



**DEPARTMENT OF WATER MANAGEMENT
CITY OF CHICAGO**

February 26, 2014

Illinois Department of Natural Resources
Office of Water Resources
160 N. LaSalle Street, Suite S-700
Chicago, Illinois 60601-3117

Enclosed is the completed yearly Pumpage Report LMO-2 for the 2013 water accounting year.

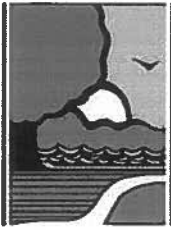
A supplemental sheet attached to the report details the average daily supply of water transferred to other entities.

A report detailing the activities of the Chicago Water System in regard to water conservation and accountability during the 2013 water accounting year is also attached.

Very truly yours,



Thomas H. Powers, P.E.
Commissioner



Illinois Department of Natural Resources

One Natural Resources Way Springfield, Illinois 62702-1271
<http://dnr.state.il.us>

Pat Quinn, Governor
Marc Miller, Director

Office of Water Resources, Michael A. Bilandic Building, 160 N. LaSalle St., S-703, Chicago, IL 60601
Office: 312/793-5947 Fax: 312/793-5968

2013 Annual Water Use Audit Form (LMO-2)

This form must be completed by all Category IA and IIB Permittees for each annual water use accounting year running from October 1, 2012 through September 30, 2013. This form must be submitted to the Department by January 6, 2014.

Section I - General Information

Name, address and phone number of Permittee:

The City of Chicago
Department of Water Management
1000 East Ohio Street
Chicago, Illinois 60611

County: Cook

Name, address and phone number of the contact person for the Permittee:

Thomas H. Powers, P. E.
312-744-7001

e-mail address _____

Authorized Official

Title: Commissioner

Date: 2/26/2014

Please provide leak survey information and population estimates for the last year.

Population: 2,714,856 Number of existing households: 1,033,022

The Illinois Department of Natural Resources is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Chapter 19, Section 120.2 of the Illinois Revised Statutes. Disclosure of this information is required. Failure to provide any information will result in this form not being processed. This form has been approved by the Forms Management Center, CMS.

Section II - Water Use Audit

Enter the amount of water pumped and utilized for each item shown below. All amounts entered in this section must be in units of million gallons per day (mgd) rounded off to three decimal places. Conversion calculations are provided for your use in Section IV.

A. Pumpage Data

Water bought or received from the following distribution systems:

1. Lake Michigan Pumpage	759.001	mgd
2. Shallow Aquifer Pumpage		mgd
3. Deep Aquifer Pumpage		mgd
4. Total Pumpage (add lines 1, 2 & 3)	759.001	mgd
5. Water Treatment Use	2.515	mgd
6. Gross Annual Pumpage (subtract line 5 from line 4)	756.486	mgd

Water sold or provided to any other distribution systems (enter the name of each system and the amount sold or provided to that system on lines 7 through 12). If additional lines are required, attach an additional sheet listing each system and amount.

7	280.061	mgd
8		mgd
9		mgd
10		mgd
11		mgd
12		mgd
13. Total (add lines 7-12 and any additional amounts)	280.061	mgd
14. Net Annual Pumpage (subtract line 13 from line 6)	476.425	mgd

B. Uses

	Metered	Unmetered	Total	
15. Residential	71.316	205.662	276.978	mgd
16. Commercial and Manufacturing	116.564	1.123	117.687	mgd
17. Municipal	20.579	0.436	21.015	mgd
18. Construction	0	0	0	mgd
19. Total Uses (add Total lines 15 through 18)	208.459	207.221	415.680	mgd
20. Percentage of Total Use to Net Annual Pumpage (divide line 19 by line 14 and multiply by 100)			87.25	%

C. Hydrant Uses

21. Firefighting and Training	2.382	mgd
22. Water Main Flushing	0.200	mgd
23. Sewer Cleaning	0.100	mgd
24. Street Cleaning	0.100	mgd
25. Construction	2.382	mgd
26. Other (attach explanation) (Explanation Note) **	4.764	mgd
27. Total Hydrant Use (add lines 21 through 26)	9.928	mgd

** Excessive hydrant use due to unauthorized and illegal open hydrants

Section II - Water Use Audit (continued)

