

628.1  
P53  
1918

ANNUAL REPORT

BUREAU OF  
WATER

PHILADELPHIA

1918

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REMOTE STORAGE

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ANNUAL REPORT

OF THE

BUREAU OF WATER

DEPARTMENT OF PUBLIC WORKS

OF THE

CITY OF PHILADELPHIA

FOR THE YEAR ENDING DECEMBER 31, 1918



ISSUED BY THE  
CITY OF PHILADELPHIA



# REMOTE STORAGE

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## BUREAU OF WATER

C. E. Davis, CHIEF

Philadelphia, January 8, 1919

Mr. George E. Datesman, Director,  
Department of Public Works.

Dear Sir:—I beg to submit herewith the annual report of the Bureau of Water for the year 1918.

The outstanding feature of the operation of the Bureau of Water in the culminating year of the war is the fact that notwithstanding the handicaps and hazards incident to the country's condition, the works were conducted without a serious breakdown, and, in the face of a greatly increased demand for water, rendered normal service.

At two separate times all previous records for daily and weekly output were broken. One period of maximum draft occurred during the excessively cold weather of the winter, and another in the excessively hot weather of the summer. During the week ending March 7th, a daily average of 348,000,000 gallons was delivered into the mains, and during the week ending August 1st a daily average of 337,000,000 gallons was delivered into the mains.

The fact that the plants during a year of maximum work and minimum resources were able to respond to these excessive peak demands, and the further fact that no breakdowns with serious results occurred, is due chiefly to the loyal and self-sacrificing work of that portion of the force which remained in the service of the City in the face of the inducements of higher pay in outside employment. The total normal force in the bureau is approximately 1,700 men. During the year 545 men left the Bureau of Water, in addition to those who joined the army and navy, and approximately 500 men were secured to take the places of those who left. In other words, nearly one-third of the entire



force was in a state of transition during the year. Naturally, the newcomers were inexperienced and generally were men who could not meet the more severe conditions prevailing in outside employment at the higher wages, and as a consequence the bureau received no greater return in services than was indicated by the comparative scale of compensation. The experience of the war tends to the theory that the offering of wages below the prevailing rate does not pay.

The pension system proved a stabilizing factor and tended to retain many men who otherwise would have left the service. Twenty years of employment is one of the requirements of participation in the pension privileges and there was a natural reluctance on the part of a man who had been in the City service for fifteen or eighteen years to lose his pension rights even at the cost of a few years' employment at less than the standard rate of compensation.

#### FILTRATION

The filtration plants produced a thoroughly safe water throughout the entire year. The health authorities of the City assert that for several years past there has been no connection between any case of typhoid fever and the City's drinking water supply, but as it is customary to use the typhoid rate as an index of the efficiency of the filter operation, the following table is submitted:

	1917	1918	Per 100,000
Cases .....	625	337	
Deaths .....	111	87	4.8

The rate of 4.8 per 100,000 is based on a population of 1,782,000. However, there is reason to believe that the great influx of workers attracted by the war industries has increased the population of the City materially beyond this figure.

The efficient operation of the filter plants has been constantly menaced by an inadequate number of laborers available for cleaning. Torresdale in particular closes the year with a large amount of necessary work undone and is consequently in poor condition to handle any excessive turbidity in the near future. Deep cleaning has been possible on only seven filters, where

20 filters should have been so cleaned to maintain the standard found necessary for the past six years.

A large amount of other vital work has likewise been necessarily postponed. Without the sedimentation basin at this plant and the opportunity afforded by it to apply a coagulant in times of high turbidity, the filters could not have been successfully operated. The following table shows the general work accomplished by the sedimentation basin in the reduction of visible turbidity, though the peak points are not indicated:

Month	Av. amount filtered per day	Turbidity				Bacteria			
		River	Outlet of basin	App. finals	F. W. B.	River	Outlet of basin	App. finals	F. W. B.
January .....	190.5	20	16	6	0+	81 000	71 000	19 000	370
February .....	195.1	79	38	15	0+	67 000	53 000	13 000	180
March .....	192.3	29	21	8	0+	13 000	11 000	2 400	21
April .....	190.1	14	12	4	0	26 000	23 000	2 900	10
May .....	196.6	25	15	3	0+	19 000	9 900	2 000	27
June .....	196.5	24	27	9	0+	19 000	9 400	2 000	29
July .....	200.6	12	10	1	0	11 000	6 800	900	12
August .....	198.7	8	7	0.5	0	8 600	6 100	750	5
September .....	187.2	11	9	0.5	0	17 000	9 800	1 200	7
October .....	180.2	13	11	2	0	14 000	17 000	3 300	37
November .....	175.3	13	12	2	0	9 500	12 000	2 800	5
December .....	172.0	31	21	8	0+	30 000	36 000	6 800	28
Average ..	180.6	24	15	5	0+	26 000	22 000	4 800	61

The preliminary filters at Torresdale have also rendered valuable aid and the increase in depth of sand from twelve to sixteen inches on these beds has been fully justified by the results.

A coagulant was applied at all the plants except Upper Roxborough during periods of excessive turbidity in the rivers. The number of days' use is shown in the following table:

Torresdale .....	16 days
Queen Lane .....	25 days
Belmont .....	14 days
Lower Roxborough .....	13 days

Ice formed to a depth of 14 inches on the Queen Lane filters during the excessively cold winter months, interfering seriously with cleaning operations. At this plant it was found necessary to begin an extensive overhauling of the preliminary filters because of an excessive accumulation of mud. Twenty of the beds were cleaned during the year, the sand being ejected and passed through a Nichols separator, and the gravel being washed in place with a hose. About 20 per cent. of the brass air and water tubing was found to be split and renewals were necessary.

A machine developed for the purpose of replacing hand labor in cleaning filter sand in place was successfully operated at Queen Lane. The machine was devised by Mr. E. M. Nichols. The apparatus is mounted on a frame supported and propelled by caterpillar tractors. A cutting revolving screw at the front of the frame delivers the sand to a revolving paddle at the center, which in turn throws the sand into an ejector which—together with a Nichols separator—is mounted on the framework. Electricity is used for power, while the ejector and separator are operated by the ordinary pressure hose connections. The machine has a capacity of about 10 cubic yards an hour under favorable conditions.

Odors typical of sulphuretted hydrogen reappeared in the Schuylkill River during low water stages in the autumn, causing annoyance and discomfort, but no sickness. This is a recurrent condition caused by the excessive pollution of the stream by decomposing organic matter.

#### PUMPING STATIONS

The pumping stations felt the wartime handicap most keenly of all divisions of the Water Bureau. Inability to obtain necessary material and supplies, together with loss of employees and changes in the force, necessarily resulted in deterioration of equipment. The initiation of improvements was out of the question, the most vital problem being to keep the plants in operation even at the cost of premature depreciation. Fortunately, a few improvements originating under the \$500,000 appropriation made for that purpose in 1916 matured during the year and proved of invaluable service.

The 25,000,000-gallon turbo-centrifugal pump at Queen Lane was put in service in January and the operation of that unit maintained the output of the station up to the practical capacity of the filters, a condition which would otherwise have been impossible because of the unreliability of the original pumping equipment. The bureau was consequently enabled to add materially to the volume of water available for the central portion of the City, the district where the need was greatest.

The eight new stokers in the No. 3 boiler house at Lardner's Point were completed and the equipment in that house carried a large part of the boiler load of the entire plant.

The new turbo-centrifugal pumping unit at Lardner's Point was put in service in the latter part of the year and immediately afforded material relief to the overworked pumping equipment. It is now possible to make repairs on any of the other eight pumps on the low service work without diminishing the output of the station. Small mishaps do not now assume the same importance, nor are the same number of emergency measures demanded for repairs. This turbo-centrifugal unit under test and in daily operation has exceeded the contract requirements as to capacity and efficiency. The capacity is approximately 40,000,000 gallons a day and the efficiency is satisfactory.

This important and expensive piece of machinery is housed under a wooden shed subject to fire risk incident to a building of that type. The funds set aside out of the \$500,000 appropriation for a suitable building were diverted to pipe-laying needed to supply water for dwellings already built on streets lacking a water supply. The Water Bureau had no other funds at its disposal, an appropriation was not forthcoming, and common humanity required the diversion of money from a building to shelter an inanimate piece of apparatus to the end of making buildings habitable for human beings. Now that that object is attained, common business prudence demands an appropriation for a suitable structure for the protection of the pump, which is a vital unit in the City's water system.

Early in August a fire, caused by a short circuit, destroyed the monitor of the No. 2 boiler house at Lardner's Point, housing the coal conveying equipment, and seriously damaged the

conveyor belt and conveying apparatus. The monitor was built of wood and for a long time has presented a menacing fire hazard. The monitor of the No. 3 house is likewise built of wood and presents a similar fire menace. Fortunately the fire caused no interruption to the operation of the pumping station, but extensive emergency measures were required for supplying coal to the boilers until necessary temporary repairs to the conveyor and structures could be made.

The importance of Lardner's Point pumping station makes it imperative that all foreseen fire risk should be eliminated. Appropriation should be forthcoming at an early date, not only to permanently repair the monitor of the No. 2 boiler house but to reconstruct the monitor of the No. 3 boiler house and at the same time eliminate other fire hazards at the plant incidental to the use of wood in buildings of such a character.

The turbo-centrifugal pumping units at Shawmont were completed and on test materially exceeded the specifications.

The electrical pumping equipment at Shawmont and at the Roxborough plants was completed and is giving satisfactory service.

#### DISTRIBUTION SYSTEM

The distribution system was necessarily operated with a minimum force and practically no extensions were made by the bureau. Very few extensions were made by private or other contracts. A few thousand feet of pipe were laid under special arrangements by the Emergency Fleet Corporation and the United States Housing Corporation for housing projects at Elmwood Avenue and Seventieth Street and south of Oregon Avenue.

The prolonged and excessive cold weather in January, February and March resulted in 2,000 frozen service pipes and a few frozen mains of small sizes. The majority of the service pipes were thawed by the Philadelphia Electric Company under arrangements with the private owners thereof. The results of leaks and damaged pipes have not yet disappeared.

The bureau again strongly recommends arrangements whereby the control and maintenance of service pipes from the main to

the curb shall be taken from private owners and transferred to the Bureau of Water.

No improvement has been effected in the unsatisfactory condition of the district offices controlling the distribution work. The West Philadelphia district probably suffers the greatest handicap in regard to the location of its yard and the character of its buildings. The headquarters of this district are under the South Street bridge fronting the Schuylkill River. No more geographically awkward location, with respect to the area of West Philadelphia, coming under the charge of this district, could be selected. There is an additional handicap of one mile of waste travel to and from the yard to its outlet on Chestnut Street. The buildings are mere sheds and shacks and the yard is subject to periodical inundations by the Schuylkill River. The men located at this district and accommodated in these structures are charged with the responsibility of safely maintaining a continuous water supply to the whole of West Philadelphia.

#### METERS

Approximately 9,000 new meters were set during the year, making a total in use of 72,543 out of a total of 370,400 services.

An ordinance effective June 1, 1918, requires the metering of all connections made to the mains after that date. Under the ordinance of December 2, 1916, practically all manufacturing establishments, business houses, hotels, saloons, and other large users of water were placed on a meter basis. The ordinance first mentioned will insure the metering of all new connections. There remain some 300,000 unmetered connections, principally private houses of a character where waste of water is excessive because of old or ineffective plumbing appliances. In these properties there is a continuing and excessive waste of water.

A special committee of Councils was appointed to consider the question of universal metering, and if such a project should be recommended, to provide a plan therefor. After a number of hearings an ordinance was introduced into Councils recommending a six-year program for the complete metering of all un-metered properties.

The influence of meters on water consumption begins to be apparent. The past year has been abnormal. There was a large, steady draft of water for war industries working at high speed and under a practically continuous schedule. There was likewise a tremendously increased demand for water, induced by the excessively cold winter, and a similar increased demand because of the unusually hot summer. There was furthermore an added demand for water because of the increased, though perhaps transient, population attracted to Philadelphia on account of the concentration of war industries at this point. Various estimates of increased population have been made and conservative opinion is to the effect that the total population approximated 2,000,000.

Notwithstanding these increased demands, pressures were maintained throughout the City at about the normal of previous years, and during periods not influenced by either the excessively hot or excessively cold weather the pressures were somewhat more satisfactory than in any recent year. It is the belief of the Bureau of Water that without the reduction of waste incident to the meters now installed, such a situation would have been impossible and the water supply would have been inadequate to a much greater degree than was actually the case.

Based on a population of 2,000,000 the daily per capita consumption was 160 gallons. On the same basis and eliminating the excessive demand of the cold and hot periods, this per capita consumption would have approximated 150 gallons.

Leak and waste work was necessarily curtailed because of the lack of qualified men. Somewhat more than 11,000 serious leaks in interior pipes and fixtures were located and repairs effected. This service required more than 25,000 individual visits to properties for both original and follow-up work.

#### GENERAL CONDITIONS OF WORKS

No false sense of security should lull the minds of those charged with the conduct of the City's activities to the dangers inherent in the present system of water works. Sixty per cent. of the supply comes through the Delaware chain of works in which

many weak links exist. An accident at any one of a number of vital points would throw the entire system out of commission and deprive a large portion of the City of its water supply. Some accidents have occurred in the past, fortunately without disastrous results. Unfortunately, the public mind seems prone to forget, and once the water service is restored, the probability of another similar or more serious accident is forgotten.

In the computation of the allotment of available funds, the water works do not receive the attention that their importance deserves. The equipment is growing older and the liability to accident is increasing from year to year.

The bureau for some years has advocated the replacement of Fairmount Dam with a permanent masonry structure. The apron of this dam was destroyed by ice in the spring break-up of the Schuylkill River. After repeated urgent appeals, an appropriation of \$45,000 was secured for repairs, and such repairs, to the extent of the money available, were completed in the autumn. The work is not entirely satisfactory, as the bureau's estimate of cost was materially reduced. The safety of the dam, however, is now probably greater than it was one year ago.

The main Water Bureau repair shop is housed in a one-time armory at Twelfth and Reed Streets. This building, and particularly the roof, is in a deplorable condition and the fire hazard is serious. The bulk of the machinery is inadequate and unsatisfactory. The continued maintenance of this shop is essential, as the equipment of the water works is continually in need of emergency repairs of all kinds. Plans have been ready for some time for a new modern shop suitable for the needs of the water works. An appropriation for this shop should be forthcoming in the near future.

Previous plans and recommendations of the bureau contemplated the Delaware River as the source of an added water supply. Revived interest in the Delaware and Raritan Canal appears to make it inexpedient to increase the dependency upon the Delaware River but to look elsewhere for a new supply, leaving the future of the present Delaware works to be determined when the question of the canal is definitely decided.

This situation naturally revives the question of a mountainous



or distant source for the whole or part of the City's water supply. Associated with this situation is the question of the desirability of abandoning the local Schuylkill River. In order that the matter may be brought seriously to the attention of the public his Honor, the Mayor, has addressed a letter to Councils advocating the appointment of a special committee to consider the entire question, of which committee the City Solicitor, the City Controller and the Chief of the Water Bureau should be members. Thus far Councils have taken no action. In view, however, of the probability of such a committee being appointed, this report makes no definite recommendations for general improvements.

