained some valuable evidence from *William Salter Millard*, Esq., who says:—

"I am a land surveyor, and late steward to the Corporation estates. I am steward to the estates of the Charity Trustees, which were under the Corporation.

"We have no artificial drainage in this neighbourhood. I am not aware of any arrangements for general drainage within five or six miles of the city. There is a considerable extent of land above and below the city that would be considerably improved by drainage, more particularly in the valley above the city. Frequently the whole width and length of the valley for miles, up as far as Fakenham, is filled with water.

"There is a regular succession of old established mills for 20 miles above the city. All the fall is taken up. The meadows are productive, but the herbage is of a coarse kind. These meadows are principally confined to the grazing of cattle. There is very little manuring or tillage, except that of the cattle. They can hardly generally be said to be cultivated at all. They are capable of great improvement. The first thing must be to drain them. Then manures could be applied. There are large exhalations and mists from them, and we hail it as an omen of a fine day to come. This valley would not exceed half a mile in width on the average. Within two miles of Norwich it would now be worth 50*l* an acre. Immediately below Norwich, 100*l*., or 120*l*. At 12 miles above Norwich some of it would be worth 30*l*. to 40*l*. per acre. Some of it is fen land, but not a large proportion. That would only be worth 15*l*. to 20*l*.. according to the quality.

"The greater part of the arable land round Norwich requires no drainage at all. I know of nothing in contemplation for the better drainage of these meadow lands. The valley is so narrow, and the mills so frequent that I think it would be a difficult thing to drain them properly and economically. The Norfolk farmers are not so careful generally of their meadow land as they are of their arable land. For five or six miles below the city, the valley would be little more than half a mile wide.

"There is a great deal of manure used. Farm yard manure is the most common, and those who live near the city cart manure from thence. In addition to that there is a good deal of artificial manure used, of various kinds. I do not know the reason why artificial manures are extensively used, except that, I suppose, they do not get enough of the other. If the city manure were not very much adulterated I think the farmers would prefer it to artificial manure. That applies only to the farmers immediately around Norwich, because, at a great distance the carting would be an obstacle. This adulteration is made by the persons who act as scavengers, and partially by the poor people who use the bins. They are generally poor persons who collect the manures of the city. They are called muck-men, and are a low-class of persons who want to make as much money as they can. There is a great demand for the town manure, but the demand would be greater if it were not for the adulteration. At a distance from the city the more portable form of artificial manure gives it a great advantage in the saving of labour and cartage. If the town manure could be kept from adulteration, and either brought into a portable form, or conveyed to the land without cost of cartage, it would be able to compete with artificial manures. I collect the drainage of my farm yard, and use it as liquid manure. A certain dilution is necessary, and I carry it to the land in a water-cart; but I should not like to have it so diluted as that I should be paying for water instead of manure. Manure must be liquified before it can be

assimilated by plants; but I would rather trust to the rain from the heavens than pump water upon it. If I could preserve manure in a solid form I would not put water in it."

Analysis and Remarks.—From the evidence it seems, that the whole of the meadows are frequently under water, and that these floods are caused by the whole of the fall for many miles being taken up for mill purposes. At the time of my visit, in May, there were hundreds of acres of these meadows so saturated that it was impossible to walk upon them dryshod. At that time some of them would not bear horned cattle, and sheep would soon have rotted. Mr. Millard says, that the meadows can scarcely be said to be cultivated. The inference from his evidence is, that the meadow land above the city would be doubled in value by drainage, and I fully concur in the opinion. The fogs arising from these meadows cannot but be injurious to health.

The statement as to the adulteration of the town manures, in consequence of the poverty and cupidity of those who collect it, is one deserving very serious consideration. This adulteration, by lessening the demand, prevents its immediate and continued removal from the town and the vicinity of dwellings, and gives time for the liberation of those noxious gases which taint the air, and injure the health of the inhabitants. Such adulteration also depreciates the value of the town manure by diluting, and dissipating its fertilising properties, so that it cannot compete with artificial manures, and at the same time keeps down the value of the suburban land, comparatively, by depriving it of the nourishment necessary to its fertility.

State of the Rivers.—It will be unnecessary for me to speak of the Yare above its junction with the Wensum, because, with the exception of Trowse Millgate and a small part of Lakenham, it nowhere approaches the city. Of the suburban part of the Wensum something will have been already gathered from the evidence of Mr. Millard, which shows that the damming up of the stream for mill purposes renders the drainage of the meadows above the city difficult to effect, and that fogs are a consequence of the want of drainage. There is no mill-dam across the stream below the New Mills, which are the property of the Corporation of Norwich, but are leased for a term of which upwards of forty years remain unexpired. These mills are situated on the north-west side of the city, above all the city bridges, and upwards of two miles above the confluence of the Wensum and the Yare. The volume of water is very considerable, and the head and fall 5 feet 6 inches. The tide nearly reaches the city. Beyond the New Mills there is no other impediment to Hellesdon mills, about two miles along the river course, and at the boundary of the county of the city.

Above the city the stream is beautifully clear; but as soon as it comes into the vicinity of human dwellings it becomes a sewer, and a cesspool,—a receptacle for dye-water, nightsoil, filth, garb-

age; and every conceivable abomination. In this condition it passes, by a circuitous course, through the city for about two miles, with houses on both sides, immediately contiguous (with the exception of factories and works, and occasionally open spaces), and in that condition the fluid is used by multitudes of the citizens in lieu of water, and as I shall hereinafter show, actually taken as food.

To save verbal description the annexed plan will exhibit at one view the manner in which this beautiful river is polluted; and *Appendix* D contains a list of these sources of contamination.

Present Water-Supply.—I now approach a part of the subject that has excited great interest in Norwich, and has given rise to very conflicting opinions and evidence. Happily it will be unnecessary, for reasons that will be apparent hereinafter, that I should lay before your honourable Board the whole of the evidence and documents produced upon my inquiry, otherwise this report would be extended to at least twice its present size. Wishing on the one hand to omit nothing material to the consideration of so important a question as the water-supply of a populous city, and on the other hand to avoid prolixity, I think it best to confine myself in this part of the report, strictly to the present supply, and to consider the proposed extension of the existing works, and the works of the new company, under the head of "Remedial Measures."

Much has been already said while treating of "Disease and Mortality," "State of the Rivers," and "Drainage of the City and Suburbs," as to the scarcity of taps, and pumps, and the great number of families who draw their supply from the polluted stream of the river Wensum. It will not, therefore, be necessary to extract largely from the notes made during my inspection. I may premise that there are public water works in Norwich, but that they are confessedly inadequate to the wants of the city. There are also 10 public pumps: and, although I do not here allege anything as to the quality of the water from them, it is a singular fact that five of them are situated adjoining to churchyards crowded with corpses. Only one of these public pumps is on the north side of the river, including 10 parishes and a hamlet, and that is placed against the fence of St. Augustine's churchyard, The private pumps in Norwich are of peculiar construction, being formed out of trunks, without casing, and standing from 6 feet to 8 feet or upwards above the ground. They are exceedingly heavy to work, and it is common for two persons to unite in pumping, especially women. The drawing of water from these pumps is too laborious an occupation for women. I did not meet with a cottage having a tap within-doors supplied by the company, and generally, where cottages are supplied, one tap is common to from 10 to 50 families.

In *St. Augustine's-street*, Mr. William Weeks complained of

the supply of water from the works. The pressure is insufficient; I examined the distributory apparatus, and found that he has two taps upon the same service-pipe; one is 3 feet above the ground, and the other only about a foot. Often, the water will not run out of the upper tap, and yet, as I was informed, it is only 8 feet above the level of the water-works, at the New Mills.

Sussex-street contains many respectable houses, but they have no water from the Company, and the reason is stated to be, that the ground there is 18 feet above the level of the ground at the works.

The *Rose Inn-yard,* near St Augustine's, contains altogether about 70 houses; 50 of which, and the Rose Inn, have no water but the churchyard pump. For the other houses, there are three pumps, and one that is dry. Mr. Fronow, chemist, and Guardian for the parish, lives in front of the street, and informed me that the pumps are frequently locked up in summer when water is scarce, and that it is a general practice in Norwich, when a pump becomes out of repair, so that it cannot be used, for the owners of other pumps to lock theirs, so as to prevent the water being abstracted. He says there is sad battling for water at times, in the yard. One consequence, of having to fetch and carry all water is, that the poor people are compelled to use the same pail for all purposes, clean and foul. The drainage and pavement is bad, some of the houses in the lower part of the yard are very dilapidated, and at the bottom is a large pool of nightsoil 15 by 25 feet, &c, from about 40 houses. There are privies, a stable, and animals under dwellings, and the people complain much of stench. There has been fever in the yard, and Mr. Garthon said it was a bad locality of cholera in 1833.

Crooks-place is, like the Pea-field, a modern suburb of cottages. There is a large population here without any pavement or drainage, because it is beyond the city walls. There are some pumps of the kind already described, and the water is occasionally so bad that the people will not use it for tea. Some wells have been turned into cesspools, on account of the expense of repairing the pumps. Several streets are included under the name of Crooks-place, and in one of them, is a very bad surface channel behind a row of 9 or 10 houses. The Water Company offered to lay a main in this street, but I was informed that the landlords will not pay the expense of service-pipes and taps. There were 13 deaths from typhus fever here in the early part of 1849.

In *Pea-field,* there are eight pumps and two draw wells for about 500 houses and 2,000 inhabitants. These pumps require two females to work them. The wells are said to be about 120 feet deep, and cost, complete with pump, 90*l.* each. I was here again, on the opposite side of the city, informed of the practice, that when a pump is out of repair, the other pumps are locked up.

South of St. Etheldred's Church there are no pipes from the water-works.

Mr. *William Delph* said, in his examination :—

"There is no water-pipe in Sussex-street. There are 60 or 70 wells in St. Augustine's parish, but I should not think there are 60 or 70 houses in the whole parish with taps in them. The well water is considerably harder than the pipe water. I call the pipe water soft water. There are two public pumps in the parish, but one is confined to watering the streets, and the church pump is the only public supply by pump. I think there are only two pumps out of order now. I repair a good many of them myself. One in Barne's-yard, and the other in the Skittles-yard. Not any of them are kept locked. I never saw one locked."

Granville Sharpe, Esq., called my attention to the want of pressure in the water mains, and said :—

"There is no watering of the roads outside the city. The watering in the city is very imperfectly done. The water is pumped into the carts from tanks, and then carried, in some cases nearly half a mile, over water mains the whole distance. The water is not always on, and there are tanks for street watering, filled when the water comes on. I know of some four or five, but cannot tell their size. Some of them have been made by the Paving Commissioners. The water is pumped by hand labour; the horse remaining idle. I can have no doubt that the watering of the roads is unnecessarily expensive, and it is to be attributed to the *low pressure* and *the intermittent supply*, and also to the fact, that the interests of the Commissioners, and the water company are not identical."

Mr. *George Blake* said :—

"I have known water sold in Lakenham at a halfpenny per pail during drought, owing to the pumps being inadequately supplied."

Mr. *Robert Kitton*, architect, was so kind as to accompany me during the whole of the inspection, and also to report to me on the constructive character of the houses. In that report he says :—

"In conclusion it may be stated that, within the walls there is a supply of water to all the houses."

These terms seemed to convey so much more than could be intended, that I asked him a few questions as to their meaning, when he gave the following evidence :—

"It is not generally the case, that the more recent cottages have been set back, so as to confine the air. The houses within the walls are supplied with water from the pumps, the water mains and the river. If the cottages comprise 10,000 houses, there would not be more than 50 pumps in their sculleries, and a less number than that in their houses. The pump water is harder than the river. *There might possibly be found* 40 *or* 50 *taps in cottages.* I do not consider the water in the river generally fit for food. Above St. Martin's-at-Oak, it might be used for food. That is above the New Mills; and also at the other extremity of the city. That is after the river has received all the drainage of the city, except what is retained in cesspools. I should not object to use the river water for food, 200 or 300 yards

below the Carrow Bridge. Below that point there are very few inhabitants to use it. Above the new mills there would be perhaps 2,000 inhabitants. *Of all the inhabitants of the city using river water, there would only be about* 2,000 *that could obtain it in such a condition, that I should think it fit for food.* All who use it have to fetch and carry it. Almost universally the cottagers in Norwich would have to fetch and carry their water, whether it was from pump, tap, or river. *I consider that a supply as far as a person pays for it.* He pays for the river water in the labour of getting it, the same of the pump water and of the tap water. Probably the inhabitants would be better supplied if there was a tap in each cottage. In many cases they would not be better supplied, if they had taps in the houses."

Mr. *Darkins*, who has been extensively engaged in building operations, is acquainted with the cost of the various apparatus used in obtaining and storing water. He gave me some evidence on the subject, from which it will appear how much the present modes of supply cost the inhabitants.

"A well, of 100 feet, which is our high depth, and a wood pump complete, would cost about 22*l.* There would be no trough to that, nor any underdrain to carry off the waste. Larch trees and low gutter trees are used for pumps. I should think the pump would last on the average seven or eight years. It would then cost in repairs approaching to 5*l.* The repairs at a moderate estimate, would be 25*s.* per annum. Some of the more opulent people have soft water cisterns. They are sunk below the ground. A 20-inch brick barrel one, would cost if well constructed, with pump, about 20*l.* Without pump, and single ring, the cost would be 8*l.* to 10*l.*; but not one in 20 of these, would stand. They would be used for about a 15*l.* house. I am not aware of any such accommodations for the poor people. The cisterns would cost about 2*s.* per annum cleaning. Some of them do not get cleansed every year. Where they are not so cleansed, the difference will be found in the worse quality of the water. The poor who have not cisterns, &c., suffer a deprivation equivalent to the cost of such conveniences. The poor people have little tubs, but I should think, where you would see one with a tub, you would find 10 without. They run with a pail or a pitcher, and put it under a spout-pipe. I have often wondered how the poor people do for water. The tubs cost various sums, from 6*d.* to 3*s.* 6*d.* These are generally what the poorer class of cottages have. Some of them last only a very short time before they fall in pieces. Many houses, say from 15*l.* to 25*l.* annual value, would have large casks, with proper covers raised up, with brass tap, at a cost of 1*l.* 5*s.* to 1*l.* 10*s.* They would cost for painting and repairs, 3*s.* 6*d.* to 4*s.* per annum, and with care would last 10 years. Great numbers of the inhabitants have wooden pails of four gallons, which would cost 2*s.*, and would last perhaps three years. I should say, that the average distance to fetch water would not be less than 20 yards. *I do not think one woman could pump the water for a family; at only two journeys per day, it could not be fetched and carried for less than one penny per week, considering only the value of the time occupied.* I am the owner of 30 or 40 houses; not many of them are cottages."

With the information thus acquired, I have been able to draw out an approximate statement of the cost of water to each of three classes of houses. It would be obviously impossible to include all the circumstances entering into the present modes of supply. Houses rated at 70*l.* per annum and upwards, of which there are 268 in Norwich, would be charged for water from the Company alone, more than the maximum stated below. It would rarely be found that so few houses as four were possessed of a common well and pump, and therefore I might fairly have included in the first and second class a charge for water from the Company, and the cost of fetching and carrying water for all. I have, however, only stated the cost in time of the fetching and carrying, at one penny per house per week for the poor, as proved by Mr. Darkins, and have omitted the additional facts proved by Mr. Crosse, one of the medical witnesses, that the expenditure of physical energy and shoe-leather for such purpose would be equal to twopence per week. I believe his statement to be perfectly true, but would rather estimate the expense under than over the actual amount.

The first class then is for those houses that have a well and pump for hard water, and a cistern and pump for soft water, but are not supposed to carry, or purchase from the Company.

First Class. Cost of Water.

	£.	*s.*	*d.*
Annual interest on first cost of well and pump .	1	2	0
Annual repairs and dilapidation of pump, &c. .	0	10	0
Annual interest on first cost of cistern and pump .	1	0	0
Annual cleansing of cistern	0	2	0
	£2	14	0

Equal to 12½*d.* per house per week.

The second class are supposed to be superior to cottages, and to have a well and pump for four houses, with a cheap soft water cistern. No charge for water from the Company, and only a halfpenny per house per week for fetching and carrying.

Second Class. Cost of Water.

	£.	*s.*	*d.*
One-fourth annual interest on first cost of well and pump	0	5	6
Annual interest on cistern without pump . .	0	10	0
Cleansing of cistern	0	2	0
Annual interest, repairs, and dilapidation of pails .	0	0	9½
Fetching and carrying one bucket of water per day, at only 0½*d.* per week, or annually . .	0	2	2
	£1	0	5½

Equal to more than 4½*d.* per house per week.

The third class includes the cottages, who, in this case, are supposed to be partly supplied by the Company from a tap common to many houses, the water having to be carried, and partly by a small tub. Those not supplied by the Company would have to get water for food anywhere, and the cost of carrying would be much greater.

THIRD CLASS. COST OF WATER.

	s.	*d.*
Annual rent of tap	4	0
Water-tub and dilapidation	2	6
Interest, repairs, and dilapidation of pails . .	0	9¼
Fetching and carrying water, at one penny per house per week, or annually	4	4
	11	7¼

Equal to about 2¾*d.* per house per week.

In concluding this part of the subject, I find that the small tenements compounded for, and those rated at 5*l.* and under, are 11,531 in number. Above 5*l.*, and not exceeding 30*l.* annual rateable value, the number of houses is 3,990. And above 30*l.* annual rateable value, the number of houses is 862. The following may be therefore taken as the cost of the present inadequate supply of water in Norwich and its hamlets *for house purposes alone.* The more distant parts of the county of the city are not better supplied, and therefore are included.

ANNUAL COST OF WATER FOR HOUSES.

	£.	*s.*	*d.*
11,531 at 2¾*d.* per house per week . .	6,390	1	11
3,990 at 4½*d.* per house per week . .	3,845	5	0
862 at 12½*d.* per house per week . .	2,327	8	0
	£12,562	14	11

I am perfectly aware that exceptions might be taken to this estimate; it is not put forward as strictly correct; but that it is a fair and unexaggerated approximation cannot, I think, be denied.

I obtained evidence as to the quality of the waters used in Norwich from Donald Dalrymple, Esq., surgeon, who said:—

"I am a surgeon practising in the city of Norwich. The document now put into my hands is a copy of my deposition before the Committee of the House of Commons on the City of Norwich Water-works Bill. I confirm that evidence now. I have also additional analyses of water from wells outside the city, showing a considerably less quantity of solid matter than any of the wells in the city. A gallon of water was evaporated in each sample. Upon the subject of the quality of the water generally in Norwich, I have nothing to add to my deposition; but as

to the water in the Norwich Hospital, we have had recently repeated complaints of the supply to the water-closets and the baths. We were last week unable to supply the number of baths required by the patients for want of water. I found three water-closets without a single drop of water in the taps; and I wish to add my firm conviction that we can do nothing for the great demand at the Hospital unless we have a constant supply at high pressure, independent of cisterns. For the same reason we have not the slightest provision in case of a fire in that large building."

For greater economy of space I have formed Mr. Dalrymple's first set of analyses into a Table, and the following is his evidence thereon :—

"In reporting upon the waters entrusted to me for analysis, I deem it requisite to lay down an average standard of what may be deemed wholesome and useful water, fitted at once for drinking, cooking, and domestic purposes.

"It often happens that the water which suits one purpose will not suit the other; the pleasantest water for drinking makes the worst tea, and the water that washes best is the least pleasant to drink.

"It has been laid down by high authorities, that the water that would be decidedly wholesome, the best for dietetic, as well as other purposes, should be free from *colour*, *smell*, and *taste*. That it should contain not less than 12, nor more than 40 grains of salts to the imperial gallon. That the organic matter should not be in greater proportion than from *one to three grains* per imperial gallon. That the saline matter should consist chiefly of common salt, carbonate of lime, and sulphate of lime.

"It will now be seen from the annexed analyses how far these waters fulfil the required indications; waters, it must be remembered, which form, with one only exception, the entire supply, or nearly so, of the poor districts whence the water is taken.

"Except Nos. 4 and 11 these samples are objectionable in taste, colour, or smell.

"The lowest quantity of solid matter per gallon is 44 grains, and the highest 172, giving an average of 96·063 grains. The organic matter averages 3·068 grains, being above Mr. Wicksteed's highest point, though this is in spring, not in river water.

"In addition to the three salts named above, there are in some samples magnesia, alumina, and silica.

"The remarkable feature, however, in all these waters is the great excess of common salt; the smallest quantity being 22 grains, the highest 104 grains, the average 54·063 grains.

"From the analysis of water taken three miles from Norwich, in a similar stratum of soil, the quantity of all salts in a gallon of water was respectively only 30, 34, and 36 grains.

"I have no doubt, from the great excess of this common salt, that it is derived from animal exuviæ, fæces, urine, &c., making their way dissolved into the wells from privies and drains.

"The great quantity of sulphate of lime proves the water bad for dietetic, culinary, and domestic purposes. It washes badly, wasting soap, makes bad tea and bad grog."

TABLE showing ANALYSIS, by DONALD DALRYMPLE, Esq., Surgeon, of WATERS now used in NORWICH, May 1850.

Number of Sample.	Designation.	Qualities.				Chemical Indications.					Solid Matter, in grains, from one Gallon of Water Evaporated to Dryness.									Total.
		Colour.	Taste.	Smell.	Curdles Soap.	Reaction.	Alkali (fixed).	Alkali (volatile).	Iron.	Lead or Iodine.	Common Salt.	Sulphate Lime.	Carbonate Lime.	Magnesia.	Silicious Sand.	Alumina.	Organic Matter.	Waste.	Unknown.	
No. 1 A	Chapel-street, Crooks-place.	Steely	Flat, inclining to brackish	None	Freely	Neutral	None	None	None	None	41·070	16·080	17·060	1·	1·060	..	2·010	..	..	80·080
No. 2 A	Cock-yard, St. Paul's .	Cloudy	Flat and nasty.	None	Readily	Neutral	None	None	None	None	49·	12·	13·	..	..	..	4·	..	..	78·
No. 3 A	Barleycorn-yard* . .	Cloudy blue.	Mawkish	None	In great quantity.	Neutral	None	None	None	None	61·020	24·	16·	4·	2·	20·050	4·	3·	8·	124·070
No. 4 A	Fisher's-lane	Fairly bright, but bluish.	Pleasant	None	Slightly	Neutral	None	None	None	None	22·	14·	3·020	..	2·	..	2·080	..	..	44·
No. 5	Sayer's-buildings, Lower Heigham-street.	Yellowish	Brackish	None	Less than some other samples.	Neutral	None	None	None	None	84·	6·	10·	..	4·	..	None	..	..	104·
No. 5 a	Marquis of Granby† .	Dull, thick, and dirty.	Nauseous	Nasty	Rapidly	Slightly alkaline.	None	A trace.	None	None	48·	15·020	44·080	..	20·	8·	8·	..	..	144·
No. 6 a	Butcher's-yard . . .	Greyish	Mawkish	None in particular.	Rapidly	Neutral	None	None	None	None	104·090	32·090	20·030	20·060	3·050	..	7·040	·040	..	172·
No. 7 a	Lawn's fields, Heigham	Slightly greenish.	Mawkish	Faint	..	Slightly alkaline.	None	A trace.	None	None	32·	8·	15·060	1·	..	2·020	3·020	..	..	62·
No. 8 a	Lown's-yard, St. James'	Bright	Tolerable, but flat.	None	Freely	Neutral	None	None	None	None	48·	6·	12·	..	..	..	2·	..	..	68·
No. 9 a	Badding's-lane . . .	Thick and dull.	Brackish	Unpleasant.	Rapidly	Neutral	None	None	..	None	57·	19·060	21·040	..	..	..	4·	..	.	102·
No. 11 a	Public pump, Hay-hill	Bright and Sparkling.	Pleasant and brisk.	None	Very Freely .	Neutral	None	None	None	None	53·020	12·080	14·080	·020	..	..	3·	..	..	84·

* The solid matter, when treated with diluted hydrochloric acid, gave a very offensive smell.

† This is the worst sample of water yet submitted.

It is unnecessary to give the analysis of suburban waters made by Mr. Dalrymple, because the much smaller quantity of saline matter contained in them is stated in his evidence.

Before leaving the quality of the water, I think it well to append other analyses that have been made, in order that I may not have to refer to this part of the subject again.

Appendix E. is a joint report of analysis of two waters marked A. and B. from Norwich, by Arthur Aitken, Esq., F.L.S., &c., and Alfred Swaine Taylor, Esq., M.D., F.R.S., Professors of Chemistry in Guy's Hospital. The designation of these waters is not given in the chemical report, and therefore I may say that A is water from the river Wensum, from the feeder at the New Mills, in fact the water supplied by the present water-works. The water called B is also water from the river Wensum at Heigham-common.

Appendix F. is analysis of another specimen of the same water at Heigham Common by Dr. Lyon Playfair. *Appendix* G. is an analysis of further sample of the same water by R. Phillips, Esq.

It is now my duty to describe as briefly as possible to your Honourable Board the nature of the existing water-works, the extent to which they supply the citizens, and the charges at which that supply is given.

The New Mills are the property of the Corporation of Norwich, and an Act of Parliament passed in 1790 authorized them to construct and enlarge works at the New Mills for better supplying the city and parts adjacent with water, and empowered them to let such works on lease. In pursuance of such powers, the works were leased in 1803, for a term of 99 years, to William White and Robert Crane, who covenanted to pay rates, not to assign without leave of lessors, to complete works, to supply the inhabitants with water, to apply one-third part of the water power for grinding wheat and making flour, to keep and leave the premises and works, mains, &c., in substantial repair, to put down, and keep in repair, proper fire-plugs, to remove mud from the mill-dam, to cut weeds, &c., above the mills, and below the mills to a certain point, and to keep the reservoir in Chapel Field constantly full. The lease fixes a scale of water-rates, and constitutes a committee of appeal in all matters of dispute between the lessees and the inhabitants.

Appendix H. contains the table of rates agreed upon and in force at the present time. Mr. *Edward James Dodd,* superintendent of the Water-works, said, however, in putting it in:—

"Considerably less rates are now charged than those in the Table. We make the best bargain we can. The rates are not equal for houses of the same size, nor proportionate for houses of different size."

I believe, however, that in these remarks he did not mean that any one was supplied with water by the Company at less than the minimum charge of 4*s.*

Before quoting the evidence of Mr. Dodd, I think it well to say that I examined the whole of the works, and the following are some of the minutes of my own observation, and the information given in answer to my questions.

The water is drawn from a creek or open water-course called Fuller's Hole, about a quarter of a mile above the New Mills, and taken by a pipe or trunk to the pumping-wells, from whence part of it is forced up a 10-inch stand-pipe, fixed in a circular tower in Chapel Field, to a height of 140 feet above the level of the river. There are two descending-pipes, one for supplying the elevated portions of the city, and the other a waste-pipe into the reservoir immediately contiguous at an altitude of 120 feet above the river. Other parts of the city are supplied direct from the works, and it is chiefly respecting such parts, of considerable extent, that the complaints are made of want of pressure. The plan hereinbefore given shows that there are numerous sources of pollution in the river above New Mills, and I examined them, as well as those below. The water is not filtered by the Company. I took the dimensions of the wheels and pumps, the fall of water, and other particulars, and have calculated their capabilities, but shall not need to give the details here, especially as much of it is contained in a statement put in by Mr. Wicksteed, the engineer employed by the Corporation to consider the best means of extending the works, which statement will be given in its proper place. The pumps used are capable of lifting to the high level 236 gallons per minute, and to the lower 174 gallons per minute, or together 551,520 gallons per 24 hours, without allowance for waste, equal to about 8½ gallons per individual of the population. The pumps are in duplicate, and there is, in addition to the water-wheel of 35 horse power, an auxiliary steam-engine of 16-horse power, only seldom used. The Chapel Field reservoir contains fish, and is not in a clean condition. At my visit bubbles of gas were rising from the mud in the bottom. The Company say that they do not supply more than *two-fifths of the houses*, even by taps, common, in many instances, to a large number of dwellings. A much smaller proportion appears from the books, but this is owing to the fact that some tenants pay for several houses. About 10,000 houses are *not* supplied from the works. Mr. Dodd said in his evidence :—

"The document now shown to me is a copy of my deposition before the Committee of the House of Commons on the City of Norwich Water-works Bill. I confirm that evidence now.

"I have had complaints of the water being turbid, and of solid matter being deposited from it after heavy falls of rain and snow. They have told me about it when I have been out collecting the rates. I cannot tell what quantity of deposit there would be from a gallon of water of the average quality. In my house we put it over-night in a cool damp place in warm weather. It is not the usual practice to do so, but we do it in summer to cool the water, and in winter to deposit

the solid matter. Heigham-common would form the smallest possible fraction of the drainage area of the Wensum. My evidence was given on the 9th of this month. I examined the Creek from the river to Mr. Wills' skin-yard, about a month ago. I walked along the bank, and looked at the water. I observed a good deal of deposit at the end next the yard, and the water quite clear at the end next the river. I think that no great alteration will have taken place since I examined it a month ago. At the spring of the year these side creeks become green. I should say that every summer of the last three that creek has been green, and I have seen it so. I do not recollect any bubbles rising when I examined it a month ago. I did not take any rod or staff to sound and ascertain what there was in it. *I tried to go up last Saturday in a boat, but could not get up.* There were four persons in the boat. We grounded at the mouth, and pushed back again. That was between 11 and 12 o'clock in the forenoon. I never took any means of disturbing that creek. Mr. Wills does not turn all his refuse into it. I have not perceived any smell from that creek. I could smell the yard when I was at it. I have not seen any other means the fellmonger has of storing or otherwise disposing of his refuse.

"At the same time last Saturday I examined the slaughter-house, and found a pound containing two paunches, but no bowels, or blood, or garbage. I do not know what that pound was made for, but it struck me that it was made to put these paunches into. I have no stated periods of examining the river. I go many times in the summer. I have been up many times this spring, but I never knew there was a slaughter-house until a few days before I went to London, and had then no time to examine it. We have 13 miles of pipes. I do not know the lengths of public roads in the city.