28. Percentage of Hydrant Use to Net Annual Pumpage (divide line 27 by line 14 and multiply by 100)	<u>2.08 %</u>
29. Department allowed maximum for Hydrant Use	<u>1.0 %</u>
30. Excessive hydrant use (subtract line 29 from line 28). If the percentage is greater than 0.0, attach an explanation. [see Rule 730.307 (e)]	<u>1.08%</u>
D. Unavoidable Leakage and Unaccounted for Flow	
31. Maximum Unavoidable Leakage (Do worksheet in Section III; enter amount from line 10 of the worksheet)	<u>10.136 mgd</u>
32. Percentage of Maximum Unavoidable Leakage to Net Annual Pumpage (divide line 31 by line 14 and multiply by 100)	<u>2.13 %</u>
33. Total Accounted for Flow (add lines 19, 27 and 31)	<u>435.744 mgd</u>
34. Percentage of Total Accounted for Flow to Net Annual Pumpage (divide line 33 by line 14 and multiply by 100)	<u>91.46 %</u>
35. Total Unaccounted for Flow (subtract amount on line 33 from line 14)	<u>40.681 mgd</u>
36. Percentage of Total Unaccounted for Flow to Net Annual Pumpage (divide line 35 by line 14 and multiply by 100)	<u>8.54 %</u>
37. Total Unaccounted for Flow and Maximum Unavoidable Leakage (add lines 31 and 35 and multiply by 365,000,000)	<u>18,548,205,000 gal/yr</u>
38. Wholesale Water Rate (the rate payed by the permittee to purchase Lake Michigan in \$/1,000 gallons)	<u>2.51 \$/1,000 gal</u>
39. Wholesale Value of Water Lost for Water Year 2013 (multiply lines 37, 38 and divide by 1,000)	<u>46,555,994.55 \$/yr</u>

Section III - Maximum Unavoidable Leakage Worksheet

Complete the following calculations to determine your maximum unavoidable leakage.
Enter the appropriate amounts in the space provided.

A. Cast Iron Pipes With Lead Joints

Age of Pipes	Miles of Pipe	Leakage Rate	Maximum Unavoidable Leakage	
1. 60 yrs. or greater	2,513.54	x 3,000 g/d/mi =	7,540,620	g/d
2. 40-60 yrs.	426.41	x 2,500 g/d/mi =	1,066,025	g/d
3. 20-40 yrs.		x 2,000 g/d/mi =	0	g/d
4. 20 yrs. or less		x 1,500 g/d/mi =	0	g/d

B. All Other Types of Pipes and Joints

Age of Pipes	Miles of Pipe	Leakage Rate	Maximum Unavoidable Leakage	
5. 60 yrs. or greater		x 2,500 g/d/mi =		g/d
6. 40-60 yrs.	126.86	x 2,000 g/d/mi =	253,720	g/d
7. 20-40 yrs.	212.34	x 1,500 g/d/mi =	318,510	g/d
8. 20 yrs. or less	957.54	x 1,000 g/d/mi =	957,540	g/d
9. Total Miles	<u>4,236.69</u>	Total Leakage	<u>10,136,415</u>	g/d
10. Total Maximum Unavoidable Leakage, in mgd (divide total leakage on line 9 by 1,000,000) (Enter this amount on line 31 of "Section II - Water Use Audit)			<u>10.136</u>	mgd