#### STORES, SUPPLIES AND ACCOUNTING

The division handling stores, supplies and accounting, including all the records appertaining thereto, operated under serious difficulties because of repeated changes in the personnel. The salaries offered by the Bureau of Water are materially less than those paid outside, and individuals having experience in this branch of the Bureau of Water service are in great demand by private concerns because of the training and experience gained in employment in the bureau.

The work of the division was largely increased because of the method of payment for coal and the separation of freight bills from coal bills. The confusion and disorder throughout the entire supply and material market added greatly to the difficulties of this branch of the bureau, and only the hearty co-operation of other branches of the City's government, such as the Department of Supplies, Controller's office and the City Solicitor's office, permitted the maintenance of the work.

Stores customarily carried in stock have been seriously depleted and emergency purchases were found to be more necessary than at any previous era.

The accounting work was necessarily curtailed to an absolute minimum and desired progress was not made in the setting up of the records required by the Public Service Commission.

## REVENUES

The revenues of the bureau amounted to \$5,311,586.48 as compared with \$5,603,928.79 in 1917 and \$5,098,822.14 in 1916. The decrease in 1918 below the revenues of 1917 was expected because of the fictitious increase of the 1917 revenues over those of 1916, due to the fact that the transition from the original schedule rate ordinance to the meter ordinance, effective the first of January, 1917, artificially augmented the revenues of that year. Approximately \$150,000 of 1916 accounts were actually collected in 1917, and the 1917 revenues reflect all of the gains and none of the losses incidental to the new meter ordinance, the losses first appearing in the 1918 revenues.

Decrease in building operations reduced the revenues of the bureau from such sources in the amount of \$63,000 below the revenues from the same sources in 1917.

Lack of sufficient clerks, loss of experienced clerks, together with the influenza epidemic, made it physically impossible for the fourth quarter's meter bills to be rendered, as expected, in November. This made it impossible to secure payment of a certain amount of these bills and will result in their being carried over into the 1919 receipts.

With proper allowance for this situation, which will be adjusted as the effect of the war diminishes, there is every reason to believe that the existing meter ordinance is a satisfactory revenue producer.

## HIGH-PRESSURE FIRE SERVICE

The high-pressure fire stations were in service at 44 fires, delivering approximately 10,000,000 gallons of water, of which one-half was filtered water drawn from the Fairhill basin. Pressure was built up for 388 additional alarms where no service was rendered. The longest run in service was 7 hours and 49 minutes, on October 16th, for a fire in the vicinity of Delaware Avenue and Race Street.

The service was satisfactory, with one exception, when a broken main required a shut-down of 36 minutes. Nineteen hydrant connections were frozen during the excessive cold of the winter,

and in all but three cases, thawing was successfully accomplished by a steam jet.

A serious case of electrolysis developed in the late fall at the corner of Jasper and Cumberland Streets. The general question of electrolysis and damage therefrom has been taken up actively with the Philadelphia Rapid Transit Company and mitigation measures are in progress.

The general condition of the entire high-pressure fire system is satisfactory, though emergency repair parts are depleted to a minimum and appropriations should be made at the earliest possible date.

#### DIVISION HEADS

The various divisions of the Bureau of Water have been in charge of the following:

Executive—William Whitby.  
 Accounts—William J. Logan.  
 Registrar—Frank J. Gorman.  
 Filtration—Seth M. Van Loan.  
 Distribution—Seth M. Van Loan.  
 Pumping—Harry S. Mellen.  
 Structures—Charles S. Kelso.  
 High-Pressure—Arthur J. Donnelly.  
 Mechanical—Harrison R. Cady.

Annexed hereto is an Appendix in which various data and specifications are included.

Very respectfully,

C. E. DAVIS,  
*Chief of Bureau.*

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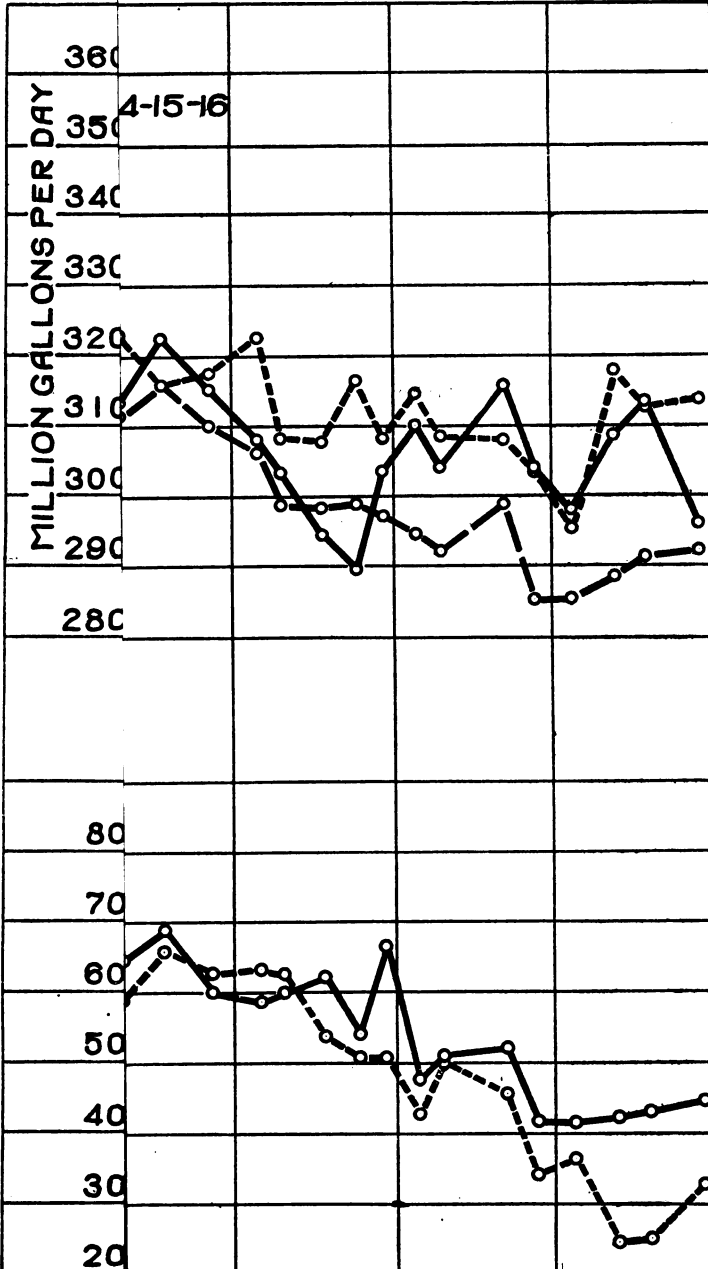
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APPENDIX





## REVENUES

	1918	1917	Increase	Decrease
Water rents—Current year..	\$3 225 436 47	\$3 740 551 92	.....	\$515 115 45
Penalties—Current year.....	29 340 45	38 103 00	.....	8 762 55
Water rents—Previous years.	92 576 98	109 887 98	.....	17 311 00
Penalties—Previous years...	13 488 76	16 452 26	.....	2 963 50
Meter rents—Current year...	1 744 215 61	1 279 509 10	\$464 706 51	.....
Penalties—Current year.....	8 293 18	6 346 22	1 946 96	.....
Meter rents—Previous years.	33 682 77	184 111 46	.....	150 428 69
Penalties—Previous years....	2 481 22	2 052 22	429 00	.....
Liens .....	8 00	10 00	.....	2 00
Interest on liens.....	47 25	36 65	10 60	.....
Permits—Fractional .....	96 943 38	138 671 24	.....	41 727 86
Pipe frontage.....	17 241 01	38 430 43	.....	21 189 42
Meter repairs .....	8 854 50	2 828 82	6 025 68	.....
Penalties—Meter repairs.....	70 88	6 74	64 14	.....
Special .....	4 276 55	4 295 28	.....	18 73
Collected by tax offices—				
Fees—Searches—Miscellaneous .....				
After first week in Feb.—				
Fees included in fractional				
permits .....	192 75	2 835 75	.....	2 643 00
Collected by City Solicitor—				
Water pipe frontage.....	12 732 47	19 513 26	.....	6 780 79
Collected by Highway Bureau				
—Ferrules delivered .....	4 457 00	6 054 00	.....	1 597 00
Collected by Department of				
Supplies—Materials sold...	17 247 25	14 232 46	3 014 79	.....
<b>Total .....</b>	<b>\$5 311 586 48</b>	<b>\$5 603 928 79</b>	<b>.....</b>	<b>\$292 342 31</b>

OPERATING EXPENSES FOR THE YEAR ENDING DECEMBER 31, 1916

	Labor	Other costs	Totals	Per cent. of total	Cost per million gallons pumped 100 feet high
<b>GENERAL OPERATING EXPENSES:</b>					
Executive .....	\$19 307 86	\$1 430 30	\$20 738 16	.006	\$0.06
Accounts, stores and purchasing .....	27 953 05	3 833 39	31 786 44	.010	.09
Collection of revenue .....	117 473 77	15 796 72	133 270 49	.042	.40
Water waste .....	15 506 62	608 41	16 175 03	.005	.04
Miscellaneous .....	8 731 30	313 52	9 044 82	.002	.02
<b>Totals—General operating expenses</b>	<b>\$189 032 60</b>	<b>\$21 982 34</b>	<b>\$211 014 94</b>	<b>.067</b>	<b>\$0.64</b>
<b>DIRECT OPERATING EXPENSES:</b>					
<b>Pumping:</b>					
Supervision .....	\$7 114 86	\$631 19	\$7 746 05	.002	\$0.02
Main pumping stations .....	417 061 44	946 701 11	1 363 762 55	.433	4.17
High-service pumping stations.....	42 981 71	29 606 44	72 588 15	.028	.22
Filtration pumping stations.....	110 088 71	201 409 60	311 498 31	.099	.95
Miscellaneous pumping station prop- erties .....	15 039 78	8 377 87	23 417 65	.007	.07
<b>Totals—Pumping operation .....</b>	<b>\$592 286 50</b>	<b>\$1 186 726 21</b>	<b>\$1 779 012 71</b>	<b>.565</b>	<b>\$5.44</b>
<b>Filtration:</b>					
Supervision .....	\$5 492 68	\$136 50	\$5 629 18	.001	\$0.01
Filter stations .....	231 660 70	82 207 74	313 868 44	.009	.96
Laboratories .....	22 437 92	5 098 31	27 536 23	.008	.08
<b>Totals—Filtration operation .....</b>	<b>\$259 591 30</b>	<b>\$87 442 55</b>	<b>\$347 033 85</b>	<b>.110</b>	<b>\$1.06</b>

OPERATING EXPENSES FOR THE YEAR ENDING DECEMBER 31, 1918—Continued

	Labor	Other costs	Totals	Per cent. of total	Cost per million gallons pumped 100 feet high
<b>Distribution:</b>					
Supervision .....	\$10 084 61	\$1 004 70	\$11 089 31	.003	\$0.03
Distribution mains and appurtenances	151 925 30	22 474 83	174 400 13	.055	.53
Transmission mains .....	195 30	.....	195 30	.....	.....
Reservoirs .....	14 595 19	277 48	14 872 67	.004	.04
Pitometer .....	8 260 14	838 01	9 098 15	.002	.02
Meters .....	21 404 23	1 326 38	22 730 61	.007	.07
<b>Total—Distribution operation ...</b>	<b>\$206 464 77</b>	<b>\$25 921 40</b>	<b>\$232 386 17</b>	<b>.073</b>	<b>\$0.71</b>
High-pressure fire service.....	54 311 95	5 813 35	60 125 30	.019	.18
<b>Totals—Direct operating expenses.</b>	<b>\$1 112 654 52</b>	<b>\$1 305 903 51</b>	<b>..... \$2 418 558 03</b>	<b>.769</b>	<b>\$7.40</b>
<b>REPAIRS:</b>					
Repairs to general property.....	\$912 50	\$1 132 83	\$2 045 42	.....	.....
<b>Pumping property repairs:</b>					
Supervising properties .....	336 08	286 39	622 47	.....	.....
Main pumping stations .....	150 113 07	102 615 83	261 728 90	.083	\$0.80
High-service pumping stations.....	7 653 13	2 503 35	10 156 48	.003	.03
Filtration pumping stations.....	38 135 56	26 884 15	65 019 71	.020	.19
Miscellaneous pumping station prop- erties .....	2 240 31	407 66	2 716 97	.....	.....
<b>Totals—Pumping repairs.....</b>	<b>\$207 487 15</b>	<b>\$132 757 38</b>	<b>\$340 244 53</b>	<b>.108</b>	<b>\$1.04</b>
<b>Filtration property repairs:</b>					
Supervising properties .....	.....	\$4 58	\$4 58	.....	.....
Filter stations .....	\$22 020 00	5 351 04	27 371 13	.008	\$0.08
Laboratories .....	112 77	102 35	215 12	.....	.....
<b>Totals—Filtration repairs .....</b>	<b>\$22 132 86</b>	<b>\$5 457 97</b>	<b>\$27 590 83</b>	<b>.008</b>	<b>\$0.08</b>

**OPERATING EXPENSES FOR THE YEAR ENDING DECEMBER 31, 1918—Concluded**

	Labor	Other costs	Totals	Per cent. of total	Cost per million gallons pumped 100 feet high .
<b>Distribution property repairs:</b>					
Supervising properties .....	\$102 44	\$209 95	\$312 39	.....	.....
Distribution mains and appurtenances	67 038 19	14 699 56	81 737 75	.026	\$0.25
Transmission mains .....	41 30	.....	41 30	.....	.....
Reservoirs .....	646 12	191 58	837 70	.....	.....
Pitometer .....	12 24	20 18	32 42	.....	.....
Meters .....	7 099 47	11 899 28	18 998 75	.004	.05
<b>Totals—Distribution repairs .....</b>	<b>\$74 939 85</b>	<b>\$27 020 55</b>	<b>\$101 960 40</b>	<b>.032</b>	<b>\$0.31</b>
High-pressure fire service repairs.....	\$17 047 03	\$3 584 38	\$20 631 41	.006	\$0.06
<b>Total repairs .....</b>	<b>\$322 519 48</b>	<b>\$169 953 11</b>	<b>\$492 472 59</b>	<b>.156</b>	<b>\$1.50</b>
Other expense .....	\$20 814 35	\$352 81	21 167 16	.006	\$0.06
<b>Total operation and repairs.....</b>	<b>\$1 645 020 95</b>	<b>\$1 498 191 77</b>	<b>\$3 143 212 72</b>	<b>1.000</b>	<b>\$9.62</b>
Total million gallons pumped 100 feet high.....	327 071		Cost per million gallons pumped 100 feet high.....		\$9 62
Total million gallons pumped .....	198 649		Cost per million gallons pumped .....		15.82
Total million gallons filtered (consumed).....	116 583		Cost per million gallons filtered (consumed).....		26 96
Population (estimated) .....	1 800 000		Cost per capita .....		1.74

EXPENDITURES FOR CONSTRUCTION AND EQUIPMENT FOR THE YEAR 1918

ADMINISTRATIVE PROPERTIES .....		\$1 277 91	
<b>PUMPING</b>			
Main Pumping Stations:			
Belmont .....	\$23 429 81		
Queen Lane .....	26 801 88		
Shawmont .....	45 563 21		
Lardner's Point .....	49 889 65		
		<hr/>	\$145 684 55
High Service Pumping Stations:			
George's Hill .....	\$20 00:		
Roxborough .....	1 065 35		
Wentz Farm .....	88 82		
Mt. Airy .....			
		<hr/>	1 174 17
Low Service Pumping Stations:			
Torresdale .....	\$6 261 22		
Roxborough .....	10 80		
Roxborough Booster .....	25 757 80		
		<hr/>	32 029 91
Miscellaneous .....	\$1 245 15		
		<hr/>	1 245 15
		<hr/>	180 133 78
<b>DISTRIBUTION</b>			
Office and Yard Equipment.....	\$4 104 86		
Pipe Lines .....	71 599 61		
Valves .....	44 774 07		
Attachments .....	3 134 92		
Fire Hydrants .....	25 707 20		
Pitometer .....	454 43		
Meters .....	43 23		
		<hr/>	149 818 32
<b>FILTRATION</b>			
Filters .....	\$9 233 88		
Laboratories .....	174 75		
		<hr/>	9 408 63
HIGH-PRESSURE FIRE SERVICE .....		1 580 02	
INCIDENTAL PROPERTIES <sup>1</sup> .....		4 594 29	
		<hr/>	
Total .....		\$346 812 95	

<sup>1</sup> Shops, engineering properties, etc.