"We have had it from time to time before the Company to alter the source of supply, *always to take it higher up the river.* We never proposed to go farther up than Heigham-common. The first proposition was to have a filter in the meadow belonging to the mills. The second was to take it about 100 yards above Mr. Wills' creek. One proposition was, to bring water from Heigham-common by a pipe to the receiving-wells at the mills, and to construct a filter-bed in the meadow. When I said that I considered the washing of skins in the river not any nuisance, I intended to confine it to the lime. I did not think there was any animal matter that could affect the water. To cleanse out that creek would pollute the whole body of water in the river so long as it was going on. I never heard of its being cleansed, and should not like to hear of it. The Chapel Field reservoir would not serve a whole day. The old Company did not propose to construct any new reservoir, but only, as to storage, to increase the capacity of the Chapel Field reservoir. I cannot say whether it would be possible to filter the water during the cleansing of that reservoir. If there is no filth brought out of the creek into the river, the creek must eventually be either cleansed or it will be filled up, and Mr. Wills have no outlet whatever. When the mill-dam is drawn down, the water is of course drawn out of that creek. When I informed the Committee of the House of Commons that one mile of main would enable the Company to supply the whole city, and 'It would then only require service-pipes for the whole city to be supplied,' I meant only to include in mains the streets leading direct to the gates or walls of the city. *I intended to*

include as services all the pipes in all the other streets, but they would be really street mains. Service-pipe ought not to mean anything more than the pipe from the street main to the house or court. There are 986 yards of lead pipe belonging to the Company not included in the 13 miles of main. In the winter season we shut down about 2 o'clock in the afternoon on Sundays, and in summer about 6 o'clock in the evening. I calculated that last year the works stood still one-seventh of the whole year. I am not able to say the depth of the well at the new mills below the head. In winter we stand 28 hours out of every seven days, and in summer 20 hours. The basin is full, and the pumps are capable of lifting more water than is used."

Analysis and Remarks.—It appears from the evidence of Mr. Dodd, that the water is *occasionally* turbid, and that, in his own house, he adopts means to improve its quality. With respect to the creek from Mr. Wills' skin yard to the river, above the water-works, I and a number of gentlemen passed along it a considerable distance, and the stench from the putrid filth, stirred up by the boat, was so horrible, that we were all very glad when we got out of it again. The whole surface was boiling with foul gases, accompanied with constant hissing from the explosion of the bubbles. It is unnecessary to remark on the other sources of pollution alluded to above the works, except that they are such as certainly ought not to flow into any stream of water from whence the inhabitants of a city are supplied with unfiltered, or even filtered water. Mr. Dodd shows that the Company are convinced that the quality of the water now given is improper. The cleansing of that creek would stop the water-works for several days, and Mr. Dodd says that the Chapel Field reservoir, which is the only one they have, would not hold a day's supply, therefore, it could not be cleansed without the supply of water to the city being stopped. The Company have only 13 miles of street, and other main pipes, and 986 yards of lead piping, and so far from an additional mile of pipe being sufficient to supply the whole city, I find that it would take upwards of 22 miles of additional pipe to effect the object, exclusive of all services.

It was stated that the city contained 1,000 public and private wells, to which I replied, that I was sorry there was a well at all in the city. The analysis of Mr. Dalrymple proves to what a great extent the wells are polluted, and that the water is quite unfit for dietetic purposes. Their existence is therefore a fact to be lamented, when it is put forward to show that a large proportion of the inhabitants of the city should depend upon a supply from such sources.

In concluding this part of my Report, I may in a few words recapitulate. The result of my inspection, and the evidence, proves generally, that the city is almost entirely dependent upon a polluted river, polluted wells, and utterly inadequate public works for its supply of water. Some of the inhabitants obtain water from

these various sources combined, but it may be said that about 30,000 are dependent upon pumps and wells, 10,000 upon the river, and 25,000 upon the Company.

The most energetic and well directed efforts of private individuals cannot supply the place of proper public arrangements, and it is not only incompatible with all sanitary considerations, but contrary to the spirit of the age, that in one of the largest and most wealthy cities in the empire, the great bulk of the inhabitants should be without any supply of water from public works.

With respect to the supply given from the existing works, it has been shown that it is partial in extent, intermittent, unfiltered, and consequently impure; that the pressure is insufficient, and the quantity inadequate, and that, though the price charged to cottages by the Company is low, yet the mode of supply, by one tap, from which the water has to be fetched and carried by many families, is such as to more than double the nominal cost to the consumer.

INSURANCE, FIRES, AND MEANS OF EXTINGUISHING THEM.—On this subject, intimately connected with the supply of water, I addressed a communication to Samuel Bignold, Esq., who is the executive of the Norwich Union Fire Insurance Company; the chairman of the New Water Company, and a very influential member of the corporation, asking him for information on the following points:—

"1. Anything you may please to communicate respecting your office, and the rates of insurance.

"2. Is building property in the city and county of Norwich, generally insured, and if not, about what proportion?

"3. Is there much property of a hazardous nature?

"4. What public arrangements exist for extinguishing fires?

"5. What private arrangements for such purpose?

"6. The amounts of damage at such fires as have occurred within the last few years, as far as you can recollect, without much trouble?

"7. Was any difficulty experienced in obtaining water to extinguish such fires?

"8. Any special, or other facts connected with any of the above?

The following is Mr. Bignold's reply to these queries:—

"*Surrey-street, Norwich,*
October 3rd, 1850.

"MY DEAR SIR,

"I AM sorry I have been obliged to defer for two days replying to your letter of the 30th ultimo by pressure of engagements. I have now to state in reply to the eight heads of inquiry embraced in your letter:—

"1. That the Norwich Union Fire Insurance Company, established in this city in 1797, is the first provincial office in the kingdom, possessing ample resources, and is conducted on principles of the highest honour and liberality in all its dealings with the public, of which the best proof that can be cited, is, that it insures 61 millions of property.

The rates are 1*s.* 6*d.* per cent. for common insurance, and 2*s.* 6*d.* hazardous, and 4*s.* 6*d.* double hazardous.

"2. I should estimate a third of the building property in Norwich uninsured.

"3. There is not much property in Norwich of a hazardous nature. The mills are considered the most risky establishments, but they are so well conducted, that fires rarely occur.

"4. The public arrangements for extinguishing fires are limited to three or four corporation engines, (kept at the Guildhall in the Market Place,) and a proper corps of firemen, (part of the city police,) and three first rate engines kept by the Norwich Union Office, with well appointed firemen to work the same. One or two of the parishes keep an engine in the parish church, but they are mostly inefficient.

"5. I am aware of no private arrangements subsisting for extinguishing fires.

"6. Fires are of unfrequent occurrence in Norwich; and when they do happen, there is rarely more than a single house destroyed, which is very remarkable, as the construction of the buildings and the absence for the most part of party walls, leave the city exposed to most fearful conflagrations.

"The amount of damage which has occurred at fires in the last few years, have been, for the extent of the city, very small, scarcely 250*l.* per annum on the average of the last five years.

"7. Great difficulty is experienced in obtaining water when fires break out; the first half hour is generally spent in crying out 'water,' 'water.'

"8. I hope the formation of the Norwich New Water Company, of which I have the honour to be the chairman, will in time remedy many of the defects.

"Believe me, dear Sir, yours truly,

"*To William Lee, Esq.*, "Samuel Bignold.

"*Inspector, General Board of Health.*"

I have received from the town clerk a statement, showing the fires that occurred from 1836 to 1846, with the situation of the premises, the cause of the fire, and the manner in which it was extinguished, but am compelled to omit it for want of space.

Ventilation of Streets and Courts, and Condition of Houses and their Appurtenances.—Like those of other ancient cities, many of the public thoroughfares are narrow, crooked, and inconvenient, and obstruct free ventilation. The market place and the Castle Hill are fine open places, and the same may be said of some parts of the vicinity of the cathedral. The authorities have made great improvements, however, in the public thoroughfares, under the powers of their local Acts of Parliament, and London-street is at present being widened and straightened at a great cost.

I do not usually notice anonymous correspondence in my Reports, but a letter received by post during the inquiry, without any signature, brought before me so great an apparent improvement, that I quote it, for the purpose of showing the improvement pointed out.

"Sir, *Norwich, May 22nd*, 1850.

"The necessity for a new workhouse has long been felt in Norwich, and the subject has been frequently agitated.

"The removal of the old and inconvenient house would greatly facilitate sanitary improvements.

"From Fye-bridge to the lower corner of the Post Office-street, may be about 200 yards in a direct line, this line would cross the workhouse, and a mass of very old property of little value, but densely inhabited.

"The present circuitous route to the market from Fye-bridge is about half a mile.

"A good street through the heart of the city is much wanted, and the improvement suggested would accomplish that, and a good approach to the market from the north, which is much needed also.

"The outlay would not be excessive, and an improved rental resulting, would probably pay good interest."

Many of the more wealthy inhabitants have gardens and extensive back premises which tend very much to aid in ventilating the city. There are also, as I have already said, some courts of cottages with considerable open areas, but there are more that are incapable of thorough ventilation in their present form, and hence, the imperative necessity of removing everything that can taint the air of such places. It has been further stated, that in the suburbs each family generally occupies a cottage, but that in the older parts of the city, immense numbers live on floors of what were originally large houses, though situated in courts. Most of the latter are destitute of proper means of comfort and decency. Numerous cottages have also been built upon the old walls of the city without any back premises or privies.

In *Chapel-field* there are some large houses with cesspools that overflow when there is rain, and at the time of my inspection there was a pool between the houses and the Water Company's reservoir, about 15 yards long and 8 yards wide, emitting a very offensive effluvium.

The *Crescent*, in St. Stephen's parish, consists of about 22 houses of from 35*l*. to 40*l*. rental. All the houses, I was informed, have cesspools near the back doors, most of them open bin-privies, and those with water-closets empty into the cesspools. Mr. Jay said he had a cesspool made to one of the houses at a cost of about 14*l*. These cesspools are intended to percolate into the gravel and the chalk below, but when the pores of the strata become closed the cesspool fills up and does no more good. There is no sewerage.

Bell's-yard, St. Giles's, is a very close, ill-ventilated place. The refuse of 13 or 14 houses flows along the surface, and then passes under a house. I examined the floor and walls of the house and found them damp. There is only one privy, and it is in front of the street.

Black-horse-yard, there is a similar surface drain running under

a house, and making the walls damp. William Wilson lives in one of the houses, and his wife says—

"We cannot keep anything in the cupboard. Victuals soon smell. When the sun is out the smell is very bad."

There are at least 20 families to one privy. The houses are very old, and the families live in flats, the rents are only 9*d.* per week, and no rates. There is only one pump for all the yard.

The rates on houses under 6*l.* per annum are paid by the landlord.

In one part of the *Fair Flora-yard* the opposite houses are within 4 to 5 feet of each other.

In *Pockthorpe* there are many houses quite unfit for human dwellings: I would particularly mention *Haywood's-rents,* which consist of a considerable number of single rooms, let with a small quantity of old furniture, at 1*s.* 6*d.* per week each. There is no water, pavement, drains, or privies. The rents of the whole are 18*s.* per week, and yet the property was bought, as I was informed, only last November for 36*l.*

Very few cottages in Norwich have underground cellars; the drainage, where any exists, is not sufficiently deep for cellars, and I was informed that the poor people have an antipathy to them.

Mr. *Darkins* said, in his evidence—

"I have been extensively engaged in building operations in Norwich. I think that a great many of the older houses occupied by the poor are more comfortable than the new ones. There have been many houses built on speculation to sell. They are mostly occupied by the poor. Some of the houses at Crooks-place, Pea-field, and other parts of the outside walls are far from being comfortable dwellings. *Many built about* 30 *years since are falling down. The object is to run them up at the least possible cost.* Many have been set back to get little gardens in front, but there are only a few feet between them and the backs of the next houses, and there can be no ventilation. Houses built so have a better appearance in front, and that is all that is cared for. I do not think that drainage or health was ever thought of by the builders in many instances."

Appendix I. is the report prepared for me by Mr. Robert Kitton, architect. With reference to a few of the statements in his report, I examined Mr. Kitton further, when he said—

"I doubt the statement that many of the cottages have been run up as cheaply as possible for sale. In Pea-field, a house letting for 5*l.* would probably cost from 80*l.* to 120*l.* They are very much depreciated now from the want of sufficient good tenants. I do not know that there are more houses empty in Pea-field than the average of the whole city. In the city it is not so generally depreciated, but there is a depreciation in the whole city. Small houses within the walls pay a sufficient rent generally. There is nothing more in the Pea-field to depreciate property than in the other hamlets. The distance from employment is a disadvantage. The weavers used to occupy them, and

wrought at home. The weaving has much declined, and there is a great change of employment. In the present circumstances cesspools are unavoidable. I should think it very desirable for them to be entirely abolished. The deepest cesspools are the most numerous. The general depth of them would be 30 feet, but many are not more than 20 feet. They are bricked round and domed over, and did cost from 10*l.* to 12*l.* each, but less now that the duty is taken off bricks. The number of small houses to a cesspool would vary from 6 or 8 up to 18 or 20. The fluid part goes away into the soil. *The pump-wells are deeper than the deep cesspools.*

Condition of the Lodging-houses.—Notwithstanding the existence of the Mendicity Society for the relief of distressed travellers and the detection of vagrants and impostors, there are many vagrants in the city, and the lodging-houses are said to be at times very much crowded. The inspection of these places is always a very disagreeable part of my duty, as I am compelled, in order to judge accurately of their condition to visit them after the inmates have retired to rest, and the stench in the close, unventilated, crowded rooms, is generally quite overpowering. I was informed by the Inspector of Nuisances, that at the time of my visit the number of vagrants in the town was much below the average, but I saw quite sufficient to convince me of the necessity of their being placed under the regulations provided for in the Public Health Act.

The first house I visited was that of Nathan Francis, in *St. Catharine's Plain.* There were 4 bed-rooms and 9 beds. The house at the time only contained 14 persons.

Ber-street, John Wisker, keeper. One living-room and one chamber. There were 12 persons down-stairs who had not retired, including children, and up-stairs 9 persons already occupied 4 out of the 5 beds. I do not know how the additional 12 were to be accommodated, but the room, at the time of my entering, only afforded 169 cubic feet of breathing space for each individual.

The opinion of medical practitioners who have paid attention to the subject is, that not less than 400 to 500 cubic feet of air is necessary for each adult to support respiration during the hours of ordinary rest.* When it is considered, therefore, that the persons and clothing of these people are often very unclean, and that every crevice that could admit air is carefully closed, the pestiferous state of the atmosphere may be conceived. The next house, kept by William Crancher, had two lodging-rooms, into one of which were crowded 6 beds, occupied already by 5 males and 4 females, with 185 cubic feet of air each. The other room had 4 beds, containing 6 men, with 187 cubic feet of air each. If this had been all, I could have said that the place was crowded; but there were, besides them, 4 men and 2 women

* See "Report to the General Board of Health on Epidemic Cholera," p. 37.

down-stairs, *smoking, drinking, and playing cards,* and when they joined their companions up-stairs, the two rooms would contain 21 persons, and would be in an unhealthy state. I cannot but remark on the occupations of the people down-stairs;—they were of the class who obtain a living by the sale of small articles in baskets, and by begging, if not by any worse means. The next house, occupied by John Blythe, and called the "Jolly Butchers," was nearly empty. It contained 4 lodging-rooms and 20 beds, but only 11 persons.

The last I shall mention, called the "Jolly Drovers," is a large house formed out of two, and is kept by George Mann. This house I understood to combine the accommodation of a lodging-house, a beer-house, and a brothel. Down-stairs there was a man, woman, and two girls. In a room up-stairs, with 4 beds, there was in one a man, woman, and 3 children. Another room contained 5 beds, one of which had not yet received its occupants; a second lodged a young man and a girl; the third, 3 girls; the fourth, a man and woman; and the fifth, a man, woman, and child. Notwithstanding the empty bed, this room afforded only 145 cubic feet of air to each person. I was fully convinced of the truth of what I was informed, that the most promiscuous intercourse is carried on between the sexes. It is impossible that any female could retain the least vestige of delicacy or chastity in such places, whatever she might have had previously, and it is equally impossible that such places can exist in a neighbourhood without lowering the general tone of morality among the inhabitants.

Nuisances.—Many of the evils mentioned under almost every head of this report might be undoubtedly included under the generic term of nuisances, but I have treated them otherwise because they admitted of specific classification. Under this head I shall therefore only briefly notice such nuisances as could not be conveniently considered elsewhere.

I was particularly requested to examine Mr. Bagshaw's premises in St. Michael's, Coslany-street. The yard and buildings are used for the two not very congruous businesses of collecting and storing bones, and of salting and drying herrings. The former is much complained of as a nuisance, and is said to cause a great stench in the neighbourhood at times. On inspecting the place I found parts of the carcases of horses, not divested of flesh, and herrings lying in salt in adjoining rooms. The quantity of bones of various kinds was considerable, and I do not think such a collection of dead animal matter ought to be permitted in the city, especially on the same premises with other articles intended for human food.

On the *Magpie-road,* in St. Paul's parish, I was asked to look at a knacker's yard, kept by Mr. James Cushing. There are no houses adjoining his premises, but the place is without water, or

drainage, or pavement, and there are houses on the opposite side of the road. Mr. Cushing said—

"We fetch water from a pump across the road, and pay 5*s.* a-year for the privilege, but now the pump will not work. It has been out of order three weeks, and I don't know of anything in progress to repair it. I should like to have water, and would not mind paying 2*d.* per week if I could have a tap in the house."

A complaint was also made of the yard rented by the Paving Commissioners, and used by the city scavenger as a depôt for town refuse. It is situated behind the Bull-close, at a considerable distance from any houses, and at the time of my visit contained very little refuse. I should think it as little a nuisance as a place of that kind could well be, but with the wind in a direction from it to the nearest houses, I have no doubt that at times it will be offensive, and on that account it would be better removed to a greater distance from the city.

Mr. *J. Jay*, plumber, of St. Andrew's-hill, complained much of the nuisance to his house from the want of public urinals in the place. The passage on the upper side of the churchyard is used for the purpose, without any means of privacy. I had several other complaints of a similar nature, and think the want of such places a great defect. The necessity for them cannot be denied, and, as the practice must continue, the only remaining question to decide is, whether it shall be done decently or indecently.

Appendix J. is a list of nuisances put in at the inquiry by Inspector Clarke as being still in existence, notwithstanding all the efforts of the Sanitary Committee, and which could not be dealt with under the Nuisances Removal Act.

Condition of the Roads, and Surface Cleansing.—The analysis of the Paving Acts will show that the jurisdiction of the Commissioners is confined to the walls of the city; and at the conclusion of the inquiry the Town Clerk pointed out that the Acts were in many other ways found defective. He said that inconveniences were experienced as to the meetings of the Commissioners and the rescinding of resolutions; that there are many lawyers who are Commissioners, and who have determined that roads paved since the Act was passed are not streets within the Act. The Commissioners have no power to pave courts. The roads in the hamlets are under the management of the surveyors of the highways elected by the inhabitants. Mr. John Aldridge, when pointing out some very bad places in Pea-field, in Lakenham, said that he was surveyor for the hamlet, but was turned out of office for collecting a rate. From a list given me it appears that there are, *within the city*, 24 streets, &c., not under the Acts for paving, &c., and consequently under no jurisdiction whatever. I could not learn the length of the roads within the walls, but the length within Norwich town would be from 25 to 27 miles, and

in the remainder of the county of the city about 31 miles, making a total of from 56 to 60 miles. Very nearly the whole of the 31 miles is either macadamized or not repaired at all, and of those within the jurisdiction of the Paving Commissioners between four and five miles are macadamized. There is some pavement in granite squares, but the greater portion of the carriage ways in the city are paved with pebbles, which, though very durable, and more economical than any other kind of road, are very rough, occasion much noise, and have large interstices for the retention of refuse. This objection is peculiarly applicable to the side channels, especially of a city where the under-drainage is so defective, and where most of the refuse has to run for a considerable distance along the surface. The footpaths within the city are generally well flagged, and, considering the narrowness of many of the streets, sufficiently wide. In this respect the Commissioners deserve great praise. In St. Michael Coslany-street a considerable length of footpath has been laid with asphaltum, but it has not given satisfaction to the authorities, and the work does not appear to have been well executed.

It would occupy too much space to enumerate the streets and places in which the liability to repair is disputed, or those in which the Paving Commissioners have clearly no jurisdiction, and to describe their condition. I name only one, which shows a very close connexion between a low state of morality and the absence of civil arrangements for comfort and health. Pockthorpe is not lighted nor drained, and the pavement and cleansing is exceedingly defective. I was informed that there are many thieves, prostitutes, and bad people there, and that it is the most immoral place in Norwich.

I have received from the Commissioners printed abstracts of their accounts for the last three years, and have formed them into a Table, with averages of the expenditure in each of the several departments under their jurisdiction. Your Honourable Board are aware that I have frequently brought before your notice the enormous cost of macadamized roads as compared with stone pavement. These accounts afford another illustration of the same fact. The maintenance of between four and five miles of macadamized roads is half as much as that of 20 miles of pavement. I have also to point out the very small annual payments for public cleansing of paved roads. They seem to justify the complaints made during the inquiry, that the scavenging of the city is very inefficient.

TABLE showing the RECEIPTS and EXPENDITURE of the PAVING COMMISSIONERS for the City of NORWICH.

Year.	Total Receipts.	Payments.			
		For Improvements.	Repairs of old Pavement.	Macadamized Roads.	Lighting.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
1847	6,998 11 4	956 16 11	586 8 5	367 16 0	2,643 14 1
1848	9,312 13 2	4,299 16 5	931 10 7	471 3 7	2,559 17 0
1849	6,951 12 2	1,049 5 4	1,126 3 9	467 15 2	2,381 11 0
Annual Average	7,754 5 7	2,101 19 7	881 7 7	435 11 7	2,528 7 4

Year.	Payments.		Balance Debit.	Balance Credit.	Total Expenditure.
	Cleansing.	Miscellaneous.			
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
1847	115 0 0	956 0 8	..	1,372 15 3	5,625 16 1
1848	60 0 0	990 5 7	1,952 2 5	..	9,312 13 2
1849	84 14 2	3,037 5 1	1,195 2 4	..	8,146 2 8
Annual Average	86 11 5	1,661 3 9	..	..	7,694 17 3½

I received from Mr. Darkins some evidence as to the nature, extent, and cost of the highways under the Commission. He says:—

"The paving is under my management now. I have understood that 20 miles of public ways are set with flints. Many of those in the inferior parts of the town are without footways, and some without kerbs. The length of the macadamized roads under the Commissioners is between four and five miles. The total length set with granite squares will not exceed a mile. We obtain granite from Aberdeen; it costs 26*s.* per ton, and a ton will pave about 2½ square yards. The labour is 7*d.* per yard. There is no concrete used as a foundation, and the grouting is paid for extra when required. Sand is found by the contractor. Flint, pebbles, and labour complete, cost 2*s.* per yard. Macadamized roads are repaired and watered and cleansed by contract, at 360*l.* per annum. I will let you know the length, and give you a copy of the contract. There are 15 scavengers besides, whose duty is to sweep the streets and keep the cockeys clean, the total payment for which is 150*l.* They are very poor people. I do not think we have scavengers enow to keep the city properly clean. If there were a few more scavengers, I think Mr. Clarke, the Inspector of Nuisances, would be able to keep them in order. Kerbstones from Aberdeen, 12 × 6 inches, cost 2*s.* per foot; laying down 2*d.* per foot. Flags cost 6*d.* per square foot. The flagged footways have been much extended within the last 12 months. We keep extending them as fast as we can. The labour is 1*d.* per foot for mortar, carting, &c. The

cutting and laying down, carting, &c., of the old flags is 1½*d.* per foot. There has been some asphaltum laid down at about 2*s.* 6*d.* per yard, but it has not given satisfaction."

Granville Sharpe, Esq., also gave evidence as to the cleansing as follows :—

"I would draw your attention to the monopoly of street manure in the city. The contractor sub-lets the cleansing of the macadamized roads, they being the least profitable. There is more silt, and less manure. The sweepings of these streets are sometimes barely worth the labour, the same of emptying the cockeys and the channels, and the cleansing is consequently very inefficient. One man told me that he allowed the manure in Ber-street to become dry, and to blow to one side of the street, in order the more easily to remove it. That street is never swept, and the monopoly is injurious because the inhabitants are forbidden to do it themselves. In June, July, and August, when manure is not much needed, these streets are worse cleansed than ever, and people cannot get their muck-bins emptied.

"When people are ill in Norwich stable-litter is put down in the streets instead of straw, and that I consider a nuisance. With reference to the accumulations of filth in the hamlets, it is common for night-soil to be taken, spread in heaps, and evaporated to dryness. It is very offensive, and injurious to the people residing there. Some of these depôts are within a few yards of houses."

Unless the public cleansing is let on a liberal scale, with proper stipulations in the contract to prevent sub-letting, and to ensure its efficiency, I think that the system of contracting is bad. The class of persons pointed out in the evidence are not likely to do more than they are paid for, if so much; and interference with the health and comfort of the inhabitants is a necessary and direct consequence of neglect in so important a branch of the public service.

Sanitary Condition of Public Institutions.—*Norfolk and Norwich General Hospital.*—I received some evidence from John Spark, Esq., who said :—

"I am house surgeon to the Norfolk and Norwich General Hospital. The usual number of patients there is 110. Venereal diseases and fevers are not admitted. Nurses and attendants and staff comprise about 20 persons more. The supply of water is certainly deficient in quantity and in quality it is bad. It is obtained from the Water Company. In such an institution a good supply of good water is of the greatest importance. Last week several of the water-closets were without water for 18 hours. The water from the taps is used for food. I should say it is not fit for food. There is one spring-well pump. I think the drains are now conducted into a public drain in the street. We have had erysipelas, and fever of low typhoid character, several cases of both, and I think they may be attributed in some degree to the water-closets not being sufficiently supplied. The symptoms of these diseases, even if they originated from other causes, would be aggravated by such defects. Convalescence in those and other diseases would be retarded from such causes. A better supply of water is very

desirable for the institution. On one side there is a colony of small cottages. I do not know that they are without drainage. I have had no conversation with Mr. Dodd as to the water supply. If any evil exists in the drainage and water-supply of these cottages it ought to be remedied."

On my inspecting the hospital, the house steward, and secretary complained that they were then without water. He said the institution paid 18*l.* per annum to the Company for water, and that 70*l.* was expended last year in draining the establishment.

City Gaol.—The gaol is supplied with water partly from the works, and partly by pumps worked by the tread-wheel. There are drains in the prison, but they percolate away into the chalk. I examined a cistern, and found vegetation going on, and the water vapid. It has to be used when the supply from the works fails. The cistern is supplied by a well 115 feet deep, from whence the water is raised by the tread-mill. I found the water from the works better than that in the cistern. There are 24 water-closets, so arranged, that there are never more than eight men to a closet. The governor says that the men seldom put them out of repair. The keeping of these closets in condition is let by contract at 17*l.* per annum, but I was informed that they need very little repair, and do not cost the contractor much. All the cells and rooms appeared very clean and healthy. The gaol has been built about 25 years.

The *Workhouse* affords accommodation for about 600 inmates. It abuts upon the river, and at a part where the stream is in its most filthy condition. I had first an opportunity of seeing it while on the river, and found under the windows of the able-bodied men's room a large catch-pit or "mud trap," inclosed with piles and boards in the river to receive the refuse of one of the public sewers that has its outlet there. I was informed that this is sometimes very offensive. The ground within the workhouse fence is much higher than the river, and there was a very considerable exudation of offensive matter through the wall on the river side. On examining the interior of the premises I found there was an open soil-pit, receiving the contents of five privies, close to the place where the exudation appeared, and cannot doubt that the whole ground there is saturated with night-soil, which endeavours to find an exit through the wall into the river. The privies had been emptied the same morning, and there was a very foul stench through the entrance gateway and in the yard. I recommended the surface to be sprinkled with lime. There are no under drains. The liquid refuse all goes along the surface into the river contiguous. Water is supplied by four taps from the works, and there are also three pumps on the premises. In the room looking upon the catch-pit above alluded to, there were 25 men picking oakum; and in adjoining rooms the tailors and shoemakers of the establishment. The house contained 239 inmates

at the time of my visit, besides the staff. I found all the rooms exceedingly clean, and the dormitories well arranged and ventilated, with the single exception of the foul wards, which contained some bad cases at the time. In them the ventilation is very imperfect, and I was affected with a sensation of sickness after passing through them.

The Court of Guardians have done all in their power to make the place healthy, but I do not think the workhouse could be in a more unhealthy locality. The Court will consider it as only a suggestion, when I say, that to give the paupers pure air is economy on the part of the ratepayers, and that I think this can only be truly effected by the erection of a new workhouse in a more elevated situation.

The *Great Hospital*, St. Helen's.—The city may well be proud of this truly noble institution, and I felt great pleasure in being taken through its wards, and in seeing the multitude of persons who here enjoy a happy old age with a princely revenue for their maintenance. I am sorry to add, however, that the drainage and water supply could scarcely be more defective. There is a meadow adjoining the hospital, in the direction of the river, and a ditch from 200 to 300 yards in length, and 6 to 9 feet in breadth through this meadow, is one of the most horrible places I ever saw. It receives all the refuse of the hospital, containing above 200 persons, besides other drainage, and is perfectly stagnant. There was a number of dead animals it it, and the noxious gases did not rise merely in bubbles, but lifted up the semifluid matter in domes and exploded into the air. There are four pumps on the hospital premises, and rain water is caught in butts from the roofs, The governor said all the water used had to be carried, and he considered a proper water supply very desirable. There are no water pipes in that part of the city. St. Helen's parish church is part of the establishment. The parish is one of the smallest in the city, and the burial-ground, which will be noticed hereafter, is small. It consists of two plots; one in the cloisters, which has not been used for 70 years, and the other adjoining the church used for the parish, and the inmates of the hospital.

Doughty's Hospital.—All the drainage is by cesspools within the premises. They are only covered with doors, and I found some of them in a very offensive state on being opened. On inquiring respecting them of Mr. Minns, the master, he said:—

"They overflow frequently in winter. We throw it on the grass plots then, and take it away as well as we can. Sometimes it lays a day or two on the surface before we can get it away, and sometimes we can hardly get to the doors of the houses.

"There are 44 inmates, 28 men, and 16 women. No person can be admitted under 65 years of age, and there is one person 91 years old. The average would be upwards of 70. There is one pump, and one

tap, and the old people have to fetch and carry water from them. There are many cesspools, and one in the centre of the quadrangle is 10 or 11 feet deep, and 8 to 10 feet in diameter."

The *Castle* is in a better sanitary condition than most of the public institutions in Norwich. Much of this arises from its isolated position, and from its great elevation above the city, which secures to it at the same time free access of air, and the greatest facility for the discharge of all refuse.