CITY OF CHICAGO
DEPARTMENT OF WATER
SUPPLEMENT TO FORM LMO-2

WATER METERED AND BILLED DIRECTLY BY CHICAGO WATER DEPARTMENT
OCTOBER 1, 2012 TO SEPTEMBER 30, 2013

ENTITY	MGD
ALSIP *	6.436
BEDFORD PARK	22.236
BERWYN	4.955
BLUE ISLAND	2.238
BRIDGEVIEW	2.142
BROOKFIELD-N. RIVERSIDE W.C. *	4.217
BURNHAM	0.085
CALUMET CITY	0.209
CALUMET PARK	0.702
CENT. STICKNEY SD	0.146
CICERO	7.190
DES PLAINES	7.004
DOLTON	2.654
DUPAGE W.C.	76.706
ELMWOOD PARK	2.034
EVERGREEN PARK	1.800
FOREST PARK	2.812
FOREST VIEW	0.075
FRANKLIN PARK	3.198
GARDEN HOMES S.D.	0.066
HARVEY *	8.906
HARWOOD HEIGHTS	0.773
HILLSIDE-BERKELEY W.C. *	1.604
HOMETOWN	0.333
JUSTICE-WILLOW SPRINGS W.C. *	3.031
LINCOLNWOOD	1.648
MAYWOOD	3.037
McCOOK *	5.236
MELROSE PARK *	8.791
MERRIONETTE PARK	0.188
MIDLOTHIAN-MARKHAM W.C. *	2.494
MORTON GROVE *	3.055
NILES	3.521
NORRIDGE	1.352
NORTHWEST SUB JOINT ACTION W. A. *	29.198
NORTHLAKE (Partial)	0.033
OAK LAWN *	31.104
OAK PARK	4.919
PARK RIDGE	4.096
RIVER FOREST	1.213
RIVER GROVE	1.065
RIVERDALE	1.362
ROBBINS	1.055
ROSEMONT	1.328
SCHILLER PARK	1.670
SOUTH HOLLAND *	2.214
SOUTH STICKNEY S.D.	2.559
STICKNEY	1.673
SUMMIT	1.175
WESTCHESTER-BROADVIEW W.C. *	3.481
WORTH	1.046
TOTAL	280.061

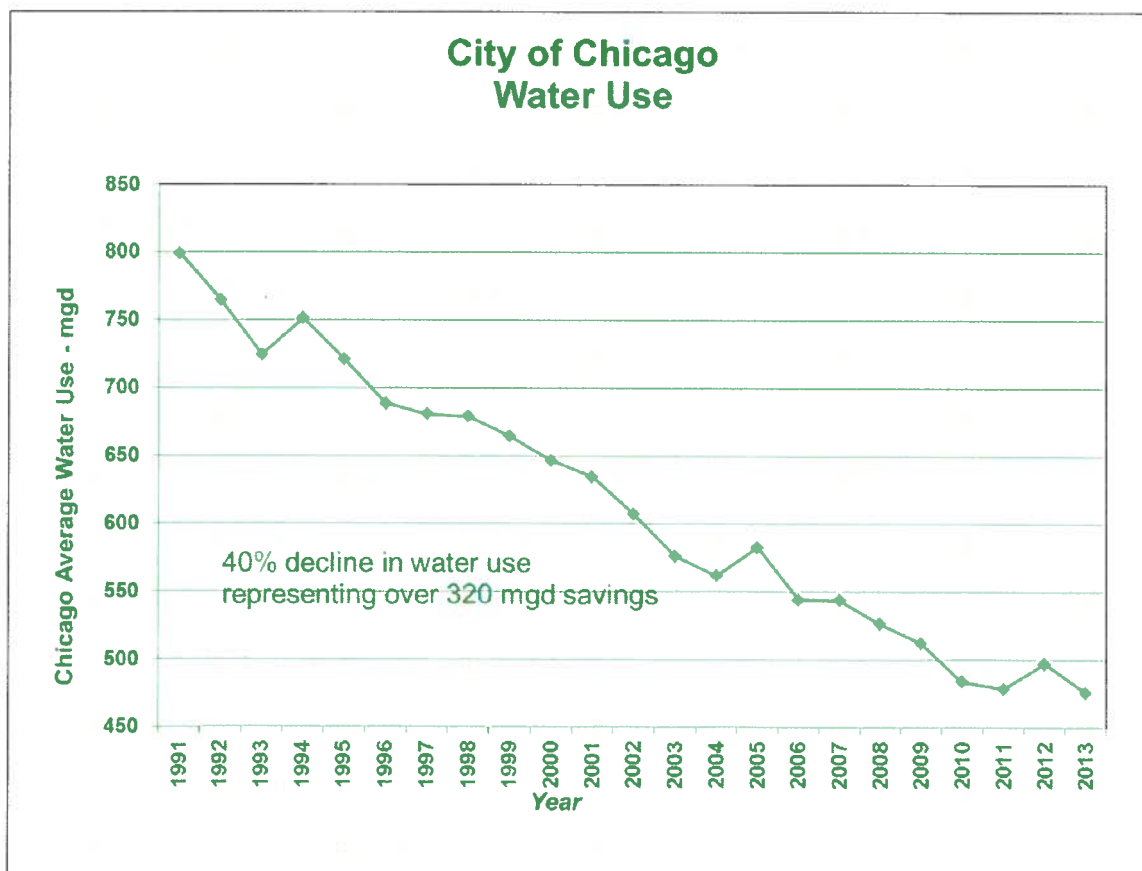
* INCLUDES OTHER MUNICIPALITIES
ALL METERS ARE READ BETWEEN THE 20TH AND 30TH DAY OF EACH MONTH