**SUMMARY OF APPROPRIATIONS AND EXPENDITURES FOR THE YEAR 1918**

*Direct Funds*

	Salary and wage items	Other than personal services	Construction items	Total direct funds	Supplies items	Grand total
<b>Appropriations:</b>						
General funds .....	\$1 802 012 50	\$209 092 05	.....	\$2 011 104 55	\$1 534 371 01	\$3 545 475 56
Loan funds .....	15 000 00	.....	\$276 161 15	291 161 15	2 065 93	293 277 08
<b>Totals .....</b>	<b>\$1 817 012 50</b>	<b>\$209 092 05</b>	<b>\$276 161 15</b>	<b>\$2 302 265 70</b>	<b>\$1 536 436 94</b>	<b>\$3 838 702 64</b>
<b>Expenditures:</b>						
General funds .....	\$1 673 605 12	\$170 190 53	.....	\$1 843 885 65	\$1 297 324 97	\$3 141 210 62
Loan funds .....	14 612 80	.....	\$193 589 42	208 202 22	.....	208 202 22
<b>Totals .....</b>	<b>\$1 688 307 92</b>	<b>\$170 190 53</b>	<b>\$193 589 42</b>	<b>\$2 052 087 87</b>	<b>\$1 297 324 97</b>	<b>\$3 349 412 84</b>
<b>Balance merged:</b>						
General funds .....	\$128 317 38	\$21 585 22	.....	\$149 902 60	\$22 018 48	\$171 921 08
Loan funds .....	387 20	.....	\$34 297 19	34 684 39	.....	34 684 39
<b>Totals .....</b>	<b>\$128 704 58</b>	<b>\$21 585 22</b>	<b>\$34 297 19</b>	<b>\$184 586 99</b>	<b>\$22 018 48</b>	<b>\$206 605 47</b>
<b>Balance carried over to 1919:</b>						
General funds .....	.....	\$17 316 30	.....	<sup>1</sup> \$17 316 30	<sup>2</sup> \$215 027 56	\$232 343 86
Loan funds .....	.....	.....	\$48 274 54	48 274 54	12 065 93	50 340 47
<b>Totals .....</b>	<b>.....</b>	<b>\$17 316 30</b>	<b>\$48 274 54</b>	<b>\$65 590 84</b>	<b>\$217 093 49</b>	<b>\$282 684 33</b>

NOTE—1917 deficiencies included, \$2,377.84; 1918 deficiencies not included, \$12,462.84.

<sup>1</sup> Under contract.

<sup>2</sup> \$21,865.00 under contract.

## COAL PURCHASED—1918

*Main Pumping Stations*

Station	Classification	Price per ton	Tons	Cost	Total cost
Belmont .....	Pea.....	\$5 60	4 298.10	\$24 059 03	.....
Belmont .....	Barley.....	3 86	39 366.96	152 172 57	\$176 231 60
Queen Lane .....	Barley.....	3 90	42 157.55	164 528 51	.....
Queen Lane .....	Culm.....	3 01	87.40	263 07	.....
Queen Lane .....	Bituminous..	5 50	50.67	278 88	164 070 46
Shawmont .....	Bituminous..	5 05	27 865.29	140 623 20	140 623 20
Lardner's Point ...	Bituminous..	5 46	27 150.13	148 289 83	.....
Lardner's Point ..	Barley.....	3 72	62 529.10	232 569 39	380 859 22
Totals and averages .....	.....	\$4 24	203 505.12	\$802 784 46	\$862 784 48

*High Service Stations*

Station	Classification	Price per ton	Tons	Cost	Total cost
George's Hill ....	Buckwheat...	\$7 31	2 315.15	\$16 930 91	.....
George's Hill ....	Pea.....	5 54	70.00	387 80	\$17 318 71
Roxborough .....	Pea.....	6 31	540.50	3 410 56	3 410 56
Wentz Farm ....	Buckwheat...	5 74	1 934.30	11 107 37	.....
Wentz Farm ....	Pea.....	5 91	177.30	1 048 74	12 156 11
Totals and averages .....	.....	\$6 53	5 037.25	\$32 885 38	\$32 885 38

*Low Service Stations*

Station	Classification	Price per ton	Tons	Cost	Total cost
Roxborough .....	Pea.....	\$6 31	1 860.65	\$11 740 70	\$11 740 70
Torresdale .....	Bituminous..	5 73	38 862.81	222 788 59	222 788 59
Totals and averages .....	.....	\$5 76	40 723.46	\$234 529 29	\$234 529 29



## Filters

Station	Classification	Price per ton	Tons	Cost	Total cost
Belmont .....	Buckwheat...	\$7 75	1 701.95	\$13 183 36	.....
Belmont .....	Pea.....	5 51	64.00	352 48	\$13 535 84
Queen Lane .....	Pea.....	5 60	1 541.35	8 624 49	8 624 49
Lower Roxborough	Pea.....	5 54	73.00	404 42	404 42
Upper Roxborough.	Pea.....	5 54	50.00	277 00	277 00
<b>Totals and av-</b>					
<b>erages .....</b>		<b>\$6 66</b>	<b>3 430.30</b>	<b>\$22 841 75</b>	<b>\$22 841 75</b>

# PUMPING STATION STATISTICS

R—Raw water to filters.  
H—High service direct.  
D—Direct.

## PUMPING MACHINERY—STEAM

Station	Description					Working conditions				
	No. of units	Year installed	Builder	Type		Rated capacity M. G. per 24 hrs.	Steam pressure lbs. per sq. in.	Vacuum in mercury	Total head feet	
				Steam end	Water end					
Belmont .....	2	1916	DeLaval .....	Turbine .....	Centrifugal..	22	190	28	316	R
	2	1908	Bethlehem .....	Hor. cross comp.....	Dble. plung..	10	150	26	316	R
	1	1900	Holly .....	Hor. comp.....	2 plung.....	10	150	27	316	R
Queen Lane .....	1	<sup>1</sup> 1895	Worthington .....	Duplex comp.....	2 plung.....	20	100	24	316	R
	4	1896	Southwark .....	Ver. trip. exp.....	3 plung.....	20	150	27	271	R
	1	1917	DeLaval .....	Turbine .....	Centrifugal..	25	150	28	271	R
Shawmont .....	1	<sup>2</sup> 1887	Gaskill .....	Hor. comp.....	2 plung.....	10	100	24	400	R
	2	1908	Snow .....	Hor. cross comp. ....	2 plung.....	5	150	26	400	R
	1	1916	Southwark .....	Turbine .....	Centrifugal..	10	150	28	400	RR
	1	1917	Worthington .....	Turbine .....	Centrifugal..	10	150	28	400	R
	1	1919	Worthington .....	Turbine .....	Centrifugal..	10	150	28	400	R
Lardner's Pt. No. 2	6	1903-4	Holly .....	Vert. trip. exp. ....	3 plung.....	20	150	28	184	D
Lardner's Pt. No. 3	4	1908	Holly .....	Vert. trip. exp.....	3 plung.....	20	175	28	253	D
Lardner's Pt. No. 3	2	1909	Holly .....	Vert. trip. exp.....	3 plung.....	20	175	28	184	D
Lardner's Pt. No. 4	1	1918	DeLaval .....	Turbine .....	Centrifugal..	35	175	29	184	D
Torresdale .....	6	1907	Reeves engines, Wood pumps ....	Vert. cross comp.....	Centrifugal..	40	175	26	42	R
	1	1908	Bates engines, Allis- Chalmers pump...	Vert. cross comp.....	Centrifugal..	40	175	26	42	R
	1	1910	DeLaval .....	Turbine .....	Centrifugal..	50	175	28	42	R
Roxborough L. S.	3	1902	Buckeye eng., Worth- ington pump.....	Vert. cross comp.....	Centrifugal..	10	100	26	17	R
George's Hill.....	1	1908	Allis-Chalmers .....	Hor. cross comp. ....	Dble. plung..	6	100	27	136	H
	1	1900	Worthington .....	Hor. comp. H. D. dup.	Dble. plung..	5	100	27	136	H
Roxborough H. S.	1	1900	Worthington .....	Hor. comp. H. D. dup.	Dble. plung..	5	100	27	85	H
Wentz Farm .....	1	1900	Holly .....	Hor. comp. ....	Dble. plung..	3	110	28	140	H
	1	1916	Kerr-D'Oiler .....	Turbine .....	Centrifugal..	2.5	150	28	140	H
	1	1916	Kerr-D'Oiler .....	Turbine .....	Centrifugal..	5	150	28	140	H

<sup>1</sup> Moved from Spring Garden in 1895.

<sup>2</sup> Moved from Spring Garden in 1908.

PUMPING MACHINERY—ELECTRIC

Station	Description					Working conditions				
	No. of units	Year installed	Builder	Type		Rated capacity M. G. per 24 hrs.	Voltage	Phase	Total head feet	
				Drive end	Water end					
Roxborough H. S..	2	1918	G. E. Platt .....	Induction motor .....	Centrifugal ..	6½	220-A-C	3	85	H
	2	1918	G. E. Platt .....	Induction motor .....	Centrifugal ..	3½	220-A-C	3	85	H
Roxborough .....	2	1918	G. E. Platt .....	Induction motor .....	Centrifugal ..	15	220-A-C	3	9	R
Booster .....	1	1918	G. E. Platt .....	Induction motor .....	Centrifugal ..	7½	220-A-C	3	9	R

**BOILERS**

Station	Description				Working conditions			
	No. of boilers	Year installed	Kind of grates	Kind of boilers	Rated horse power	Steam pressure	Method of firing	Draft
Belmont .....	10	1906	Fur. flue tubular.....	Stationary .....	100	150	Hand	Natural
	2	1915	Wickes water tube.....	Grieve dumping ....	500	200	Hand	Forced
	4	1917	Wickes water tube.....	Coxe stoker .....	500	200	Stoker	Forced
	2	1918	Wickes water tube.....	Coxe stoker .....	500	210	Stoker	Forced
Queen Lane .....	4	1913	Badenhausen water tube	Coxe stoker .....	300	150	Stoker	Forced
	4	1914	Badenhausen water tube	Coxe stoker .....	300	150	Stoker	Forced
Shawmont .....	4	1908	Edgemoor water tube..	Type E stoker ....	500	150	Stoker	Forced
Lardner's Pt. No. 2...	8	1905	Fur. flue tubular.....	Stationary .....	110	150	Hand	Natural
	6	1907	Edgemoor water tube..	Wetzel stoker .....	500	150	Stoker	Natural
Lardner's Pt. No. 3...	8	<sup>1</sup> 1908	Edgemoor water tube..	Coxe stoker .....	500	175	Stoker	Forced— Induced
Torresdale .....	6	1907	Heine water tube.....	Murphy stoker ....	325	175	Stoker	Natural
	3	1908	Heine water tube.....	Murphy stoker ....	325	175	Stoker	Natural
Roxborough H. S.....	1	1895	Fur. flue tubular.....	Stationary .....	80	100	Hand	Natural
	2	1911	Fur. flue tubular.....	Stationary .....	100	100	Hand	Natural
George's Hill .....	1	1895	Fur. flue tubular.....	Stationary .....	80	100	Hand	Natural
	2	<sup>2</sup> 1915	Fur. flue tubular.....	Stationary .....	110	100	Hand	Natural
Wentz Farm .....	1	1900	Fur. flue tubular.....	Stationary .....	100	160	Hand	Natural
	2	<sup>3</sup> 1916	Fur. flue tubular.....	Stationary .....	100	160	Hand	Natural

<sup>1</sup> Green economizer.

<sup>2</sup> Boilers built 1905—Removed from Lardner's Point Pumping Station.

<sup>3</sup> Boilers built 1905—Removed from Lardner's Point Pumping Station.

ANNUAL PUMPAGE, COAL, LUBRICANTS, ETC.—1918

Station	Pumpage				Coal		Lubricants		
	Total million gallons	Average daily million gallons	Million gallons raised 100 feet per lb. of coal	Mean head, feet	Total tons	Average daily tons	Grease, pound	Engine oil, gallons	Cylinder oil, gallons
Belmont .....	18 533	51	558.76	296	43 829	120	272	4 222	3 421
Queen Lane .....	23 485	64	676.55	271	41 996	115	4 741	7 867	4 868
Shawmont .....	9 303	25	526.42	393	31 005	85	573	5 233	2 266
Lardner's Point .....	67 061	185	731.60	202	83 400	228	4 151	17 747	10 492
George's Hill .....	1 079	3	341.91	136	1 916	5	410	178	675
Roxborough High .....	1 313	3	815.44	85	611	2	133	55	127
Wentz Farm .....	1 211	3	333.38	134	2 173	6	8	289	122
Roxborough Booster .....	5 097	14	146.72	12	1 861	5	.....	37	138
Torresdale .....	70 967	194	373.73	42	36 451	100	724	1 270	1 111
Totals and averages.....	198 649	544	638.03	165	243 242	666	11 012	36 898	23 220

**COAL CONSUMED FOR PUMPAGE—1917-1918**  
*Main Pumping Stations*

Stations	Coal—Tons		Pumpage—M. Gallons	
	Increase	Decrease	Increase	Decrease
Belmont .....	9 984	.....	2 460	.....
Queen Lane .....	7 494	.....	294	.....
Shawmont .....	8 247	.....	.....	331
Lardner's Point .....	5 576	.....	2 000	.....
Totals .....	31 301	.....	4 522	.....

*High Service Pumping Stations*

Stations	Increase	Decrease	Increase	Decrease
George's Hill .....	394	.....	.....	36
Roxborough .....	.....	898	.....	23
Wentz Farm .....	189	.....	7	.....
Totals .....	.....	315	.....	52

*Low Service Pumping Stations*

Stations	Increase	Decrease	Increase	Decrease
Roxborough .....	.....	2 192	.....	77
Torresdale .....	355	.....	2 084	.....
Totals .....	.....	1 857	2 007	.....