The *Barracks* are situated on rising ground behind Pockthorpe. The situation is good, and the inclination of the surface sufficient for the discharge of all drainage. Norwich is always head quarters for the district, and the buildings are very extensive and commodious. The privies and dung-pits are immediately behind the living rooms of the men at the upper end of the yard, the parade gound being in front. There are two wings, and behind each of them is a women's privy, four holes, and a cluster of three privies for men, with four holes each. The accommodation is equal to 32 persons, or less than 1 in 10 of the usual number of persons in the barracks. The soil passes into the dung-pits, and there are no underground drains from them. An easterly wind would carry the effluvia from the privies and dung-pits into the men's rooms. In front of the buildings there are three drains which pass into two cesspools near the guard-house at the lower end of the parade ground. The cesspools are not trapped, and from them there is an overflow drain down to the abominable stagnant ditch I have already described, as being behind the houses in Pockthorpe-street. This ditch receives all the drainage of the Barracks. The only supply of water for the Barracks are obtained from five spring wells with pumps. There is no cistern for rain-water. The left wing was entirely burnt down in 1845, and I was informed that water was obtained with the greatest difficulty. Mr. William England, foreman of works, who has been here two years, says that there is a fire-engine kept on the premises, and a length of hose, but he does not think it would reach more than one pump at a time. The area of ground enclosed by the Barracks is upwards of 10 acres.

Baths.—Mr. Alderman Sultzer, with a public spirit, that deserves much commendation, has on his own responsibility erected and opened baths in the parish of St. Augustine, for the use of the public. I inspected them, and finding the arrangements good, I requested him to favour me with an account of them in writing. I regret that I am unable to insert his communication in full. The establishment consists of a tepid swimming bath, No. 1; a tepid swimming bath, No. 2; and six private baths.

The charge to the public for admission to No. 1 is one penny, including the use of a towel, and the time allowed is 20 minutes. Mr. Sultzer says:—

"A proportionate number of my own workpeople are admitted daily to the *free* use of this bath, so that each may have an opportunity of bathing once a week."

The charge for No. 2 swimming bath is 3*d.*, and to the private baths 6*d.*

As to the motives that induced him to construct these baths, Mr. Sultzer says:—

"I have been long desirous that opportunities for the frequent use of the bath should be open at all times, to all classes of the inhabitants of this city, making it the cheapest of all luxuries, and the means of promoting that cleanliness of the person which is conducive to health and respect, and a sure precursor of further sanitary and social improvement."

Of the success attending his efforts he adds:—

"I have ventured to carry it out myself, under a conviction that it would prove self-supporting. The result, so far, has fully realized my expectations. The swimming bath, No. 1, and the private baths, were opened on the first of this month; and the bathers from that date to the 18th, the day on which you visited them, was 1,527. I continue daily to receive abundant evidence of the gratification they have afforded, and how highly they are appreciated, especially by the classes for whose benefit they are chiefly intended; and I hope the day is not far distant when we shall see extended accommodation provided in each quarter of the city. When that is accomplished I purpose appropriating this little experimental establishment to the use of my own workpeople and immediate neighbours."

Inadequacy of existing Local Jurisdiction.—Much has been already adduced under other heads of this Report, showing incidentally that a large portion of Norwich proper—all beyond the old walls—is out of the jurisdiction of the Paving Commissioners, and that within the walls there are many streets not owned by them. The evils of such a state of things have also been to some extent exhibited. I shall only, therefore, add a few of the statements and evidence of some of the inhabitants themselves, given at the inquiry.

A. A. H. Beckwith, Esq., said:—

"I believe that the general opinion is, that the management of the city, with regard to sanitary matters, and particularly in regard to the supply of water and the sewerage, should be under the control of the Corporation. There are at present no less than three or four different authorities with regard to the sewerage of the city; 1st, the Paving Commissioners, who have control within the walls of the city, but not to the whole of it, because there are certain roads respecting which it is doubtful whether they ought to be repaired,—and the same, of course, as to any sewers under those roads,—by the Paving Commissioners, by the Tonnage Committee, or by the Surveyors of the Highways in the different parishes in which the roads are situated. There are three conflicting jurisdictions, and between the three, the roads are not repaired at all. For the space of three or four months

one road of the city, Rose-lane, leading to the railway station, and having the greatest traffic, was nearly impassable, because it could not be ascertained what body ought to repair it. This shows the necessity of some central sole authority in the city, in which such matters should all be vested. Then again, with regard to sewerage, the city of Norwich comprehends a large district which has lately very much increased in population without the walls, and the local Acts for paving and lighting the city do not extend to the newly-erected buildings in those parts, and therefore they are all either without management at all, or it is in the hands of small local bodies, and there cannot be any efficient plan of sewerage carried out. In fact, in most of those localities there is no sewerage at all, but merely cesspools, into which the drainage water runs; and it would be necessary, in order to have an efficient system of sewerage, to unite the sewerage of these places with the sewers of the city, but that cannot be done under present circumstances. In regard to Lower Heigham, which is a very low locality, I may observe that it is a hamlet not under the control of the Paving Commissioners; it is just without the walls, and so flat that the water does not get off. Now, by means of a sewer through Heigham-street into the city, the drainage of the hamlet might be effected; but as it is, the scarlet fever now prevails in the locality, arising from the want of drainage, and the stagnant condition of the surface refuse. This cannot be remedied, because they have not the power to make a sewer commencing in the hamlet and running into the city, and therefore it will be necessary, in this inquiry, to examine what localities out of the city might be connected with the city itself, so as to form an efficient system of water supply and drainage."

Mr. *Beckwith* also said subsequently:—

"The present proprietors of the water-works would have increased the supply of water, but they could not get persons to take it. There is this inefficiency in the Act that there is no power to compel persons to be clean. I apprehend that to carry out any efficient measure for this city, there must be vested in the Corporation a power, if persons will not be clean, to make them be clean, in order to prevent the spread of disease amongst those who *are* willing to be so."

Mr. Granville Sharpe said that the present jurisdiction was very bad, and the powers inadequate; that, in the hamlets, he was the best surveyor who expended the least money; and in the city the Paving Commissioners were *authorised,* but not *required,* to repair the roads, and some were not repaired. At a subsequent period, Mr. Sharpe gave evidence as to other defects in the Acts for Paving, Lighting, &c., as follows:—

"The 18th, 27th, and 43rd sections authorise the Commissioners to repair all the roads in the city. Surrey-road, otherwise St. Catharine's-lane, is rather more than a quarter of a mile long, and yet there are three parishes and a turnpike trust. It is within the city, but is repudiated by the Commissioners, and, owing to the extreme unwillingness of the inhabitants to submit to a rate, the road is rarely repaired. One portion of it was only once very badly repaired during seven years. The drainage in the same road is also very defective.

"Section 76 authorizes an annual frontage-rate upon all streets liable to be repaired by private individuals at the time the Act was passed. That frontage-rate seems to be exceedingly objectionable, because, although the Act gives powers to pave, the Commissioners have no power to levy frontage-rates upon property paved since the passing of the Act. It is a grievance that the valuable property outside the city should be deprived of the privilege. The cleansing of the roads without the city is only done when the profit of removing the refuse is sufficient to defray the expenses."

The evidence of Mr. Beckwith and Mr. Sharpe, in addition to what has been previously mentioned in this Report, fully proves that more extended jurisdiction, and consolidation of the local authority is absolutely necessary to good government, and an improved sanitary state of the whole city.

STATE OF THE BURIAL-GROUNDS.—The burial-grounds in Norwich are very numerous, and the greater part full, and quite unfit for further interments. Indeed, this was the case so far back as 1671, as appears by the following extract from Evelyn's Memoirs of that date, vol. i. p. 421. Speaking of Norwich, he says:—

"I observed that most of the churchyards, (though some of them large enough,) were filled up with earth, or rather the congestion of dead bodies one on another for want of earth, even to the very top of the walls, and some above the walls, so as the churches seemed to be built in pitts."

I inspected the whole of the burial-grounds attached to both churches and chapels, and, with the exception of St. Mark's, at Lakenham, that of the Friends, adjoining the Gilden Croft and a few small grounds attached to Dissenting chapels, they all appear to be crowded with bodies. I have looked over my minutes, and could safely adopt Evelyn's words as applicable at the present time to the churchyards. Of the chapels, the two in Willow-lane and in St. John's, belonging to the Roman Catholics, have small grounds, but no interments take place in them. The Dutch Church has no burial-ground; about one interment per annum has taken place during the last 10 years.

The burial-ground at Gilden Croft is very large and has been *apparently* very little used. There are no houses near. The following was put in:—

"The following memorandum respecting the cemetery belonging to the Society of Friends, adjoining the Gilden Croft, in the parish of St. Augustine, is respectfully submitted to the consideration of Mr. Lee.

"This cemetery, which is rather extensive, was opened about 1670 for the exclusive use of the Society, and has been used ever since. It is chiefly surrounded by gardens, and is in a very airy situation. As the graves which have been made there are chiefly levelled, it has been more used than it appears to be, but it is still capable of being used for some time to come, as the Society belonging to it is very small. They are very desirous of continuing it for its present purpose unless any

regulation should interfere with it. It appears very desirable that Mr. Lee should see this ground, that he may form his professional opinion on the propriety of its continuance, and for that purpose the undersigned will be happy to accompany him at any time which he may appoint.

JOSEPH GELDART.

"*Surrey-street, May* 20, 1850."

There is a public unconsecrated cemetery in Norwich, called the Rosary Burial-ground. It is the property of a Joint Stock Company, and was, I believe, the first of the kind formed in this country, being established in 1819. It is situated in the hamlet of Thorpe, on the side of a hill from whence there is a fine view of Norwich and the adjacent country. It occupies about 5 acres of land, and is divided into sections for single and family graves and vaults. The company has a plan showing the whole arrangement of the ground, and a register is kept, with numbers corresponding with those on the plan. The graves can be dug to any depth, as the soil is quite dry.

The cemetery is under the management of twelve trustees, and I was informed by Horatio Bolingbroke, Esq., the chairman, that the grove adjoining, containing 2 acres, 1 rood, and 9 perches, was purchased for the purpose of being added, also that land to the east belonging to Mr. Skipper, and containing 2½ acres, may be had for the same purpose, as well as other land on the north, the property of Sir R. J. Harvey.

The following are a few of the charges and regulations:—

	£.	*s.*	*d.*
For a square of ground 8 feet by 8 feet	5	5	0
For a private separate grave 8 feet by 2 ft. 6 in.	2	2	0
For each interment	0	15	0
If in a brick grave (additional)	1	1	0
If a vault be made	2	2	0
Re-opening a brick grave for any subsequent interment	0	10	6
Re-opening a vault for ditto	1	1	0
For the privilege of erecting a tomb over any vault or grave	2	2	0
For putting down a flat grave-stone	0	10	6
For replacing the above in case of any subsequent interment	0	5	0
For erecting a head-stone or foot-stone	0	5	0
For replacing the above in case of any subsequent interment	0	2	6
Fee for the minister's service at the grave	0	5	0
But if the service be performed by any minister not belonging to the cemetery, 2*s.* 6*d.* only shall be charged as a fee for the registration for the funeral.			
For the use of the chapel or desk service	0	2	6
For the sexton's attendance	0	2	6

	£.	*s.*	*d.*
For the use of the bier	0	1	0
For the entry of shares in case of purchase or transfer (each)	0	1	0
For a copy of the register of any funeral at any time	0	2	6

The privilege of purchasing SQUARES or GRAVES is open to persons of every religious denomination, and all have equally the privilege of using funeral rites and ceremonies, and of having the assistance of such ministers or teachers as they may please.

In order to enable me to judge as to the condition of the numerous burial-grounds in the city, and of the measures that it might be proper to recommend, I addressed circulars to the incumbents, ministers, and persons in charge of the different burial-grounds, to the following effect :—

" *Guild Hall, 20th May*, 1850.

Sanitary Condition of the City of Norwich.

" REV. SIR,

" WILL you have the kindness to return to me in writing on Wednesday morning next, at half-past 9 o'clock, the area of your churchyard (or burial-ground), exclusive of the church (or building), and also the annual number of interments from 1829 to 1849 inclusive.

" I am, your obedient servant,

" WILLIAM LEE,

" *To* ———— " *Superintending Inspector.*"

&c. &c.

In reply to these circulars I have obtained numerous returns, which have enabled me to exhibit the actual state of each of the burial-grounds in a tabular form. The time requisite for perfect decomposition appears to vary from about 15 to 30 and even 40 years. The causes of this variation are, the differences in the geological character and chemical nature of the soil and subsoil of the ground containing the bodies,—the capacity of such soils for the retention, absorption, or percolation of moisture,—the natural and artificial drainage of the neighbourhood,—the length of time during which the ground has been used for interments, and the extent to which its character has been consequently altered by the saturation of animal matter,—and also by the usual depths of the graves, and by the description of coffins commonly used. Taking all these circumstances into consideration my experience brings me to the conviction that the softer parts of the bodies in the burial-grounds of Norwich would become a black, unctuous, earthy mass, not free from offensive and injurious emanations in from 16 to 18 years, but that the bones would remain with animal matter in them from 30 to even 40 years if undisturbed. *No undecomposed human remains ought to be* DISTURBED ANYWHERE, *much less in a crowded city.*

In the following Tables I have concluded that where the greater

part of any old burial-ground has been turned over within 20 years it is unfit for further interments, and ought to be legally closed forthwith, on grounds of health alone, irrespective of those feelings of public decency which are outraged by the exhibition of the mutilated remains of friends, neighbours, and fellow citizens.

The fact that there may be, in some *such* burial-grounds, many graves that have not been opened for more than 20 years does not alter the case; it only proves inferentially that there are other graves in the same burial-grounds that must have been opened more than once during the same period, and the public injury is increased by concentration in at least as great a proportion as it is diminished in extent. It will be obvious that the area of the burial-ground being given the number of graves is determined, and the average number of interments will show the number of years required to fill the ground, while the aggregate number of bodies interred will show the space afforded to each body, and the available graves remaining, if any.—(*For Tables, see pages* 82, 83, 84, *and* 85.

I received along with the returns upon which the above Tables are founded, explanatory statements of the peculiar circumstances connected with some of them. The *Rev. W. K. Betts*, incumbent of Christchurch, St. Clements-Without, says—

"This churchyard was consecrated in November, 1841, and there was only one interment that year. I, therefore, give on the other side the annual number of interments for 1842 to 1849 inclusive.

"The churchyard is too small; and it would prove very beneficial for future years if an additional piece of the field adjoining, of which it once formed a part, were secured to be annexed to the same."

The following is from the *Rev. William Robbins*, rector of Heigham:—

"Sir, *Norwich, 21st May*, 1850.

"According to the survey for the commutation of tithe of the parish of Heigham, the churchyard measures 3 roods and 27 perches, but the church occupies a portion, leaving full 3 roods of ground. It is at a distance, without the walls of the city, and is surrounded by land chiefly arable, and perfectly dry and well suited for a burial-ground if a larger space should be required. The population at the last census was 6,050, and at the next will not fall short of 7,000 by the rapid increase of buildings. The number of burials bears no proportion to the deaths, as many bury in the city, as nearer to them, or from a desire to bury near their relations. I have copied from the register-book the number of burials in the years mentioned in your letter. As I am not aware that I can give any information beyond what is now laid before you,

"I remain, your's, respectfully,

"Wm. Robbins,

"*Rector of Heigham.*"

Mr. *J. W. Dowson*, trustee of the Octagon chapel, says—

"The interments hitherto have been almost entirely on the west side of the chapel, the north and east sides being nearly free from graves."

The *Rev. J. Gray*, minister of St. Margaret's chapel, says—

"Agreeable to your request received this morning, Wednesday, I give you the area of St. Margaret's chapel burial-ground, 35 feet by 25 feet; besides which there is much more than the quantity given that has not at present been used."

I have reason to believe that in a few of the parishes the area of the church is included in the table, but notwithstanding this apparent addition to the space for interments it appears, from the premises already laid down, that at least 20 out of the 34 parish burial-grounds within the city are in so crowded a state that no further interments ought to be permitted, and that in St. John's Sepulchre, St. Paul's, St. James's, and St. Martin's at Oak, the ground has been entirely turned over within 10 years, or half the minimum time necessary for decomposition. With respect even to some of those that do not appear to be in so crowded a state from the interments within 20 years, I cannot doubt that their pre-existing condition, as old burial-grounds, is such as to retard decomposition, and to render it exceedingly desirable that arrangements should be made for closing them with as little delay as possible, and for the formation of cemeteries at a convenient distance from the city. This part of the subject belongs however to a subsequent part of this report.

WATCHING, LIGHTING, AND GAS.—The police and night-watching are under the control of the Corporation. It is only necessary for me to say that the force is very efficient. Policemen are employed under a local Act for the protection of property on the river. The lighting of the city is vested in the Paving Commissioners.

The gas works were established under an Act of Parliament passed in 1820, the title of which will be given hereinafter, as well as that of a subsequent Act to alter, amend, &c., passed in 1826. The works were originally at the back of St. Stephen's, and the gas was manufactured from oil, but in 1825 the works were purchased by the British Gas Light Company, and in 1830 removed to their present situation at the foot of St. Leonard's-hill, opposite to Bishop's-bridge. The situation is well chosen, being low, and at some distance from the thickly inhabited parts of the city.

Mr. *William Tadman* was examined, as to the nature and extent of the works, and gave the following evidence:—

"I am manager of the gas-works in Norwich. The works were purchased 25 years ago, by the British Gas Light Company. The capital is 40,000*l.*, but I cannot say that 40,000*l.* is the value of the works. The financial arrangements are made in London. We have a number of Norwich proprietors, but there is no Local Committee. (*Mr. Tadman's evidence continued at page* 86.)

TABLE of INTERMENTS in the

No.	NAME OF BURIAL GROUND.	Area of Burial Ground.	Number of Graves 7 feet by 3 feet.	1830	1831
		Sq. Yds.			
1	St. Peter of Southgate	4,840	2,074	11	16
2	St. Etheldred	1,815	777	26	14
3	St. Julian	2,420	1,037	41	23
4	St. Peter per Mountergate	2,783	1,192	45	49
5	St. John of Sepulchre	2,160	925	83	83
6	St. Michael at Thorne	1,261	535	30	37
7	St. John of Timberhill	1,332	570	23	32
8	All Saints	1,260	535	17	16
9	St. Stephens	6,050	2,593	82	110
10	St. Peter of Mancroft	1,421	609	21	21
11	St. Giles	4,800	2,057	44	61
12	St. Benedict	2,843	1,218	23	33
13	St. Swithin	3,327	1,425	14	20
14	St. Margaret	1,966	842	34	52
15	St. Lawrence	882	378	22	24
16	St. Gregory	686	294	24	28
17	St. John of Maddermarket	726	311	20	20
18	St. Andrew	1,121	480	13	19
19	St. Michael at Plea	800	352	10	10
20	St. Peter of Hungate	644	276	10	8
21	St. Simon and Jude	1,613	691	12	12
22	St. George of Tombland	574	246	16	25
23	St. Martin at Palace	1,361	583	29	49
24	St. Helen	700	300	26	26
25	St. Michael of Coslany	2,571	1,101	28	50
26	St. Mary of Coslany	3,000	1,285	43	43
27	St. Martin at Oak	1,365	585	27	46
28	St. Augustine	6,896	2,955	95	125
29	St. George of Colegate	1,210	518	27	31
30	St. Clement	1,300	557	29	24
31	St. Edmund	835	358	13	23
32	St. Saviour	1,011	433	24	24
33	St. Paul	1,320	565	47	64
34	St. James	900	385	50	47
35	Heigham Church	3,630	1,555	24	45
36	Christ Church, St. Clements	..	..	..	..
37	Lakenham Church	1,210	518	27	21
38	St. Mark's, Lakenham	4,840	2,074	..	..
39	St. Andrew, Eaton	1,815	777	6	4
40	Earlham Church	5,445	2,333	4	4
41	St. Mary in the Marsh	2,420	1,037	8	8
42	St. Margaret's Chapel	97	41	1	1
43	Old Meeting	3,240	1,388	8	8
44	Wesleyan Chapel	515	220	..	..
45	Octagon Chapel	767	328	1	2
46	Rosary Cemetery	20,298	8,699	..	..
	Totals	108,870	45,512	1,168	1,350

NOTE.—In several instances it will be observed that the annual average of the tial. No. 46, the Rosary burial ground, gives only the aggregate since the opening Norwich, the churchyard is beyond the boundary. Many of the dissenting return.

County and City of Norwich.

INTERMENTS IN										
1832	1833	1834	1835	1836	1837	1838	1839	1840	1841	1842
18	19	26	22	6	22	17	20	17	22	23
17	16	11	21	9	18	12	14	21	17	16
22	22	24	25	31	23	26	47	39	17	34
67	82	61	71	71	67	39	56	61	46	71
83	83	83	83	83	83	83	83	83	83	83
27	38	45	56	48	34	28	53	45	20	39
26	37	22	25	24	20	20	23	22	19	33
17	21	27	32	33	31	30	47	27	27	32
84	100	108	123	132	102	105	120	119	87	107
24	26	26	30	20	16	17	19	20	24	23
53	63	71	67	65	54	56	58	62	70	65
14	32	26	30	27	37	32	26	37	28	25
16	14	23	21	17	17	19	13	18	16	20
30	40	50	51	45	50	41	63	62	44	38
23	20	22	18	22	17	12	31	15	25	19
24	25	33	34	30	24	27	28	23	27	17
21	20	20	21	20	20	21	20	20	21	20
9	16	17	21	13	23	21	17	18	15	13
10	10	10	10	10	10	10	10	10	10	10
10	13	7	9	9	10	8	13	11	9	13
12	12	12	12	12	12	12	12	12	12	12
15	16	16	9	11	10	8	14	10	6	14
43	45	49	42	40	38	30	43	41	30	40
26	26	26	26	26	26	26	38	24	40	30
38	48	68	54	57	58	56	53	72	57	59
43	43	43	43	43	43	43	43	43	43	43
50	35	67	71	61	57	53	74	56	44	61
101	116	117	106	130	110	96	146	129	81	115
34	32	33	36	34	33	29	35	37	36	20
25	27	43	29	37	26	22	38	43	36	31
18	23	30	16	17	26	15	23	23	15	23
24	24	24	24	24	24	24	24	24	24	24
59	46	50	52	52	63	49	95	57	44	52
55	44	36	33	52	24	28	59	36	32	25
36	37	51	53	54	58	39	50	51	39	40
..	..	..	..	..	..	..	..	..	1	16
10	19	18	21	17	18	12	17	27	20	26
..	..	..	..	..	..	..	..	..	..	..
10	8	10	8	8	4	12	11	9	5	6
7	1	..	4	2	4	6	6	1	3	3
8	8	8	8	8	8	8	8	8	8	8
1	1	1	1	1	1	1	1	1	1	1
8	8	8	8	8	8	8	8	8	8	8
..	..	..	..	..	..	..	..	..	..	..
1	2	1	2	1	2	1	2	2	1	2
..	..	..	..	..	..	..	..	..	..	..
1,199	1,398	1,403	1,428	1,410	1,331	1,252	1,561	1,444	1,223	1,370

20 years only has been given. In Nos. 36, 38, and 44, the returns are only par- in 1819. Although the hamlet of Hellesdon is within the County of the City of chapels have no burial grounds, and a few with small grounds have made no

Table of Interments in the

No.	Name of Burial Ground.	Area of Burial Ground.	Number of Graves 7 feet by 3 feet.	1843	1844
		Sq. Yds.			
1	St. Peter of Southgate	4,840	2,074	12	27
2	St. Etheldred	1,815	777	28	14
3	St. Julian	2,420	1,037	21	27
4	St. Peter per Mountergate	2,783	1,192	50	55
5	St. John of Sepulchre	2,160	925	83	83
6	St. Michael at Thorne	1,261	535	35	32
7	St. John of Timberhill	1,332	570	16	20
8	All Saints	1,260	535	21	23
9	St. Stephens	6,050	2,593	70	83
10	St. Peter of Mancroft	1,421	609	13	21
11	St. Giles	4,800	2,057	75	70
12	St. Benedict	2,843	1,218	32	25
13	St. Swithin	3,327	1,425	13	17
14	St. Margaret.	1,966	842	40	37
15	St. Lawrence	882	378	21	12
16	St. Gregory	686	294	17	20
17	St. John of Maddermarket	726	311	20	21
18	St. Andrew	1,121	480	21	33
19	St. Michael at Plea	800	352	10	10
20	St. Peter of Hungate	644	276	12	9
21	St. Simon and Jude.	1,613	691	12	12
22	St. George of Tombland	574	246	17	14
23	St. Martin at Palace	1,361	583	31	43
24	St. Helen.	700	300	28	32
25	St. Michael of Coslany.	2,571	1,101	56	59
26	St. Mary of Coslany	3,000	1,285	43	43
27	St. Martin at Oak	1,365	585	47	53
28	St. Augustine	6,896	2,955	83	107
29	St. George of Colegate	1,210	518	30	33
30	St. Clement	1,300	557	22	21
31	St. Edmund	835	358	30	23
32	St. Saviour	1,011	433	24	24
33	St. Paul	1,320	565	50	65
34	St. James	900	385	42	50
35	Heigham Church	3,630	1,555	32	34
36	Christ Church, St. Clements	..	..	27	37
37	Lakenham Church	1,210	518	20	22
38	St. Mark's, Lakenham	4,840	2,074	..	40
39	St. Andrew, Eaton	1,815	777	6	7
40	Earlham Church	5,445	2,333	1	1
41	St. Mary in the Marsh	2,420	1,037	8	8
42	St. Margaret's Chapel	97	41	1	1
43	Old Meeting	3,240	1,388	8	8
44	Wesleyan Chapel	515	220	7	6
45	Octagon Chapel.	767	328	1	2
46	Rosary Cemetery	20,298	8,699	..	..
	Totals	108,870	45,512	1,236	1,384

* In those marked thus, the aggregate only is given.
† This is the number for 1829 ; the year 1849 is not given.

County and City of Norwich—*continued.*

INTERMENTS IN					Aggregate Number of Interments	Annual Average.	Number of Years required to fill Ground.	Space afforded to each Body.	Available Space for Burials.
1845	1846	1847	1848	1849					
								Sq. Ft.	Graves.
21	19	17	20	26	381	19	109	114	1,693
12	15	17	9	15	322	16 1/10	48	50	455
44	31	29	21	27	574	28 3/4	36	37	463
63	44	44	37	48	1,127	56 1/3	21	22	65
83	83	83	83	84	1,661*	83	11	11	..
41	32	20	40	30	730	36 1/2	14	15	..
28	18	26	20	20	474	23 3/4	24	25	96
26	26	14	26	21	514	25 3/4	20	22	21
117	80	76	86	87	1,978	98 9/10	26	27	615
21	19	16	22	10	409	20 1/2	29	31	200
81	68	47	73	67	1,270	63 1/2	32	34	787
36	27	21	19	20	550	27 1/2	44	46	668
19	26	11	17	20	351	17 1/2	81	85	1,074
52	29	36	43	38	875	43 3/4	19	20	..
25	20	16	17	20	401	20	19	19	..
16	21	15	14	26†	473	23 2/3	12	13	..
20	20	21	20	20	406	20 1/4	15	16	..
18	12	13	10	18	340	17	28	29	140
10	10	10	10	10	200*	10	35	36	152
12	13	8	8	3	195	9 3/4	28	29	81
12	12	12	12	13	241*	12	57	60	450
14	14	11	7	14†	261	23	10	19	..
47	51	24	31	43	789	39 1/2	14	15	..
28	18	14	17	18	521	26 ‡	11	12	..
75	46	44	50	65	1,093	54 2/3	20	21	8
43	43	43	44	44	862*	43 1/10	29	31	423
55	55	49	43	59	1,063	53 1/7	11	11	..
134	105	90	94	134	2,214	110 3/4	26	28	741
20	21	21	39	36	625	31 1/4	16	17	..
22	20	21	16	28	560	28	19	20	..
18	8	12	17	18	391	19 1/2	18	19	..
24	24	24	25	25	482*	24 1/10	17	18	..
65	63	43	41	70	1,127	56 1/3	10	10	..
31	50	28	44	31	797	39 7/10	9	10	..
40	41	32	33	46	825	41 1/5	75	39	730
68	44	70	..	54	311	45 1/2	..	..	..
11	12	4	13	10	345	17 1/5	30	31	173
75	75	75	75	75	415§	75	27	104	1,659
4	6	11	12	11	158	7 9/10	98	103	619
6	6	6	6	5	70	3 1/2	666	7,000	2,263
8	8	8	8	8	160	8	129	136	877
1	1	1	1	2	21	1	41	41	20
8	8	8	8	8	160	8	172	18	1,228
7	6	7	6	7	46	6 1/2	33	100	174
2	2	2	2	2	33	1 2/3	196	209	295
..	..	..	..	..	1,670	..	..	109	7,029
1,555	1,352	1,200	1,239	1,434	27,471	..	..	..	23,199

‡ The return is only from 1839 to 1849, and the remainder is filled up according to the average.

§ The average since the opening only is given.

"We have generally 70 retorts at work in winter, and about 20 in summer. The holders are two of 33,238 cubic feet each, and one of 65,616 cubic feet. We have a very good storage. We use both D and oval retorts. We purify with dry lime. The consumption is by meter, universally, except the public lamps. The price is 5*s.* 10*d.* per 1000 cubic feet, subject to a discount varying from 2½ to 20 per cent., according to the quantity consumed. The price for the public lamps is 4*l.* 4*s.* The lamps and posts are the property of the company. We repair, cleanse, light, and extinguish, for that sum. The lamps are lit all the year every night, from an hour after sunset to an hour before sunrise. There are 449 public lamps in the city, and 167 in the hamlets. The latter are also paid for by the Commissioners. Part of Pockthorpe is not lighted. I do not know the reason why. There is a contract for two years between the company and the Commissioners. There is no obligation to lay mains and erect lamps on being required to do so by the Commissioners; but no difficulty has arisen, and the company have laid many miles of pipes, chiefly for public lamps. Before the last contract the price was 4*l.* 7*s.* 6*d.* per lamp. The burners are invariably bat-wings. The works are so constructed that we have no difficulty in getting the requisite pressure. Coals cost, at the works, on the average 17*s.* 4*d.* The *Pelaw Main Urpath* is the kind most used. Lime costs about 4*d.* per bushel. Coke is sold at 11*s.* to 12*s.* per chaldron. We have no means of disposing of the spent lime, but cart it away as rubbish. The farmers will not have it. We are compelled to evaporate the ammonia water. We have never attempted to use it for chemical purposes. We sell a portion of the tar at 1*d.* per gallon for coarse painting. It has not been used for making roads, only what I have used myself on the premises. The effect was very good. That was 17 or 18 years ago. It was a foot-road, is still in existence, and in very good repair. It is quite hard and firm. I am acquainted with the public footpaths laid down in Norwich, *called asphaltum*, they are not so. It was very indifferently done. A better road might be formed of gas-tar and gravel. It would make very good footways. I have used lime with it. The smell is gone from that I put down, but it remained a long time. If some means could be adopted of laying down concrete that would not be offensive, I should be prepared to sell the tar at 1*d.* per gallon. I did not boil the tar, but prepared the bed, poured the tar over, and then covered it with fine breeze to prevent it from adhering to the foot. I did not roll the breeze in. The gas-works are in good condition; but we are going to alter some of the old mains. We have very little corrosion inside the mains, but they are some of them too small, having been down nearly 30 years. There is a greater corrosion in the wrought-iron services than in the mains. We now use cast-iron 1½ inch pipes. There are no lead services, and never were. Three-quarter inch pipe costs 4½*d.* per foot, with a discount. One inch, about 8*d.*, with a similar discount. I cannot tell the exact amount of discount. I should never lay lead services; the iron are much cheaper, and there is no jointing. The company are about to erect a new gasholder that will contain 157,000 cubic feet."