**REPORT BY THE CITY OF CHICAGO
DEPARTMENT OF WATER MANAGEMENT
TO
THE ILLINOIS DEPARTMENT OF NATURAL RESOURCES
FOR THE 2013 WATER ACCOUNTING YEAR**

During Water Year 2013, the City of Chicago has continued to promote water conservation through a number of initiatives and policies to better conserve our fresh water and to wisely manage storm water. Our water conservation plan is a partnership among public and private sectors, and each resident of Chicago. It includes investing in infrastructure upgrades, working with our sister agencies and large industrial customers to promote conservation, and developing a plan to meter all residential water users. With the exception of 2005 and 2012 drought years, the Department continues to see declining water usage due to its continued efforts to reduce water waste by investing in the following programs:

- a) Water Main Replacement
- b) Hydrant Custodian Installation
- c) Education and Public Awareness
- d) Meter Repair and Replacement
- e) Elimination of Unused Services
- f) Underground Leak Detection and Repair
- g) SCADA System Upgrade
- h) Installation of Variable Speed Pumps

The chart below demonstrates our progress with a plan that has had significant results in reducing water usage for the City of Chicago.



WATER MAIN REPLACEMENT

The Water Main Replacement Program was designed to address the City's aging water mains which were installed over 100 years ago at the height of Chicago's exponential growth rate. The selection of water mains to be replaced is based primarily from analyzing break history records to determine where replacement would most benefit the water system. The City has placed a high priority on this key component of the Water Conservation Program, and believes it has had a large impact on the reduction of unaccounted for water, and a significant impact on the decline in water pumpage. Prior to 2012, the program had targeted a replacement rate of approximately 1% of the system's 4,350 miles of pipe each year. We are now on a path to target over 2% per year allowing us to mirror the installation rates over 100 years ago. The following table shows the past and current miles of main replaced per year.

We are pleased to report that through the leadership and support of Mayor Rahm Emanuel, the funding to address the needs of our aging infrastructure has become available through a series of water rate increases starting in 2012 with 25% and continuing the next 3 years with 15% each year. Water mains are critical assets to deliver safe potable water to not just Chicago but to its wholesale customers. These unprecedented water rate increases were based on the fact that over 25% of our water mains are over 100 years old and demonstrate Mayor Emanuel's vision and commitment to focus on the long-term needs of this aging water system. The rate increases will allow us to continue this successful program to reduce water waste as well as fund critical treatment plant and pumping station upgrades. Our long-term goals have been set to replace nearly 900 miles of water mains in the next 10 years.

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Miles of Pipe Laid	49.5	42.3	38.7	35.9	23.0	33.7	20.7	34.0	32.0	30.0	30.0	70.0	75.0	85.0

HYDRANT CUSTODIANS

The City has historically experienced difficulty in deterring people from opening hydrants during hot summer days. The opening of hydrants creates hazardous traffic situations, may damage adjacent property, and wastes water. In addition, open hydrants reduce the pressure and amount of water available for fire fighting.

In order to minimize this problem, the City began installing hydrant custodians in areas where previous experience indicated that open hydrants may be a problem. This program had to be coordinated with the Fire Department to insure that the hydrants would always be available for fighting fires. The installation of hydrant custodians is a repetitive and evolutionary process. The City develops a locking mechanism and the water thieves develop methods of removal. This has occurred multiple times with the City attempting to stay one lock ahead of the thieves.

The City has experimented with various locking devices throughout the years and has developed two types of technologically advanced custodians that are fairly effective. In addition, the City has developed a stem design that makes it difficult to turn the hydrant valve by reaching through the ports and manually turning the stem.