**OPERATING COSTS**

Station	Pumpage, million gallons	Average lift	Labor	Coal	Grease, oils and waste	Packing, rubber valves, etc.	Sundries	Totals	Average cost per M. G. 100 feet high
Belmont .....	18 533	296	\$117 436 22	\$175 834 47	\$3 632 95	\$2 283 37	\$44 704 26	\$343 891 27	\$6 26
Queen Lane .....	23 485	271	116 014 15	161 087 66	4 726 03	1 709 81	51 939 48	335 477 13	5 27
Shawmont .....	9 308	393	104 740 09	159 403 74	3 707 13	2 428 08	18 465 83	288 744 96	7 89
Lardner's Point .....	67 661	202	237 978 06	377 148 62	9 077 44	3 536 37	29 472 14	657 212 63	4 80
George's Hill .....	1 079	136	18 039 83	10 815 95	365 32	98 86	1 949 36	31 319 32	21 34
Roxborough High ...	1 313	85	11 643 84	2 616 90	136 24	62 15	1 139 83	15 598 96	13 97
Wentz Farm .....	1 211	134	18 134 44	12 773 51	263 09	380 79	1 234 23	32 841 06	20 23
Torresdale .....	70 967	43	135 292 60	179 660 58	1 474 75	708 04	33 403 17	350 539 14	11 48
Roxborough Low ...	5 097	12	8 738 69	11 866 57	123 36	4 76	2 876 66	23 610 04	38 60
<b>Totals .....</b>	<b>193 649</b>	<b>165</b>	<b>\$768 117 91</b>	<b>\$1 091 208 00</b>	<b>\$23 511 31</b>	<b>\$11 212 23</b>	<b>\$185 184 96</b>	<b>\$2 079 234 41</b>	<b>\$6 35</b>

VOLUME AND COST OF MAIN STATION PUMPAGE FOR THE YEARS  
1908 TO 1918 INCLUSIVE

Year	Number of gallons pumped	Number of gallons pumped 100 feet high	Cost per million gallons pumped 100 feet high	Gallons pumped per capita per day	Population estimated
1908 .....	117 885 662 022	256 334 927 765	\$5 44	210.2	1 531 752
1909 .....	111 129 767 510	277 020 429 051	4 12	196.2	1 552 000
1910 .....	114 933 585 836	284 227 631 428	3 92	203.2	1 549 000
1911 .....	116 076 669 254	285 932 295 175	3 65	201.6	1 577 000
1912 .....	116 570 226 260	296 213 419 687	3 36	198.3	1 606 000
1913 .....	109 176 822 180	274 908 269 779	3 13	182.8	1 635 000
1914 .....	108 144 052 330	269 802 307 607	3 28	179.4	1 660 000
1915 .....	108 844 874 602	269 712 460 533	3 13	176.4	1 690 000
1916 .....	117 501 821 758	293 206 978 455	3 69	186.6	1 720 000
1917 .....	118 665 950 570	296 060 580 000	4 54	185.7	1 750 000
1918 .....	118 982 000 000	291 270 000 000	5 58	181.0	1 800 000

VOLUME AND COST OF HIGH SERVICE PUMPAGE FOR THE YEARS  
1908 TO 1918 INCLUSIVE

Years	Number of gallons pumped	Number of gallons pumped 100 feet high	Cost per million gallons pumped 100 feet high
1908 .....	3 008 496 156	3 781 371 423	\$27 76
1909 .....	3 202 300 942	4 017 996 096	18 74
1910 .....	2 901 832 140	3 678 944 116	19 80
1911 .....	2 974 246 220	3 788 556 376	18 78
1912 .....	3 159 121 670	4 040 849 132	16 64
1913 .....	3 021 998 830	3 802 442 062	15 67
1914 .....	3 139 324 084	4 045 648 183	13 27
1915 .....	2 727 607 180	3 511 286 313	16 47
1916 .....	3 034 796 050	3 921 512 949	16 05
1917 .....	3 609 255 088	4 750 700 000	16 03
1918 .....	3 603 373 000	4 182 680 000	19 78



VOLUME AND COST OF LOW SERVICE PUMPAGE FOR THE YEARS  
1908 TO 1918 INCLUSIVE

Years	Number of gallons pumped	Number of gallons pumped 100 feet high	Cost per million gallons pumped 100 feet high
1908	39 370 537 000	8 306 843 417	\$14 02
1909	80 171 636 350	32 865 400 640	5 27
1910	83 597 208 650	34 090 119 574	5 62
1911	82 652 948 130	33 098 370 153	5 65
1912	81 244 929 400	33 156 588 838	5 48
1913	76 211 251 640	31 045 296 132	5 14
1914	74 852 122 010	30 288 698 537	5 83
1915	74 324 641 800	30 138 207 029	6 11
1916	79 732 105 350	32 369 653 752	7 48
1917	78 224 819 314	31 731 280 000	13 06
1918	76 063 800 000	31 880 000 000	11 82

COMPARISON OF PUMPAGE FOR 1917 AND 1918

	Gallons			
	1917	1918	Increase	Decrease
Annual pumpage from rivers	118 665 950 000	122 288 000 000	3 622 000 000	
Average daily pumpage from rivers	324 811 000	335 085 000	10 274 000	
Pumpage per capita per day	185.7	186.1	.4	
Maximum daily pumpage from rivers during month of greatest consumption	340 570 785	337 500 000		3 100 000
Pumpage per capita during month of greatest consumption	194.1	187.4		6.7
Total supplementary pumpage at high service stations	3 609 255 088	3 603 373 000		5 882 000
Filtration pumpage—Torrisedale and Roxborough	78 224 819 314	76 063 800 000		2 161 020 000

**TOTAL GALLONS PUMPED DURING THE YEAR 1918**

Months—1918	Main pumping stations					
	Belmont (Meters)	Queen Lane (Meters)	Shawmont (Meters)	Lardner's Point	Totals	Average per day
January .....	1 537 600 000	1 785 000 000	580 000 000	5 846 600 000	9 749 200 000	314 100 000
February .....	1 265 600 000	2 170 000 000	910 000 000	5 100 000 000	9 445 600 000	337 000 000
March .....	1 570 000 000	1 890 000 000	782 000 000	5 600 000 000	9 842 000 000	367 500 000
April .....	1 670 000 000	2 030 000 000	635 000 000	5 500 000 000	9 835 000 000	328 000 000
May .....	1 490 000 000	1 760 000 000	778 000 000	5 910 000 000	9 938 000 000	320 200 000
June .....	1 585 000 000	2 100 000 000	837 000 000	5 550 000 000	10 072 000 000	357 000 000
July .....	1 530 000 000	2 020 000 000	810 000 000	5 990 000 000	10 350 000 000	334 100 000
August .....	1 640 000 000	2 060 000 000	775 000 000	5 720 000 000	10 195 000 000	328 200 000
September .....	1 500 000 000	1 800 000 000	830 000 000	5 250 000 000	9 380 000 000	312 300 000
October .....	1 610 000 000	1 970 000 000	816 000 000	5 800 000 000	10 196 000 000	329 000 000
November .....	1 635 000 000	2 010 000 000	754 000 000	5 610 000 000	10 009 000 000	336 200 000
December .....	1 500 000 000	1 890 000 000	796 000 000	5 790 000 000	9 976 000 000	321 000 000
<b>Totals .....</b>	<b>18 533 200 000</b>	<b>23 485 000 000</b>	<b>9 303 000 000</b>	<b>67 660 600 000</b>	<b>118 981 800 000</b>	<b>325 994 000</b>
Increase—1918 .....	2 468 750 744	.....	331 230 000	.....	421 849 000	1 156 000
Decrease—1918 .....	.....	294 005 000	.....	2 000 126 000	.....	.....

**TOTAL GALLONS PUMPED DURING THE YEAR 1918—Continued**

Months—1918	High service stations				
	George's Hill	Roxborough	Wentz Farm	Totals	Average per day
January .....	96 500 000	122 340 000	96 000 000	314 840 000	10 140 000
February .....	87 000 000	107 229 000	84 000 000	278 229 000	9 935 000
March .....	77 500 000	112 267 000	113 000 000	302 767 000	9 635 000
April .....	93 400 000	102 035 000	104 100 000	299 535 000	9 980 000
May .....	83 800 000	96 000 000	99 200 000	279 000 000	9 000 000
June .....	81 100 000	101 700 000	118 000 000	300 800 000	10 050 000
July .....	100 420 000	108 200 000	107 000 000	315 620 000	10 150 000
August .....	96 400 000	114 798 000	105 500 000	316 698 000	10 210 000
September .....	86 900 000	107 980 000	96 000 000	290 880 000	9 690 000
October .....	90 300 000	103 893 000	90 000 000	284 193 000	9 180 000
November .....	90 000 000	117 817 000	91 000 000	298 817 000	9 960 000
December .....	96 100 000	118 394 000	107 500 000	321 994 000	10 790 000
<b>Totals .....</b>	<b>1 079 420 000</b>	<b>1 312 653 000</b>	<b>1 211 300 000</b>	<b>3 603 373 000</b>	<b>9 872 000</b>
<b>Increase—1918 .....</b>	<b>.....</b>	<b>22 712 000</b>	<b>7 073 000</b>	<b>.....</b>	<b>.....</b>
<b>Decrease—1918 .....</b>	<b>35 667 000</b>	<b>.....</b>	<b>.....</b>	<b>5 882 000</b>	<b>16 115</b>

TOTAL GALLONS PUMPED DURING THE YEAR 1918—Concluded

Months—1918	Low service station				Total pumpage and auxiliary pumpage	Average per day	Percent- age of pump- age
	Roxborough	Torresdale	Totals	Average per day			
January .....	489 300 000	6 121 600 000	6 344 300 000	204 200 000	16 408 340 000	530 000 000	8.41
February .....	399 000 000	5 375 000 000	5 519 000 000	198 000 000	15 242 820 000	545 000 000	7.82
March .....	438 200 000	5 875 000 000	6 028 200 000	195 000 000	16 172 967 000	522 000 000	8.29
April .....	413 000 000	5 775 000 000	5 913 000 000	197 500 000	16 047 535 000	535 000 000	8.14
May .....	452 900 000	6 185 000 000	6 382 000 000	205 500 000	16 599 000 000	535 000 000	8.51
June .....	399 700 000	5 825 000 000	5 960 700 000	199 000 000	16 333 500 000	545 000 000	8.37
July .....	465 675 000	6 265 000 000	6 475 675 000	209 500 000	17 141 295 000	553 000 000	8.79
August .....	443 625 000	5 995 000 000	6 163 625 000	199 000 000	16 675 323 000	537 000 000	8.56
September .....	403 900 000	5 525 000 000	5 658 900 000	188 500 000	15 329 780 000	512 000 000	7.88
October .....	395 100 000	6 075 000 000	6 195 100 000	200 000 000	16 675 293 000	539 000 000	8.57
November .....	396 800 000	5 885 000 000	5 641 800 000	188 000 000	15 949 617 000	532 000 000	8.19
December .....	410 000 000	6 065 000 000	6 220 000 000	201 000 000	16 517 994 000	534 000 000	8.47
<b>Totals .....</b>	<b>5 097 200 000</b>	<b>70 966 600 000</b>	<b>76 063 800 000</b>	<b>208 393 000</b>	<b>198 648 973 000</b>	<b>544 216 364</b>	<b>100.00</b>
Increase—1918 .....	.....	.....	.....	.....	.....	.....	.....
Decrease—1918 .....	76 893 000	2 084 126 000	2 161 019 000	5,920,600,000	1 751 052 000	4 825 000	.....

## FILTER STATISTICS

TABLE I—OPERATING COSTS

	Upper Roxborough		Lower Roxborough		Belmont		Queen Lane		Torresdale	
	1917	1918	1917	1918	1917	1918	1917	1918	1917	1918
Prefilters .....			\$7 471	\$7 506	\$10 236	\$26 480	\$33 027	\$29 967	\$31 654	\$40 554
Final filters .....	\$18 237	\$23 007	11 242	13 461	31 717	36 776	35 667	42 236	143 791	122 252
<b>Total cost .....</b>	<b>\$18 237</b>	<b>\$23 007</b>	<b>\$18 713</b>	<b>\$20 967</b>	<b>\$41 953</b>	<b>\$63 256</b>	<b>\$68 694</b>	<b>\$72 203</b>	<b>\$175 455</b>	<b>\$162 806</b>
Million gallons filtered..	5 174	5 185	3 128	3 612	15 400	16 086	24 473	22 508	65 497	69 192
Cost per million gallons:	\$3 52	\$4 43	\$5 98	\$5 80	\$2 72	\$3 93	\$2 80	\$3 20	\$2 68	\$2 35

TABLE II—METHODS OF OPERATION OF FINAL FILTERS FOR THE YEAR 1918

Station	Total quantity filtered, million gallons	Daily average, million gallons	Average rate per acre per day, entire area	Maximum rate per acre per day for area in service	Average number cleanings per filter	Average number days in service between cleanings	Average number cleanings by Nichols method, per filter	Average number cleanings by Brooklyn method, per filter	Average number cleanings by ejecting, per filter	Average number rakings between cleanings
Torresdale .....	69 192.233	189.568	3.810	4.371	2.23	150.56	1.06	0.57	.....	1.12
Queen Lane .....	22 508.100	61.666	3.830	4.828	2.00	170.54	2.00	0.00	.....	3.86
Belmont .....	16 086.024	44.071	3.257	4.649	7.06	46.61	0.83	6.23	.....	0.44
Upper Roxborough .....	5 184.781	14.205	2.536	3.595	8.75	37.89	0.50	8.25	.....	0.07
Lower Roxborough .....	3 612.464	9.897	3.735	4.838	16.40	19.96	1.00	15.40	.....	0.07

TABLE III—CHEMICAL AND MICROSCOPICAL CHARACTER OF DELAWARE RIVER WATER FOR YEAR 1919

Parts per million

Month	Chlorine	Total hardness	Permanent hardness (Non-carbonate)	Alkalinity			Free CO <sub>2</sub>		Dissolved oxygen		Iron	Total solids	Suspended matter	Oxygen consumed	Micro-organisms	
				Average	Maximum	Minimum	Average	Maximum	P. P. M.	Per cent. saturation					st'd'd units per c. c.	Number per c. c.
January ....	4.7	53	24	20	32	27	4	5	12.8	98	1.23	99	19	3.2	41	23
February ...	3.8	46	20	26	34	19	5	6	12.8	99	2.24	136	.....	4.4	26	8
March .....	2.5	34	20	14	16	12	4	4	12.7	98	1.23	78	23	3.8	1	1
April .....	3.2	40	17	23	25	20	6	8	10.8	96	.88	79	18	3.0	30	8
May .....	4.7	43	21	22	26	18	4	5	8.3	93	2.14	114	33	5.4	52	10
June .....	4.5	44	19	25	29	21	4	4	6.8	79	1.22	110	22	4.4	110	21
July .....	6.0	58	28	32	37	26	2	3	6.3	76	.82	120	17	3.6	131	53
August .....	7.2	63	31	32	34	29	3	4	5.5	68	.98	140	18	4.4	246	112
September ..	8.0	71	35	36	38	34	3	3	6.0	67	.88	142	13	4.0	387	118
October .....	4.8	48	23	23	28	18	3	3	8.6	96	.83	97	11	4.2	165	65
November ...	4.6	41	20	21	24	19	3	4	9.8	96	1.03	90	18	3.9	110	45
December ...	4.2	35	16	19	23	11	3	4	11.8	80	1.30	95	18	4.2	217	60
Averages..	4.8	48	23	25	.....	.....	4	.....	9.4	84	1.24	103	18	4.0	126	44