I shall have again to allude to the evidence as to the use of gas-tar for pavements, and I have, therefore, only to remark here, upon

Mr. Tadman's evidence, that, considering the cost of coals, the citizens of Norwich have great reason to be satisfied with the company's prices for gas.

Local Acts of Parliament.—From an anxiety to avoid all unnecessary extension of this Report I can do little more than quote the titles of the numerous Local Acts of Parliament in force within the city and county.

12 Geo. I., c. 15, is "An Act for repairing the walls, gates, and other public works in the city of Norwich, and several bridges in and near the said city, and for amending the roads therein mentioned."

30 Geo. III., 1790, is "An Act for better supplying the city of Norwich, and the parts adjacent, with water."

46 Geo. III., c. 67, is "An Act for better paving, lighting, cleansing, watching, and otherwise improving the city of Norwich."

6 Geo. IV., c. 78, is "An Act for amending and enlarging an Act of His late Majesty, for better paving, lighting, cleansing, watching, and otherwise improving the city of Norwich."

Neither of these Acts extend to the hamlets constituting the county of the city, and consequently all the suburbs of the *town*, where the increments of the population, and formation of new streets require special attention, are excluded from the jurisdiction of the Acts.

1 Geo. IV., c. 11, is "An Act for lighting with gas the city of Norwich, and county of the same city."

7 Geo. IV., c. 66, is "An Act to alter, amend, and enlarge the powers of an Act of His present Majesty's reign, for lighting with gas the city of Norwich, and county of the same city."

1 and 2 Will. IV, passed 23 August, 1831, is "An Act for the better management of the poor in the several parishes and hamlets in the city of Norwich, and the county of the same city."

2 Victoria, Session 1839 is, "An Act to repeal so much of an Act passed in the 12th year of the reign of His Majesty King George the First, 'for repairing the walls, gates, and other public works in the city of Norwich, and several bridges in and near the said city, and for amending the roads therein mentioned,' as relates to the tolls and duties thereby authorized to be raised, and to provide a new mode of application thereof."

Since the date of the inquiry another Local Act of Parliament has passed, of the greatest importance to the city, and which was under the consideration of the legislature at the time of my visit to Norwich. It is intituled, "An Act for supplying the city of Norwich, and the neighbourhood thereof, with water," and received the Royal Assent on the 15th July, 1850.

After reciting that the city is not sufficiently supplied with water, the Act incorporates the General Acts with this, and defines the limits, so as to include all the county of the city, and the precincts of the cathedral. The amount of capital is declared to be 60,000*l.* in six thousand shares of ten pounds each. The company is empowered to borrow to the extent of 20,000*l.* The dividends are

limited to 6*l.* per centum. The source from whence the water is to be taken is specifically named as "the river Wensum, otherwise Wenson, opposite to and adjoining a certain meadow called Heigham common." The company are empowered to purchase by agreement the interest of the lessees of the Corporation in the existing water works. The rights of the Corporation as lessors of the existing works are not to be affected. The proprietors of existing works are enabled to sell and assign to the company, and the company to connect the existing works with the new works. The present *and substituted* pipes are, however, to revert to the lessors. The company are empowered to purchase, and the Corporation of Norwich to sell, with the approbation of the Treasury, the reversion in the existing water-works, on terms to be settled by arbitration in case no agreement be come to. The 45th Section enacts that, if the Public Health Act be applied to Norwich, and the company be required by the Local Board of Health to sell their works, and interest in the existing works, the company shall at, upon, or at any time within twelve months after the completion of the works, sell and convey to the Local Board, upon such terms as may be agreed upon, or as shall be fixed by arbitration, provided that if notice of purchase be given before the completion of the works, and if, after such notice, any authorized officer of the General Board of Health shall require any alteration to be made in the works by this Act authorized, or such of them as for the time being shall be unfinished, the said company shall make such alteration accordingly. Provided that the company shall not be required to do anything contrary to their Act, and in the event of the works being constructed as required by the said officer, the Local Board shall be bound to complete the purchase. The supply of water is to be constant after the period of five years. The company are to supply water when required by the Local Board, for any of the purposes mentioned in the Public Health Act, 1848, and upon such terms as, in case of difference, may be fixed and determined in the manner provided by the said Act. The 49th Section fixes the rates at which water is to be supplied. If there be no water-closet or bath in the dwelling-house, at the following rates:—

"Where the annual value of such house shall not amount to 5*l.*, at a rate not exceeding 4*s.* 4*d.* per annum; where the annual value of such dwelling-house shall be 5*l.*, and under 100*l.*, at a rate per centum per annum not exceeding 5*l.*; where the annual value of such dwelling-house shall be 100*l.* and upwards, at a rate per centum per annum not exceeding 4*l.* 10*s.*"

If there be a water-closet or water-closets, or bath or baths, in such dwelling-house, then, in addition to the rates above specified, the following rates shall be payable:—

"Where the annual value of such dwelling-house shall not amount

to 40*l.* per annum, the sum of 8*s.* for each water-closet or bath, and the further sum of 4*s.* for each additional water-closet or bath.

"Where the annual value of such dwelling-house shall be 40*l.* and under 100*l.*, the sum of 10*s.* for each water-closet or bath, and the further sum of 5*s.* for each additional water-closet or bath."

"Where the annual value of such dwelling-house shall be 100*l.* and upwards, the sum of 12*s.* for each water-closet or bath, and the further sum of 6*s.* for each additional water-closet or bath."

The apparatus is to be constructed so as to prevent waste of water or return of foul air into the pipes. Buildings used only partly as dwelling-houses are to be assessed for water-rate accordingly. Owners of houses not exceeding 8*l.* value are to be liable for water-rate. Domestic purposes are not to include water for baths, horses, cattle, washing of carriages, &c., or for any trade or business whatsoever. The rights of the Corporation, as conservators of the river, are not to be interfered with.

Recapitulation.—I have now endeavoured to perform that part of my duty to your Honourable Board, which has reference to the "sewerage, drainage, and supply of water" at present existing in the city of Norwich, and county of the same; the state of the burial-grounds; the number and sanitary condition of the inhabitants; the local Acts of Parliament in force within the city; the natural drainage areas, and the existing municipal and other boundaries;" and other matters, with respect to which I have deemed it expedient to report for the purposes of the Public Health Act.

The large space over which this report has extended renders it desirable that I should briefly recapitulate the principal facts proved.

The present water-supply is bad in quality, deficient in quantity, and obtained with difficulty; and whatever improvements might be made in these respects, this essential element to health and life would not be used so as to secure all the advantages attainable from a water-supply, without the exercise of greater powers than the legislature will confer upon any trading company.

A very large proportion of the streets are without any sewers; while some of those that have would be better without, few being deep enough to drain the basement of a building. The existing sewers have not been laid down on recognised principles of hydraulic construction, so as to secure efficient action with economy in cost. House-drainage does not exist in Norwich. The undrained state of the suburban meadow-land is calculated to be prejudicial to the health of the city. The river Wensum is a great source of disease.

The constructive character and ventilation of many of the dwellings of the poor, and the improper position and inadequate number of privies for their accommodation, tend much to depress

the health and morals of the same classes, who constitute the greater part of the inhabitants of Norwich.

The pavements of the public ways in some parts of the city, and generally in the hamlets, are defective. A very large number of streets are without any pavement, and the court-yards occupied by the poor are paved or unpaved, at the option of the owner.

The burial-grounds within the city are in a crowded state, and further interments of the dead in them would be incompatible with the health of the living.

The jurisdiction of the Paving Commission is defective, even within its limits, and a large proportion of the population is beyond the reach of the Paving Acts. In some instances several jurisdictions conflict with each other; and there is no local authority whatever, at present, capable of dealing effectually with the sanitary evils of the city and its hamlets, included within the county of Norwich.

Nuisances exist that cannot be removed without more extended powers; the surface-cleansing is very defective, and limited in extent; the sanitary condition of many of the public institutions of the city is very bad; there are no places of public recreation freely open to all the citizens; and, as a natural consequence of all the evils I have enumerated, there is a great amount of preventible disease and mortality, in a city that ought to be one of the most healthy places in the kingdom.

REMEDIES.

PUBLIC HEALTH ACT BENEFICIAL.—The legislature has provided the means of remedying such serious evils as have just been brought under review, by enacting that after due preliminary inquiry, the Corporation of the city, as a Local Board of Health, may be invested with adequate powers. The importance of the preliminary inquiry will, I trust, be manifest from the preceding part of this report, and also because it affords the means of adapting the provisional order for the application of the Act to the peculiar circumstances of the locality.

The Public Health Act will enable the Council, as Local Board of Health, to secure for each dwelling-house a PROPER supply of water, and, if necessary, to *require* that no house shall be without such a supply; to lay down a system of efficient drainage, not only for the public streets and places, but for the courts, houses, and other buildings of the city and suburbs, so that all offensive refuse can be conveyed away in underground channels; to arrange for the drainage of the suburban lands; to prevent the pollution of the river courses; to improve the character of the dwellings of the poor, and secure better ventilation of the houses, courts, and public thoroughfares; to regulate, by license and in-

spection, the lodging-houses for tramps; to extend and improve the pavements; to make such arrangements for future burials that the living may not be injured, and that the dead may rest in their graves; to provide places of public recreation; and to effect other similar improvements, all tending to raise the general standard of health, and to promote the comfort and well being of the inhabitants.

I cannot, therefore, doubt that the application of the Public Health Act will be highly beneficial to the city and county of Norwich.

I now proceed briefly to explain such of the above improvements as are of the nature of public works, and to state how they may be carried into effect in Norwich. Having shown the existence of sanitary evils, and having stated that such evils may be remedied under the Public Health Act, it is my duty to your Honourable Board to suggest specific remedies, and within the terms of the Act. I would have it clearly understood, however, by the Corporation, that I only suggest what appears according to my judgment best calculated to effect the objects in view; and that they will be under no obligation to carry any one of those suggestions into effect as having emanated from me, but only so far as such suggestions may appear the best adapted to what is required. Upon the Town Council, as Local Board of Health, will devolve the exceedingly great responsibility of improving the health and protecting the lives of between 60,000 and 70,000 human beings; and the specific character of the works to effect and secure this will depend upon their own wisdom, and the wisdom of those who may be called upon to advise in such important matters.

Water Supply.—I need not explain to your Honourable Board the qualifications pronounced by the Public Health Act to be necessary to a proper supply of water. It may, however, be proper to inform the inhabitants of Norwich, that by the 75th section the supply is to be *pure* and *wholesome* water, *constantly laid on*, at such *pressure* as will carry the same to the top story of the highest dwelling-house within the district supplied; and by the 76th section it is enacted,—

"That if upon the report of the surveyor, it appear to the Local Board of Health that any house is without a proper supply of water, and that such a supply of water can be furnished thereto *at a rate not exceeding* TWOPENCE PER WEEK, the said Local Board *shall* give notice to the occupier, requiring him, within a time to be specified therein, to obtain such supply, and to do all such works as may be necessary for that purpose."

In case of default, the Local Board may lay on the water, &c., and levy water-rates. Twopence per week is therefore the maximum rate that the Local Board can require any householder to pay for a constant supply of pure water under high pressure.

During the inquiry, two different schemes came before me for

giving a better supply. It will be my duty to state the nature of the proposals, although subsequent events have relieved me from the responsibility of reporting at present as to the source of supply, or the character of the works to be constructed. Important considerations remain as to the authority in whose hands the works should be, and the prices at which water should be supplied to the inhabitants, especially to the poor, who need water quite as much as the rich, are less able to pay for it, and yet constitute the mass of the population.

In the latter end of 1849 a company was formed, called the Norwich Union Waterworks Company, with a capital of 60,000*l.*, and power to borrow 20,000*l.*, to obtain water from the river Wensum, at Heigham Common, and after filtration, to pump it into a service reservoir at Lakenham. The works to be capable of affording 1,755,000 gallons daily, or 27 gallons for each inhabitant of the city and suburbs, the population being estimated at 65,000; the supply to be constant, and all houses under 5*l.* rack-rent to be supplied at one penny each per week, while those above 5*l.* to 100*l.*, were to be charged 5 per cent. on the rack-rent, and above 100*l.*, 4½ per cent. An additional charge of 8*s.*, 10*s.*, and 12*s.*, was included for water-closets; baths were to be paid for by agreement, and the consumers were to pay for service-pipes and taps, unless they wished the company to do it as provided in the Waterworks Clauses Act. The new company proposed to purchase the existing works, and to limit dividends to 7 per cent.

On the application of the company to Parliament, the Corporation of the city, as lessors of the existing works, and owners in reversion, and also as the guardians of the public interest, appeared as petitioners against the Bill, and the Committee of the House of Commons was, I believe, already nominated, when a petition, signed by not less than one-tenth of the rated inhabitants of the city and county of the same, was presented to your Honourable Board, praying for a preliminary inquiry, with a view to the application of the Public Health Act.

The inquiry was fixed, under the circumstances, as early as possible, and in consequence of a representation made by the Corporation, you addressed the Committee of the House, requesting them to reserve their decision on the preamble of the Bill until I had made my report. You also instructed me, should the Bill remain in abeyance, to report to you specially on the water supply, immediately after the close of the inquiry.

I was ignorant of any further proceedings until the opening of the inquiry at Norwich on the 16th day of May, when a minute from the short-hand writer's notes, was laid before me, from which it appears that on the 2nd May, Mr. Merewether, counsel for the Corporation, referred the Committee on the Bill to the letter from the General Board of Health, and that after some desultory con-

versation between the counsel on both sides, and consideration by the Committee,—

"The chairman stated that the Committee had decided to hear the evidence in proof of the preamble, but would perhaps reserve their decision on the point. He said it appeared to be understood on all hands that a further supply of water was required at Norwich. They were satisfied on that point. The question was where was it to be got from, and how was it to be supplied."

The next document put in was a copy of the proceedings of the Committee of the House of Commons on the 10th May, 1850, when Mr. Hope having replied on the whole case, the room was cleared, after which, counsel, agents, and parties were called in, and informed that the Committee had unanimously come to the following Resolutions:—

"That the preamble of the Bill was proved, and

"That in the event of the Corporation giving notice of purchase, and proceeding *bonâ fide* to carry out the same, such modification be made in the works as may be certified to be improvements by an authorized officer of the Board of Health, but the Committee must insist on the source of supply being taken from Heigham Common, as intended by the Bill."

The Bill might be said to have passed the Commons at the time of my inquiry at Norwich, and therefore without presuming to express an opinion as to the preamble, it became a matter of the greatest importance that if the Bill should pass into a law, such arrangements or modifications should be made as would enable the Corporation, as Local Board, to give full effect to the Public Health Act. In this, at least, I trust I have not been unsuccessful.

The Corporation retained Mr. Wicksteed, the engineer, to oppose the new company's Bill, and also to examine and report on the existing works at the New Mills, with a view to their extension, so as to give a larger supply of water, and of better quality, without the necessity of new works. Mr. Wicksteed was in Norwich, but confined by indisposition until the day on which he returned to town, which he did immediately after presenting the statement, (*Appendix* K.) His report is an important and valuable one, but I had no opportunity to ask him questions that would have elucidated some parts of it, and as the inquiry could only, according to the Public Health Act, be held publicly, I was precluded from further investigation with respect to it, without laying myself open to a charge of *ex parte* proceedings, in a matter where there was much difference of opinion in the city. Mr. Wicksteed's abrupt departure also gave Mr. Lynde, the engineer to the new Water-works Company an opportunity of animadverting upon his statement, without Mr. Wicksteed being able to make any replication. At the request of the new Water Company a copy of Mr. Wicksteed's paper was furnished to them,

and the letters in the margin were made by me to distinguish the paragraphs referred to by Mr. Lynde, in his evidence at the inquiry, *Appendix* L. Being convinced that the scale of rates in the company's Bill were too high, I had several times stated in Court, in the most forcible terms I could use, that under the Public Health Act, a tap could be placed in every house in the city constantly charged with pure water at a price not exceeding two pence per week, and for the cottages of the poor at one penny. Considerable dissatisfaction was also expressed by the Corporation, and some of the inhabitants, as to the rates proposed to be charged on the higher classes of buildings, and especially upon premises partly used for trading purposes. The following was put in:—

"*Statement of John Copeman, jun., grocer, of the parish of St. Peter Mancroft, to Wm. Lee, Esq.*

"SIR,

"I BEG to submit to you the injurious operation of the rating clauses of the new Bill on the trade of the city of Norwich, especially that portion of it which is assessed at high rentals in consequence of the commercial position of the premises assessed. I will state the case of myself, and three of my neighours:—

	£.
Copeman and Sons, grocers (my own firm), rated upon	210
Howlett, music seller*	140
Cundal, draper	120
Etheridge, silversmith	120
	£590

This at 4½ per cent, will be 26*l.* 11*s.*, which we shall have, (or be liable) to pay for water, in addition to the charges for water-closets. Our premises are chiefly used for business purposes, and we consume very little water for domestic purposes. Brewing and washing are not done at home. My own share of the above mentioned sum of 26*l.* 11*s.* is 9*l.* 9*s.*, with the additional charge for water-closets. I now pay 3*l.* 2*s.*, which includes everything.

"I now beg to call your attention to the following assessments:—

	£.
R. N. Bacon, Esq., rated upon . . .	60
George Durrant, Esq. ,, . . .	70
William Geary, Esq. ,, . . .	35
John Sultzer, Esq. ,, . . .	45
	£210

"The rate upon these gentlemen will amount to 10*l.* 10*s.* only, although they occupy four capital mansions, keeping commensurate establishments, and their consumption of water being three times as much as that of myself and brother tradesmen.

"The names of these gentlemen are selected to illustrate the partiality of the rating, not from any speciality in their respective cases, but simply from their connexion with the new company as directors.

"This specific evil has been slightly modified, by an exemption introduced by the Committee of the Commons, as to warehouses. The Chairman of the Committee proposed to exempt 'shops,' but the promoters objected.

"(Signed) JOHN COPEMAN, Jun."

The document referred to in Mr. Lynde's evidence (*Appendix* L.), and put in at the inquiry, shows, that under the Public Health Act, the company could supply water at much lower rates than under their own Act of Parliament merely. It is as follows:—

"*City of Norwich Water Works.*

"If the company are requested to furnish such a supply of water to every house as may be proper and sufficient for the purposes of the Public Health Act, and for private use, the limitation of their profits, named in the Bill, would cause their charges for the supply of water to dwelling-houses to be about five-eighths, perhaps as low as one-half of their maximum rates; it would bring about three-fourths of the houses within the operation of the 76th clause of that Act; and for houses under the annual value of 5*l.* the charge would be something less than 1*d.* per week, including the supply for water-closets; that they would be prepared to reduce their charges for water-closets to the smaller houses to the following rates.

"Where the annual value of such dwelling-house shall not amount to 10*l.* per annum, the sum of 2*s.* for each water-closet.

"Where the annual value of such dwelling-house shall not amount to 20*l.* per annum, the sum of 4*s.* for each water-closet, and the further sum of 2*s.* for each additional water closet.

"Where the annual value of such dwelling-house shall not amount to 30*l.* per annum, the sum of 6*s.* for each water-closet, and the further sum of 3*s.* for each additional water-closet.

"If any water-closet is used for more than one house, half the above rates to be charged for every house so using it.

"(Signed) JAMES G. LYNDE, Jun.,

"*Norwich, May* 22, 1850. *Engineer to the Company.*"

This statement, though not included in the Act of Parliament incorporating the company, would no doubt be taken to bind them, in any arbitration between the company and the local Board, under the provisions of the Public Health Act.

At the conclusion of Mr. Lynde's evidence, the town clerk made a verbal statement in which he pointed out that Mr. Lynde ought to have included 300*l.* per annum for exhaustion, because at the end of 42 years they would have to leave the New Mills works, which had cost them 26,000*l.* for the benefit of the Council. All this would be lost to the company if the Corporation should refuse to sell the reversion. Referring to the covenants of the lease, and the 36th section of the new company's Act, they

would be placed in a very disadvantageous position. A reversion in the Corporation, with the contingency of their being hostile, does appear under the circumstances to require some pecuniary provision. As an engineering question, the reversion is of considerable value, and may, whether purchased by the company, or not, affect the price of water to the consumer. The Corporation can refuse to sell, but the company cannot refuse to purchase. There is very much more hangs upon this question than is at first sight apparent, or than it will be necessary for me to state. The town clerk went on to say:—

"My object in calling the Inspector's attention to this subject, is to show how much better it is that the supply of water, independent of the question of its being necessarily adjunct to the sewerage, should be vested in the Local Board of Health, because the Corporation are the owners of the existing works, and at the end of the term of the lease, those works, and all the improvements, will become the sole property of the town."

The town clerk urged as another reason why the water supply should be in the hands of the Corporation, that the company were confined to Heigham Common as their source, and that the extension of the city might cause the water there to become polluted in the same manner as was now alleged of the water at the New Mills, in which case the company would have no power to go higher up the stream, while the Corporation, as conservators of the river would have such power. He also pointed out other objections to the company's Bill, and said that it confirmed, and made the company liable as purchasers to all the covenants, &c. of the lease, under one of which, the corporation could compel them to supply the city of Norwich with water from the New Mills works, while another clause of the same Bill required them to go to Heigham Common; and also, that as lessees, they would be bound by the scale of rates fixed under the lease, which were lower than the scale in their Bill. That under such a state of things, nothing but confusion would arise, and that all the difficulties to which he had referred, might be avoided under the Public Health Act.

Mr. Dalrymple, the solicitor to the company, disputed some of the conclusions of the town clerk, and said that, under the old Water Act, the power to remove nuisances from the river only extended 600 yards above the New Mills, and that, even as conservators of the river, the jurisdiction of the Corporation did not extend so far as that of the new company. He fully concurred with Mr. Staff the Town Clerk as to the necessity for the application of the Public Health Act, but contended that Heigham Common, as a source of supply, was not so liable to contamination as the New Mills, and that the new company had full power, under the Water Works Clauses Act, to remove every nuisance. He referred to the 43rd and 49th clauses to show that the com-

pany would not be under the restrictions in the lease named by Mr. Staff.

On the 13th June I received the document *Appendix* M, being an "Answer to the Report of the Corporation Committee to the Inspector, under the Public Health Act." I immediately wrote to Mr. Lynde, the engineer, stating that I was only able to thank him because the envelope said it was "with Mr. Lynde's compliments;"—and that I had better be informed if it was the answer of the company he represented. In reply to which I received the following:—

"DEAR SIR, "37 *Great George-street, Westminster,*
"14*th June* 1850.

"As the answer to the Report of the Corporation Committee did not emanate from me, although I was cognizant of its contents, I did not attach my name to it. It should have been signed by the solicitors, and I expected it would have been so. I have no hesitation in stating that it is what it purports to be; *viz.*, the answer of the city of Norwich Water Works Company, which I represent.

"I am, my dear Sir,
"Yours very truly,
"*W. Lee, Esq.*" "JAMES G. LYNDE, JUN."

I have been exceedingly anxious to avoid even the appearance of partiality, and therefore if the extensive oral and documentary evidence should appear tedious, I trust that the importance of a proper water-supply for 65,000 persons will excuse me; and your Honourable Board will recollect that my inquiry took place in the midst of a parliamentary struggle in which very many of the most influential citizens of Norwich took one side or the other. I have already said that the promoters obtained their bill. I carefully inspected the site of the proposed works, examined the plans, and have gone through all the estimates. I should have preferred water softer than 16 degrees, and I spent some time in searching for a collecting ground from whence a supply of land drainage water could have been obtained, before it had taken up so much lime in solution, but my examination was without success. I am fully convinced, therefore, that a better site than Heigham Common could not, for present purposes, have been selected, and, that the proposed works will be capable of furnishing to the whole of the inhabitants a constant supply of pure and wholesome water, under such pressure as will carry the same to the top story of the highest building in the district to be supplied.

At the same time, the whole of the proceedings have confirmed the opinion that, for unity of action in the water-supply, drainage, surface cleansing, &c., of the town, the works ought to be in the hands of the Council, as the Local Board of Health. I do not think that a trading company, having to divide profits, could supply water much cheaper than the terms set forth in the proposal hereinbefore given by the company, but where the local

administrative authority of a great city is willing to undertake a service so legitimately within their province, as Local Board, under the Public Health Act, no person or persons whatsoever ought to derive any profit from the supply of an essential element of health and life. I am able to say, that, with the powers of the Public Health Act, the Town Council as the Local Board could place a tap in every house in Norwich, without any extra charge for water-closets, at *one penny per week* for cottages, *one penny halfpenny per week* for houses from eight to fifteen pounds rental, and *two pence per week* for houses above fifteen pounds ;—additional services for dressing-rooms, baths, &c., in the large houses, being paid for extra at proportionate rates ;—and, at the end of 30 years, the whole of the capital, being repaid by equal annual instalments of principal and interest, the charge for water would only need to be sufficient to cover the working expenses, and a sinking fund for dilapidations. Without expressing here any opinion as to the proposal to disinfect the sewage, I beg to direct the attention of the Board to the latter part of Mr. Wicksteed's statement, *Appendix* K, showing the propriety of the water and sewerage being under the direction of one governing body, and the pecuniary advantages that would result to the city.

I cannot say in too strong terms that I think the Town Council should give notice of purchase as early as possible, in order that the distributory apparatus may be fully adapted to a system of efficient drainage, under one and the same management.

Improved Drainage of the City.—I need not discuss the necessity of proper drainage in the city. The desirableness of this is now scarcely disputed by any person of sound mind. Without systematic drainage it is impossible to remove the decomposing refuse and to prevent disease, and without it I should even doubt the advantages of an abundant supply of water. The two are as intimately connected as the venous and arterial systems in the physiology of our bodies. I shall proceed, therefore, to describe, as clearly as I can, without special plans and sections, the mode in which Norwich may be effectually drained, and at what cost to the inhabitants.

During the inquiry I inspected the valley of the Yare below its confluence with the Wensum, and I found an immense area to which the sewage of the city could be applied with advantage in a liquid state ; but the evidence as to tillage proving that heretofore liquid manures had not been sufficiently appreciated, I was convinced of the necessity of providing an outfall that should serve either for its application as liquid manure to the agricultural land, or for the precipitation and disinfection of its fertilizing properties, or for its discharge into the river without the possibility of creating a nuisance to the city. Such an outfall, I have no doubt, might be obtained in Trowse Marsh, at the angle below Whitlingham Whitehouse ; but if this should, on more careful

examination than it was in my power to give in a merely preliminary inquiry, be found too near the city, an excellent outlet could be obtained at The Woods End, south of Kirby Marsh, two miles further down the river. In order that my estimate for drainage should be free from all sanitary objection, and on a liberal scale, therefore I have provisionally adopted the latter locality. From thence a main sewer of well-constructed brickwork would be brought up the valley, nearly parallel with the river, and along King-street to Tombland, where it would receive the sewage of the city from converging drains. I drew the attention of Mr. Lynde to this part of the subject in his evidence, *Appendix* L., and found that he coincided with me in opinion. I should carefully avoid allowing the high level drainage to descend into the valley of the Wensum before it reached the mouth of the main sewer; but should conduct it obliquely along the sides of the valley, so as to obtain the greatest and most equal fall to the main. I would then collect the drainage of the low land by earthenware pipes as near as possible to the margin of the Wensum on each side, and raise this in the vicinity of Tombland to the level of the main sewer by engine power. By thus separating all the high level drainage, not more than about one-eighth would require artificial power for its discharge, as the main sewer would have a sufficient natural inclination. No nuisance need be apprehended from the pumping operation in the vicinity of Tombland as the whole can be made perfectly inoffensive, except the ordinary smoke of the engine chimney. The main sewer would have to pass under the bed of the Yare near its confluence with the Wensum; to prevent leakage, and also for facility in the laying down and connecting it, I should use an iron tube. Some of the parishes on the north side of the river Wensum, as St. Martin-at-Oak, St. Mary, St. Michael Coslany, and St. George-at-Colegate, would have to be drained at the lower level, and the sewage passed under the river near Fyebridge. The conduit under the water here also should be an iron pipe. Almost the whole of the remainder of the public and private drains in the city would be earthenware pipes.

It would be an unnecessary waste of money to make provision for underground conveyance of all the rain-water falling on the streets and public places, because that would only increase the size and cost of the drains, dilute the sewage, and render it less valuable for agricultural purposes, and, with respect to the lower level, would very much increase the expense of pumping. By the systematic separation of all the offensive part of the sewage, the rain-water of the streets could be conveyed in such drains as already exist, with trifling improvements in the present junctions, which are right-angled, and with such additions as circumstances would require, the whole could be conducted directly to the river, without any noxious result to the stream.

The street drain-pipes would commence with diameters of about 6 inches, in the suburbs, gradually increasing as they converged to the main sewer, where they would be 10 or 12 inches diameter, according to the area drained. All the refuse of the houses and other buildings, capable of being removed by the action of water, —the soil from all water-closets and improved privies,—the roof-water of buildings,—and the surface-drainage of courts and private premises, should be conducted into these sanitary drains by pipes of 3 and 4 inches diameter, every inlet, except the roof-pipes, being securely trapped.

Many parts of the city would be drained with a great saving of cost by a system of back drainage such as I have illustrated by the accompanying plans; on examination of which it will be at once seen that all the branch communications are very much shorter, and the interference with the fabric of the buildings less, than by direct connection of each with the public drain. The saving in cost would be above one-third, and the same fall being obtained with shorter drains, the efficiency will be proportionately increased.

Proper plans and other data might probably enable me to reduce the following estimate; but in the absence of such necessary information I am only able to approximate to the cost of the whole system of drainage complete. I have omitted the service-drains from stables, dye-houses, factories, &c.; but, on the other hand, the income I have assumed from the same is so small as to leave abundant margin, all the public part of the system being already provided, and the connections only wanting. With such reservations I have no doubt that the following, in which I have included the additional two miles of main from Trowse Marsh to the Woods End, would cover the whole cost of construction.