In the 1990's, the City investigated and tried many other deterrents and have found them to be readily defeated by determined vandals. Over 20,000 of the City's 48,000 hydrants now have custodians. A total of 8,400 of these 19,000 are the newer "NEO" version which operates with a stronger magnet. In areas where repeated open hydrants occur, the City is retrofitting the custodian with an additional spider guard deterrent to prevent damage to the operating mechanism. These retrofits installed since 1998, have demonstrated their effectiveness by a reduction in their frequency of opening. The City has found that the newer "NEO" version of the custodian has had a very significant impact on illegal hydrant openings. The City will still install the additional spider guard retrofits, but only in the areas where the "NEO" has not been successful.

EDUCATION AND PUBLIC AWARENESS

The Department of Water Management engages in public education and awareness on a continuing basis. Conservation messages are conveyed through a variety of channels, including community meetings, literature distribution, and extensive use of online material. Over the past years, we have included themes from the Chicago Water Agenda. This is a gathering of local initiatives, policies, programs and proposals that address

issues of conservation, water quality and storm water management in a coordinated way. The Agenda applies not just to the City of Chicago, but to suburban communities and other cities across the Great Lakes region. We have also ramped up efforts in a promotional campaign to get conservation messages out to the public through various transportation ads and street signage advertising. Our Metersave program message is quite visible throughout the city.

Coordinating with other City departments, the Department of Water Management has been including Agenda messages in the annual Consumer Confidence Report, in development of an educational program for schools, in grassroots presentations to community groups and Chambers of Commerce, and in other appropriate settings. Topics range from techniques of conservation to fire hydrant usages to the prospect of universal customer metering.

METER REPAIR AND REPLACEMENT

The City has also continued to make great strides with its volunteer metering program. Accounts which are currently unmetered can have a meter installed free of charge. By the end of 2013, we installed over 40,000 meters under this program since its inception in 2009, and we plan to install 15,000 meters in 2014. To keep up with the program, we have continued to engage in a contract to allow a private contractor to install meters from the volunteer program and supplement our in-house work force. As this program is continuously promoted and more customers realize the financial and resource benefits, we anticipate a stronger participation and are committed to making this a successful program. The highlights of this program are presented on our promotional website at www.metersave.org.

The City continued to service those meters presently installed on suburban, commercial, industrial, and municipal accounts. The total installed meter base in Chicago is in excess of 190,000 units. As new housing is erected and rehabilitation continues, the number of meters is increasing. Maintenance of this large installed meter base requires a considerable commitment of manpower and equipment. The City is committed to maintaining its meters in conformance with the recommendation of the meter manufacturers and the AWWA.

COMMERCIAL NON-METERED ACCOUNTS

The Department of Water Management has continued its efforts to install meters on all non-metered commercial accounts. To date we have installed 1,290 meters with another 190 targeted for 2014, which will complete the program. We have accomplished this task by efforts of sending letters requesting that meters be installed per Chicago Municipal Ordinance and conducting field visits to assure that all properties requiring meters work toward installing meters. Although most of these accounts require smaller meters, we have found that the larger meters have various circumstances which make this task difficult such as the need to get permits, design plans and the feasibility to construct larger meter vaults to accommodate the some of the larger meters. We are working hard to continue our efforts to have all of these accounts metered by the end of 2014.

ELIMINATION OF UNUSED SERVICES

The City continued its efforts to cut and seal unused services. The following table shows the data for termination of unused services since 1999.

Year	00	01	02	03	04	05	06	07	08	09	10	11	12	13
Number of Services Terminated	1108	1206	1140	650	820	620	422	297	488	510	692	342	476	635

The Department of Water Management has made a major effort to eliminate these potential sources of leakage. These water services were terminated by both City forces and by private contractors. Although the termination of unused water services is very expensive, the continued reduction in the number of unused services should help reduce the amount of unaccounted for water.