AVERAGE FOR PREVIOUS YEARS

Year	Chlorine	Total hardness	Permanent hardness (Non-carbonate)	Average	Maximum	Minimum	Average	Maximum	Dissolved oxygen P. P. M.	Per cent. saturation	Iron	Total solids	Suspended matter	Oxygen consumed	st'd'd units per c. c.	Number per c. c.
1917 .....	4.3	46	22	24	.....	.....	4	.....	10.0	.....	1.77	.....	22	3.5	320	139
1916 .....	4.5	48	19	28	.....	.....	4	.....	10.0	.....	1.68	.....	22	3.7	291	189
1915 .....	3.9	48	23	25	.....	.....	4	.....	9.5	.....	2.47	.....	64	3.8	476	302
1914 .....	5.1	53	24	31	.....	.....	4	.....	9.8	.....	1.58	.....	34	3.4	656	467
1913 .....	6.0	48	20	27	.....	.....	.....	.....	.....	.....	2.28	.....	36	3.7	650	348

TABLE IV—CHEMICAL CHARACTER OF WATER IN EFFLUENT FINAL FILTERS, TORRESDALE, FOR YEAR 1918  
Parts per million

Month	Chlorine	Total hardness	Permanent hardness	Alkalinity		Free CO <sub>2</sub>		Total solids	Iron	Oxygen consumed
				Average	Minimum	Average	Maximum			
January .....	5.3	53	24	29	27	5	8	.....	.13	1.8
February .....	4.2	45	22	23	9	7	8	.....	.16	2.1
March .....	2.8	34	21	13	11	6	6	.....	.10	2.2
April .....	3.9	40	17	23	19	7	8	64	.02	1.6
May .....	5.2	44	22	22	20	7	8	74	T	2.1
June .....	5.1	43	20	23	20	6	6	84	.02	2.1
July .....	5.6	56	25	31	24	5	5	95	T	1.5
August .....	7.3	64	32	32	30	5	6	114	T	1.8
September .....	8.3	68	33	35	33	6	6	128	.03	2.0
October .....	5.2	49	26	23	18	6	6	85	.02	2.2
November .....	5.0	41	20	21	19	5	6	74	.09	1.8
December .....	4.6	35	18	17	9	5	6	75	.13	2.4
Averages ...	5.2	48	23	24	.....	6	.....	88	.06	2.0

AVERAGES FOR PREVIOUS YEARS

Year	Chlorine	Total hardness	Permanent hardness	Average Alkalinity	Minimum Alkalinity	Average Free CO <sub>2</sub>	Maximum Free CO <sub>2</sub>	Total solids	Iron	Oxygen consumed
1917 .....	4.6	46	21	25	.....	5	.....	.....	.16	1.9
1916 .....	4.8	47	19	28	.....	5	.....	.....	.13	1.9
1915 .....	4.1	48	23	25	.....	5	.....	.....	.17	1.7
1914 .....	5.2	55	24	31	.....	5	.....	.....	.12	1.6
1913 .....	6.1	48	20	28	.....	.....	.....	.....	.16	1.85



TABLE V—TURBIDITY AND COLOR OF DELAWARE RIVER WATER FOR YEAR 1918

Parts per million

Month	No. of test days	Mean turbidity	Median turbidity	Turbidity—Variations: No. of test days							No. of test days	Mean color	Color Variations: No. of test days				
				0 to 10	11 to 25	26 to 50	51 to 100	101 to 250	251 to 500	Above 500			0 to 10	11 to 25	26 to 50	51 to 100	Above 100
				January	31	20	6	20	5	2			2	2	0	0	5
February	28	79	23	12	2	2	3	0	4	0	4	22	0	4	0	0	0
March	31	30	19	8	14	5	2	12	0	0	4	18	0	4	0	0	0
April	30	14	11	15	12	3	0	0	0	0	5	16	0	5	0	0	0
May	31	26	10	19	7	2	0	3	0	0	4	14	0	4	0	0	0
June	30	34	25	0	17	9	3	1	0	0	4	19	0	4	0	0	0
July	31	12	12	8	23	0	0	0	0	0	5	18	0	5	0	0	0
August	31	8	8	27	4	0	0	0	0	0	4	20	0	4	0	0	0
September	30	11	10	19	11	0	0	0	0	0	4	15	0	4	0	0	0
October	31	13	12	3	28	0	0	0	0	0	5	16	0	5	0	0	0
November	30	13	13	8	22	0	0	0	0	0	4	21	0	4	0	0	0
December	31	31	22	0	18	8	5	0	0	0	5	24	0	4	1	0	0
Total	365			139	163	31	20	8	4	0	53		0	52	1	0	0
Average		24										18					
Per cent. time.				38	45	9	5	2	1	0			0	98	2	0	0

AVERAGES FOR PREVIOUS YEARS

Year	No. of test days	Mean turbidity	Median turbidity	0 to 10	11 to 25	26 to 50	51 to 100	101 to 250	251 to 500	Above 500	No. of test days	Mean color	0 to 10	11 to 25	26 to 50	51 to 100	Above 100
1917	31	20	15.5	129	16	15.4	14.1	1	1			20	10	1100	10		
1916	31	16	51	38	7	3	1					19	0	96	4		
1915	31	52	1.4	29	37	26	5.8	1.1	0.3			18	6	92	2		
1914	31	20	44	40	11	2	2	0.3				15	0	98	2		
1913	31	29	13	52	24	6	5					17	6	92	2		

<sup>1</sup> Per cent. time.

TABLE Va—TURBIDITY OF APPLIED WATER TO PRE-FILTERS, TORRESDALE, FOR YEAR 1918  
Parts per million

Month	No. of test days	Mean turbidity	Median turbidity	Variations: No. of test days							Per cent. removed by sedimentation basin
				0 to 10	11 to 25	26 to 50	51 to 100	101 to 250	251 to 500	Above 500	
January .....	31	15	5	23	2	3	3	0	0	0	.....
February .....	28	36	17	12	4	4	6	2	0	0	.....
March .....	31	21	19	12	10	7	2	0	0	0	.....
April .....	30	12	9	19	10	1	0	0	0	0	.....
May .....	31	15	9	22	5	1	3	0	0	0	.....
June .....	30	27	18	0	20	8	1	1	0	0	.....
July .....	31	10	10	25	6	0	0	0	0	0	.....
August .....	31	8	7	29	2	0	0	0	0	0	.....
September .....	30	9	9	23	7	0	0	0	0	0	.....
October .....	31	11	11	17	14	0	0	0	0	0	.....
November .....	30	12	11	14	16	0	0	0	0	0	.....
December .....	31	21	19	0	24	6	1	0	0	0	.....
Total .....	365	.....	.....	196	120	30	16	3	0	0	.....
Average .....	.....	16	.....	.....	.....	.....	.....	.....	.....	.....	33
Per cent. time .....	.....	.....	.....	53.7	33	8.3	4.4	0.8	0	0	.....

AVERAGES FOR PREVIOUS YEARS

Year	No. of test days	Mean turbidity	Median turbidity	0 to 10	11 to 25	26 to 50	51 to 100	101 to 250	251 to 500	Above 500	Per cent. removed by sedimentation basin
1917 .....	364	18.5	.....	168	117	15.8	16.0	13.6	10	10	8.0

<sup>1</sup> Per cent. time.

TABLE VI—TURBIDITY OF APPLIED WATER TO FINAL FILTERS, TORRESDALE, FOR YEAR 1918

Parts per million

Month	No. of test days	Mean turbidity	Median turbidity	Variations: No. of test days							Per cent. removed
				0 to 10	11 to 25	26 to 50	51 to 100	101 to 250	251 to 500	Above 500	
January .....	31	6	0.5	25	4	2	0	0	0	0	60.0
February .....	28	16	4	16	4	7	0	1	0	0	55.6
March .....	31	8	6	23	7	1	0	0	0	0	62.0
April .....	30	4	4	30	0	0	0	0	0	0	66.7
May .....	31	3	2	28	3	0	0	0	0	0	80.0
June .....	30	9	6	20	9	1	0	0	0	0	66.7
July .....	31	1	1	31	0	0	0	0	0	0	90.0
August .....	31	0.5	0.5	31	0	0	0	0	0	0	93.7
September .....	30	0.5	0.5	30	0	0	0	0	0	0	94.5
October .....	31	2	2	31	0	0	0	0	0	0	81.8
November .....	30	2	2	30	0	0	0	0	0	0	83.3
December .....	31	8	5	22	9	0	0	0	0	0	62.0
<b>Total .....</b>	<b>365</b>			<b>317</b>	<b>36</b>	<b>11</b>		<b>1</b>			
<b>Average .....</b>		<b>5</b>									<b>70.0</b>
<b>Per cent. time.....</b>				<b>86.8</b>	<b>9.9</b>	<b>3</b>	<b>0</b>	<b>0.3</b>			

AVERAGES FOR PREVIOUS YEARS

Year	No. of test days	Mean turbidity	Median turbidity	0 to 10	11 to 25	26 to 50	51 to 100	101 to 250	251 to 500	Above 500	Per cent. removed
1917 .....	365	7.4		182	49.6	14.4	14.1	10.3	0	0	60.0
1916 .....	366	5		89	8	2	1	0	0	0	69.0
1915 .....	365	22		43	37	13	4.4	2.5	0	0	58.0

<sup>1</sup> Per cent. time.

TABLE VII—TURBIDITY AND COLOR OF WATER IN EFFLUENT FINAL FILTERS, TORRESDALE, FOR YEAR 1918

Parts per million

Month	Turbidity							Color				
	No. of test days	Mean turbidity	Median turbidity	Variations: No of test days				No. of test days	Mean color	Variations: No. of test days		
				0	0.5 to 5	6 to 10	Above 10			0 to 5	6 to 10	Above 10
January .....	31	0	0.5	26	5	0	0	5	12	0	1	4
February .....	28	0.5	0.5	18	9	1	0	4	11	0	2	2
March .....	31	0	0+	19	12	0	0	4	11	0	1	3
April .....	30	0	0	30	0	0	0	5	9	0	5	0
May .....	31	0	0	30	1	0	0	4	8	0	4	0
June .....	30	0	0	29	1	0	0	4	9	0	4	0
July .....	31	0	0	31	0	0	0	5	7	1	4	0
August .....	31	0	0	31	0	0	0	4	7	0	4	0
September .....	30	0	0	30	0	0	0	4	6	2	2	0
October .....	31	0	0	31	0	0	0	5	6	1	4	0
November .....	30	0	0	30	0	0	0	4	7	0	4	0
December .....	31	0	0	26	5	0	0	5	10	0	3	2
Totals .....	365			331	33	1	0	53		4	38	11
Average .....		0	0						9			
Per cent. time.....				90.7	9	0.3	0			7	72	21

AVERAGES FOR PREVIOUS YEARS

Year	No. of test days	Mean turbidity	Median turbidity	0	0.5 to 5	6 to 10	Above 10	No. of test days	Mean color	0 to 5	6 to 10	Above 10
1917 .....	364	0.4	0	<sup>1</sup> 80	<sup>1</sup> 18	<sup>1</sup> 2	<sup>1</sup> 0	.....	12	<sup>1</sup> 0	<sup>1</sup> 41	<sup>1</sup> 59
1916 .....	366	0	0	95	5	.....	.....	.....	12	.....	38	62
1915 .....	365	0.6	0	79	17	1.4	1.9	.....	12	.....	55	45
1914 .....	365	0.6	0	93	7	.....	.....	.....	10	.....	79	21
1913 .....	365	0	0	82	16	.....	.....	.....	.....	.....	.....	.....

<sup>1</sup> Per cent. time.

TABLE VIII—NUMBER OF BACTERIA IN DELAWARE RIVER WATER—TORRESDALE—FOR YEAR 1918

Month	Number of bacteria on gelatin at 20° C.						Bacillus coli									
	No. of test days	Mean per c. c.	Median per c. c.	Variations: No. of test days				0.01 c. c. tests			0.1 c. c. tests			1.0 c. c. tests		
				0 to 1000	1001 to 10000	10001 to 100000	Above 100000	Total number	Number +	Per cent. +	Total number	Number +	Per cent. +	Total number	Number +	Per cent. +
January .....	31	81 000	72 000	0	0	25	6	.....	.....	.....	12	11	92	12	12	100
February .....	27	69 000	60 000	0	0	22	5	.....	.....	.....	11	8	73	11	10	91
March .....	30	13 000	8 000	0	18	12	0	.....	.....	.....	12	12	100	12	12	100
April .....	29	26 000	20 000	0	5	24	0	7	1	14	11	8	73	4	4	100
May .....	30	19 000	9 000	0	20	10	0	30	6	20	30	16	53	.....	.....	.....
June .....	30	19 000	11 000	0	13	16	1	30	9	30	30	18	60	13	9	69
July .....	31	11 000	7 100	0	22	9	0	31	10	32	31	18	58	31	31	100
August .....	31	8 600	6 000	0	27	4	0	31	12	39	31	22	71	31	27	87
September .....	30	17 000	6 200	0	22	7	1	30	12	40	30	19	63	29	27	93
October .....	27	5 800	5 200	2	21	4	0	30	10	33	30	20	67	31	27	87
November .....	30	9 500	6 400	0	20	10	0	29	9	31	29	18	62	30	26	87
December .....	31	30 000	20 000	0	7	23	1	31	7	23	31	23	74	31	27	87
Total .....	337	.....	.....	2	175	166	14	249	76	.....	288	193	.....	235	212	.....
Average .....	.....	25 700	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Per cent. time .....	.....	.....	.....	0.6	49	46.5	3.9	.....	.....	30.5	.....	.....	67	.....	.....	90

TOTALS AND AVERAGES FOR PREVIOUS YEARS																
Year	No. of test days	Mean per c. c.	Median per c. c.	0 to 1000	1001 to 10000	10001 to 100000	Above 100000	Total number	Number +	Per cent. +	Total number	Number +	Per cent. +	Total number	Number +	Per cent. +
1917.....	365	15 500	.....	10.3	165	132	12.5	148	5	13.4	148	120	181	148	148	100
1916.....	366	11 300	.....	1.4	77	20	1.4	150	5	3	150	122	81	150	150	100
1915.....	365	10 300	.....	1	73	26	0.3	150	12	8	150	140	94	150	149	99.3
1914.....	365	16 800	.....	1	63	32	3	154	24	16	154	115	75	154	154	100
1913.....	365	7 680	.....	1	83	16	.....	.....	.....	.....	153	131	86	153	152	99

1 Per cent. time.

TABLE VIIIa—NUMBER OF BACTERIA IN APPLIED WATER—PRE-FILTERS—  
TORRESDALE—FOR YEAR 1918

Month	Number of bacteria on gelatin at 20° C.							
	No. of test days	Mean per c. c.	Median per c. c.	Variations: No. of test days				
				0 to 300	301 to 1000	1001 to 10000	10001 to 100000	Over 100000
January .....	31	71 000	63 000	0	0	0	26	5
February .....	27	55 000	48 000	0	0	2	22	3
March .....	30	9 700	7 300	0	0	23	7	0
April .....	29	23 000	24 000	0	0	6	23	0
May .....	31	9 900	9 000	0	0	22	9	0
June .....	30	9 400	6 500	0	0	21	9	0
July .....	31	6 800	5 200	0	2	25	4	0
August .....	31	6 100	4 100	0	1	25	5	0
September .....	30	10 000	5 100	0	0	21	9	0
October .....	27	10 000	6 200	0	0	20	7	0
November .....	30	12 000	7 700	0	0	19	11	0
December .....	31	36 000	19 000	0	0	9	19	3
Totals .....	358	.....	.....	0	3	193	151	11
Average .....	.....	21 500	.....	.....	.....	.....	.....	.....
Per cent. time..	.....	.....	.....	0	0.8	53.9	42.2	3.1

AVERAGES FOR PREVIOUS YEARS

Year	No. of test days	Mean per c. c.	Median per c. c.	0 to 300	301 to 1000	1001 to 10000	10001 to 100000	Over 100000
1917 .....	363	13 900	.....	*0	*1	*71	*26	*2

\* Per cent. time.