ESTIMATE FOR DRAINAGE.

	£.	*s.*	*d.*
Main sewer from Trowse Marsh to Tombland	5,280	0	0
Main sewer, if necessary, from the Woods End to Trowse Marsh	3,520	0	0
Iron tube under the river Yare, and laying .	100	0	0
Iron pipe for low level under the Wensum .	40	0	0
Land at pumping station	150	0	0
Steam engines, pumps, and boilers . .	1,500	0	0
Engine-house, boiler-house, and well .	1,000	0	0
Street drains	14,666	13	4
Earthenware, house, court, and closet drains	28,875	0	0
	55,141	13	4

NATURE OF RATES AND DISTRIBUTION OF CHARGES.—In the above estimate I have included all charges in the same class; but in

the practical operation of the Public Health Act, the amount would have to appear under several specific forms. The legislature has carefully provided in the Act for an equitable distribution of any rate over such property only as may be benefited by that rate. For purposes of management, salaries, office expenses, &c., in which the whole district will participate, the expenses would have to be defrayed by a "general district rate." For water supply only the property supplied with water can be charged. The same for town drainage, "a special district rate" must be levied for the public drains upon the district benefited by them. Any house or building beyond the reach of such drains, and all agricultural land, would be exempt from the special district rate, but if any town drain were made subservient to the drainage of any lands, then, the land benefited, and it only, would be rateable to the extent of the advantage derived. The water services, and house and court drains, being upon private property, would be liable to "Private Improvement Rates," in which each property would pay for its own improvements, but no man could be called upon to pay for that which benefited his neighbour's property, but was not required for his own. I think it will, therefore, be clearly understood, that, under the Public Health Act, no charge can be made without benefit derived; and, that the charges can only be co-extensive with the improvements effected.

By another equitable arrangement of the Public Health Act, the Local Board may, with the consent of the General Board of Health, borrow the money for these public and private works and improvements, on security of the rates, and repay the same by equal annual instalments of principal and interest, in a period not exceeding 30 years. At the time of the inquiry an objection was made to this provision, that the present generation ought not to be called upon to pay for posterity; to which I replied, that the security was such that the money would be obtained at a low rate of interest; that the improvements would be immediate and permanent, and of such a nature that the present possessor of the property would have the enjoyment of them, and that no reasonable man would object to receive a pecuniary advantage on the ground that he would at the same time benefit his immediate descendants; especially when it was considered that the works being executed by a public body and from public funds, no person could derive any profits from their construction except the owners and occupiers of property. It would be unjust that the present owners and occupiers should enjoy the advantages of these improvements, and leave the whole of the repayment to others. So on the other hand, it would be inequitable that persons with limited incomes from house property, or with only a life estate; or mortgagees in possession, who can perhaps scarcely obtain interest for their capital invested, should be called upon to pay at once for improvements that will be equally enjoyed by their

successors in possession. I submit, therefore, that the distribution of charges for permanent improvements over a term of years is one of the most equitable arrangements of the Public Health Act.

To apply this provision in gross, to the case under consideration, I find that the annual instalment of principal and interest to repay 55,141*l.* 13*s.* 4*d.* in 30 years would be 3,262*l.* 11*s.* 5*d.*, and, therefore, the annual amount to be raised in "Special District Rates" and "Private Improvement Rates," for drainage would be about as follows:—

ANNUAL EXPENSES FOR DRAINAGE.

	£.	*s.*	*d.*
Instalments to repay 55,141*l.* 13*s.* 4*d.* in 30 years	3,262	11	5
Engine worker, stoker, and labourer	156	0	0
Wear and tear and depreciation of engines . .	70	0	0
Coals	254	18	6
	£ 3,743	9	11

The means of raising this amount are very easy, and such as the poorest inhabitant of Norwich would scarcely feel, irrespective of any saving from the improved health of families, and of increased ability and energy for labour, which must follow the effectual removal of many causes of disease from the vicinity of the dwellings of the people.

It would be unfair that the poor man's cottage should be charged as much for drainage as the mansion of the wealthy citizen, and I should have no difficulty in showing that the houses of not more than 8*l.* annual rateable value, namely, *three fourths of all the dwellings in the city and suburbs, can be effectually drained at a charge of not more than three farthings each per week.* I think it best, however, at present simply to adduce the following:—

ESTIMATED INCOME FOR DRAINAGE.

	£.	*s.*	*d.*
16,500 at 1*d.* each per week, or 4*s.* 4*d.* per annum	3,575	0	0
Inns, stables, factories, &c.	200	0	0
	£ 3,775	0	0

This statement leaves a surplus in favour of the public, and it must be borne in mind that they now pay to the Paving Commissioners for drainage, which they would no longer have to do; that the extension of the city would tend to reduce the rates, and that after 30 years had elapsed, the only charge remaining would be for the working expenses.

IMPROVED LAND DRAINAGE.—I shall offer but few remarks on this head, in addition to the evidence in the former part of this report. There can be no doubt that the drainage of the meadows bordering on the Wensum would improve the health of the city,

by drying the atmosphere, and would also increase the value of the land at the same time. Under these circumstances, the Local Board of Health would have power to arrange for, and execute such drainage, and the owners or occupiers would enjoy the privilege already described, of having the cost distributed over a term of years, so that if the drainage were to cost, say 5*l.* per acre, the farmer, instead of having that sum to pay at once, would be called upon for an annual "Private Improvement Rate," of about 6*s.* per acre, and if he should remove from the land before the expiration of the term, his successor, who would derive the advantage of the improvement, would have to pay the remaining annual instalments.

The following suggestion may at first sight appear chimerical, but I have no hesitation in saying that between the New Mills and the Hellesdon mills the meadow land could well afford to pay thrice the compensation that would be necessary to the Corporation, if they were to lower the head of water at the New Mills about two feet. I would even venture to add that if the New Mills' dam were taken away altogether, the increased scouring action along the devious course of the Wensum through the city, and the improved state of the meadows above, would very much contribute to the health of the inhabitants. As I have already stated, these are but suggestions thrown out for consideration; they are, however, on topics that have an intimate bearing upon the sanitary condition of the inhabitants.

Sewage Distribution.—In this preliminary report I shall not enter at large upon the question of sewage distribution, but I should not discharge my duty either to your Honourable Board, or to the citizens of Norwich, if I were to omit the subject altogether. The excreta of the town contain all the elements of food, and as food, whether animal or vegetable, is derived from the land, it is in the economy of nature that the land must be sustained by the elements of that food, in order to continue its fertility. The experience of the last few years has proved that these elements in solution and suspension in water, are most easily assimilated by plants, and that for green crops and horticultural produce, no manure is equal to it. Its value has been set forth in various ways: chemists have stated, from analyses, that its fertilizing properties are worth 20*s.* for each individual of the population; other scientific men have calculated that, if systematically applied, it ought to produce a revenue equal to the gross amount of local taxation in the place. The immense rental obtained for land to which it has been applied—20*l.* to 40*l.* per acre—as in the case of the Edinburgh meadows, is another mode of estimating its value. Again, the weight of the crops is adduced, amounting to from 10 to 12 heavy crops of grass in a year, and in one instance it is stated that 100 tons of green food has been cut within twelve months from an acre of land. If space permitted, I

could name many instances that have come under my own observation, showing its wonderful fertilizing powers. At Newcastle-under-Lyme some fields are irrigated with the water of a brook into which one of the sewers empties, and I found men mowing a heavy crop of grass in the month of October; and at Ashby-de-la-Zouch, a brook which receives part of the drainage of the town has been for many years used to irrigate 40 acres of land belonging to the Dowager Marchioness of Hastings. On my inquiry at that town, when speaking of the necessity of keeping the drainage of the town from the brook, I was informed by John Mammatt, Esq., the agent to the Marquis of Hastings, that they could not take less than 100*l.* per annum as compensation for the abstraction of the sewage from those 40 acres of land. There cannot be a doubt, therefore, that the sewage of Norwich has an enormous money value for agriculture, or that ultimately the city must derive a large revenue from its application. The sewers should be laid down in the way best adapted to improve the health of the town, and this can be effectually accomplished consistently with the profitable application of the sewage manure, as soon as the farmers become sufficiently alive to its great value as a fertilizer. The outlet at the Woods End would be a very favourable locality for an establishment for the precipitation of the fertilizing salts, and being on the margin of a navigable river like the Yare, it could be easily transported so as to obtain an extensive market. In a liquid or solid form, or both, there is great facility for the disposal of the sewage of the city.

Improvements in the Pavements of the City, and Reparation of the Roads in the Hamlets.—I think the powers of the Paving Commissioners should be transferred to the Local Board of Health, and the Acts from which they derive their authority extended, so as to include the whole county of the city. The Public Health Act would enable the Corporation, as Local Board of Health, to deal with all those roads about which there has been so much disputing, not only within the city, but beyond the walls, as well as the very numerous roads used by the public in the new suburbs, but never repaired at all. The court-yards occupied by the poor are not generally paved, and even where pavement exists, it is of an inferior kind, and often in a dilapidated condition. Over these also, as exercising a baneful effect upon the health of the inhabitants, the Local Board would have sufficient jurisdiction to bring about the necessary alterations as private improvements.

The evidence of Mr. Tadman shows, that the public foot-paths, laid down as asphaltum, were a failure, owing to the improper way in which the work was executed. I have been instrumental in laying down large quantities of a concrete of gas-tar and sand or ashes, with a small admixture of lime, and I can say that after years of wearing, in busy public thoroughfares, it has continued a

smooth impervious pavement. It can be laid down very cheaply for private court-yards, and I should recommend its general adoption for such purpose. The ground should be previously prepared and levelled, and the concrete laid about 3 inches thick, upon a bed of hard materials, and afterward rolled with a heavy roller. In this manner it can be laid down complete at one shilling per square yard, and if it be supposed to last 15 years, and the large quantity of 20 square yards of court be taken for each house, which I am sorry to say is greatly above the average, still the whole charge, according to the principle of distribution described, would not exceed *one halfpenny per week per house.*

Improved Surface Cleansing.—Having hypothetically obtained a constant supply of water under pressure, with hydrants or fire-plugs at convenient intervals in the streets; also, a complete system of underground drainage, with proper pavement of all streets and public places; and smooth impervious concrete in the court-yards, the whole surface of the town may be washed and made perfectly clean with hose-pipe and jets of water, at a price not exceeding *one halfpenny per week for a cottage house.*

Extramural Interments.—In addition to the Rosary Burial-ground, already existing as a public cemetery, my attention was directed to a site behind the Barracks in Pockthorpe; and a letter from the Honourable and very Rev. the Dean to Samuel Bignold, Esq., late Mayor, was placed in my hands. The following is a copy:—

"*Intramural Burials.*

"The Worshipful Samuel Bignold, Esq., Mayor of Norwich.

"Mr. Mayor,

"Distinguished as your year of office has been for beneficial public undertakings there is still an object of great practical utility, which existing circumstances force prominently into notice, and which, therefore, I anxiously desire to see commenced before that year shall have expired. I allude to the subject of extramural sepulture, the necessity for which is no where more urgent than in our ancient city. It requires, indeed, only a passing inspection of our noble churches, occupying nearly the whole dimensions of their scanty cemeteries, to convince any reasonable man of this fact. Nor is the disproportionate size of our present churchyards the chief evil, for they are so elevated by successive interments that, in many instances our departed fellow citizens must of necessity, sleep their last sleep in beds raised above the level of the adjacent land, so that in fact, there is nothing but a crumbling wall between the living passengers in our streets and the mouldering relics of mortality accumulated around our churches. I am the more anxious to direct general attention to this evil because I believe there is no other city in the kingdom where a remedy for it could so readily be found. At the back of the Barracks, and in immediate contact both with the northern and the eastern exits from Norwich, there lies a large uncultivated district, now treated as a waste by the poor of the hamlet of Pockthorpe, part of which is admirably calculated to form a general cemetery for all the parishes in

Norwich. In space it is more than ample; it is accessable by the Bishop's-bridge and Pockthorpe; and whilst close to the most densely inhabited parishes of the city it is not far distant from any of the others. It requires little or no drainage. Though useless for cultivation it is well adapted for sepulture, and being fringed by an amphitheatre of hills, and varied with numerous undulations it might speedily be converted by judicious planting, into one of the chief ornaments of the city. There is another, and that an unusual advantage attaching to this tract of land, namely, that the public may now obtain it, for the purpose I have mentioned without submitting to the disagreeable process of paying for it. For notwithstanding this waste is by some erroneously regarded as appertaining to Pockthorpe, every professional man, who has been consulted, agrees with the Hon. and Learned Baronet, who presides as steward over our Manor Courts, that the real right to the property indisputably belongs to the Dean and Chapter of Norwich, and, although my reverend brethren and myself have hitherto felt reluctant to enforce a right under such circumstances, for our personal advantage, the case becomes entirely altered when the exercise of a lawful claim tends to an important public benefit. I am authorized, therefore, to suggest through you, Sir, to our common city, the acquirement without purchase of such a portion of our waste land in the vicinity of Norwich as, when enclosed and otherwise prepared and consecrated, will supply a spacious and separate burial ground for every parish in Norwich that may enter into the measure. The Act 9 and 10 Vic., c. 68, contains ample provision for such an arrangement. Under that statute the plan has been successfully carried out and is now in full operation at Cambridge and Oxford. In those instances, however, very large sums were given for the sites, which after all are greatly inferior, as regards space, appearance and convenience, to the one which is now offered by us gratuitously. Notwithstanding this advantage, however, my plan cannot be effected without considerable expense, which I propose should be defrayed by a public subscription. The ground must be enclosed by a substantial wall, a chapel adapted to the solemn service that will be recited within it must eventually be erected; a cottage will be required for the guardian of the cemetery; and I am anxious also to provide for the poor of Pockthorpe some real and substantial benefit in exchange for the scanty and predatory advantage they now derive from a soil which in reality is not their own. This return I should wish to be effected through the permanent endowment of the national school in Pockthorpe, which should be conducted in the best possible manner, and be accessible without charge to the children of all the poor inhabitants of that hamlet. These, however, and other similar details, are better suited for the consideration of a committee than for public discussion. At Cambridge, I am informed, they furnished occupation to a committee during numerous sittings, which terminated in the satisfactory adjustment of all claims, and the removal of every difficulty, and I entertain but little doubt that equal success would attend a similar attempt in this city, if you, Sir, would convene a meeting for the purpose of taking this, my proposal, into consideration, and appointing a committee to carry it, if accepted, into effect.

"I have the honour to remain, dear Sir,

"*Deanery, Norwich,*
Oct. 23, 1849.

"Your most faithful and obedient servant,

GEORGE PELLEW.

I visited the locality in company with the Dean and Mr. Bignold, and must say, that I never saw a finer site for the purpose. It is at present a barren waste, as described in the Dean's letter, on steeply rising ground, but with a sufficiently good access in two directions, and is at a short distance from houses, without the probability of any houses being erected in the vicinity. The soil is sandy and quite dry. I should think water would not be found at 50 feet deep. The whole surface forms hills and hollows, as if it had been at some former time turned over, and thrown up into large heaps. At a comparatively small expense in laying out and planting it might be formed into a cemetery sufficiently large to serve all the city of Norwich for ages to come, and for beauty of situation, and appropriateness of character, it would be unequalled by any cemetery I have ever seen.

The Dean, who appears to have taken so proper a view of the subject, also forwarded to me the following minute of the Dean and Chapter on the subject :—

"ORDER BOOK.

"*Dean and Chapter of Norwich, December 4th*, 1849.

"GENERAL CHAPTER.

"Agreed to offer to the city of Norwich such a portion of the waste land in Pockthorpe, the property of the Dean and Chapter, as may be required for an additional burial-ground for the respective parishes in the said city."

I am bound to say, that the situation of the Rosary cemetery is very beautiful, and the greater portion of the ground yet unoccupied, as will appear by the table in the earlier part of this report. I must also call attention to the facilities for enlarging it, but I must likewise add that no part of it is now consecrated.

There can be no sufficient reason therefore for keeping open the crowded burial-grounds of the city longer than is required to make the necessary arrangements.

It is not my province to enter into any adjustment as to fees, or compensation to the incumbents of the numerous parishes, but it would be easy to apportion the duty of performing the burial service by weeks or months in rotation, and to divide the fees, either according to the number of interments attended by each incumbent, or according to a scale, proportionate to the average burials in each of the churchyards for a series of years past.

PLACES OF RECREATION AND PUBLIC WALKS.—I believe no place of this kind exists in the vicinity of Norwich, and I can scarcely conceive a finer locality for the pupose than the continuation northward of the same waste land I have just described, including Mousehold Heath. It is at a great altitude above the city, and there is ample level space for cricket and other athletic games, and also for the formation of a public park, with all the

undulation that would ensure an ever varying and picturesque beauty to the walks and promenades. With all these great advantages it would be little more than a mile from the centre of the city.

PUBLIC BATHS AND WASHHOUSES.—In all the large towns where baths and washhouses for the poor have been established, so far as my experience and knowledge extends, they have proved to be self-supporting, and I know not why Norwich should be an exception. The example of Mr. Sultzer's experimental establishment is such as to encourage the authorities of the city to make more commodious arrangements for the enjoyment by the poor inhabitants of one of the very few luxuries that can be said to be highly conducive to health. The machinery and apparatus of the bath for the poor has its fitting accompaniment in the public washhouse. The enjoyment arising from cleanliness of the skin is enhanced by everything that facilitates the cleanliness of clothing. I should therefore strongly recommend the establishment of at least one such institution in Norwich.

CONSOLIDATION OF JURISDICTION.—It is scarcely needful for me to say, after what has already appeared herein, that I think the water supply, drainage, paving, lighting, cleansing, and all other matters of local government affecting the health and comfort of the citizens should be consolidated, and vested in the Town Council, who should be the Local Board under the Public Health Act.

CONCLUSIONS AND RECOMMENDATIONS.

It now only remains for me to lay before your Honourable Board the conclusions to which I have come upon the whole of this inquiry, and the recommendations I have to urge thereupon for your consideration :—

I. That epidemic disease is now prevalent in Norwich, and that there is a great amount of preventible sickness and mortality.

II. That the sanitary condition of Norwich has deteriorated within the last few years ; and that this has been owing to indigenous local disease, the deaths from cholera during the last year having been comparatively few.

III. That the present local arrangements having reference to health are exceedingly defective.

IV. That the physical condition, the geographical position, and the geological character of the district are all favourable to the health of the inhabitants.

V. That the city would be much improved by the drainage of the meadow land in the valley of the Wensum, contiguous to the city, and in the county of the same.

VI. That the construction of many of the cottages is very defective ; that the privies and appurtenances of the houses are frequently improper in construction and position ; defi-

cient in number; without drainage, and very offensive and injurious.

VII. That the ventilation of many of the streets, courts, and houses is bad, and the condition of the lodging-houses such as to imperatively require the regulations provided in the Public Health Act.

VIII. That many of the public institutions of the city are in a very bad sanitary condition.

IX. That the health of the city and county of the same would be much improved—

a. By an abundant supply of pure water carried into every house.

b. By efficient drainage of the courts, houses, and other buildings, the remodelling of privies with soil-pan apparatus, and the construction of additional privies where necessary.

c. By improved pavement of the streets and courts.

d. By improved surface cleansing.

X. That the above objects may be probably accomplished at the following rates per week for a cottage house:—

a. A constant supply of pure water, with a tap in the house, *at one penny*.

b. A system of complete drainage, with the use of soil-pan apparatus, at less than *one penny*.

c. Improved pavement of courts, &c. at one *halfpenny*.

d. Public cleansing of the whole surface of the town by hose and jets of water at *one halfpenny*.

XI. That the city would be greatly improved by further widening of the existing public thoroughfares, and by the formation of additional thoroughfares.

XII. That the numerous burial-grounds in the city ought to be legally closed, and proper arrangements, made without delay, for interments in a suburban cemetery.

XIII. That the sewage of the city may be applied to the agricultural land so as to produce a large public revenue.

XIV. That the establishment of places of public recreation would be highly beneficial to the inhabitants.

XV. That public baths and washhouses would be a great boon to the poor.

XVI. That a consolidation of existing local jurisdiction is exceedingly desirable, both for economy and efficiency.

XVII. That the Local Acts of Parliament for paving, &c. contain many provisions which it is desirable should be continued, and extended to the hamlets.

XVIII. That the application of the Public Health Act would be of great advantage to the inhabitants.

WHEREUPON I RECOMMEND:—

1. That the Public Health Act, 1848, except the section

numbered 50 in the copies of that Act printed by Her Majesty's printers, should be applied to the city of Norwich and the county of the same.

2. That the whole of such powers as are given by the Acts hereinbefore recited, for paving, lighting, cleansing, improving, and regulating the city of Norwich, and are not inconsistent with the provisions of the Public Health Act, shall be invested exclusively in the Town Council of Norwich, as the Local Board of Health, that such powers be extended so as to include the whole of the county of Norwich, but that such powers as may be given by the said Acts, and are inconsistent with the Public Health Act, should be repealed.

3. That the other Local Acts of Parliament in force within the said city and hamlets should remain unaltered.

I have the honour to be,
My Lords and Gentlemen,
Your very obedient servant,

WILLIAM LEE,
Superintending Inspector.

The General Board of Health, &c. &c.

APPENDIX A.

REPORT OF THE COMMITTEE OF THE CORPORATION.

THE Committee appointed by the Corporation of Norwich to attend the Superintending Inspector on the inquiry into the sanitary condition of the city and county of Norwich, with a view to the application of the Health of Towns Act, 1848, beg to state the objects of the Corporation in promoting this measure.

The city and county of Norwich comprises an area of about 14 miles in circumference.

There are, within the walls of the city, exclusive of the precincts of the Cathedral and of the Bishop's Palace, 34 parishes, parts of some of which extend without the walls into the county; and without the walls in the county of the city of Norwich, are eight hamlets and a district called the Town Close. A very large proportion of the land within the hamlets is occupied for agricultural purposes, or as market gardens, but within the last forty years a vast number of houses have been erected in the vicinity of the city.

The general government of the city and county is vested in the Municipal Council consisting of sixteen alderman and 48 councillors.

The 34 parishes within the walls are subject to the jurisdiction of certain commissioners, appointed under the provisions of an Act of Parliament, for paving, lighting, cleansing, and otherwise improving the city of Norwich. There are, however, certain roads and unpaved places in the city to which the jurisdiction of these commissioners is held not to extend, and that the roads and places in question ought to be maintained in repair either by the surveyors of the highways of the respective parishes in which they are situate, or out of a fund belonging

to the Corporation, called the tonnage revenues. The consequence of these disputed liabilities is, that those roads and places are either very inefficiently repaired, or not repaired at all, and are generally without any adequate drainage.

At the time the Paving Act passed, which was nearly 50 years since, there were comparatively very few houses in the hamlets, which, it is presumed, was the reason they were not included in the Act.

The precincts of the Cathedral and of the Bishop's Palace, lying surrounded by the city, are not within the jurisdiction of the paving commissioners.

Whole streets of houses in the hamlets are without any water supply, except from wells sunk for the use of the inhabitants, and there are no sewers in the streets, the drainage being into cesspools or dead wells.

With these separate and conflicting jurisdictions it is impossible that any efficient system of drainage can be carried out, or any proper supply of water introduced, it is therefore become essential that the management of the sewerage and water-supply for the city and county of Norwich, and of maintaining in repair the streets and roads, should be vested in one governing body.

The present water-supply, exclusive of that derived from upwards of 1,000 public and private wells, is from the water-works at the New Mills, these works are the property of the Corporation, who are empowered by Act of Parliament to lay down pipes and purchase land for erecting works for supplying the inhabitants of Norwich and the parts adjacent with water.

These works were leased by the Corporation to certain individuals between 50 and 60 years since, for a term, of which about 42 years are unexpired.

Under the covenants in this lease the lessees are bound to supply the city of Norwich and the inhabitants thereof with clean, pure, and wholesome river water, at certain specified rates, in no case exceeding 4*l*. a-year for any house, and as to houses of 5*l*. or under, not exceeding 4*s*. a-year. And to employ one-third of the power of the stream in grinding corn. About two-fifths only of the power of the stream are now employed in raising water, two-fifths being employed in grinding corn, and the remaining fifth running to waste.

The objects of the Corporation are,—

1. To procure an ample supply of wholesome water, at the cheapest possible rate.

2. To establish a comprehensive system of sewerage throughout the city and such part of the hamlets as require it.

3. An uniform system of repair of all streets and roads.

4. The prevention of intermural interment in overcrowded churchyards, and providing cemeteries in fit places without the city.

5. That the management of all these matters be vested in one governing body.

Norwich having been for some years past very heavily burdened with local rates, and now being subject to such rates to the extent of more than one-third of its rack rental, it is of the greatest importance that the increased supply of water should be furnished, and any new system of drainage constructed, at the smallest cost.

The committee, therefore, beg to submit for the consideration of the Superintending Inspector whether all impurities which may effect the

present source of the water-supply might not, by means of the powers which the Corporation possess under the existing Water-works Act, and as conservators of the river Wensum, be removed and prevented, and, by proper alterations in, and additions to the existing works, a supply of water sufficiently ample and pure, might not be afforded to the inhabitants of Norwich.

Could these objects be effected it is evident a considerable saving of expense would result, and the Corporation, under the covenants in their lease, would have the right to call on their lessees to carry out these improvements.

But assuming it should be thought essential that the source of supply should be from the river near Heigham Common, then the committee beg to state that under the existing Act the Corporation have full powers for the compulsory purchase of land, and to lay down mains and erect any works requisite for carrying out the scheme of the promoters of the bill now before parliament, and that such bill is consequently unnecessary, and, if allowed to pass, will incur a needless expense, besides imposing a very unreasonable increase of rates on the inhabitants.

As the bill now before Parliament at present stands it would seem that the benefit to which the Corporation is entitled under the covenants in their lease to compel the lessees well and sufficiently to supply the city of Norwich, and the inhabitants thereof, with clean, pure, and wholesome river water, and other beneficial covenants will be taken away without any compensation.

Mr. Wicksteed estimates the extreme expense of so improving the present works as to render them capable of furnishing an ample supply of filtered water to the city at £22,000
Add the cost of the present works 26,000

Total cost . . £48,000

4 per cent on this would be £1,920
Add the expenses of working and wear and tear as per Mr. Wicksteed's estimate . . . 1,280

Total cost . . £3,200

Thus shewing a total annual cost of 3,200*l.*, if the supply of water be placed in the hands of the Corporation, to whom, it should be recollected, must be committed the management of the sewerage if the Health of Towns Act be applied.

Mr. Lynde's estimate for the works of the new company is £53,000
The price agreed to be paid by them for the present work is 26,000

£79,000
Deduct 20,000*l.* stated by Mr. Lynde to be the value of the old works as applied to the exigencies of the new company 20,000

£59,000
Add the costs of the Act of Parliament, say . . . 3,000

Total . . £62,000

The company limit themselves to 7 per cent. on their capital; they say they shall only take 6.

6 per cent on 62,000*l.* is	£3,730
Add for wear and tear and working expenses as per Mr. Lynde's estimate	2,000
For rent to Corporation	300
	£6,030

Shewing a total annual cost of 6,030*l.* if the bill of the new company be suffered to pass; and as the present works must be given up to the corporation at the expiration of the lease (42 years) the company would have to raise a sufficient annual sum to repay themselves the purchase price of 26,000*l.*, about 500*l.* per annum more, making a total annual cost of upwards of 6,500*l.*

Should the Corporation deem it expedient to liquidate the 48,000*l.* in 30 years, which is not at all necessary, as they could always borrow that sum on the security of their rates, it might be done by an annual payment of 980*l.*, making the total annual expenditure for 30 years 4,180*l.*, less by more than 2,000*l.* a year than the cost of the new company; and at the 30 years' end, the annual expenditure would be only 1,280*l.* a year.

In conclusion the committee submit that the proposed bill will be inefficient as a sanitary measure it containing no compulsory power to take water; and as it increases the expense of the supply, it will render parties less willing to take it. The committee also much fear that if the maximum rates for water charged by the proposed bill should be enforced, and which they must be to pay the company interest on their capital, it will interpose a very serious obstacle to carrying out efficiently the beneficial provisions of the Health of Towns Act.

A. A. H. Beckwith,
Chairman.

Appendix B.

Monthly Mean Temperature, for the Years 1840 to 1849 inclusive, from Observations taken at Norwich, by Wm. Brooke, Gray Friars' Priory.

Years.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Mean.
1840	36·2	37·0	38·5	49·0	52·3	59·8	57·6	63·0	53·2	..	..	..	..
1841	31·0	32·7	44·5	46·5	55·8	55·4	56·2	60·0	55·2	44·7	38·3	36·4	46·3
1842	32·5	39 7	41·7	44·0	50·2	59·8	56·6	64·4	55·2	43·0	37·5	38·6	46·9
1843	38·6	37·0	40·3	45·8	53·5	56·2	60·6	62·0	61·0	47·6	40·6	43·5	48·9
1844	37·8	34·8	40·9	49·1	50·8	59·6	63·7	57·7	57·5	49·0	44·0	34·0	48·1
1845	37·5	32·6	35·0	45·7	49·1	62·3	59·8	56·6	53·5	49·8	43·9	38·6	47·1
1846	41·3	42·5	46·1	46·4	53·2	64·2	65·4	65·1	60·1	50·5	45·5	32·4	51·0
1847	34·8	35·7	41·6	46·7	58·8	59·4	64·5	66·8	52·1	51·7	46·4	40·3	49·9
1848	33·7	42·8	42·6	47·5	59·6	60·7	62·2	58·9	56·3	51·5	41·9	40·9	49·8
1849	39·1	42·1	42·1	44·4	54·3	57·9	59·7	64·1	58·5	50·4	42·4	37·8	49·4
Monthly Means	36·2	37·6	41·3	46·5	53·7	59·5	60·6	61·9	56·2	48·7	42·2	38·0	48·6*

* Average mean.

N.B.—These means are deduced from the means of the maximum and minimum of each day, the instruments used being Rutherford's self-registering thermometers.

MONTHLY READINGS of the BAROMETER, reduced to 32°, for the Years 1840 to 1849 inclusive, registered at NORWICH, by WM. BROOKE, Gray Friars' Priory.