LEAK DETECTION AND REPAIR

The Department has maintained a high level of effort in its leak detection program over the past years. The Department employs one TriCorr TM 2001 correlator and in 2009 purchased some of the newer Digicorr correlators from FCS which is considered the product of choice by most professional leak detection firms and consultants, particularly in North America. These models are more sensitive in detecting leaks and have better noise filtering capabilities. In addition to our in house forces, the Department also contracts out services for leak detection. The services include not only an ongoing systematic coverage for leak detection of our distribution system every 3-4 years, but also the monitoring for leak noises while performing an ongoing valve inspection program. Where noise was detected, they returned with electronic correlators equipment to pinpoint the leaks for repair. Through our leak detection consultant, we have been able to employ various technologies use to detect and pinpoint underground leakage. The Radcom SoundSens Leak Noise Correlator system combines sound logging and correlation by installing three or more correlating pods within an area. The units pick up sound during the night and are then analyzed the next day by downloading the sounds to a central correlator. A multipoint correlation can then be performed between the units resulting in higher degrees of accuracy and allowing nighttime sounding without the need to work during the nighttime.

The Department is also employing the latest technology in the leak detection field for feeder mains also. During 2005 and 2006, we started to survey sections of 36-inch and 60-inch mains with the Sahara® leak detection technology. A tether-controlled Sahara® sensor is deployed inside a pipeline without any disruption to pipeline service. It moves through the pipeline with the flow and pinpoints even the smallest leaks in water mains. More documentation on this technology can be found at:

http://www.puretechltd.com/products/sahara/sahara_leak_gas_pocket.shtml.

In 2007 we started using another newer technology for large diameter pipeline leak detection. This technology is Echologics and is differs from traditional leak correlators in that it uses the water column inside the pipeline to transmit the sound wave generated from a leak. This technology allows greater distances to between transmitters and has proven to be worthwhile. More documentation on this technology can be found at:

http://www.echologics.com/leakfinder_overview.html.

Since then, we have been using a similar product, the Primayer leak correlator system and have made an effort to systematically survey our older trunk main systems to assure no leaks are occurring on these mains which could cause catastrophic failures and extensive damage. More documentation on this technology can be found at: http://www.primayer.co.uk/wlc_leak_location_eureka_digital.htm

The following table demonstrates the Department's efforts toward leak detection.

Year	02	03	04	05	06	07	08	09	10	11	12	13
Miles of Pipe Surveyed	2390	2310	2200	700	734	1220	1700	1460	1220	1600	1900	1760
Number of Underground Leaks Located	809	1050	938	400	320	356	590	477	402	300	660	637

SCADA SYSTEM

The SCADA system was upgraded during 1996-97 when the five steam stations underwent re-instrumentation. At that time, new well gauges, discharge pressure gauges, and flow meters were replaced. In addition, remote pressure sensors were installed at 36 continuously monitored points in the distribution system. The Department also installed a total of 48 intermittent pressure monitoring points. Over the past few years, eight additional continuously monitored points have been added. These points are located mainly in the outlying areas to monitor supply pressure and suburban flow demand patterns. These pressure sensors have proven to aid in pumping station operation by avoiding over-pressuring the system and is believed to contribute to significant savings in water use. The upgrade also allowed the SCADA system to monitor in real time the entire pumping station operation. It has also allowed a more complete monitoring and control of pressures and flows in the distribution system on a real time basis. In 2006, the Department started a two year contract to upgrade both the equipment and software to improve the operations and allow even better pressure management. This project finished late in 2009 and has already proven to be a useful tool to improve operations.

VARIABLE SPEED ELECTRIC DRIVES

The Southwest pumping station which supplies nearly 70 percent of its demand to suburban wholesale customers was the first electric pumping station to undergo installation of variable speed drives. Prior to installation there were wide swings in demand and pressures due mainly to the suburban customer loading. These units have proven to be more efficient concerning water use by adding the flexibility of meeting varying demands without the need to start up additional pumps, and thus over pressurizing the water system. The Department has also completed the construction in 2012 of installing variable speed drives for Thomas Jefferson pumping station. This improvement has already demonstrated great improvement in pumping operations on the City's northeast side.

In 2002, the department completed the work at the Roseland pumping station. This station was converted from steam driven turbines to variable speed electric drives. An additional pump was also installed as part of this capital project. The conversion of this station has provided reliability, flexibility and efficiency over steam. The Department completed final design plans for the conversion of the Springfield Pumping Station from steam to variable speed electric drives in 2009 and has awarded and started work in 2011 for this multi-year construction project which is on schedule to be completed in 2015. We are also awarded a contract for design engineering for the conversion of Central Park Pumping Station. It is anticipated that once construction is complete at Springfield in 2015 we will proceed with a multi-year construction contract for conversion of Central Park Pumping Station.