TABLE VIII—NUMBER OF BACTERIA IN APPLIED WATER—FINAL FILTERS—TORRESDALE—FOR YEAR 1918

Month	Number of bacteria on gelatin at 20° C.								Bacillus coli								
	No. of test days	Mean per c. c.	Median per c. c.	Variations: No. of test days					0.01 c. c. tests			0.1 c. c. tests			1.0 c. c. tests		
				0 to 300	301 to 1000	1001 to 10000	10001 to 100000	Above 100000	Total number	Number +	Per cent. +	Total number	Number +	Per cent. +	Total number	Number +	Per cent. +
January .....	30	18 000	14 000	0	0	13	17	0	0	.....	.....	12	6	50	12	10	83
February .....	27	14 000	10 000	0	0	14	13	0	0	.....	.....	11	2	18	11	10	91
March .....	30	2 200	1 600	0	9	21	0	0	0	.....	.....	12	5	42	12	12	100
April .....	29	2 800	1 600	1	5	22	1	0	9	1	11	12	4	33	11	9	82
May .....	31	1 500	1 000	0	17	14	0	0	31	0	0	31	6	19	31	24	77
June .....	30	2 100	1 400	0	12	17	1	0	30	0	0	30	11	37	30	22	73
July .....	31	950	720	1	21	9	0	0	31	0	0	31	8	26	31	23	74
August .....	31	770	500	5	19	7	0	0	31	1	3	31	9	29	31	26	84
September .....	30	1 200	1 000	0	18	12	0	0	30	1	3	30	12	40	30	20	67
October .....	27	1 000	850	0	17	10	0	0	30	2	7	30	9	30	30	26	87
November .....	30	2 800	1 600	1	8	21	0	0	30	2	7	30	12	40	30	23	77
December .....	31	6 800	3 400	0	3	23	5	0	31	1	3	31	16	52	30	26	87
Total .....	357	.....	.....	8	129	183	37	0	253	8	.....	291	100	.....	289	231	.....
Average .....	.....	4 510	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Per cent. time...	.....	.....	.....	2.2	36.1	51.3	10.4	0	.....	.....	3	.....	.....	34	.....	.....	80

AVERAGES FOR PREVIOUS YEARS

Year	No. of test days	Mean per c. c.	Median per c. c.	0 to 300	301 to 1000	1001 to 10000	10001 to 100000	Above 100000	Total number	Number +	Per cent. +	Total number	Number +	Per cent. +	Total number	Number +	Per cent. +
1917 .....	363	3 570	.....	12	140	150	18	10	.....	.....	10	.....	.....	119	.....	.....	195

<sup>1</sup> Per cent. time.

TABLE VIIIc—NUMBER OF BACTERIA IN EFFLUENTS—FINAL FILTERS<sup>1</sup>—TORRESDALE—FOR YEAR 1918

Month	Number of bacteria on gelatin at 20°									Number of bacteria on Agar at 37½° C.							
	No. of test days	Mean per c. c.	Median per c. c.	Variations: No. of test days						No. of test days	Mean per c. c.	Median per c. c.	Variations: No. of test days				
				0 to 10	11 to 25	26 to 50	51 to 100	101 to 250	Above 250				0 to 10	11 to 25	26 to 50	51 to 100	Above 100
January .....	17	1 000	640	0	0	0	0	4	13	18	24	18	1	11	5	1	0
February .....	13	1 800	1 400	0	0	0	0	1	12	13	94	88	2	2	1	3	5
March .....	24	100	97	0	0	2	12	10	0	25	30	26	0	13	9	3	0
April .....	28	100	77	1	4	5	8	9	1	29	61	41	0	5	15	5	4
May .....	31	97	82	3	4	4	8	12	0	31	50	28	5	9	8	5	4
June .....	26	56	49	0	4	11	10	1	0	26	43	19	6	10	5	4	1
July .....	31	16	14	7	21	2	1	0	0	31	15	12	12	17	0	2	0
August .....	30	10	5	23	5	1	1	0	0	30	9	8	21	8	1	0	0
September .....	30	13	11	13	15	2	0	0	0	30	11	9	19	9	1	1	0
October .....	27	20	13	7	13	5	2	0	0	30	14	10	15	11	3	1	0
November .....	28	36	28	3	6	14	4	1	0	28	8	6	20	7	1	0	0
December .....	27	140	94	0	2	4	11	7	3	27	10	10	14	13	0	0	0
Total .....	312	.....	.....	57	74	50	57	45	29	318	.....	.....	115	115	49	25	14
Average .....	.....	182	.....	.....	.....	.....	.....	.....	.....	.....	28	.....	.....	.....	.....	.....	.....
Per cent. time .....	.....	.....	.....	18.3	23.7	16.0	18.3	14.4	9.3	.....	.....	.....	36.2	36.2	15.4	7.8	4.4

<sup>1</sup> Before treating with chlorine.



TABLE IX—NUMBER OF BACTERIA IN EFFLUENTS—FINAL FILTERS—TORRESDALE<sup>1</sup>—FOR YEAR 1918

Month	Number of bacteria on gelatin at 20° C.					Number of bacteria on Agar at 37½° C.										
	No. of test days	Mean per c. c.	Median per c. c.	Variations: No. of test days					No. of test days	Mean per c. c.	Median per c. c.	Variations: No. of test days				
				0 to 10	11 to 25	26 to 50	51 to 100	101 to 250				Above 250	0 to 10	11 to 25	26 to 50	51 to 100
January	30	390	140	2	2	6	5	13	31	18	16	10	12	8	1	0
February	27	180	50	2	6	8	2	3	28	28	22	7	10	6	5	0
March	30	21	19	4	20	5	1	0	31	20	18	4	4	21	6	0
April	29	10	8	24	4	1	0	0	30	37	28	1	11	13	3	2
May	31	27	13	15	7	5	3	0	31	39	18	5	13	8	3	2
June	30	29	10	17	6	3	2	1	30	18	12	9	16	3	2	0
July	31	11	8	21	9	0	1	0	30	10	8	20	9	0	1	0
August	31	5	4	28	2	1	0	0	31	6	6	27	4	0	0	0
September	30	8	6	25	4	1	0	0	30	13	5	21	3	3	3	0
October	27	13	6	21	4	1	0	1	31	16	9	17	10	3	1	0
November	30	5	4	25	5	0	0	0	29	4	3	28	1	0	0	0
December	31	28	11	16	7	3	4	0	31	6	5	29	2	0	0	0
Totals	357	.....	.....	200	76	28	25	9	363	.....	.....	178	112	50	19	4
Averages	.....	60	.....	.....	.....	.....	.....	.....	.....	18	.....	.....	.....	.....	.....	.....
Per cent. time	.....	.....	.....	56.0	21.3	7.9	7.0	2.5	5.3	.....	.....	49.0	30.9	13.8	5.2	1.1

TOTALS AND AVERAGES FOR PREVIOUS YEARS

Year	No. of test days	Mean per c. c.	Median per c. c.	0 to 10	11 to 25	26 to 50	51 to 100	101 to 250	Above 250	No. of test days	Mean per c. c.	Median per c. c.	0 to 10	11 to 25	26 to 50	51 to 100	Above 100
1917	364	64	.....	44*	29 <sup>12</sup> *	4*	2*	9	361	14	.....	.....	50*	34*	15*	1*	0*
1916	361	38	.....	71	18	2.5	1.7	3.4	359	11	.....	.....	63	30	4.5	1.7	0.3
1915	364	28	.....	72	14	4.7	2.5	3.6	361	14	.....	.....	65	21	9.4	4.4	0.3
1914	564	51	.....	64	15	6	4	6	357	12	.....	.....	63	28	6	3	.....
1913	365	13	.....	77	{ 11 to 50 } 19	2.2	1.4	0.3	.....	.....	.....	.....	.....	.....	.....	.....	.....

<sup>1</sup> After chlorine treatment.

\* Per cent. time.

TABLE X—COMPARISON BETWEEN BACTERIAL COUNTS ON GELATIN AND AGAR—TORRESDALE—FOR YEAR 1918

Month	Bacteria per cubic centimeter						Average temperature, Degrees Fahr.	Chlorine applied P. P. M.
	Delaware River		Effluent of final filters		Filtered water basin			
	Gelatin	Agar	Gelatin	Agar	Gelatin	Agar		
January .....	81 000	2 400	1 000	24	390	18	32	.181
February .....	69 000	4 300	1 800	94	180	28	33	.161
March .....	13 000	2 200	100	30	21	20	40	.134
April .....	26 000	8 000	100	61	10	37	51	.121
May .....	19 000	31 000	97	50	27	39	70	.118
June .....	19 000	6 300	56	43	29	18	73	.118
July .....	11 000	4 400	16	15	11	10	78	.115
August .....	8 600	5 400	10	9	5	6	80	.116
September .....	17 000	3 400	13	11	8	13	70	.103
October .....	5 800	2 600	20	14	13	16	60	.101
November .....	9 500	1 100	36	8	5	4	50	.107
December .....	30 000	980	140	10	28	6	38	.115
Averages .....	25 700	6 030	182	28	60	18	56	.125

AVERAGES FOR PREVIOUS YEARS								
1917 .....	15 500	2 620	152	22	64	14	53	.165
1916 .....	11 300	3 630	88	23	39	11	54	.15
1915 .....	10 300	2 810	141	30	28	14	56	.18

TABLE XI—BACTERIA RESEMBLING *B. COLI COMMUNIS* IN EFFLUENTS\*—  
FINAL FILTERS—TORRESDALE—FOR YEAR 1918

Month	Bacillus coli						
	No. of test days	One c. c. tests			Ten c. c. tests		
		Total number	Number +	Per cent. +	Total number	Number +	Per cent. +
January .....	31	31	0	0	<sup>1</sup> 155	23	15
February .....	28	28	0	0	<sup>1</sup> 140	8	6
March .....	31	31	0	0	<sup>1</sup> 155	1	0.6
April .....	30	30	0	0	<sup>1</sup> 46	1	2
May .....	31	31	0	0	31	6	19
June .....	30	30	0	0	30	1	3
July .....	31	31	0	0	31	1	3
August .....	31	31	0	0	31	0	0
September .....	30	30	1	3	30	3	10
October .....	31	31	0	0	31	1	3
November .....	30	30	0	0	30	2	7
December .....	31	31	2	6	31	5	16
Totals .....	365	365	3	.....	741	52	.....
Averages .....	.....	.....	.....	0.8	.....	.....	7
Per cent. time .....	.....	.....	.....	.....	.....	.....	.....

## TOTALS AND AVERAGES FOR PREVIOUS YEARS

Year							
1917 .....	364	364	9	2.5	364	39	10.7
1916 .....	365	365	7	1.9	365	27	7.4
1915 .....	362	362	1	0.3	362	18	5.0
1914 .....	365	365	2	0.5	365	31	8.5
1913 .....	365	365	5	1.4	365	31	8.5
1912 .....	365	365	15	4.1	365	80	21.9

\* After chlorine treatment.

<sup>1</sup> From January 1st to April 4th inclusive, five 10 C. C. tests made daily.

TABLE XII—CHEMICAL CHARACTER OF SCHUYLKILL RIVER WATER FOR YEAR 1918  
Intake at Belmont Pumping Station—Parts per million.

Month	Chlorine	Total hardness	Permanent hardness	Alkalinity			Iron	Suspended matter	Total solids	Oxygen consumed
				Average	Maximum	Minimum				
January .....	6.6	74	39	35	44	19	1.41	18	184	3.0
February .....	5.1	80	44	36	50	20	4.32	95	247	4.0
March .....	3.8	73	49	24	30	20	2.51	61	180	2.4
April .....	4.6	87	55	32	43	25	1.38	28	177	2.1
May .....	6.0	98	63	35	39	31	1.05	18	187	2.4
June .....	6.2	99	60	39	43	36	1.38	26	212	2.6
July .....	9.1	119	67	52	57	42	.63	11	258	2.8
August .....	10.0	124	67	57	66	48	.96	24	314	3.5
September .....	11.2	115	61	54	65	41	.86	12	323	3.0
October .....	10.0	<sup>1</sup> 133	.....	47	50	44	<sup>1</sup> .84	<sup>2</sup> 10	<sup>1</sup> 327	3.1
November .....	9.5	120	74	46	50	42	.86	9	326	3.3
December .....	8.1	100	67	33	45	20	1.24	20	222	3.2
Average .....	7.5	102	59	41	48	32	1.45	27	246	3.0

NOTE:—Determinations made once a week excepting those indicated in October.

<sup>1</sup> One determination in the month.

<sup>2</sup> Two determinations in the month.

TABLE XIII—CHEMICAL CHARACTER OF WATER IN EFFLUENTS FROM SCHUYLKILL PLANTS FOR YEAR 1918  
Parts per million

Month	Lower Roxborough filters		Upper Roxborough filters Auxiliary Pumping Station		Belmont filters		Queen Lane filters	
	Oxygen consumed	Total solids	Oxygen consumed	Total solids	Oxygen consumed	Total solids	Oxygen consumed	Total solids
January .....	<sup>1</sup> 1.25	<sup>1</sup> 125	<sup>1</sup> .85	<sup>1</sup> 227	<sup>1</sup> .85	<sup>1</sup> 169	<sup>1</sup> 1.6	<sup>1</sup> 160
February .....	<sup>1</sup> .95	<sup>1</sup> 111	<sup>1</sup> .85	<sup>1</sup> 169	<sup>1</sup> .55	<sup>1</sup> 105	<sup>1</sup> 1.0	<sup>1</sup> 185
March .....	<sup>2</sup> .68	<sup>2</sup> 135	<sup>2</sup> .9	<sup>2</sup> 118	<sup>2</sup> .6	<sup>2</sup> 138	<sup>2</sup> 1.0	<sup>2</sup> 120
April .....	<sup>2</sup> .6	<sup>2</sup> 154	<sup>2</sup> .65	<sup>2</sup> 144	<sup>2</sup> .6	<sup>2</sup> 146	<sup>2</sup> .88	<sup>2</sup> 138
May .....	<sup>2</sup> .7	<sup>2</sup> 156	<sup>2</sup> .8	<sup>2</sup> 156	<sup>2</sup> .7	<sup>2</sup> 165	<sup>2</sup> .9	<sup>2</sup> 154
June .....	<sup>2</sup> 1.2	<sup>2</sup> 158	<sup>2</sup> 1.0	<sup>2</sup> 160	<sup>2</sup> 1.2	<sup>2</sup> 156	<sup>2</sup> 1.1	<sup>2</sup> 170
July .....	<sup>2</sup> 1.1	<sup>2</sup> 240	<sup>2</sup> .9	<sup>2</sup> 224	<sup>2</sup> 1.1	<sup>2</sup> 269	<sup>2</sup> .8	<sup>2</sup> 228
August .....	<sup>2</sup> 1.0	<sup>2</sup> 292	<sup>2</sup> 1.1	<sup>2</sup> 272	<sup>2</sup> 1.1	<sup>2</sup> 285	<sup>2</sup> 1.2	<sup>2</sup> 280
September .....	<sup>2</sup> .9	<sup>2</sup> 333	<sup>2</sup> .8	<sup>2</sup> 306	<sup>2</sup> 1.2	<sup>2</sup> 292	<sup>2</sup> 1.1	<sup>2</sup> 303
October .....	<sup>2</sup> .8	.....	<sup>2</sup> 1.0	<sup>2</sup> 314	<sup>2</sup> 1.0	.....	<sup>2</sup> 1.0	.....
November .....	<sup>2</sup> 1.0	<sup>2</sup> 341	<sup>2</sup> 1.0	<sup>2</sup> 305	<sup>2</sup> .9	<sup>2</sup> 330	<sup>2</sup> .8	<sup>2</sup> 317
December .....	<sup>2</sup> 1.2	<sup>2</sup> 235	<sup>2</sup> 1.5	<sup>2</sup> 215	<sup>2</sup> 1.2	<sup>2</sup> 220	<sup>2</sup> 1.4	<sup>2</sup> 184
Averages .....	.95	207	.95	218	.92	207	1.06	204

Note:—<sup>1</sup> Once a month; <sup>2</sup> twice a month; <sup>3</sup> three times per month.