Years.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Means.
1841	29·796	29·846	29·877	29·823	29·845	29·897	29·798	29·806	29·741	29·525	29 765	29·620	29·778
1842	29·995	29·985	29·824	30·076	29·887	30·073	29·912	30·003	29·823	29·936	29·717	30·052	29·940
1843	29·738	29·599	29·900	29·964	29 829	29·819	29·902	29·948	30·123	29·479	29·783	30·513	29·866
1844	29·974	29·750	29·788	30·117	30·078	29·894	29·856	29·764	30·020	29·655	29·804	30·056	29·896
1845	29·822	29·756	29·953	29·835	29 839	29·888	29·869	29·810	29·955	29·923	29·666	29·707	29·835
1846	29·772	29·758	29·744	29·721	29·916	29·985	29·844	29·903	29·959	29·615	29·956	29·767	29·828
1847	29·893	29·880	30·030	29·730	29 862	29·990	30·032	29·984	29·866	29·917	29·988	29·834	29·917
1848	29·968	29·582	29·595	29·645	30·038	29·701	29·932	29·810	29·553	29·742	29·934	29·859	29·813
1849	29·862	30·197	29·992	29·667	29·910	30·002	29·863	29·845	29·940	29·839	29·873	29·856	29·904
Monthly Means	29·868	29·817	29·856	29·842	29·912	29·917	29·890	29·875	29·931	29·737	29·830	29·896	29·864*

* Average for 9 years.

N.B.—The barometer from which these means are reduced is a standard one by Newman; its cistern placed about 39 feet above the level of the sea. The observations were made at 10 a.m. and 2 p.m.

DIRECTION of the WIND, during Monthly Periods, for the Years 1836 to 1849 inclusive from Observations taken at NORWICH, by WM. BROOKE, Gray Friars' Priory.

Years.	Direction of Wind.								Number of Days.		Total.	Remarks.
	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Observed.	Not Observed.		
	days.	days.	days.	days.	days.	days.	days.	days.				
1836	33	38	13	18	54	48	99	58	361	5	366	Leap year.
1837	35	26	31	22	49	52	73	49	337	20	365	
1838	32	37	26	35	31	45	71	65	342	33	365	
1839	19	29	28	39	34	70	62	52	333	32	365	
1840	19	19	29	19	28	54	83	41	292	74	366	Leap year.
1841	12	14	32	29	47	41	137	28	340	25	365	
1842	24	34	30	42	25	71	99	21	346	19	365	
1843	31	25	28	22	55	81	49	41	332	33	365	
1844	28	35	28	20	31	75	45	48	310	56	366	Leap year.
1845	45	24	13	27	51	75	34	45	314	51	365	
1846	27	27	11	37	63	81	29	33	308	57	365	
1847	25	33	13	60	26	70	82	32	341	24	365	
1848	19	19	19	67	51	72	53	56	356	10	366	Leap year.
1849	12	40	34	39	45	91	58	21	340	25	365	
	361	400	335	476	590	926	974	590	4,652	462	5,114	

N.B.—Direction of wind observed daily at 9 a.m.

MONTHLY DEPTH of RAIN fallen, for the Years 1836 to 1849 inclusive, from Observations taken at NORWICH, by WM. BROOKE, Gray Friars' Priory.

Years.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Amount.
1836	1·800	1·875	3·525	1·750	·800	3·325	1·800	·675	3·700	3·725	3·500	2·650	29·125
1837	3·200	2·275	·950	1·675	1·300	1·750	2·700	2·500	1·525	2 250	2·300	2·500	24·925
1838	2·317	1·350	1·125	1·625	·475	3·050	1·025	2·600	2·525	1·950	2·050	1·500	21·592
1839	1·550	1·300	2 100	·900	1·150	2·900	3·550	2·725	2·650	1·950	2·650	2·500	25·925
1840	2·250	·970	·720	·120	2 980	1·690	2·140	1·080	2·990	2·400	..	..	..
1841	3·030	1·760	1·450	1·545	1·660	2·030	5·270	3·800	3·740	6·915	3·090	3·450	37·740
1842	1·050	·520	2·175	1·735	1·150	1·350	3·730	1·425	3 830	3·100	3·325	·650	24·090
1843	1·625	2·550	1·010	1·670	3·970	2·080	1·760	4·330	1·960	3·840	3·530	·340	28·665
1844	2·230	1·200	1·970	·240	·490	·900	2 210	2·400	1·350	4·000	2·830	·520	20·340
1845	2 000	·650	·150	1·630	3·440	·980	1·820	3·840	1·010	2 100	1·230	3 120	21 970
1846	2·680	·690	1·180	2·890	1·150	1·400	1·380	2·180	1·290	3·530	1·640	2·060	22·072
1847	1·150	·970	·547	1·630	2·110	2·620	·430	1·550	1·640	2·060	1·880	2·400	18·987
1848	1 050	2·250	2·770	2·680	·540	2·830	1·410	2·910	2·690	5·425	2·210	1·890	28·495
1849	1·540	·520	1·300	2·770	4·540	1·180	1·150	1·520	1·775	3·580	2·095	4·000	25·970
Monthly Average	1·962	1·348	1·498	1·732	1·839	2·006	2·169	2·495	2·334	2·344	2·486	2·121	25·376*

* Annual average.

N.B.—The earlier years of this table were registered from a floating gauge, about 3 feet from the surface of the ground; the two or three last years from Howard's gauge, placed on the ground and registered monthly.

HYGROMETRICAL CONDITION of the ATMOSPHERE, from 1st July 1847, to 31st December 1849, inclusive, from Monthly Means of Observations taken at NORWICH, by WM. BROOKE, Gray Friars' Priory.

Months.	1847						1848						1849					
	Dry Bulb.	Dew Point.	Elasticity.	Weight of Vapour in a Cubic Foot.	Ditto required to saturate.	Humidity.	Dry Bulb.	Dew Point	Elasticity.	Weight of Vapour in a Cubic Foot.	Ditto required to saturate.	Humidity.	Dry Bulb.	Dew Point.	Elasticity.	Weight of Vapour in a Cubic Foot.	Ditto required to saturate.	Humidity.
January . . .	..	..	..	..	..	..	34·8	31·0	·193	2·30	·30	·876	39·0	34·8	·220	2·60	·40	·863
February. . .	..	..	..	..	..	..	44·1	38·6	·252	2·90	·60	·827	42·6	37·8	·245	2·90	·80	·847
March	..	..	..	..	..	..	48·7	41·5	·280	3·20	·90	·783	41·8	36·4	·232	2·70	·60	·831
April.	..	..	..	..	..	..	53·1	45·3	·318	3·60	1·10	·766	43·5	38·8	·253	3·00	·50	·871
May	..	..	..	..	..	..	62·7	49·6	·371	4·30	2·20	·688	52·8	47·6	·344	3·90	·70	·848
June	..	..	..	..	..	..	62·8	55·5	·445	5·00	1·60	·788	54·4	48 8	·358	4 10	·80	·831
July	67·8	59·0	·504	5·60	1·90	·747	63·3	57·0	·474	5·30	1·60	·765	58·8	53·1	·415	4·70	1·00	·831
August	64·9	57·9	·488	5·40	1·40	·793	60·7	53·8	·424	4·80	1·10	·792	60·5	55·4	·450	5·00	·90	·848
September . .	55·6	49·1	·349	4·00	1·10	·782	58·5	53·4	·419	4·70	·90	·843	56·9	51·7	397	4·50	·80	·843
October. . . .	53·2	48·4	·353	4·00	·70	·850	52·6	48·8	·358	4·10	·60	·879	49·4	46·0	·323	3·70	·50	·883
November . .	47·7	42·9	·301	3·50	·50	·873	43·5	38·3	·252	2·90	·50	·840	42·6	38·5	·250	2·90	·60	·868
December . .	42·0	37·6	243	2·80	·50	·845	42·3	39·4	·260	3·00	·40	·906	39·1	35·4	·225	2·60	·60	·879
Annual Means	55·2	49·1	·373	4·22	1·16	·815	52·3	46·0	·337	3·84	·98	·813	48·4	43·7	32·7	35·5	·68	·854

The results of this table were obtained from five daily observations of the dry and wet bulb thermometers; the deductions taken from the tables of J. Glaisher, Esq., and the hours of observation 9 a.m., 12 noon, 3 p.m., 6 p.m., and 9 p.m. The instrument by Barrow, and tested at the Greenwich Observatory.

APPENDIX C.

CLASSIFICATION AND RATEABLE VALUE OF HOUSES.—Through the assistance of the Court of Guardians, and Mr. W. Tallack, their office clerk, I am able to give, in a tabular form, some very important information respecting the modes of rating property in the city, and the number of tenements rated in each manner in every parish and hamlet within the county of the city.

Occupier's Rate.—The columns under this head shew the number of assessments, the gross rental, and annual rateable value of property, for which the occupiers are rated upon *nine-tenths* of the rent, or gross annual value, consisting of lands, houses, shops, warehouses, &c.

Empties.—The column under this head shew the gross rental, and annual rateable value of property, (included in the occupier's rate) which was empty and did not pay rates at Lady day 1850, and may be taken as rather below the average of empty property.

Small Tenements.—The columns under this head show the number of assessments and number of tenements with the gross rental, and annual rateable value thereof, assessed under the "Norwich Small Tenements Act, 1847." The Act directs the assessment to be upon the owners, at one-third of the annual value, to be ascertained according to the Parochial Assessments Act. The Guardians allow 25 per cent off the gross rental for repairs, &c., and assess upon one third of the remainder, so that practically it is a rating upon one-fourth of the gross rental. Shops, warehouses, counting-houses, stables, coach-houses, cellars, coal-bins, or buildings used for any trade, or business are expressly excluded, and must be rated upon nine-tenths of the

gross rental. The rates are payable by the owners whether the houses are occupied or not. The Act limits the Small Tenements Assessment to houses of 6*l.* value, but by making the deduction of 25 per cent., its practical effect is to include the 8*l.* houses. The rents of these small tenements vary from 8*l.* downwards. The gardens in St. Clement's, noticed in this table are not strictly correct, but it is the only way of obtaining any rate, the tenants being paupers or poor labouring persons.

Compositions.—Under this head is shown the property rated at a reduced sum under the provisions of the Norwich Guardians' Act The rates are payable by the owners, whether the houses are occupied or not, and they may all be classed as 8*l.* houses.

I may be still ignorant of some circumstances connected with the rating of different classes of house property, but on the face, it does not seem equitable that a house of 8*l.* rental should first have a deduction of 25 per cent for repairs, and then the rateable value be taken at one-third, or 2*s.* only, for a rate of 1*s.* in the pound, while a house of 10*l.* rental would have to pay 9*s.* to the same rate. After deducting for repairs, &c. the only further claim of the owner is on account of empty property; but I find by these returns that the annual value on empty property does not amount to 4 per cent. of the tenements rated to the occupier's rate, and though the empty is below the average at the present time, it can never even approach to one third in value of all the small tenements in the city. At the same time I have no doubt the Court have some good reason for so large a deduction as three-fourths.

Classification.—From this table all gardens, land assessed by itself, and property obviously not requiring water, have been excluded, still it doubtless contains much property that would not take water, and most of the larger assessments, especially in the hamlets, include land with the houses.

I have divided St. Clement into two parts, because the parish consists of two detached portions, one within the city walls, and the other without the gates, being like the hamlets in all but the name.

Earlham is a village at a considerable distance from the city, although included in the county of the city.

For this classification, I have taken as you wished, the annual rateable value, not the gross rental. Under 15*l.* means 10*l.* and under 15*l.* Under 20*l.* means 15*l.* and under 20*l.*, and so on.

Parish or Place.	Occupiers' Rate.					Empties (included in Occupiers' Rate).				
	Number of Assessments.	Gross Rental.			Rated at	Number of Assessments.	Gross Rental.			Rated at
		£.	s.	d.	£. s.		£.	s.	d.	£. s.
1. St. Peter of Southgate	46	1,374	0	0	1,224 0	4	76	0	0	67 10
2. St. Etheldred	36	623	19	6	561 0	8	40	3	0	35 15
3. St. Julian	116	1,492	18	0	1,339 10	10	57	5	0	50 10
4. St. Peter per Mountergate	157	3,707	3	0	3,362 0	5	110	0	0	98 10
5. St. John of Sepulchre	133	1,694	13	0	1,511 5	4	33	10	0	29 15
6. St. Michael at Thorn	124	1,750	15	0	1,558 10	6	127	0	0	113 10
7. St. John of Timberhill	117	2,025	6	4	1,819 10	3	22	0	0	19 10
8. All Saints	75	1,458	12	0	1,313 0	2	50	0	0	45 0
9. St. Stephen	389	10,194	10	6	9,176 0	19	300	13	6	269 10
10. St. Peter of Mancroft	477	18,156	2	0	16,321 0	10	283	10	0	250 0
11. St. Giles	194	4,687	0	0	4,213 10	11	215	10	0	189 0
12. St. Benedict	76	1,255	12	0	1,125 10	4	17	4	0	14 10
13. St. Swithin	71	1,514	11	0	1,357 10	8	136	0	0	121 10
14. St. Margaret	55	881	4	0	788 10	2	13	0	0	11 10
15. St Lawrence	109	1,656	0	0	1,490 10	7	72	10	0	64 10
16. St. Gregory	178	3,253	15	0	2,927 10	14	179	10	0	160 10
17. St. John of Maddermarket	131	4,139	10	0	3,721 10	9	100	0	0	90 0
18. St. Andrew	214	6,150	16	0	5,533 5	24	497	0	0	446 10
19. St. Michael at Plea	74	2,677	0	0	2,407 10	6	103	0	0	92 10
20. St. Peter of Hungate	54	680	5	4	609 0	6	35	2	0	30 10
21. St. Simon and Jude	52	1,225	10	0	1,100 10	3	11	0	0	9 10
22. St. George of Tombland	124	3,466	12	0	3,116 0	2	19	0	0	17 0
23. St. Martin at Palace	76	1,211	0	0	1,089 10	5	107	0	0	97 0
24. St. Helen	16	348	0	0	313 10	..	..			..
25. St. Michael of Coslany	118	1,767	8	0	1,585 0	14	247	18	0	222 10
26. St. Mary of Coslany	85	1,308	10	0	1,174 0	4	23	5	0	20 10
27. St. Martin at Oak	83	1,127	0	0	1,009 10	5	81	0	0	73 0
28. St. Augustine	139	1,833	10	0	1,637 0	5	31	10	0	27 10
29. St. George of Colegate	75	2,976	2	0	2,673 0	13	179	0	0	160 0
30. St. Clement Within	104	1,841	10	0	1,656 0	7	73	0	0	65 0
30. St. Clement Without	100	1,506	10	0	1,350 0	6	120	10	0	107 10
31. St. Edmund	43	779	0	0	700 0	4	35	0	0	31 10
32. St. Saviour	137	2,246	14	0	2,015 0	9	130	0	0	115 10
33. St. Paul	118	1,401	15	0	1,257 15	4	47	0	0	42 10
34. St. James	49	621	0	0	557 0	4	27	5	0	24 10
35. Hamlet of Pockthorpe	76	1,350	5	0	1,213 10	1	7	0	0	6 0
36. Hamlet of Heigham	674	10,705	10	0	9,540 10	33	522	17	6	470 10
37. Hamlet of Lakenham	390	8,738	19	0	7,813 5	5	136	0	0	122 10
38. Hamlet of Eaton	96	3,411	15	0	3,073 10	2	43	0	0	38 10
39. Hamlet of Earlham	18	1,478	0	0	1,329 10	..	..			..
40. Hamlet of Hellesdon	42	1,981	5	0	1,725 10	4	67	0	0	60 0
41. Hamlet of Thorpe	141	5,657	11	0	5,062 15	4	73	0	0	65 10
42. Hamlets of Trowse Millgate, Carrow, and Bracondale	69	2,121	0	0	1,909 0	5	165	0	0	148 10
43. The Town Close	29	1,211	0	0	1,089 10	1	45	0	0	40 10
Total	5680	129,688	18	8	116,350 15	302	4,660	3	0	4,166 0

W. Tallack.

Parish or Place.	Small Tenements.						Compositions.			
	Number of Assessments.	Number of Tenements.	Gross Rental.			Rated at	Number of Assessments.	Number of Houses.	Gross Rental.	Rated at
			£.	s.	d.	£. s.			£. s.	£.
1. St. Peter of Southgate	27	125	476	4	4	115 10	..	..	..	..
2. St. Etheldred	19	79	400	9	0	99 5	..	..	..	..
3. St. Julian	57	268	1,186	6	7	291 5	..	..	..	..
4. St. Peter per Mountergate	69	393	1,761	5	7	432 5	1	7	56 0	28
5. St. John of Sepulchre	74	341	1,497	4	0	366 5	2	3	27 0	12
6. St. Michael at Thorn	93	417	1,903	17	6	472 5	..	..	..	..
7. St. John of Timberhill	46	171	827	6	0	201 15	..	..	..	..
8. All Saints	28	107	429	19	4	105 5	1	1	8 0	4
9. St. Stephen	164	695	3,189	10	8	782 10	1	4	32 0	16
10. St. Peter of Mancroft	43	261	1,191	3	4	294 15	..	..	..	..
11. St. Giles	55	204	989	5	0	241 5	..	..	..	..
12. St. Benedict	72	291	1,127	16	3	274 5	..	..	..	..
13. St. Swithin	52	177	661	1	5	161 0	..	..	..	..
14. St. Margaret	40	182	644	9	5	156 15	..	..	..	..
15. St. Lawrence	38	150	610	9	8	153 10	..	..	..	..
16. St. Gregory	41	129	573	17	4	143 10	..	..	..	..
17. St. John of Maddermarket	24	73	343	3	8	84 0	..	..	..	..
18. St. Andrew	17	80	311	5	8	75 10	..	..	..	..
19. St. Michael at Plea	10	25	127	8	0	31 0	..	..	..	..
20. St. Peter of Hungate	16	85	377	19	4	94 5	..	..	..	..
21. St. Simon and Jude	10	50	182	11	0	44 10	..	..	..	..
22. St. George of Tombland	19	67	242	18	8	59 0	..	..	..	..
23. St. Martin at Palace	51	282	959	13	8	234 15	..	..	..	..
24. St. Helen	7	67	242	3	4	60 10	..	..	..	..
25. St. Michael of Coslany	56	257	898	15	1	219 5	1	1	8 0	4
26. St. Mary of Coslany	84	316½	1,313	8	5	320 15	..	..	..	..
27. St. Martin at Oak	116	642	2,222	4	2	542 0	..	..	..	..
28. St. Augustine	89	388	1,631	0	1	401 0	2	3	‡40 0	‡20
29. St. George of Colegate	57	246	1,148	15	1	280 0	1	1	8 0	4
30. St. Clement Within	26	122	*500	3	8	*122 15	..	..	..	..
30. St. Clement Without	123	412	†1,775	16	7	†432 5	..	..	..	..
31. St. Edmund	44	182	736	10	4	179 5	..	..	..	..
32. St. Saviour	68	209	1,018	11	1	250 10	..	..	..	..
33. St. Paul	142	601	2,356	8	11	575 0	..	..	..	..
34. St. James	88	341	1,148	10	2	277 0	..	..	..	..
35. Hamlet of Pockthorpe	88	340	1,013	1	2	244 10	..	..	..	..
36. Hamlet of Heigham	279	1,210	6,810	13	8	1,695 0	24	51	408 0	204
37. Hamlet of Lakenham	169	747	3,283	1	4	806 5	1	14	118 6	59
38. Hamlet of Eaton	12	57	244	1	0	59 10	..	..	..	..
39. Hamlet of Earlham	2	3	16	0	0	4 0	..	..	..	..
40. Hamlet of Hellesdon	11	52	190	8	0	46 15	..	..	..	..
41. Hamlet of Thorpe	56	260	1,307	2	8	315 0	..	..	..	..
42. Hamlet of Trowse Millgate, Carrow, and Bracondale	18	75	280	9	10	68 15	..	..	..	..
43. The Town Close	..	..	..			..	..	..	..	..
Total	2600	11,179½	48,152	10	0	11,814 5	34	85	705 6	351

* In this amount, tenement gardens gross rental 9*l.* 4*s.*, rated 2*l.* 5*s.*
† ,, ,, ,, 63*l.* 12*s.*, ,, 15*l.* 15*s.*
‡ ,, ,, ,, 16*l.* ,, 8*l.*

CITY and COUNTY of the CITY of NORWICH. Classification of the Annual Rateable Value of the Houses and other Buildings

Parish or Place.	Under £8 Value compounded for by the Owners.	Under £8 Value Rated under small Tenements Act.	Rateable Value Under £3	£4	£5	£6	£7	£8	£9	£10	£15	£20	£25	£30	£40	£50	£60	£70	£80	£90	£100	Rateable Value over £100.	Total Number of Houses in each Parish.
1. St. Peter of Southgate	..	125	1	2	1	2	.	4	.	3	5	8	5	1	3	2	1	.	.	3	.	2	168
2. St. Etheldred	..	79	.	.	.	1	.	1	.	3	4	1	3	.	.	1	.	.	.	1	.	1	95
3. St. Julian	..	268	.	5	4	1	1	.	.	10	14	6	2	2	1	2	1	.	3	.	.	1	321
4. St. Peter per Mountergate	7	393	.	1	5	2	4	5	3	12	44	32	8	8	5	4	.	.	3	1	2	3	542
5. St. John of Sepulchre	3	341	4	4	7	9	13	15	8	15	23	18	2	1	3	3	.	.	.	.	.	1	470
6. St. Michael at Thorne	..	417	2	3	6	14	3	5	5	22	28	16	8	1	1	1	.	1	.	.	1	.	534
7. St. John of Timberhill	..	171	6	3	5	5	1	6	3	23	23	16	7	7	5	.	1	.	.	.	1	.	283
8. All Saints	1	107	3	1	1	7	1	3	1	9	19	11	3	6	4	4	1	.	.	.	.	1	183
9. St. Stephen	4	695	8	5	7	11	6	11	6	39	95	36	32	22	55	14	16	10	2	2	5	3	1,084
10. St. Peter of Mancroft	..	261	1	9	5	22	16	14	6	31	61	53	58	30	44	30	31	11	14	7	8	25	737
11. St. Giles	..	204	4	4	3	10	3	4	5	16	46	20	19	15	12	11	6	6	1	1	.	3	393
12. St. Benedict	..	291	2	1	8	2	1	13	2	7	18	11	2	1	2	1	1	.	.	.	.	1	364
13. St. Swithin	..	177	2	4	2	1	7	5	1	6	14	7	1	2	.	.	.	2	.	.	1	1	233
14. St. Margaret	..	182	1	1	3	.	4	8	2	8	12	8	1	.	.	1	1	.	1	.	1	.	234
15. St. Lawrence	..	150	.	1	2	14	5	14	4	12	30	12	3	.	3	2	1	1	1	.	1	.	256
16. St. Gregory	..	129	.	2	3	6	4	4	3	22	43	27	11	4	8	6	2	1	2	.	.	2	279
17. St. John of Maddermarket	..	73	.	.	.	1	1	.	4	8	21	18	13	14	15	9	5	5	1	1	2	3	194
18. St. Andrew	..	80	.	1	1	2	1	3	6	18	23	28	20	19	24	10	5	8	5	3	2	4	263
19. St. Michael at Plea	..	25	.	.	.	.	.	2	.	5	8	15	4	8	13	6	3	3	.	.	2	2	96
20. St. Peter of Hungate	..	85	.	2	1	1	1	3	3	6	13	8	1	3	2	.	.	.	.	.	.	.	129
21. St. Simon and Jude	..	50	.	1	1	.	1	3	2	3	10	10	2	2	5	.	.	.	1	1	.	2	94
22. St. George of Tombland	..	67	1	.	1	1	1	3	1	13	26	18	10	9	11	12	5	2	1	1	4	.	187
23. St. Martin at Palace	..	282	.	3	.	7	4	3	2	10	19	13	2	5	2	1	2	.	.	.	.	.	355
24. St. Helen	..	67	.	1	.	1	.	.	.	5	2	2	.	1	.	2	.	.	1	.	.	.	82
25. St. Michael of Coslany	1	257	.	3	5	5	10	7	.	10	33	12	6	1	2	4	.	1	.	1	.	.	358
26. St. Mary of Coslany	..	316½	1	2	.	3	5	8	5	10	26	8	3	1	1	1	1	1	.	.	.	1	393½
27. St. Martin at Oak	..	642	1	1	7	9	4	8	.	7	22	10	2	2	2	2	1	.	.	.	.	.	720
28. St. Augustine	3	388	.	3	5	12	17	18	3	15	31	14	4	3	3	3	.	.	.	.	.	1	523
29. St. George of Colegate	1	246	2	.	1	9	9	10	9	12	55	27	11	6	5	2	1	.	1	1	1	.	409
30. St. Clement { Within	..	122	.	1	1	3	8	3	2	9	30	17	5	2	3	4	1	2	.	.	.	.	213
30. St. Clement { Without	..	412	.	4	3	6	5	6	3	12	24	8	6	2	2	3	2	.	.	1	.	.	499
31. St. Edmund	..	182	.	.	.	4	2	4	2	9	11	2	.	1	2	.	.	.	.	.	.	1	220
32. St. Saviour	..	209	.	.	3	4	4	6	4	19	37	25	7	6	9	1	2	.	.	.	.	.	336
33. St. Paul	..	601	1	7	5	7	9	8	5	24	32	5	1	1	1	1	.	.	.	.	.	1	709
34. St. James	..	341	.	7	3	8	4	3	.	6	9	2	.	.	.	1	.	1	.	.	.	.	385
35. Hamlet of Pockthorpe	..	340	2	4	9	4	3	3	2	7	14	3	2	3	1	.	2	1	.	.	.	1	401
36. Hamlet of Heigham	51	1,210	1	2	7	3	7	85	36	79	171	73	32	14	15	17	4	4	2	2	2	3	1,820
37. Hamlet of Lakenham	14	747	3	.	9	15	16	19	28	45	90	49	18	12	11	3	3	1	1	1	1	9	1,095
38. Hamlet of Eaton	..	57	1	.	.	.	2	2	.	1	13	9	9	10	7	8	1	1	.	.	2	3	126
39. Hamlet of Earlham	..	3	.	.	.	.	.	.	.	.	2	.	.	1	.	.	.	.	1	.	2	4	13
40. Hamlet of Hellesdon	..	52	1	2	2	.	.	3	1	2	6	6	.	2	2	.	.	1	.	.	.	3	83
41. Hamlet of Thorpe	..	260	.	1	1	1	1	5	.	7	25	18	4	8	11	3	3	.	1	.	3	5	357
42. Hamlet of Trowse Millgate, Carrow, and Bracondale	..	75	.	.	1	.	.	3	.	2	5	5	13	7	5	2	1	5	.	.	.	1	125
43. The Town Close	..	..	.	.	.	.	.	.	.	.	.	1	.	6	5	8	.	1	.	.	1	.	22
Totals of the County of the City	85	11,179½	48	91	128	213	184	330	167	582	1237	688	340	249	305	185	104	69	42	27	42	88	16,383½

It has been already stated, that the precincts of the cathedral church are not under the civil jurisdiction of the city authorities. The same exclusion is applicable to all matters connected with the laws relating to the relief of the poor. The Court of Guardians have not therefore the means of making any return for the precincts. I find from the Enumeration Returns of the Census in 1841, that there were then in St. Mary-le-Marsh 101 houses, occupied by 498 persons. This would make a total of 16,484 tenements rated to the relief of the poor in the county of the city.

The whole of these returns are made up to Lady-day, 1850.

The classification of houses shows that the hamlets contain 4,042 tenements, *or one-fourth of the whole number of houses in the county of the city*. By far the greater proportion of these houses constitute part of the town of Norwich, and yet they are all beyond the jurisdiction of the Acts for paving, lighting, cleansing, watching, &c.

The same table shows that 12,258 tenements, or three-fourths of the whole, do not exceed the annual value of 8*l*.

From a printed statement before me, it appears that the expenditure of the Court of Guardians for the year ending the 31st December, 1848, was 38,548*l*. 15*s*. 3*d*.

Appendix D.

List of the principal sources of contamination draining into the River Wensum, between the village of Heigham and Carrow Bridge.—20*th March*, 1850.

1. Tinkler's bathing-house and laundress's ground.
2. Creek running up to Heigham village, houses at side draining into river.
3. Howard's public slaughter-house and piggery, drains into ditch running into stream.
4. Dolphin bath-house.
5. Wills's fellmonger's and tanner's yard.
6. Dye's fellmonger's yard.
7. Fuller's Hole watering-place.
8. Nicholl's slaughter-house, draining into river.
9. Ditch into which three public privies drain.
10. Smith's bath-house.
11. Ditch into which two privies drain, and numerous houses.
12. Drain.
13. Drain.
14. Privy.
15. Privy.
16. Dye-house.
17. Dye, fellmonger.
18. Harvey, fellmonger.
19. Harvey, fellmonger's yard and privy draining into river.
20. James Smith Rump, fellmonger.
21. Boult's fellmonger's yard and privy.
22. 14-inch barrel drain from Finch's malthouse.

23. 12-inch barrel drain.
24. 18-inch barrel drain.
25. 18-inch barrel drain.
26. 14-inch barrel drain, from Bagshaw's, bone-boiler.
27. Main sewer, 3 feet 6 inches by 2 feet 4 inches, under dye-house.
28. 3-feet barrel sewer under coal sheds.
29. Bunting and Co.'s soap works.
30. 12-inch barrel drain.
31. 20-inch barrel drain, from Jay's wharf and Arnold's brewery.
32. Gedge's dye works.
33. 16-inch barrel drain, under Bullard's yard, maltster.
34. Kid's dye-house.
35. Two privies from Bullard's premises.
36. Two privies and dust-bin emptying into river, Williamson's premises.
37. 6-feet sewer.
38. Privy drain, Bullard's brewhouses.
39. 12-inch square drain from Bullard's.
39. 12-inch square drain from Bullard's.
40. 12-inch barrel drain, Webb's.
41. Sewer, 18 inches by 24 inches, Turk's-yard.
42. 18-inch barrel drain, Baker, corn merchant.
43. 12-inch barrel drain.
44. 12-inch barrel drain, Nash's-yard, under steps.
45. Privy, dust-bin, and 12-inch barrel drain, Scott's-yard.
46. Sewer, 2 feet by 16 inches.
47. Drain, 9 inches by 12 inches, St. John's Head-yard.
48. Privy, Lord Camden-yard.
49. Privy used by Scott's workmen, cabinet maker.
50. Drain, 6 inches square, Hanks, coal merchant.
51. Drain, 16 inches square, under Scott's workshops.
52. Privy, Blakely's.
53. Drain, 18 inches by 12 inches, Blakely's.
54. 12-inch barrel drain, Harmer, wharfinger.
55. 22-inch barrel sewer, Rudrum's wharf.
56. Privy, Stark, dyer.
57. Stark's dye-house.
58. 2-feet barrel drain, under ditto.
59. 2-feet sewer, under Water-lane.
60. Privy, Weston's brewhouse.
61. Privy, Culley's-yard.
62. Privy, Dixon's-yard.
63. Cuttermole's dye-house.
64. 3-feet barrel sewer.
65. Privy, Bray, tailor.
66. Main sewer, St. George's Bridge, about 4 feet.
67. Workhouse drain, 18 inches square.
68. 18-inch barrel drain, under Pegg's premises.
69. Drain from workhouse, washhouse.
70. Drain from Elm-hill.
71. Privy, Crown Court-yard.
72. Drain, 12 inches by 18 inches.

