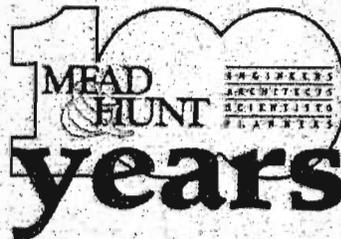


Review of Nine Lake Michigan Water Supply Withdrawers

Prepared for:

**U.S. Army Corps of Engineers – Chicago District
Chicago, Illinois**

Prepared by:



October 2000

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- A Site-specific Data Sheets

Review of Nine Lake Michigan Water Supply Withdrawers

1. Introduction

Mead & Hunt, Inc., under contract with the Chicago District U.S. Army Corps of Engineers (USACE), has completed a preliminary field investigation of water supply metering systems used by nine Illinois direct diverters of Lake Michigan water. A similar study entitled *Preliminary QA/QC Field Investigations of Domestic Water Supply Metering Systems for Illinois' Major Direct Diverters of Lake Michigan Water* was completed for the major direct diverters of Lake Michigan water by the USACE in September of 1996. This study follows up the 1996 study by investigating nine additional diverters whose Lake Michigan water pumpages are less than those originally investigated.

As in the case of the 1996 USACE study, this preliminary investigation is the result of a request by the U.S. Department of Justice stemming from the Great Lakes Mediation and Memorandum of Understanding (MOU). Through this mediation process it was agreed that revised Lake Michigan Diversion accounting procedures would be tested over a 3-year period. The revised procedures may result in relocating the primary measurement point for diversion accounting from the Chicago Sanitary and Ship Canal at Romeoville to the Lake Michigan lakefront. This would involve the measurement of domestic water supply pumpages from Lake Michigan and the measurement of direct diversion flows at the Chicago River Controlling Works, the O'Brien Lock and Dam, and the Wilmette Controlling Works. The MOU also calls for fixing the runoff from the diverted Lake Michigan watershed for each accounting year at 800 cubic feet per second (cfs), in addition to providing a fixed credit for consumptive use of water supply in the amount of 168 cfs, based on recent studies conducted by the USACE. If at the end of this 3-year trial period it is agreed upon that the accounting would be moved to the lakefront, the accuracy and reliability of the existing metering systems for Illinois' direct diverters of Lake Michigan water takes on greater significance. Consequently, the preliminary investigation of the domestic water supply metering systems centered on the adequacy of the existing measurements for the potential shift to the lakefront as the primary measurement point for Illinois' Lake Michigan diversion.

Nine facilities, withdrawing or pumping between 0.46 and 5.4 million gallons per day (MGD) of Lake Michigan water during Water Year 1994 (WY94), were investigated to obtain a qualitative summary of their metering and data collection systems. The field investigations of LTV Steel Company and Acme Steel's water metering systems were conducted on June 27, 2000. The water treatment metering systems for the City of Lake Forest, City of Highwood, Village of Glencoe, and the Village of Winnetka were investigated on June 28, 2000; and the Village of Kenilworth, the City of North Chicago, and the Lake County Public Water District were

investigated on June 29, 2000. During all field investigations the metering systems were inspected with regard to meter design, condition, adequacy, calibration, maintenance, and data collection procedures. The intent of the field investigations was to conduct initial inspections and verification of the metering systems used at these nine direct diverters of Lake Michigan water. The review did not include an analysis of measurement accuracy, statistical analysis of the measured flows, or recommendations for further evaluations or potential measurement corrections.

2. Northshore Treatment Facilities

The seven northshore withdrawers inspected were all water treatment facilities which in WY94 pumped between 0.46 and 5.4 MGD. These seven plants accounted for approximately 1.5 percent of the total diverted Lake Michigan domestic water supply. In 1996, six northshore sites along with the City of Chicago pumping stations were investigated in a similar study. Three additional diverters (Shedd Aquarium, U.S. Steel, and Outboard Marine) were not visited because their cumulative flow (0.03 MGD for WY94) was considered negligible. The seven northshore stations inspected for this report are tabulated below along with their reported WY94 withdrawals.

| Direct Diverter | WY94 Reported Withdrawal (MGD) |
|-----------------------------------|---------------------------------------|
| City of North Chicago | 5.64 |
| Village of Winnetka | 3.68 |
| City of Lake Forest | 3.66 |
| Lake County Public Water District | 2.60 |
| Village of Glencoe | 1.77 |
| City of Highwood | 0.63 |
| Village of Kenilworth | 0.47 |

A. Metering

A wide variety of meter types are used to measure the flows through the seven northshore plants. In many cases, more than one type of meter is used at an individual site. Only the meters used in the LMO-3 reporting are discussed in this section. However, site-specific data sheets for each station, which include both the raw and finished meters for each application, are included in Appendix A. The Village of Winnetka and the Village of Kenilworth use venturi type metering systems. Two propeller tube meters are used in the Village of Glencoe's metering system and a turbine meter is used in the City of Highwood's metering system. North Chicago uses an ultrasonic meter for its measurements. The Lake County Public Water District uses one ultrasonic meter and one magnetic meter for their LMO-3 reporting. Due to the complex nature of Lake Forest's piping layout, a total of two venturi meters – one magnetic meter and one propeller meter – may be used for the LMO-3 reporting. However, under most circumstances, only the one 24-inch finished water magnetic meter is operated and, hence, used in the reporting. All sites use their finished water meters for LMO-3 reporting, with the exception of the Village

of Glencoe, which uses its raw water meter; the City of North Chicago, which uses its raw water meter minus its service and backwash water; and the Lake County Public Water District, which uses its finished water and wastewater meters.