TABLE XIV—TURBIDITY AND COLOR OF SCHUYLKILL RIVER WATER FOR YEAR 1918  
Parts per million

Month	Turbidity									Color					
	No. of test days	Mean turbidity	Variations: No. of test days							No. of test days	Mean color	Variations: No. of test days			
			0 to 10	11 to 25	26 to 50	51 to 100	101 to 500	501 to 1000	1001 to 1500			1501 to 2000	0 to 10	11 to 20	21 to 50
January .....	31	34	16	8	3	2	2	.....	.....	.....	4	22	.....	3	1
February .....	28	34	7	5	.....	2	9	.....	3	2	4	14	2	2	.....
March .....	31	66	.....	11	9	6	5	.....	.....	.....	4	11	3	1	.....
April .....	30	42	.....	18	5	4	3	.....	.....	.....	5	14	1	4	.....
May .....	31	145	6	16	2	1	4	1	1	.....	4	15	1	3	.....
June .....	30	52	.....	9	15	2	4	.....	.....	.....	4	19	1	2	1
July .....	31	18	1	29	1	.....	.....	.....	.....	.....	5	14	1	4	.....
August .....	31	25	.....	25	3	3	.....	.....	.....	.....	4	16	.....	4	.....
September .....	30	19	2	25	3	.....	.....	.....	.....	.....	5	15	.....	5	.....
October .....	31	13	2	20	.....	.....	.....	.....	.....	.....	2	15	.....	2	.....
November .....	30	15	9	19	2	.....	.....	.....	.....	.....	4	16	.....	4	.....
December .....	31	47	9	10	3	4	5	.....	.....	.....	5	13	1	4	.....
Totals .....	365	.....	52	204	46	24	32	1	4	2	50	.....	10	38	2
Per cent. time .....	.....	.....	14	56	13	7	9	0.3	1	0.5	.....	.....	20	76	4

TABLE XV—TURBIDITY OF WATER IN EFFLUENTS FROM SCHUYLKILL PLANTS, FOR YEAR 1918

Month	Lower Roxborough					Upper Roxborough Auxiliary Pumping Station					Belmont					Queen Lane				
	No. of test days	Mean turbidity	Variations: No. of test days			No. of test days	Mean turbidity	Variations: No. of test days			No. of test days	Mean turbidity	Variations: No. of test days			No. of test days	Mean turbidity	Variations: No. of test days		
			0+	0.5 to 5	Above 5			0+	0.5 to 5	Above 5			0+	0.5 to 5	Above 5			0+	0.5 to 5	Above 5
January	31	0+	23	8	.....	31	0.5	20	11	.....	31	0+	25	6	.....	31	0.5	18	13	.....
February	28	0+	23	5	.....	28	0.5	18	10	.....	28	0.5	19	9	.....	28	0.5	14	14	.....
March	31	0+	31	.....	.....	31	0+	26	5	.....	31	0+	31	.....	.....	31	0+	26	5	.....
April	30	0+	30	.....	.....	30	0+	30	.....	.....	30	0+	30	.....	.....	30	0+	30	.....	.....
May	31	0+	31	.....	.....	31	0+	31	.....	.....	31	0+	31	.....	.....	31	0+	31	.....	.....
June	30	0+	30	.....	.....	30	0+	30	.....	.....	30	0+	30	.....	.....	30	0+	30	.....	.....
July	31	0+	31	.....	.....	31	0+	31	.....	.....	31	0+	31	.....	.....	31	0+	31	.....	.....
August	31	0+	31	.....	.....	31	0+	31	.....	.....	31	0+	31	.....	.....	31	0+	31	.....	.....
September	30	0+	30	.....	.....	30	0+	30	.....	.....	30	0+	30	.....	.....	30	0+	30	.....	.....
October	31	0+	31	.....	.....	31	0+	31	.....	.....	30	0+	30	.....	.....	30	0+	31	.....	.....
November	30	0+	30	.....	.....	30	0+	30	.....	.....	30	0+	30	.....	.....	31	0+	30	.....	.....
December	31	0+	31	.....	.....	31	0+	31	.....	.....	31	0+	31	.....	.....	31	0+	31	.....	.....
Total	365	.....	352	13	.....	365	.....	339	26	.....	364	.....	340	15	.....	365	.....	333	32	.....
Per cent. time	.....	.....	96	4	.....	.....	.....	93	7	.....	.....	.....	96	4	.....	.....	.....	91	9	.....

TABLE XVI—NUMBER OF BACTERIA IN SCHUYLKILL RIVER WATER, FOR YEAR 1918  
Intake at Belmont Pumping Station

Month	Number of bacteria on gelatin at 20° C.								Bacteria resembling B. Coli Communis						
	No. of test days	Mean per c. c.	Median per c. c.	Variations: No. of test days					0.1 c. c. tests			1.0 c. c. tests			
				500 to 1000	1000 to 10000	10000 to 100000	100000 to 500000	500000 to 1000000	Above 1000000	Total number test days	Number +	Per cent. +	Total number test days	Number +	Per cent. +
January .....	31	1 400 000	840 000	.....	.....	1	9	8	13	31	18	58	31	28	90
February .....	28	300 000	180 000	.....	.....	6	18	12	2	28	21	75	28	27	96
March .....	31	62 000	46 000	.....	.....	27	4	.....	.....	30	27	90	31	29	94
April .....	30	50 000	34 000	.....	.....	27	3	.....	.....	30	25	83	30	30	100
May .....	31	49 000	33 000	.....	.....	28	3	.....	.....	31	30	97	31	30	97
June .....	30	55 000	45 000	.....	.....	28	2	.....	.....	30	29	97	30	27	90
July .....	31	14 000	9 600	.....	15	16	.....	.....	.....	31	27	87	31	29	94
August .....	31	7 000	3 600	1	23	7	.....	.....	.....	31	23	74	31	30	97
September .....	30	12 000	12 000	.....	14	16	.....	.....	.....	30	30	100	30	30	100
October .....	31	17 000	15 000	.....	3	28	.....	.....	.....	31	29	94	31	31	100
November .....	29	39 000	29 000	.....	2	25	2	.....	.....	28	28	100	28	27	96
December .....	31	190 000	180 000	.....	.....	10	21	.....	.....	30	29	97	30	30	100
Total .....	364	.....	.....	1	57	219	62	10	15	361	316	.....	362	348	.....
Average .....	.....	186 000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Per cent. time .....	.....	.....	.....	0.3	16	60	17	3	4	.....	.....	88	.....	.....	96



TABLE XVII—NUMBER OF BACTERIA IN EFFLUENTS FROM SCHUYLKILL PLANTS FOR YEAR 1918

Month	Gelatin at 20° C.																	
	Lower Roxborough									Upper Roxborough Auxiliary Pumping Station								
	No. of test days	Mean per c. c.	Median per c. c.	Variations: No. of test days						No. of test days	Mean per c. c.	Median per c. c.	Variations: No. of test days					
				0 to 10	11 to 50	51 to 100	101 to 500	501 to 1000	Above 1000				0 to 10	11 to 50	51 to 100	101 to 500	501 to 1000	Above 1000
January .....	31	13 000	3 200	1	2	.....	5	3	20	31	1 400	280	1	7	3	8	2	10
February .....	27	500	200	.....	1	4	12	6	4	28	92	72	.....	11	7	10	.....	.....
March .....	31	51	18	6	18	5	12	.....	.....	31	28	22	8	22	1	.....	.....	.....
April .....	30	44	7	22	4	1	3	.....	.....	30	5	4	29	1	.....	.....	.....	.....
May .....	31	9	6	22	8	1	.....	.....	.....	31	7	3	23	8	.....	.....	.....	.....
June .....	29	9	5	19	10	.....	.....	.....	.....	30	2	2	30	.....	.....	.....	.....	.....
July .....	30	6	5	25	5	.....	.....	.....	.....	31	4	3	28	3	.....	.....	.....	.....
August .....	31	7	6	23	8	.....	.....	.....	.....	31	5	4	30	1	.....	.....	.....	.....
September .....	28	4	4	26	2	.....	.....	.....	.....	30	2	12	30	.....	.....	.....	.....	.....
October .....	29	3	2	28	1	.....	.....	.....	.....	31	2	1	31	.....	.....	.....	.....	.....
November .....	29	4	3	29	.....	.....	.....	.....	.....	29	4	3	29	.....	.....	.....	.....	.....
December .....	29	41	38	9	9	10	1	.....	.....	31	60	52	1	14	13	3	.....	.....
Total .....	355	.....	.....	210	68	21	23	9	24	364	.....	.....	240	67	24	21	2	10
Average .....	.....	1 100	.....	.....	.....	.....	.....	.....	.....	.....	130	.....	.....	.....	.....	.....	.....	.....
Per cent. time .....	.....	.....	.....	59	19	6	6.5	2.5	7	.....	.....	.....	66	18	6.7	6	0.6	2.7

TABLE XVIII—NUMBER OF BACTERIA IN EFFLUENTS FROM SCHUYLKILL PLANTS FOR YEAR 1918

Month	Gelatin at 20° C.																	
	Belmont									Queen Lane								
	No. of test days	Mean per c. c.	Median per c. c.	Variations: No. of test days						No. of test days	Mean per c. c.	Median per c. c.	Variations: No. of test days					
				0 to 10	11 to 50	51 to 100	101 to 500	501 to 1000	Above 1000				0 to 10	11 to 50	51 to 100	101 to 500	501 to 1000	Above 1000
January .....	30	12 600	3 800	.....	3	2	4	.....	21	31	10 000	2 400	.....	6	.....	1	2	22
February .....	27	1 900	170	1	5	3	9	4	5	27	2 300	160	.....	9	1	8	4	5
March .....	31	78	26	6	15	6	3	1	.....	31	57	18	9	13	5	4	.....	.....
April .....	30	12	10	17	13	.....	.....	.....	.....	30	19	5	24	4	.....	2	.....	.....
May .....	31	7	4	27	4	.....	.....	.....	.....	31	13	5	22	6	3	.....	.....	.....
June .....	30	4	4	30	.....	.....	.....	.....	.....	30	9	9	18	12	.....	.....	.....	.....
July .....	31	6	5	25	6	.....	.....	.....	.....	31	8	3	28	2	1	.....	.....	.....
August .....	31	7	6	25	6	.....	.....	.....	.....	31	4	3	31	.....	.....	.....	.....	.....
September .....	30	4	3	30	.....	.....	.....	.....	.....	30	4	3	29	1	.....	.....	.....	.....
October .....	31	4	3	30	1	.....	.....	.....	.....	31	3	3	31	.....	.....	.....	.....	.....
November .....	29	4	3	28	1	.....	.....	.....	.....	30	12	8	18	12	.....	.....	.....	.....
December .....	31	29	16	15	11	3	2	.....	.....	31	164	65	8	7	2	11	3	.....
Total .....	362	.....	.....	234	65	14	18	5	26	364	.....	.....	218	72	12	26	9	27
Average .....	.....	270	.....	.....	.....	.....	.....	.....	.....	.....	1 100	.....	.....	.....	.....	.....	.....	.....
Per cent. time....	.....	.....	.....	64	18	3.8	5.0	1.4	7.2	.....	.....	.....	60	20	3.3	7	2.5	7.4

TABLE XIX—BACTERIA RESEMBLING B. COLI COMMUNIS IN EFFLUENTS FROM SCHUYLKILL PLANTS FOR YEAR 1918

Month	Lower Roxborough Filters						Upper Roxborough Filters Auxiliary Pumping Station					
	No. of test days	One c. c. test		No. of test days	Ten c. c. tests		No. of days test	One c. c. test		No. of test days	Ten c. c. tests	
		Total No.	Per cent +		Total No.	Per cent. +		Total No.	Per cent. +		Total No.	Per cent. +
January .....	31	1	3	31	6	19	31	0	0	31	0	0
February .....	28	2	7	28	8	29	28	0	0	28	0	0
March .....	31	0	0	31	5	16	31	1	3	31	0	0
April .....	30	1	3	30	6	20	30	1	3	30	3	10
May .....	31	2	6	31	10	32	31	5	16	31	13	42
June .....	29	3	10	29	8	28	30	0	0	30	4	13
July .....	31	2	6	31	6	19	31	1	3	31	4	13
August .....	31	1	3	31	7	23	31	0	0	31	3	10
September .....	30	0	0	30	8	27	30	1	3	30	4	13
October .....	30	2	7	30	5	17	31	1	3	31	4	13
November .....	30	1	3	29	1	4	30	0	0	30	6	20
December .....	30	1	3	30	3	10	31	0	0	31	0	29
<b>Totals .....</b>	<b>362</b>	<b>16</b>	<b>.....</b>	<b>361</b>	<b>73</b>	<b>.....</b>	<b>365</b>	<b>10</b>	<b>.....</b>	<b>365</b>	<b>50</b>	<b>.....</b>
Per cent. time....	.....	.....	4.4	.....	.....	20.2	.....	.....	2.8	.....	.....	13.7

TABLE XX—BACTERIA RESEMBLING B. COLI COMMUNIS IN EFFLUENTS FROM SCHUYLKILL PLANTS FOR YEAR 1918

Month	Belmont Filters						Queen Lane Filters										
	One c. c. test			Ten c. c. tests			One c. c. test				Ten c. c. tests						
	No. of test days	Total number		No. of test days	Total number		No. of test days	Total number		Per cent. +		No. of test days	Total number		Per cent. +		
		Per cent. +	Per cent. +		N. Basin	S. Basin		N. Basin	S. Basin	N. Basin	S. Basin		N. Basin	S. Basin			
January .....	31	0	0	31	2	6	31	0	0	0	0	31	2	3	6	10	
February .....	28	0	0	28	1	4	28	2	0	7	0	28	4	1	14	4	
March .....	31	0	0	31	1	3	31	0	0	0	0	31	1	0	3	0	
April .....	30	1	3	30	4	13	30	1	1	3	3	30	0	2	0	7	
May .....	31	1	3	31	9	29	31	1	0	3	0	31	8	6	26	19	
June .....	30	1	3	30	10	33	30	0	0	0	0	30	10	9	33	30	
July .....	31	3	10	31	10	32	31	0	0	0	0	31	6	5	19	16	
August .....	31	3	10	31	18	58	31	1	0	3	0	31	6	5	10	16	
September .....	30	1	3	30	16	53	30	1	0	3	0	30	8	4	27	13	
October .....	31	0	0	31	8	26	31	0	0	0	0	31	4	3	13	10	
November .....	29	0	0	29	7	24	30	1	0	3	0	30	7	8	23	27	
December .....	31	1	3	31	8	26	31	1	3	3	10	31	8	20	26	65	
Totals .....	364	11	.....	364	94	.....	365	8	4	.....	.....	365	64	66	.....	.....	
Per cent. time.....	.....	.....	3.	.....	.....	25.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	17.5	18.1