73. Shickle and Towler's dye-house.
74. Drain, 18 inches by 24 inches, under Shickle and Towler's works.
75. Drain, 12 inches by 24 inches.
76. Willet's dye-house.
77. Drain from cow-house, Reid's-yard.
78. 3-feet sewer under Fye Bridge.
79. Privy, Newton, fishmonger.
80. 18-inch barrel drain, next bridge.
81. Geary's dye-house.
82. 12-inch barrel drain, quay side.
83. 9-inch barrel drain, Howard's premises.
84. 12-inch barrel drain, end of Pig-lane.
85. Drain from Barnard's boat-house, 12 inches square.
86. 12-inch barrel drain, quay side.
87. 12-inch barrel drain, quay side.
88. Privy from Teazle's-yard.
89. Staff's soap works.
90. Privy from Cook's-yard.
91. 18-inch barrel drain from St. Edmund's watering.
92. Drain, 18 inches by 24 inches, from Badding's-lane.
93. Privy.
94. Drain, 9 inches by 12 inches.
95. 18-inch barrel drain from Yarn Company's factory.
96. 20 inches by 30 inches, sewer next Whitefriars Bridge.
97. 2 feet 3 inches by 2 feet, sewer under bridge.
98. Urinal against wing-wall of Whitefriars Bridge.
99. Sewer, 3 feet by 1 foot 6 inches.
100. Drain, 9 inches square, premises next to Yarn Company's factory.
101. Privy, Leman and Staff's yard.
102. Privy, premises next to Yarn Company's factory.
103. Yarn Company's privy.
104. Blyth's, paper maker, drain.
105. Blyth's privy.
106. 2 inches by 6 inches, drain next Staithe, Brickwood's-buildings.
107. 12-inch barrel drain, Yarn Company's factory.
108. 12-inch barrel drain from under malthouse, next Yarn Company's factory.
109. Drain, 1 foot by 9 inches, end of Water-lane.
110. 18-inch barrel drain, at end of Patteson's-cut.
111. 18-inch square drain, World's End-lane.
112. Drain ditch from Pockthorpe.
113. Drain ditch from Old Man's Hospital.
114. 18-inch barrel drain.
115. Drain ditch from Bishopsgate-street.
116. 18-inch barrel drain out of wing-wall of Bishop's Bridge.
117. 12-inch barrel drain.
118. Privy.
119. 18-inch barrel drain from Cathedral Close.
120. Privy from Ferry House.
121. Drain ditch from St. Faith's-lane.
122. 12-inch barrel drain under Railway Tavern Foundry Bridge.
123. Privy opposite railway.

124. Sewer 3 feet 6 inches by 2 feet.
125. Drain, 12 inches square.
126. Drain ditch.
127. Privy, Watson's stone works.
128. 12-inch drain from King-street.
129. 9-inch square drain, St. Ann's, Staithe.
130. 12-inch barrel drain, Barge-yard.
131. Drain 12 inches by 9 inches.
132. 2-feet sewer.
133. 9-inch drain from King-street.
134. 12-inch barrel drain under Rudrum's premises.
135. Privy, Young's premises.
136. 2-feet sewer next above Harmer's premises.
137. 2-feet drain under Jay's factory.
138. 12-inch drain, Brown's premises.

And a great number of small drains, of which no detailed account was taken.

Appendix E.

Report of Analysis of two Waters marked A and B from Norwich.

The waters were received on Tuesday, April 23rd, in glass bottles, sealed and well secured. The quantity of each amounted to about two imperial gallons. The analysis of the specimens was commenced on Wednesday, April 24th, and was completed on Wednesday, May 1st.

Both A and B had a slight yellowish colour, and to one of us a slight taste, equally perceptible in both waters. We considered that they were somewhat vapid. They became very bright, and equally so on filtration through sand. The colour was entirely removed, and the taste was no longer perceptible.

A preliminary qualitative examination showed that the two specimens contained the usual constituents of potable waters, namely, lime, magnesia, carbonic and sulphuric acids, with the exception that in both specimens the sulphuric acid was in smaller proportion than in good Thames water, or than is usually found in good spring water. The specimens were entirely free from any odour, and on applying tests they were found to contain no sulphuretted hydrogen, the foul gas which gives offensiveness to sewer-water.

Mechanical Impurity.

A fine light brownish coloured substance was seen floating in the two waters, which was slowly deposited on standing. On filtration through paper, A gave no ponderable quantity of mechanical impurity; but B gave a proportion of 0·06 grains to the imperial gallon, being less than one millionth part by weight. This is a very small proportion, and insufficient to affect the qualities of a water required for the general supply of a town.

Gaseous Contents.

The addition of lime-water and other tests showed that the two specimens contained a nearly equal proportion of free carbonic acid, about as much as Thames river water. The deposit obtained as car-

bonate of lime, by adding an equal proportion of lime-water to forty ounces of each specimen, was brownish coloured in B (owing to separation of organic matter), but was nearly white in A. No offensive effluvia were evolved from either specimen during evaporation. The only gaseous contents were carbonic acid and air: the former not being in sufficient proportion to give them the sparkling character or the aerated fresh taste of good spring water.

Action on Lead.

Both waters acquired a slight impregnation of lead by contact with a bright surface of that metal for a week. This effect was more marked in A than in B, but in both cases the result was so slight as not to affect the general properties or wholesomeness of the waters.

Solid Contents.

By slow evaporation a brownish white residue was obtained from each water weighing respectively for the imperial gallon—

In A 20·14 grains. In B 20·2 grains;

and making a fractional proportion in the solid contents of A of 1·3473rd and of B of 1·3465th part.

The brownish white dry residue of each water, when exposed to a low red heat, became blackened (from the charring of organic matter), and evolved a small quantity of ammonia, indicating that the organic matter was of a nitrogenous nature; and as the quantity of sulphur evolved was barely recognizable by tests, we are inclined to infer that the organic matter in each specimen was of a *vegetable* and *not* of an *animal* nature.

Chemical Constitution.

The imperial gallon of 70,000 grains of each water is thus constituted:—

	Grains.
Analysis of A.:—Carbonate of lime with a small quantity of carbonate of magnesia	13·27
Sulphate of lime	2·11
Common salt, with traces of nitrate of lime	2·21
Organic matter (nitrogenous) probably of a vegetable nature	2·36
Silica and oxide of iron, mechanical impurity	0·19
Total residue in imperial gallon of unfiltered water	20·14

	Grains.
Analysis of B.:—Carbonate of lime, with traces of carbonate of magnesia	11·48
Sulphate of lime	1·49
Common salt, with traces of nitrate of lime	2·01
Organic matter, as in A	5·08
Mechanical impurity	0·06
Silica and oxide of iron	0·08
Total residue in imperial gallon of unfiltered water	20·20

Action of Soap.

The two specimens tried by the common soap test are nearly equally soft, and are only a little harder than good Thames river-water. Their relative hardness compared with distilled or absolutely pure water, is thus expressed :—

	Measures of Soap to produce the same softening effect.	Distilled Water taken as unity.
Distilled water	23	1
Water A	139	6
Water B	131	5·7
Thames (Southwark Company)	127	5·09
New River	114	4·5

Conclusions.

We conclude from these results that the two specimens of water here submitted to analysis closely resemble each other in their chemical properties. The water A contains a rather larger proportion of saline matter in the imperial gallon; it is also somewhat harder than the water B. On the other hand the water marked B contains more organic matter than A; but the two waters are very similar to good Thames water, and fall within the standard composition of wholesome and potable waters.

Ar. Aikin, F.L.S., &c.
Alfred Swaine Taylor, M.D., F.R.S.
Professors of Chemistry in Guy's Hospital.

Chemical Laboratory, Guy's Hospital,
May 3rd, 1850.

Appendix F.

Sir, 28, *Jermyn Street.*

I herewith send you the results of my analysis of the water from the river near Heigham Common, Norwich. The water gave a hardness of 17 degrees by Clark's test, indicating 17 grains of hardening matter (lime and magnesia salts). The analysis gave the following results—

	Grains.
Silica	0·24
Carb. lime	16·08
Sulphate lime	traces
Chloride magnesia	0·87
,, sodium	1·85
,, potassium	traces
Organic matter	1·96
	21·00

I am, Sir,
Your obedient servant,
Lyon Playfair.

Appendix G.

Copy Letter from Mr. Phillips, with analysis of water proposed to be taken by the new Company.

Sir, *Craig's-court,*
Charing-cross, 15th January, 1850.

I have analyzed the water which you sent to me from the City of Norwich Waterworks Company, but before I state the results of my analysis I may remark that the water, although slightly turbid when I received it, became quite transparent on standing, and is free from colour, smell, or taste.

An imperial gallon of the water left, by evaporation to dryness, 24·84 grains of residue, which I found to consist of—

	Grains.
Carbonate of lime	17 08
,, magnesia	0·86
Common salt	2·55
Sulphate of lime	1·34
Silica	0·68
Organic matter and loss	2·33
	24·84

These are the salts and substances usually contained in river water. Estimating the hardness of the water on Dr. Clark's principle, it amounts to 19.

As the water contains so small a quantity of organic matter, I apprehend that it will be but very little subject to putrefaction, and I have not observed any tendency to this change during nearly a month which the water has been in my possession.

Under the circumstances of the natural properties and chemical composition of this water, I consider it as perfectly wholesome, fit for drinking, and well suited to culinary and various other domestic and manufacturing purposes for which its use may be required.

I am, Sir,
Your obedient servant,

To J. G. Lynde, Esq. R. Phillips.

Appendix H.

Norwich.—To the Mayor, Sheriffs, Citizens, and Commonalty in Common Council assembled.

We whose names are hereunto subscribed, being nine of the Committee appointed at a Special Assembly, on the seventh day of March instant, to draw up a system of restrictions under which any lessee of the water-works should be put in making his charges on the inhabitants for water, do now report—That we are of opinion, that the payments for water yearly shall not exceed the sums mentioned in the following

Table, and calculated on the rack rents of the several occupations, taking, as far as may be, the assessments to the poor-rates for the standard.

	£.	s.	d.
Houses of 5*l.* rent and under to pay no more than	0	4	0
6	0	5	0
7	0	5	0
8	0	6	0
9	0	7	0
10	0	8	0
11	0	9	0
12	0	10	0
13	0	11	0
14	0	12	0
15	0	13	0
16	0	15	0
17	0	15	0
18	0	17	0
19	0	17	0
20	0	18	0
21	0	19	0
22	1	0	0
23	1	1	0
24	1	1	0
25	1	2	0
26	1	2	0
27	1	3	0
28	1	3	0
29	1	4	0
30	1	4	0
31	1	6	0
32	1	6	0
33	1	6	0
34	1	6	0
35	1	9	0
36	1	9	0
37	1	9	0
38	1	9	0
39	1	12	0
40	1	12	0
41	1	15	0
42	1	15	0
43	1	15	0
44	1	18	0
45	1	18	0
46	1	18	0
47	2	1	0
48	2	1	0
49	2	1	0
50	2	5	0
51	2	5	0
52	2	5	0
53	2	5	0
54	2	5	0
55	2	8	0
56	2	8	0
57	2	8	0
58	2	8	0
59	2	8	0
60	2	10	0
61	2	10	0
62	2	10	0
63	2	10	0
64	2	10	0
65	2	10	0
66	2	10	0
67	2	10	0
68	2	10	0
69	2	10	0
70	2	15	0
71	2	15	0
72	2	15	0
73	2	15	0
74	2	15	0
75	2	15	0
76	2	15	0
77	2	15	0
78	2	15	0
79	2	15	0
80	3	0	0
81	3	0	0
82	3	0	0
83	3	0	0
84	3	0	0
85	3	0	0
86	3	0	0
87	3	0	0
88	3	0	0
89	3	0	0
90	3	10	0
91	3	10	0
92	3	10	0
93	3	10	0
94	3	10	0
95	3	10	0
96	3	10	0
97	3	10	0
98	3	10	0
99	3	10	0
100*l.* and upwards	4	0	0

Inns and public-houses, coach-houses and stables to be rated according to the above table of assessment.

The occupation of dyers, combers, and trowsterers to be rated 3*d.* per pound more on their rentals than other houses.

Brewers to pay 10*s.* per 1000 barrels in addition to the rent of their several occupations.

Persons having private baths to pay 12*s.* additional for the same.

	£.	s.	d.
The water rent for the two workhouses and bridewell to be	11	10	0
The hall in the market	1	0	0
The fish-stalls, &c.	10	0	0
The city gaol	3	0	0

And, we are further of opinion, that there should be a Committee of Appeal, consisting of two members of the Court of Aldermen and two of the Common Council, to be annually appointed by the Corporation. and four inhabitants, of the city (occupying houses of not less than 20*l*, a year rent each) to be named by the lessee or lessees, at the same time, five of whom should constitute a Committee for transacting of business, and to whom should be referred all disputes between the lessee or lessees and the inhabitants concerning the supply of the water to be afforded, and the charges made upon them, or for any improper use or waste of the same, and the decision of such Committee to be final.

Dated this 21st day of March, 1792.

ROBERT PARTRIDGE. JOHN BRITTAIN.
JOHN HARVEY. WILLIAM SIMPSON.
J. HUDSON. JOSEPH STANNARD.
CHARLES WESTON, Jun. ROBERT WARD.
JOHN HERRING.

APPENDIX I.

CONSTRUCTION, &c. OF HOUSES.

SIR,

IN this statement regarding the houses of Norwich in reference to sanitary matters, it is proposed to divide them into two portions—those within the walls and those without.

It will be necessary to subdivide these portions, although it must be done somewhat arbitrarily. Those within the walls will be here described, first as houses rented at 40*l*. and upwards annually; secondly, those from 20*l*. to 40*l*.; thirdly, from 10*l*. to 20*l*.; fourthly, from 6*l*. to 10*l*.; and, lastly, those which are under 6*l*. a year of annual rent.

The houses in the hamlets will be classed in a similar manner.

The houses within the walls of the first class will be found as various in plan as they are in elevation, and not ten in this class can be found of precisely similar arrangement.

Most of them are occupied for business purposes and dwellings conjointly, the number occupied as private dwellings only being comparatively small.

Some, but not many, have basements containing kitchens, sometimes warerooms, and will most of them be found to have offices, such as are usually attached to this description of residence.

Many in the market-place and adjoining streets have water-closets, but where the houses are not so thickly placed privies and bins are common in gardens, which are often to be met with, or other open spaces.

The supply of water is either by means of wells or pipes, but as most

of these buildings form each a separate property, the cost of wells and pumps would be greater than the *present* cost of pipe-water, which has therefore superseded them in many cases.

The drainage is sometimes defective where there are rooms in the basement, sometimes from irregularity of plan, and sometimes owing to there not being proper sewers. Cesspools, however, are not very common, and where found are mostly used for the reception of water from surface-drains.

The second class of houses have the same variety of plan, and are mostly occupied as dwellings and places for a retail business. They have mostly the usual offices, but water-closets are rarely to be found in them.

The drainage of these buildings is more defective, being mostly by means of surface-drains, even where there are sewers in the streets. Cesspools are not frequently found in use for any purpose.

These houses, like the former, are mostly separate properties, and although some have wells whence they could be supplied with water, yet in most cases the supply is derived from the pipes, and that frequently for the reason before given.

The houses of the third class are chiefly occupied as dwellings and places of business for some small retail trade. They have the same variety of plan, mostly the usual offices. Water-closets are not found in them. The supply of water is frequently derived from pumps in the adjoining yards (except Ber-street, the highest one within the walls), but sometimes from the pipes. The drainage is almost solely effected by surface-drains, and cesspools are not used.

The fourth class will be found to consist mostly of small retail shops with dwellings, being, with regard to plan, like the last-named class, and agreeing with the houses of that class in most particulars; but these will frequently be found without a proper scullery or washhouse, and sometimes without any at all; no water-closets; the water obtained most frequently from pumps, and the drainage like that in the last class.

There have been, however, a few rows of dwelling-houses erected of this class on a uniform plan and with sufficient offices, but not always with proper fittings to the sculleries. The water is obtained from wells, and the drainage as before described.

Nearly all the houses hitherto described may be found situated by some street, public place, or thoroughfare, and therefore are, or could be in most cases, sufficiently lighted and ventilated. There are generally several of those of the last class belonging to each owner.

The fifth, and by far the most numerous class of houses, consists for the most part of old houses, very much varied in plan, and are built round irregularly-formed courts or yards, the old practice of arranging buildings in such a manner having been continued down to a very late period. Many of these houses are formed out of a smaller number of larger buildings; some were constructed originally for small dwellings, and others are divided into floors, and so are occupied by several tenants.

A separate washhouse is scarcely ever found attached to these houses; some have a washhouse in common with three or more dwellings, and many are without any at all.

The supply of water to these houses is almost solely by means of wells and pumps (the former exception still holding good); they are most of them within reach of the water-mains, and in some cases the water-pipes are made use of as well as the pumps.

Sinks are most uncommon, and the house-water is mostly poured on the surface, or into small surface-drains, and finds its way into the sewers or river.

There are very few cesspools in these yards; the privy and bin are commonly found, and the latter is the receptacle of the worse portion of the house-sewage or water.

In most instances there is no other open space attached to these buildings than the yard which gives means of access to the tenements around it. This space, although often of a considerable length, is not often of a sufficient width to admit a proper quantity of light or air, and owing to several causes is but seldom found to be sufficiently cleansed or drained.

There are generally several houses in one property, and there will mostly be found several owners to one yard, as each yard may be said to contain from four to twenty or more dwellings.

A considerable number of houses of this class have been erected during the last forty years, but they have been generally built in rows, with considerable regularity, and with more open space, and are therefore better lighted and ventilated, although to the back of some of these rows sufficient attention has not been given to these two points.

They will be found to have more washhouse or scullery accommodation, but in other respects they are similar to those last described, although, upon the whole, much better abodes. A row of these houses is most frequently the property of one owner.

The houses in the hamlets may be described in a more general manner, there being more similarity of arrangement, &c., no sewers, and few water-pipes.

The first class will be found to be nearly entirely composed of detached buildings, each building or establishment including all the usual offices. Water-closets are not constantly found in them, and pumps and cesspools are used. They are occupied solely as residences, and generally each building forms a separate property, and perhaps no two will be found alike in plan or fitting.

The second class of houses is in many respects like the first, extent making the greatest difference.

These houses, however, are frequently to be found in rows, arranged with an uniformity of plan, and having a water supply and drainage in common, in some cases by agreement, in others from several houses being the property of one owner, or perhaps the row. The arrangement is similar.

Water-closets are but rarely found, and pumps and cesspools are used.

The third class of houses will be found erected in rows in almost all instances, regular in plan, and being in respect to water and drainage about the same as the second, a separate privy and bin will generally be found to belong to each house in both classes; but in the former a greater amount of washhouse or scullery room will be found, and the proper fittings for such places more commonly met with. Proper

house-drains will be found, but surface drains are not uncommon. These houses are almost all occupied as residences, and several houses, or an entire row, will mostly be found to form one property.

In this division also by far the greatest number of houses will be found to be included in the fourth and fifth classes.

These houses are built in regular rows in almost all cases, with abundance of open space for light and air, and most of them have small gardens.

Here, as within the walls, the spaces at the back of the houses are in a few instances too confined, and occasionally crowded in an offensive manner, but such is not generally the case.

A small washhouse forms a part of nearly all these houses, but a sink is rarely to be found, save in the former of the two classes, but not commonly in that.

Privies and bins, in common to several houses, are used. The water is supplied from wells and pumps. Cesspools are used for the surface-water, and covered drains will not often be found, surface-drains being almost the only ones used.

In conclusion, it may be stated, that within the walls there is a supply of water to all the houses, but that there are large districts containing some thousands of houses where there are no sewers or proper covered drains; that in the hamlets the two classes of houses most requiring water and drains have both in about equal proportions, both being deficient, with the exception of a large part of the hamlet of Heigham, where there is a considerable supply of water from pumps, with no other description of drainage than is to be found in the other hamlets, but it is better of its kind.

Within the walls a large number of the small houses have not sufficient light nor air, but in the hamlets there is little to complain of in those respects. There is also more accommodation in the form of washhouses, &c., so that the decencies of life need not be disregarded.

Norwich, May 1850. ROBERT KITTON, *Architect.*

APPENDIX J.

LIST of PUBLIC NUISANCES—*April* 17, 1850.

No.	WHERE SITUATE.	REMARKS.
1	Coburg-street, and the back of St. Stephens.	No sewerage, the place constantly in a filthy state.
2	Heigham, Lower-street.	In a wretched filthy state.
3	Horn's-lane.	Filthy drainage from slaughter-houses, tripe dressers, &c.
4	Thorn's-lane.	Large filthy gutters, &c.
5	Mariner's-lane.	The stench of this place is exceedingly bad.
6	All Saint's-green.	Large offensive gutters, &c.
7	Crooks-place.	Great want of sewerage.
8	Pockthorpe.	The whole hamlet in a filthy state.
9	World's End-lane.	Filthy gutter and no gas.
10	Bull Close.	A general receptacle for filth.
11	Bad constructed sewers.	Containing great accumulations.
12	Public staithes and lanes thereto.	Filthy and out of repair.

No.	Where Situate.	Remarks.
13	Mud traps at sewers' mouths.	Very offensive.
14	Cowgate-street gutters.	Always full of putrid matter.
15	Ber-street.	Want of sewerage.
16	Pea-field.	No sewerage, place always filthy.
17	St. Faith's-lane ditch.	Large ditch of putrid matter.
18	Scole's-green and Stepping-lane.	Offensive gutters.
19	Castle ditches, Cattle-market, &c.	Generally kept very filthy.
20	Chapel-field.	Receives part of the drainage of Coburg-street, causing a filthy ditch.
21	The Little Butchery.	Filthy stinking place.
22	New Catton.	No sewerage.
23	The ditch, Magpie-road.	Receives the water off road, &c.
24	Parish Bin, Trumpet-lane.	A very great nuisance.
25	Fountain-lane.	Long stinking gutter.
26	Hole-in-the-wall-lane.	Filthy urine place.
27	The ditch, Reynold's-garden, Lakenham.	Receives the drain off the road.
28	Urine corners and places.	Very offensive places.
29	The ditch, Pockthorpe.	Receives the drainage of the whole hamlet.
30	Doughty's Hospital.	
31	Public thoroughfare, lanes, and Church-alleys.	Perforated with cesspools. Badly cleansed and paved.
32	The George Looke, Pockthorpe.	Disgusting filthy place.
33	The Creek, Coslany.	Foul stinking place.
34	Tinkler's lane.	Want of sewerage.
35	City-road, and Long John's-road.	Filthy gutters.
36	Roadway, Kensington-place, Lakenham.	Foul stinking gutters.
37	Leaky soil-waggons.	The source of great complaint.
38	The ditch, Hospital-meadow, Helen.	Filthy beyond conception.
39	The pits at the back of the Greyhound, Ber-street.	Swarming with vermin and full of filth.
40	Vinegar-yard.	No sewerage.
41	Weaver's-lane.	Foul stinking place.

Presented by Samuel Clark,
Sanitary Inspector.

Appendix K.

Statement as to the present and future supply of water for, and improvement of the sewerage of, the city of Norwich, made for W. Lee, Esq., C.E., Superintending Inspector of the Public Board of Health, by Thomas Wicksteed, *Engineer.*

Royal Hotel, Norwich, May 20, 1850.

Having been desired by the Town Council of the city of Norwich to survey the present water-works, and make an examination of the river Wensum, above and below, the new mills, with a view to give an opinion as to the capabilities of the present water-works, and their power of affording an increased supply to the city. As to the quality of the water in the river above the new mills, as far as Heigham Common, and below the mills through the city, as to the plan of the proposed new company for an increased supply of water; and as to the practicability of diverting the sewage from the river and rendering it a source of profit to the city,—I visited this city on the 19th ult. and remained until the 23rd ult. and made such investigation as so short a

period would allow of. I afterwards gave evidence before the Committee of the House of Commons upon the bill for the proposed new works as far as I could with my limited means of information, and having heard the evidence given before that committee, and again visited the present works, and examined the river Wensum, upon the 18th inst., I am enabled to lay before the Superintending Inspector a more detailed statement than I was prepared to do after my *first* visit to the works.

Population.—According to the census in 1841 the population amounted to 61,846, and the inhabited houses to 13,889 or $4\frac{4}{10}$ individuals per house. The town clerk informs me that the present number of inhabited houses amounts to 15,000, and, supposing the number per house to be the same as in 1841, the present population will amount to 66,000.

He also informs me that the number of houses supplied by the present company is equal to 6,000, although, in consequence of some tenants paying for several houses, so large a number does not appear upon the books. This number, at the rate of $4\frac{4}{10}$ per house, represents a population of 26,400.

Present Supply of Water.—From a personal inspection, and from information derived from the Water Works officers, I find that there is a water-wheel, 19 feet in diameter, and 13 feet 6 inches wide, with a fall of 5 feet 6 inches; this wheel works 7 pumps, 3 of which are $8\frac{7}{8}$ inches bore, and 20 inches stroke; and 4 are 6 inches bore and 18 inches stroke. The pumps during the last 12 months have made upon an average 18 strokes per minute, 24 hours per diem, 6 days per week, allowing $\frac{1}{10}$ for probable waste through imperfect valves, the quantity raised per diem will amount to 484,600 gallons, or $18\frac{1}{3}$ gallons per diem, per individual, supplied by the company, an ample supply for those who pay for the water.

The gross rental is stated to be 2,200*l.* per annum, which is equal to an average charge per house of 7*s.* 4*d.* per annum, or $1\frac{7}{10}d.$ per week, or nearly $3\frac{1}{2}d.$ per 1,000 gallons.

It would appear that there are 9,000 houses not supplied with water by the company, and it is stated that, in addition to the supply obtainable from the river, there are about 1,000 public and private wells in the city, and, supposing each of these wells yield only $\frac{1}{2}$ a gallon per minute, they would afford to the 9,000 houses, containing a population of 39,600 unsupplied by the company, a supply equal to $18\frac{1}{3}$ gallons, per individual, per diem.

Auxiliary Power.—The present company have a steam-engine which is used in case of accident to the wheel or pumps, it works 3 pumps of $8\frac{7}{8}$ inches bore, and 18 inches stroke, and 4 pumps 6 inches bore and 18 inches stroke, these can be worked at 22 strokes per minute, and, after deducting $\frac{1}{10}$ for loss through valves, the quantity raised per 24 hours will be equal to 551,520 gallons, a most abundant auxiliary power.

Capability of present Water Wheel Pumps.—These pumps might be worked at 22 strokes per minute, instead of 18, and would then raise 592,300 gallons per 24 hours, which would afford an additional supply to 3,115 individuals, or 730 houses, at the rate of $18\frac{1}{3}$ gallons per diem, per individual, or $22\frac{1}{4}$ gallons to the *present* number of tenants.

The power to raise this quantity 140 feet above the Mill Head Stream, or to the height of the present stand-pipe, and adding 12 feet, which

will be the head required to overcome the friction of the water passing through the present 9½ inch and 8½ inch mains, laid between the pumps and the stand-pipe, will be equal to 19 horses; this is supposing the *whole* of the water is raised to the greatest height at present attainable, namely, 140 feet.

Power of the Present Water-works Wheel.—The present water-works wheel has been constructed and erected within the last two years, and, with the exception of the floats, is made of cast iron; it is capable of producing 35 horses power.

The present company have purchased, and intended to lay a 13 inch main, in lieu of the present 9½ inch and 8½ inch main, to the stand-pipe. They also proposed to raise the stand-pipe higher, to enable them to reach the highest parts of the city, and to erect new and larger pumps in lieu of the present old ones.

With such alterations properly made, supposing the stand-pipe to be raised 35 feet, making a total elevation above the Mill Head of 175 feet, and that the new pumps were made large enough to deliver 100 cubic feet per minute, the head, to overcome friction, would amount to 6 feet, and the power required to 34¼ horses.

This quantity would be equal to 897,408 gallons per 24 hours, or a summer supply of 25 gallons per diem for 35,848 individuals, and, taking the inhabitants per house at 4 (according to the proposed company's statements) instead of $4\frac{4}{10}$, the number of houses to be supplied would be 8,962, or exactly equal to half of 10,564 poor houses plus $\frac{8}{9}$ of 5,521 houses of a higher class, which is the number from which the proposed company have calculated a revenue, may be expected. (*See* Answer to Question 30, p. 9, in the Preliminary Inquiries of the Commissioners of Her Majesty's Woods and Forests.)

Power of the Stream at the New Mills.—Upon an inspection of the Ordnance Map it will be seen that the river Wensum rises at East Rudham Common, in the N.W. of the county of Norfolk, and in its course of above 40 miles, following its windings to Norwich, receives a great many tributary streams. The area of the valley or water-shed down to the new mills, from the Ordnance Map, is equal to about 236 square miles, 151,040 acres.

According to a certified copy from the Meteorological Register, kept by Mr. Quinton, the Librarian and Secretary of the Norfolk and Norwich Literary Institution, the following depths of rain fell in the respective years, from 1841 to 1849 inclusive, at Norwich, *viz.*:—

Years.	Inches.
1841	34·52
1842	23·55
1843	28·95
1844	20·37
1845	23·09
1846	21·89
1847	20·13
1848	31·02
1849	27·48
Average Fall	25·66
Least Fall	20·13 in 1847
Greatest Fall	34·52 in 1841

I consider that half the depth of rain falling will flow off the ground into the streams, then, in the shortest water year, 10 inches of rain would have flowed off,—this, upon a water-shed of 236 square miles, would amount to an average daily supply of 15,021,237 cubic feet, or 93,612,349 gallons.

In 1841 it would have been 160,531,459 gallons. And the average for 9 years would have been 119,329,005 gallons.

The quantity flowing down per minute in the shortest water year would amount to 10,431 cubic feet per minute, which quantity falling 5 feet 6 inches is equal to $108\frac{6}{10}$ horses power, and will produce an effective power equal to $71\frac{6}{10}$ horses power. The average of nine years will be equal to 91½ horses effective power, and in 1841 it would have been equal to 122¾ horses effective power.