DISTRIBUTION  
TOTAL FEET OF PIPE IN USE DECEMBER 31, 1918

Size Inches	Total in use Dec. 31, 1917	Extensions and relays during 1918			Deductions during 1918 Abandoned and taken up	Total in use Dec. 31, 1918	Size inches
		Laid	Relaid	Total			
1	175	.....	.....	.....	.....	175	1
1½	3 566	.....	.....	.....	.....	3 566	1½
2	3 655	.....	.....	.....	.....	3 655	2
3	78 639	297	.....	297	221	78 715	3
4	151 769	391	.....	391	2 695	149 465	4
6	6 185 349	26 075	1 521	27 596	9 029	6 203 916	6
8	800 809	18 246	416	18 662	.....	828 471	8
10	634 248	4 157	60	4 217	305	638 160	10
12	659 476	6 641	172	6 813	506	665 783	12
16	207 998	42	.....	42	.....	208 040	16
18	16 044	.....	.....	.....	.....	16 044	18
20	303 798	119	.....	119	1 340	302 577	20
22	364	.....	.....	.....	.....	364	22
23	27	.....	.....	.....	.....	27	23
24	24 825	52	.....	52	.....	24 877	24
30	300 390	734	.....	734	920	300 204	30
36	106 677	800	.....	800	438	107 039	36
42	564	.....	.....	.....	.....	564	42
48	373 926	45	.....	45	62	373 909	48
60	43 801	.....	.....	.....	.....	43 801	60
<b>Totals</b>	<b>9 905 100</b>	<b>57 599</b>	<b>2 169</b>	<b>59 768</b>	<b>15 516</b>	<b>9 949 352</b>	<b>Totals</b>

1,884.35 miles of pipe in use December 31, 1918.

**WORK ON WATER PIPES**

Purposes for which used	3-in.	4-in.	6-in.	8-in.	10-in.	12-in.	16-in.	20-in.	24-in.	30 in.	36-in.	48-in.	Totals in feet
<b>New pipe or feet added:</b>													
Service mains .....			23 668	18 246	4 080	6 633							52 627
Supply mains .....										610	685		1 295
Pumping mains .....					77				52	104	100	45	378
Connections between mains.....			16			8	42	119		20	15		54 300
Fire hydrant connections .....			1 438										220
Fire connections (private).....		29	625										1 438
Supply connections (private)....	297	362	297										654
Drains .....			31										956
													31
													3 299
<b>Totals—Feet .....</b>	<b>297</b>	<b>391</b>	<b>26 075</b>	<b>18 246</b>	<b>4 157</b>	<b>6 641</b>	<b>42</b>	<b>119</b>	<b>52</b>	<b>734</b>	<b>800</b>	<b>45</b>	<b>57 599</b>
<b>Pipe hauled, but adding nothing to feet under ground:</b>													
Pipe relaid .....			1 521	416	60	172							2 160
Repairs, general .....	22	45	1 427	53	64	67	51		5	53	13	42	1 842
Pipe abandoned and taken up....	221	2 695	9 029		305	506		1 340		920	438	62	15 516
Pipe shifted .....			1 474	160									1 634
<b>Totals—Feet .....</b>	<b>243</b>	<b>2 740</b>	<b>13 451</b>	<b>629</b>	<b>429</b>	<b>745</b>	<b>51</b>	<b>1 340</b>	<b>5</b>	<b>973</b>	<b>451</b>	<b>104</b>	<b>21 161</b>
<b>Total handled—Feet .....</b>	<b>540</b>	<b>3 131</b>	<b>39 526</b>	<b>18 875</b>	<b>4 586</b>	<b>7 386</b>	<b>93</b>	<b>1 459</b>	<b>57</b>	<b>1 707</b>	<b>1 251</b>	<b>149</b>	<b>78 760</b>

## COMPARISON OF WORK DONE IN 1917 AND 1918

	1917	1918	Increase	Decrease
Service mains, 6 inches to 12 inches.....	110 775	52 627	.....	58 148
Supply mains, 20 inches to 48 inches.....	3 470	1 295	.....	2 175
Pumping mains, 10 inches to 48 inches.....	.....	378	.....	.....
Miscellaneous work .....	20 004	24 460	4 456	.....
Totals in feet .....	134 240	78 760	4 834	60 323

## SERVICE, SUPPLY AND PUMPING MAINS LAID IN 1918

	6-in.	8-in.	10-in.	12-in.	24-in.	30-in.	36-in.	48-in.	Totals
By Bureau of Water ...	2 517	2 562	77	1 214	52	104	100	45	6 671
Water Bureau, laying only	2 716	5 863	319	16	.....	.....	.....	.....	8 914
Contract—Water Bureau	6 053	1 241	.....	.....	.....	.....	.....	.....	7 294
Contract—Bureau of Highways .....	93	403	3 024	.....	.....	610	685	.....	4 815
Contract—Emergency Fleet Corporation ....	7 050	5 758	.....	2 252	.....	.....	.....	.....	15 060
Emergency Fleet Corpora- tion .....	632	2 419	.....	3 119	.....	.....	.....	.....	6 170
Private pipe—U. S. Mid- vale Gun Plant.....	.....	.....	737	32	.....	.....	.....	.....	769
Private contract .....	4 607	.....	.....	.....	.....	.....	.....	.....	4 607
Totals .....	23 668	18 246	4 157	6 633	52	714	785	45	54 300

## FIRE HYDRANTS BY WARDS

Wards	No. 1	No. 2	No. 3	High Pressure	Totals
First .....	216	62	8	.....	286
Second .....	152	74	15	.....	241
Third .....	86	44	5	.....	135
Fourth .....	72	30	14	.....	116
Fifth .....	129	54	1	29	213
Sixth .....	116	34	4	81	235
Seventh .....	169	69	3	.....	241
Eighth .....	155	77	3	35	270
Ninth .....	158	56	2	60	276
Tenth .....	125	56	.....	43	224
Eleventh .....	85	20	1	10	116
Twelfth .....	81	14	1	.....	96
Thirteenth .....	121	41	5	.....	167
Fourteenth .....	119	60	.....	21	200
Fifteenth .....	275	155	3	25	458
Sixteenth .....	105	20	3	26	154
Seventeenth .....	113	16	1	38	168
Eighteenth .....	242	45	6	51	344
Nineteenth .....	410	80	2	198	690
Twentieth .....	196	100	.....	27	323
Twenty-first .....	512	31	7	.....	550
Twenty-second .....	1 381	131	14	.....	1 526
Twenty-third .....	480	70	3	.....	553
Twenty-fourth .....	383	139	7	.....	529
Twenty-fifth .....	325	49	2	15	391
Twenty-sixth .....	262	121	14	.....	397
Twenty-seventh .....	221	48	6	.....	275
Twenty-eighth .....	200	114	23	.....	337
Twenty-ninth .....	141	86	3	.....	230
Thirtieth .....	131	115	5	.....	251
Thirty-first .....	275	51	4	43	373
Thirty-second .....	180	64	7	13	264
Thirty-third .....	584	100	7	110	801
Thirty-fourth .....	559	39	3	.....	601
Thirty-fifth .....	302	21	5	.....	328
Thirty-sixth .....	304	71	16	.....	391
Thirty-seventh .....	133	62	2	22	219
Thirty-eighth .....	629	84	12	.....	725
Thirty-ninth .....	314	102	7	.....	423
Fortieth .....	584	63	2	.....	649
Forty-first .....	71	9	6	.....	86
Forty-second .....	548	61	7	.....	616
Forty-third .....	431	53	4	15	503
Forty-fourth .....	264	57	7	.....	328
Forty-fifth .....	402	62	1	10	475
Forty-sixth .....	491	75	13	.....	579
Forty-seventh .....	135	84	1	4	224
Forty-eighth .....	167	42	9	.....	218
1918 Total .....	13 534	3 111	274	876	17 795
1917 Total .....	13 543	3 140	279	876	17 838

Total fire hydrants taken out, 1918, 255.

Total fire hydrants placed, 1918, 212.



VALVES IN USE

Style	3-inch	4-inch	6-inch	8-inch	10-inch	12-inch	16-inch	18-inch	20-inch	24-inch	30-inch	36-inch	48-inch	Totals
Department .....	249	873	24 300	1 063	2 079	1 709	282	25	192	.....	102	44	12	31 839
Department (Butterfly) .....									27	.....	34	24	65	150
Smith Patent .....	113	137	354	45	53	31	22	.....	10	.....	3	2	.....	770
Smith .....										1				1
Eddy .....	4	.....	192	117	75	45	57	.....	51	17	35	34	21	648
Eddy (Butterfly) .....											3			3
Rensselaer .....	3	.....	9	33	11	9	6	.....	6	2	3			82
Pratt & Cady .....	5	.....	6	19	5	.....	1	.....	5		2	8	.....	51
Chapman .....	12	2	95	124	34	13	6	.....	1	.....		3	.....	290
Kennedy .....	17	5	574	544	101	64	3	.....	3	.....	4	14	.....	1 329
Ludlow .....	51	1	21	5	.....	7	.....	.....	.....	.....	.....	.....	.....	85
Nelson .....	10	5	73	19	28	12	2	.....	.....	.....	.....	.....	.....	149
Fairbanks .....	21	2	253	104	10	2	.....	.....	.....	.....	.....	.....	.....	392
Wood .....			13	2	2	.....	.....	.....	.....	.....	.....	.....	.....	17
Crane .....			4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
Jenkins .....	11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
Barton .....			54	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	57
Viney .....			476	6	12	6	.....	.....	.....	.....	.....	.....	.....	500
Miscellaneous .....	5	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
Totals .....	501	1 025	26 434	2 084	2 410	1 898	379	25	295	20	186	129	98	36 384

VALVES IN USE—HIGH PRESSURE

Style	3-inch	4-inch	6-inch	8-inch	10-inch	12-inch	16-inch	18-inch	20-inch	24-inch	30-inch	36-inch	48-inch	Totals
Williamsport .....	.....	.....	.....	190	.....	54	19	.....	.....	.....	.....	.....	.....	263
Chapman .....	.....	.....	.....	12	.....	3	3	.....	.....	.....	.....	.....	.....	18
Smith .....	.....	.....	.....	1 011	.....	188	63	.....	70	.....	.....	.....	.....	1 332
Ludlow .....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	3
<b>Totals</b> .....	.....	.....	.....	1 213	.....	245	85	.....	73	.....	.....	.....	.....	1 616
<b>Grand Total</b> .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38 000

Note:—279 valves added to Distribution in 1918.

VALVES SET DURING 1918

Style	3-inch	4-inch	6-inch	8-inch	10-inch	12-inch	16-inch	20-inch	24-inch	30-inch	36-inch	48-inch	Totals
Department .....		2	48	4	1	5		1					61
Department (Butterfly) .....												1	1
Smith Patent .....	11	14	26	2		1	6	1					61
Smith .....									1				1
Eddy .....			4	1					1		1		7
Eddy (Butterfly) .....										3			3
Bensselaer .....		2			8			1		1			12
Chapman .....			3		2			1					6
Kennedy .....	5	2	142	78	8	16					1		252
Ludlow .....	1												1
Nelson .....	1		1										2
Fairbanks .....			5										5
<b>Totals .....</b>	<b>18</b>	<b>20</b>	<b>229</b>	<b>85</b>	<b>19</b>	<b>22</b>	<b>6</b>	<b>4</b>	<b>2</b>	<b>4</b>	<b>2</b>	<b>1</b>	<b>412</b>

## HIGH-PRESSURE FIRE SERVICE

## OPERATION

During the year 1918 the Race Street High-Pressure Pumping Station was in service for 28 fires and pressure was built up but not used on 142 alarms.

The Fairhill Station was in service on 16 fires and started up on 246 alarms where no service was rendered.

## SUMMARY OF RUNS AT RACE STREET H. P. STATION DURING THE YEAR 1918

Kind of run	No.	Time		Average Time		Cu. ft. of gas consumed	Average cu. ft. per run	Remarks
		Hrs.	Min.	Hrs.	Min.			
Service .....	28	50	29	1	48	243 870	8.709	4 085 395 gallons
Non-service .....	142	42	45	0	18	153 910	1 083	.....
Tests, etc. ....	106	66	36	0	37	194 290	1 833	.....
.....						38 940	.....	Running air compressor gas ranges
.....						52 200	.....	.....
Totals .....	276	159	50			683 210	.....	.....

Longest run—7 hours and 49 minutes, October 16, Box 1754, Delaware Avenue, above Race Street.

## SUMMARY OF RUNS AT FAIRHILL H. P. STATION DURING THE YEAR 1918

Kind of run	No.	Time		Average Time		Cu. ft. of gas consumed	Average cu. ft. per run	Remarks
		Hrs.	Min.	Hrs.	Min.			
Service .....	16	59	31	3	43	248 115	15 507	5 816 400
Non-service .....	246	59	35	0	15	191 580	778	.....
Tests, etc. ....	68	21	19	0	19	62 155	914	.....
.....						59 900	.....	Gas range
Totals .....	330	140	25			561 750	.....	.....

Longest run—21 hours, 38 minutes, May 17, Box 2612, 918 Beach street.

The line-walkers responded to a total of 432 alarms during the year.

FILTERED WATER USED BY THE HIGH-PRESSURE FIRE SERVICE SYSTEM

	<i>Daily Average, Gals.</i>	
<i>Fairhill Station</i>		
Fire service .....	5,800,000	
Leakage .....	31,550,000	86,300
<i>Race Street Station</i>		
Leakage .....	16,300,000	44,600
Total .....	53,650,000	

NOTE: Race Street Station pumps water direct from the Delaware River.

Fairhill Station pumps water from Fairhill Basin which is supplied with filtered water.

The pumps were started promptly on all occasions when alarms were struck in the high-pressure districts, and the service rendered to the Fire Bureau was uniformly satisfactory, with one exception, *viz.*:—On a six alarm fire on Broad street, north of Columbia Avenue, in the Fairhill District, on October 20th, the pumps at Fairhill Station were put in operation at 11.31 A. M. and rendered good service with 225 pounds pressure until 12.34 P. M. when a 12-inch main on Richmond Street, opposite Earl Street, failed by blowing out a piece of pipe about 18 in. by 3 ft. long. Upon notice of the location of the break, the line-walkers proceeded at once to the above point and shut out the broken portion of the main. At 1.10 P. M. the pumps were again started, after an interval of 36 minutes, and furnished service at the fire until 6 P. M., when orders were received from Chief Murphy to shut down.

SYSTEM  
Daily  
Average,  
Gals.

65,300

4,600

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