Power of the two Wheels.—In addition to the wheel for working the pumps, there is one 12 feet wide for grinding corn; the power of this will be equal to 31 horses, and the two together to 66 horses power, or 92 per cent. of the average effective power of the stream in shortest water years, and 72 per cent. of the average effective power of the stream during the last nine years.

The Quality of the Water of the Wensum.—Upon this point I would refer to the analysis made by Professors Aikin and Taylor, the eminent chemists of Guy's Hospital (see Copy of Analysis), after a very careful analysis of two samples of water taken from the feeder to the present works, marked A, and from the river above Heigham Common, marked B; it appears that before filtration *both* waters had a slight yellowish colour, that after filtration *both* became very bright, the colour was entirely removed, and the taste which *one* of the chemists detected before was no longer perceptible after filtration; *both* were entirely free from any odour, and contained no sulphuretted hydrogen, the foul gas which gives offensiveness to sewer water; after filtration through sand, there was no mechanical impurity sufficient to affect the qualities of a water required for the general supply of a town. The solid contents of *both* were as nearly as possible the same; it was slightly less in A, which was from the present water-works feeder, than in B, which was from the river above Heigham Common, and they conclude that both waters are very similar to good Thames water, and fall within the standard composition of wholesome and potable waters. It may be as well to state that the opinions of Messrs. Aikin and Taylor as to what the composition of wholesome and potable waters should be, and which is given in their Report to the Town Council of Leicester, are supported and agreed to by Messrs. Brande, Cooper, Miller, and other eminent chemists.

The chemical question, however, I leave to chemists, and upon the mechanical qualities of the water the Superintending Inspector will form his own opinion upon a personal survey of the river. I am of opinion that the water taken by the present company is equally good as that proposed to be taken by the new company; that both will be much improved by filtration, especially at periods when the water is discoloured by land-floods or vegetable matter, and this I consider is one of the improvements required in the present supply of water.

I believe the nuisances that flow into the river above the present source are offensive in *appearance* only; but if it had been proposed to

establish a Water-works Company for the first time, I think it is probable that I should, in deference to public opinion, have selected a higher source, not because I believed there was any real occasion for it, nor without expressing my own opinion against its necessity. It must be recollected that these works have belonged to the present leaseholders since 1793; at that period the source was probably as free from the *appearance* of contamination as the proposed source *now* is, but as the city extends, the *new* source may become exposed to similar nuisances above it, and upon the same grounds should be removed higher up the river. I feel very confident that it is not worth while to increase the cost of the water to the consumer or rate-payer for what I consider an imaginary evil. With reference to the general sanitary condition of a city, I think no sewage or filthy waters, however small in quantity they may be in proportion to the volume of water flowing in the river, should be allowed to flow into the river if means can be devised to divert them at a reasonable cost, more especially when the filth might be collected, and disposed of profitably in reduction of the cost of sanitary improvements.

The river for a considerable distance *below* the new mills is polluted by the refuse from the city and from manufactories flowing into it, and I think there can be no doubt that these sources of pollution ought to be diverted, and after undergoing the process of disinfection and separation of the obnoxious gases and organic matter should be returned into the river *below* the city.

As any system of sewers that may be adopted should extend equally to the neighbourhood *above* as *below* the new mills, when it is accomplished then no preference can, under any pretence, be given to the source at Heigham Common; and as it is fully intended that the sewage of the city shall be removed from the river, is it worth while to increase the cost of water *permanently* to the rate-payers for the purpose of avoiding a nuisance which, if real, is only temporary, as it will be removed in a short time in the most effectual manner?

Scheme for an Improved Supply of Water to the City.—1st. In forming any scheme for the supply of water to a town, provision should be made for an increased population, and supposing that to be for 30 years to come, then the population in 1841 having been 61,846, and in 1849, or eight years after, 66,000, being an increase of 4,154, then in 30 years, if the population increases at the same rate, it will amount to 81,577, and for this number in my opinion provision should be made.

2nd. That to obtain the greatest advantage from sanitary improvements, every house in the town should have a supply of water; that, amongst other important objects, the house drains may be kept constantly cleansed, and it appears to be generally admitted that a supply of water should be always accessible, especially to the poor, without the necessity of providing cisterns; it is also considered, that an average supply of 20 gallons per diem per individual will be ample for all domestic and public purposes.

3rd. The quantity of water required for a population of 81,577 will therefore be equal to 1,631,450 gallons per diem.

4th. That the water may be clear and bright in all seasons, filtration through sand should be adopted; to filter the above quantity the area of the bed should be 2,266 square yards, say half an acre; the area of

the meadow through which the present Company take their water is above three acres, there is, therefore, plenty of space for a filter bed on that site.

5th. That a supply of water may be given to the houses in the highest parts of the city; the stand-pipe in Chapel-field should be 35 feet higher than the present one is, or 175 feet above the head stream of the new mills; this would make the height above the floor only 94 feet, it might safely and without difficulty be made twice the height if it were necessary.

6th. The reservoir in Chapel-field is 87 feet above the head stream, and will command the tops of more than half and probably two-thirds of the houses in the city; the less the size of the reservoir, so long as it is sufficient to hold a day's supply, the better, as it would be very injudicious to expose the water after filtration to the action of the sun unnecessarily. A day's supply for half the city will be equal to 815,770 gallons, and the reservoir being three quarters of an acre in extent and 2 feet deep, will hold 1,832,395 gallons; supposing, however, the water is never lowered more than 4 feet, this will produce 814,396 gallons, the present reservoir is, therefore, of sufficient capacity.

7th. Supposing one-half of the water to be raised 87 feet, and the remainder 175 feet, and that two mains are laid from the New Mills, one of 13 inches diameter, which is already provided, and that the present main be made 9½ inches for the whole distance; then for friction in the large main an addition of 5 feet must be added to the elevation, and in the small main 29 feet. The power required to raise 91 cubic feet per minute 180 feet will be equal to 31 horses, and for 116 feet 20 horses, making an aggregate power equal to 51 horses.

8th. The present wheel will be sufficient for the 31 horses power, and if the corn mill is to be continued a new wheel of 20 horses power will have to be erected, and the present engine being equal to 28 horses power will be sufficient as auxiliary power. New pumps and connections would have to be provided for wheels and engine. The water power required being equal to 51 horses, and the corn-mill wheel to 16, makes a total of 67 horses, and the average power of the stream being in short water years equal to 71 horses, it would appear, that with the assistance of the 28 horses power steam engine the flour mill might be continued.

9th. The length of old and new streets within the walls is stated to be . . . . . 13½ miles.
Ditto of yards, courts, &c., and within precincts of cathedral . . . . . 11⅙ „
Ditto of new streets, yards, courts, &c., in the hamlets . . . . . 14⅙ „
Total . . 38⅓ „

The length of streets in which pipes are already laid amounts to 13½ miles, there are, therefore, 25 miles of streets, courts, and alleys in the city that have no water-pipes laid into them.

10th. To add to and alter the present machinery, to construct a filter bed in the new mills meadow, and extend the pipage through the

whole of the streets, alleys, and courts, would not cost more than 22,000*l.*

When I formed an "*extreme* estimate" for the probable cost of these works for my evidence before the Parliamentary Committee, I stated that it was an outside one, and having since obtained more information I am satisfied the alterations and additions could be made for the sum I now state; if to this amount be added 26,000*l.* for the purchase of the present leaseholders' interest, the total capital required will amount to 48,000*l.*

11th. I consider that the annual cost of carrying on the works will not exceed 1,280*l.*; this sum added to 1,920*l.*, which is 4 per cent. upon the capital, will amount to 3,200*l.*, or the revenue required to effect all the improvements hereinbefore enumerated as required, to afford an abundant and constant supply of good filtered water to the top of every house.

If the capital is to be liquidated in 30 years, an addition of 2 per cent., or 960*l.* per annum, must be added, making the total annual cost 4,160*l.* per annum for 30 years, and 1,280*l.* per annum after the expiration of that period.

12th. Supposing there are 10,000 of the poorer class of houses, and 5,000 of the higher class, then the following charges per house must be made to produce the required revenue:—

	£.	*s.*	*d.*
1st. 10,000 houses at ½*d.* per week, or 2*s.* 2*d.* per annum	1,083	6	8
5,000 houses at less than 2*d.* per week, or 8*s.* 6*d.* per annum	2,126	0	0
Total	£3,209	6	8
2nd. 10,000 houses at ¾*d.* per week, or 3*s.* 3*d.* per annum	1,625	0	0
5,000 houses at about 2⅛*d.* per week, or 10*s.* 2*d.* per annum	2,541	13	4
Total	£4,166	13	4
3rd. 10,000 houses at ⅛*d.* per week, or 6½*d.* per annum	270	16	8
5,000 houses at 1*d.* per week, or 4*s.* 4*d.* per annum	1,083	6	8
	£1,354	3	4

13th. The rateable value of the property in the city and hamlets, according to the returns given to me, is equal to 144,802*l.* per annum. In these returns, I am informed that two-thirds of the rates only for the hamlets are charged, none being made for land.

	£.	*s.*	*d.*
A rate therefore of 6⅞*d.* in the pound would produce	4,140	2	6
Of 5½*d.* in the pound would produce	3,213	0	0
Of 2¼*d.* " "	1,338	15	0

14th. The capital for a population of 66,000 will be 48,000*l.*, or 14*s.* 6½*d.* per head.

The new company propose to supply 10,564 houses at 1*d.* per week, or 4*s.* 4*d.* per annum; and 5,521 houses at a rental of 112,815*l.*, at 5 per cent upon the rental. If the whole were supplied the total annual charge upon the town would be

	£.	*s.*	*d.*
For the lower class . .	2,288	17	4
For the higher class . .	5,640	15	0
	£7,929	12	4

The company are limited to a capital of 80,000*l.*, and a dividend of 7 per cent. or 5,600*l.* per annum; and if when the whole are supplied their expenses amount to 2,330*l.*, they will be able to make this annual charge of 7,930*l.*

This, upon the rental of the city, amounting to 144,802*l.* per annum, will be equal to 13*d.* in the pound instead of 5⅓*d.*; as by the scheme proposed by the Town Council the lower classed houses will be charged 4*s.* 4*d.* per annum instead of 2*s.* 2*d.*, and the higher classed houses 20*s.* per annum instead of 8*s.* 6*d.*

With such a statement of facts before me, I cannot hesitate in expressing an opinion that the introduction of the new company would be most prejudicial to the interests of the city, as it can provide itself, under the provisions of the Public Health Act, with all the advantages offered to it by the new company at one-half of the *annual* cost, and, in my opinion, in a much more satisfactory manner to the public.

In addition to this, I consider that the supply of water and the sewerage of the city ought to be under the direction of one governing body, invested with powers to carry out the regulations provided for in the Public Health Act.

The cost of providing sewerage for the city of Norwich, and of conveying the sewage from it to a distance, would not exceed a sum of 60,000*l.*; but without a proper and minute survey I am not prepared to state for how much less it might be effected.

The cost of *maintaining* the works, *disinfecting* the sewage-water, *interest* upon capital, and *liquidating* it in 30 years, would *not exceed*, and I believe would be much less than 7,000*l.* per annum, or at a rate of 11$\frac{6}{10}$*d.* in the pound upon a rental of 144,802*l.*; this rate would gradually be reduced, first by the increase of the assessed rental of the city requiring a less rate in the pound; and secondly, by the profits to be derived from the sale of the manure, and which, I feel satisfied, would be sufficient eventually to extinguish the rate altogether.

The greatest annual charge to the inhabitants would be for 18,540 houses, 7*s.* 6½*d.*, or 1¾*d.* per week each house, and this, as before stated, would gradually be extinguished.

The greatest charge for water and sewerage for 30 years, after which time, as the capital will have been liquidated, the charge will be trifling, if any, will be—

For water . .	£4,140	
For sewerage . .	7,000	
		£11,140

This upon 18,540 houses will be equal to 12*s.* per annum, or about 2¾*d.* per week per house, or 18½*d.* in the pound.

After the expiration of the 30 years, and supposing *no* profits to arise from the sale of the manure, the annual cost would be reduced to 4,680*l.* per annum, equal to 5*s.* per annum, or about 1⅛*d.* per week per house, or 7¾*d.* in the pound.

The capital required for *water works and sewage* combined, if done by the Corporation, will not exceed 108,000*l.*, or 28,000*l.* only beyond the amount of the new company's capital of 80,000*l.*, which is to be expended upon the supply of water only.

The capital for *water supply and sewerage* will amount to 26*s.* 6*d.* per head upon a population of 81,677.

THOS. WICKSTEED, *Engineer.*

Royal Hotel, Norwich, May 20, 1850.

APPENDIX L.

EXAMINATION of Mr. JAMES G. LYNDE, C.E., before the Superintending Inspector at Norwich.

"I am engineer to the City of Norwich Water-works Company, who are now seeking an Act of incorporation. The document now shown to me is a copy of my evidence given before the Committee of the House of Commons on the Company's Bill. I beg to confirm that evidence here. The 17,000 houses named were obtained from the Court of Guardians. The 4,791 houses named are those supplied by the present works."

(Mr. Dalrymple explained that the number was afterwards found to be 5,619.)

Mr. Lynde resumed. "By the Water-works Clauses Act, the 10 Vict. c. 17, section 44, the Company would be bound to make the communications. The existing Company would be under no such obligation. The estimates remain the same as before. The annual income may be somewhat altered. I will read you a statement and will then put it in, showing that the rates can be much reduced if the supply be extended to a greater number of houses than the Company estimated for, on the voluntary principle. The statement supposes that a supply of water to the houses should be required by the Local Board of Health, and on that supposition I am prepared to say that the Company would give the supply on the terms I have named."*

(Mr. Dalrymple said, in answer to a question from Mr. Beckwith, that he should not feel at liberty to insert a clause binding the Company to such terms; but the statement was made in good faith, and might at any future time be used against the Company.)

(Mr. Beckwith asked for a copy of the statement, and Mr. Dalrymple promised to supply same.)

Mr. Lynde resumed. "The population assumed is 65,000, but the provision of 27 gallons is only another way of prudently providing a

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* For statement, *see* p. 138.

sufficient supply for an increased population. The practical effect is the same.

"The extent to which the existing works might be adapted to the scheme before Parliament is a matter not decided. The water-power might be used for pumping, and some of the existing pipes used. We never contemplated taking water from any other source than Heigham Common. It would be easy to put down a small engine at Heigham Common to lift the water to the filter-beds there, and then run it down to pumping wells at the new mills. I would not under any circumstances construct a filter-bed in the meadow at the new mills. Looking at it professionally, it could not be done at a reasonable expense. It is a kind of site one would studiously avoid for such purpose. The effect of constructing flood-banks in that meadow to keep the flood-water from the filter-beds would be to inflict very great injury on the property in Heigham and St. Martin's-at-Oak, besides damming back the waters over the meadows, and keeping them flooded for a greater length of time. As to the pollution of the wells, our Bill would obviate the necessity for wells altogether. The question put to me before the Committee was beside the question. I am of opinion that there ought to be a proper and efficient system of drainage for the city, and that the absence of such drainage would not be a sufficient justification in withholding water from the inhabitants. Even if all the drains were kept out of the river, the stream could not be kept sufficiently pure within the city for domestic use. Below the new mills the river is tidal, and there are many boats, the refuse from which must go into the river. Under the best circumstances that water would not be sufficiently pure for food unfiltered. If the water power at new mills were used for pumping, the reservoir at Lakenham would not be abandoned; the only difference would be the substitution of water power for steam power. There cannot be efficient drainage without a proper water supply. The means of preventing any pollution of the river above our works are contained in the Water-works Clauses Act. The company would indict any one who should attempt. The present company's powers under their Act to prevent nuisances in the river extend only to a distance of 600 yards above the new mills. The premises of Mr. Wills are beyond that distance. Mr. Dye's premises are also more than 600 yards above the mills. There is no limitation of distance in the 10 Vict. c. 17, s. 61, which would be the remedy in the hands of the Company I represent."

(Mr. Beckwith explained, that the Corporation, as conservators of the river Wensum, have ample jurisdiction for such purposes from the new mills up to Hellesdon mills, a distance of three miles.)

Mr. Lynde resumed. "I put in a copy of the evidence of Mr. Wm. Wilde, auctioneer, as to the correct figures of the income by the proposed works with respect to the statement put in on Tuesday by Mr. Wicksteed. He has estimated 18¾ gallons as an ample supply, which, he says, is sufficient as far as it goes. That relates to the portion of the town supplied from the new mills. To obtain that supply the people must pump night and day, every day, Sundays and week days, to obtain the quantity stated by him upon his own basis.

(Mr. John Kitton said, that there is one well from which 30 gallons per minute has been pumped night and day, except Sundays, for months, for steam-engine purposes.)

Mr. Lynde resumed, "At B, Mr. Wicksteed has given the power of the water-works wheel at 35 horses. In making it 15 horses only I took the power of the water going through the sluices at that time.

"The result of that clause B seems to be, that he would provide a summer supply of 25 gallons per diem for 35,848 individuals.

"That was the number from which the proposed company calculated their revenue on the voluntary principle, and is the total number that he appears here to have provided for.

"At C, in calculating the power of the stream, he has taken the drainage area, and the fall of rain, and fixed the quantity upon those data. He has taken half the depth of rain falling; that, he assumes, would fall into the stream, and be available as power at the new mills. Now, with a fall of rain of only 20 inches, I think you will agree with me that one half would never reach the new mills; one-third would have been much nearer the mark. He seems studiously to avoid, in this statement, giving any statement as to the water passing through the gauge at the new mills.

"At D, the gist of that seems to be, that if the water is free from perceptible odour, it is fit for food. I have gone to the source that he says he should have adopted, from deference to public opinion. I have adopted it with regard to the quality of the water. I did not obtain an analysis of the water at the suction-pipe in the new mills meadow. I was induced to go higher up from the nuisances that I saw flowing into the river."

(Mr. Beckwith said, he thought the nuisances should be enumerated.)

Mr. Lynde resumed. "I enumerate them. Tinkler's bathing house, and laundress ground. A creek running up to Heigham village, and the houses draining into it. Howard's public slaughter-house and piggery drains into a ditch that runs into the river. The Dolphin bath-house. Wells', fellmongers and tanner's yard. Dye's, fellmonger's yard. Fuller's Hole, public watering-place in the river, a place where horses are watered. Nicholl's slaughter-house and piggery, which you examined. It drains into the river. A ditch, into which three *public* privies, besides minor drains, enter. That flows into the river. Smith's bath-house ditch into which two privies and numerous houses drain, it falls into the river.

There are two other drains into the river from the premises in St. Martin's-at-Oak. All those are between Heigham Common and the watercourse from whence the company take their supply.

"As to increasing the cost, the estimate Mr. Wicksteed gave to the Committee tallied very nearly with mine. He has since reduced it from 27,000*l.* to 22,000*l.* For this sum he does not propose to change the source, nor to construct a high service reservoir, nor to improve the Chapel-field reservoir. Those things added to the 22,000*l.* make a sum in excess of my estimates for going to a purer source, and giving a constant supply from the reservoir.

"E. I direct your attention to the paragraph—2nd section, and I would ask you to contrast that with what Mr. Wicksteed states about 1000 wells with half a gallon per minute,—4th section. That area would certainly give the supply of water, but when the filter required cleansing, the town would be without water, and there appears no provision for a second filter in Mr. Wicksteed's estimate.

"5th section. This would involve, to give the constant supply that Mr. Wicksteed admits to be necessary, working the pumps continually night and day, otherwise there would be no provision in case of fire, there being no elevated reservoir, and during the night the whole of this pumping must be to waste, because the people could not take the water during the night except in cisterns, on the intermittent system, as at present. It is hardly necessary to add, that if they did not work in the night, and a fire were to happen in the upper part of the city, no water would be obtained until they had given notice at the new mills, and the pumps could be started. It would be some time before the water would go over the standpipe, and the velocity would not be more than 2½ feet, or at the most, 3 feet per second. The distance is about half a mile.

"6th section. There is nothing that I can find to be done to the Chapel-field reservoir.

"The new company do not state before the house any alteration in that reservoir, because the standing orders will not admit of alteration in the principle of the works; and the purchase of the existing works is not completed.

"8th section. States the power of the steam-engine at 28 horses, whereas, it is not more than 18 horse-power.

"There is a clause in the lease compelling the lessee to employ one-third of the power of the mill in grinding corn. Mr. Wicksteed takes the power of the corn-mill at 16 horses, and assumes that as the state of things that would continue; whereas, if the power of the stream be made equal to what he states, a much greater power must be applied to grinding, and to that extent a deduction must be made from the remainder of the water-power that Mr. Wicksteed has given as applicable to the pumping of water, and the deficiency must be made up by some means not provided for in his estimate.

"The 10th section gives the estimate at 22,000*l.* In addition to that I would suggest, that the addition to the standpipe should have been included, and all those things that I have suggested to you should also have been included, which would have increased his estimate to a larger amount than I have proposed, in order to bring the water from a purer source.

"In the 11th section, Mr. Wicksteed must have made a mistake as to the 1,280*l.* annual expenditure for such a supply. That expenditure must be based upon the quantity he proposes to supply. 18⅔ gallons for only half the houses of one class, and ⅔ the houses of another class, and not as he states, for a constant supply at the top of every house. My estimated expenditure is based upon the supply required under the Public Health Act.

"14th section. I appeal to you whether that is sufficient to give a constant supply, on the pumping principle, to the inhabitants of Norwich. The bare amount of the engineer's estimate is given as the capital. There is no margin whatever. Mr. Wicksteed seems to have made a mistake as to the capital of the company being limited to 80,000*l.* The capital is limited to 60,000*l.*, with powers to borrow 20,000*l.* I must draw your attention to the contrast between the two estimates Mr. Wicksteed has made upon that clause as to the charge to be made upon the city. He takes the amount of the capital of the company, and adds to that, the whole amount they are empowered to

borrow, irrespective entirely of the cost of the works, or the money to be expended, and upon which the dividends will be limited. He takes the whole money power of the company, and states that we shall be able to make a charge upon the town to the amount of that sum, to the extent of 7 per cent., together with our annual expenses, which he has assumed at an amount much larger than any I have ever given; and makes the annual charge upon the town amount, in this manner, to 7,930*l.*, or 13*d.* in the pound, instead of 5½*d.*, as in the scheme proposed by the Town Council.

"In order to obtain that 5½*d.*, Mr. Wicksteed appears to have taken the bare amount of the money he proposes to expend in carrying out the improvement he suggests. It is a most unfair way of comparing two estimates.

"I think, from the statement you have had handed in, you will see that we can serve water quite as cheaply as it can be served by the Corporation, and if the Public Health Act be introduced, and it be compulsory on the inhabitants to have a proper supply of water the scale of charges would be lower than in any town in the kingdom."

(Mr. Staff, Town Clerk, called attention to the fact that no provision was made in the expenditure as to the reversion of the works to the Corporation at the end of 42 years, and the covenants and arrangements consequent thereon.)

Mr. Lynde resumed. "There is a clause in the Bill to compel the company to sell the water works to the Local Board of Health if they should desire it.

"With reference to the desirableness of consolidating the water supply and drainage in the same hands, there can be no doubt that one should be reciprocated, and adapted to the other, so that the two shall be worked as parts of the same system. I have taken levels all over the city. I have been induced to consider the drainage with reference to the water supply, and to lay out the pipage, with a view to a proper and efficient system of drainage. That was done before I was aware of the application of the Public Health Act to Norwich. I always endeavour to do that in any town. I have become acquainted to some extent, necessarily, with the character of the existing drains and their outfalls.

"I should construct the outfall of the city on the southern side of the river.

"There appear to be two suitable places for outfalls: the former, which I consider sufficient for all practical purposes, is at a bend of the river below Trows-marsh. The latter is at Woodend, but I do not think the benefit gained would justify the expense of going so far.

"The tide does not flow up to the city from Trowse-marsh. At Woodend it only flows a mile. There is a very good line of main sewer from Trowse-marsh skirting the side of the hill, with a regular rise the whole way.

"I would bring it up King-street and continue on to Tomb-land. It could be made in that direction without interfering with any of the cathedral property at all. This would serve for more than seven-eighths of the whole city with a natural outfall. The remainder would have to be raised by pumping. The lift would not exceed about 14 or 15 feet. For one-eighth of the city a very small power would be sufficient. I should propose to keep the rain-water out of the main sewer, and

to let it flow into the river. I would use the existing drains after improvement, to carry off rain-water. I would have a separate system of drains for all the refuse that would be offensive and injurious, and that might be turned to valuable account. I should construct the street-drains of earthenware. I should not commence the street-drains with more than 8 or 9 inch drains. The pipes from the cottages and water-closets would be 4 inch pipes, coming down into the streets. A system of pipe-drainage like that would be very much cheaper than the usual mode of drainage. With a proper water supply, such a system would be much more efficient than with drains constructed of masonry. You would bring the water to bear more directly upon the sewage.

Appendix M.

City of Norwich Water-works.

Answer to the Report of the Corporation Committee to the Inspector under the Public Health Act.

It is not essential that the management of the sewerage and the water supply for the City of Norwich should be vested in one governing body; the sewerage once complete would require no further outlay; but a water supply is a matter of daily expenditure and labour, being in fact a commercial undertaking, and when jealously guarded from monopoly and encroachment, according to the provisions of the Water-works Clauses and the Public Health Acts, can be more cheaply and efficiently managed by a private company than by a public, irresponsible, fluctuating, and political body, whose interests are but remotely affected, and whose vigilance, therefore, is likely to be less awakened as the experience of Norwich has amply proved in matters confided to the management of corporate bodies.

The old act of Parliament and the covenants of the lease from the Corporation to the present lessees are totally insufficient for the purposes of furnishing a proper and sufficient supply of water, they were intended for a state of things which have passed away; and neither as conservators of the river nor in any other way, have the Corporation power to prevent the stream from being polluted as it now is, nor can these powers be acquired under the Public Health Act. It has also been determined by Parliament that the supply shall be taken from the river Wensum at Heigham Common; and any estimates, therefore, must prove fallacious which are based on other principles than those of a constant supply of pure filtered water from that source at such a pressure as will carry the same to the top story of the highest dwelling-houses.

When before Parliament, Mr. Wicksteed estimated the expense of improving the present works, including the purchase of the new mills, at 53,000*l.* This, he stated, did not include any change in the source whence the water would be taken, nor any high service reservoir to ensure a constant and unlimited supply to the inhabitants. Mr. Wicksteed now states that this can be effected for 48,000*l.* and even if this were true it would be only waste of money to patch up old works which would not then be capable of affording a proper and sufficient supply.

The bill now before Parliament will enable the promoters to give a constant and unlimited supply of pure filtered water from the source at Heigham Common at a cost of 53,000*l.*; it also gives them ample power to maintain that source unpolluted, and contains a clause obliging the Company to transfer all their powers and works to the Corporation, as the Local Board of Health, should they think it advisable to purchase them after their completion.

The estimates and figures contained in the Report of the Corporation Committee are very arbitrary, unfair, and incorrect.

It must be borne in mind that Mr. Wicksteed's scheme is incapable of affording constant pressure, as well explained by Mr. Lynde in his observations before the Superintending Inspector, and in instituting any comparison between the scheme of Mr. Wicksteed, and that of Mr. Lynde, it must be remembered that the one provides for a constant supply while the other does not.

And first, as the promoters have power under their agreement with the new mills company to complete their purchase whenever they please, the Corporation cannot obtain possession of the present works without the consent of the promoters, and even assuming that this would be given, it certainly would not be without the costs of the Act of Parliament, which the committee estimate at 3,000*l.*; to this must be added the expenses they have already incurred in opposition, which cannot be mentioned at less than 1,200*l.*

2nd. With regard to the annual expenditure stated by Mr. Wicksteed at 1,280*l.*; he has based it upon the supposition that only one-half or two-thirds of the inhabitants will be supplied, whereas the estimate of the annual expenditure contemplated by the promoters assumes that an abundant and constant supply will be afforded to every house. In order, therefore, to render the comparison just, the one-half or one-third must be added to Mr. Wicksteed's estimate, making it, instead of 1,280*l.*, 2,560*l.* or 1,920*l.* If we take the medium between the two latter sums we have 2,240*l.* as the annual cost of a supply to every house by means of pumping.

3rd. Mr. Lynde stated that the value of the old works as applied to the exigencies of the new company would be equal to the price given, and not to 20,000*l.* as most unfairly assumed by the Report.

4th. Mr. Lynde estimated the cost of wear and tear and working expences at 1,965*l.*, not 2,000*l.*, which included also the rent to the Corporation.

5th. By the 113th section of the Public Health Act, it is *compulsory* on the Local Board of Health to appropriate and set apart as a sinking fund such a sum of money as will, in a period of 30 years, be sufficient to repay both principal and interest of any moneys borrowed for the purposes of the Act.

The comparative expence of Mr. Wicksteed's pumping scheme, and Mr. Lynde's constant supply, will therefore, stand thus:—

Mr. Wicksteed's reduced estimate	£22,000
Cost of present works	26,000
Costs of Act of Parliament	3,000
Costs of opposition	1,200
Total Cost	£52,200

Four per cent. would be	2,088
Sinking Fund	1,044
Expences of working and wear and tear. .	2,240
	£5,372

Thus showing a total annual cost of 5,372*l.* instead of 3,200*l.* as stated in the Committee's Report if the supply of water be placed in the hands of the Corporation, besides any contingent loss which, if it should occur, must be added to that sum and be raised out of the borough rates besides the cost of the sewerage, which, according to Mr. Wicksteed's estimate, will be 7,000*l.* a year.

Mr. Lynde's estimate for the works of the new company is	£53,000
The price agreed to be paid for the present works . .	26,000
	£79,000
Deduct as stated by Mr. Lynde to be the value of the old works as applied to the exigencies of the new company .	26,000
	£53,000
Add costs of Act of Parliament	3,000
	£56,000

Six per cent. on 56,000*l.*	£3,360	
Sinking Fund	250	
Add for wear and tear and working expences, as per Mr. Lynde's estimate, including rent to Corporation	1,965	
		£5,575

Thus shewing a total annual cost of 5,575*l.* if the supply be placed in the new company, or a difference of 203*l.* per annum only for a constant supply of filtered water from an improved and perfect source, by gravitation instead of an intermittent supply by pumping from the present polluted source; and any contingent loss, should it occur, will fall on the promoters, not on the public.

An impartial Committee of the House of Commons, after seven days of patient investigation, unanimously pronounced in favour of the plans of the promoters; and the House of Commons, on the 3rd instant, after an unusual and abortive attempt to negative it on the third reading, passed the bill.

June 6th, 1850.

This document has been hereinbefore authenticated by Mr. Lynde, the engineer to the New Water Works Company, as the answer of the Company to the Report of the Committee of the Corporation.

W. L.

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