B. Data Collection

All plants record daily readings (or bi-daily readings in the case of Kenilworth) either directly or remotely from the metering unit, with the exception of North Chicago, which takes daily readings from the plant's supervisory control and data acquisition (SCADA) computer system. A SCADA computer system is designed to automatically record and store data within a central computer within the treatment facility. The Village of Winnetka also has a SCADA system installed in its plant. Likewise, the Lake County Public Water District has a direct digital control system, which is similar to a SCADA system, installed in its facility. Both the Village of Winnetka and the Lake County Public Water District have chosen, however, only to use these automatic computer recording systems to observe plant operations and not for diversion records.

3. Steel Mills South of Chicago

Two steel mills, located south of Chicago, were also inspected. LTV Steel Company pumped 1.51 MGD in WY94, and Acme Steel pumped 1.24 MGD in WY94. Site-specific data sheets for both of these steel mills are included in Appendix A.

A. Metering

The steel mills withdraw water from Lake Michigan for both plant use and non-contact cooling. At both steel mills, the plant use water is metered at its discharge to the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) system, while the non-contact water is returned to the Calumet River. LTV Steel uses an ultrasonic meter to measure the water discharged to the MWRDGC. Acme Steel uses two meters for data collection, an ultrasonic meter and a bubble meter, which are located at its coke plant and furnace plant, respectively.

B. Data Collection

Both steel mills collect data for their LMO-3 reporting directly from the totalizers of their flowmeters. Both of Acme Steel's metering systems also include a strip chart with a rapid transfer device, which is used to download data for entry into Acme Steel's computer system. LTV Steel collects data from the meters weekly and monthly.

4. Conclusions

- ▶ Most of the metering seemed appropriate. Although some of the metering systems are less sophisticated than many of those included in the September 1996 report, this appears reasonable given that the Lake Michigan water diverted by these nine plants is considerably less than that diverted by the plants discussed in the September 1996 study. Many of the meters at the nine sites included a primary element, such as a venturi, orifice plate, or a weir. The calibration of these meters usually only verify the accuracy of the transmitters that measure the pressure differential or water depth differential across the primary unit. This pressure differential, which is measured as a depth differential in a manometer, produces a current signal, normally from 4 to 20 mA, in the transmitter. It is this variable current signal that is converted into an equivalent flow measurement by the microprocessor, which converts the signals into flows based on the rating curve of the transmitter. Unless volumetric calibrations are periodically conducted, as done at the Lake County Public Water District, the possibility exists that the measured pressure differential does not equate to an accurate flow measurement. Physical variances of the meter over time (i.e., internal deposits or erosion) may result in slight variances in the measured pressure or depth differential and, thus, the measured flow for the same exact flow over time. However, since there are few parts to “wear out” in a primary element, it is the conditions of the lines and transmitters and the proper calibration of the transmitters that is largely responsible for accurately measuring the flow passing through the meter. The calibration techniques for the transmitters seemed appropriate at the stations, but volumetric calibrations are suggested if the opportunity exists.
- ▶ Only two plants – the Village of Glencoe and the City of Lake Forest – have inactive meters and lines should the active metering system fail. In many of the cases where there are no inactive lines and meters are available, a temporary transmitter can be installed in a reasonable amount of time. In the cases where it’s unlikely that a temporary meter would be installed, the plant appears to have a way of estimating the missing data by either using pumping charts or average flows.
- ▶ The findings of this initial investigation are that the metering and record keeping at all sites appear to be adequate for the use in the lakefront diversion accounting system. Although some of the metering systems are less sophisticated than many of the 18 plants discussed in the September 1996 report, this appears reasonable given that the Lake Michigan water diverted by these nine plants is considerably less than that diverted by the 18 plants in the September 1996 study. As part of the future activities for lakefront accounting, a more detailed statistical analysis of these metering systems may be performed, but would very likely not change total diversion volumes significantly.

Appendix A. Site-specific Data Sheets

DIRECT DIVERTER: Acme Steel--Coke Plant

CONTACT: David Holmberg
11236 S. Torrence Ave.
Chicago, IL
(708) 841-8383 Ext. 2438

METER INFORMATION:

DESIGN: Finished -primary device - 1.5 ft rectangular weir with end contractions with a Isco ultrasonic meter (model 4210)

CONDITION: Very good. Isco meter installed in 2000.

DATA COLLECTION PROCEDURES:

Data collected on a strip chart and a fixed mechanical totalizer. LMO-3 flows are read directly off the totalizer. System includes a rapid transfer device that downloads data into the plant computer system.

METER CALIBRATION:

Monthly in-field calibrations and annual factory authorized calibration.

METER MAINTENANCE:

No scheduled routine maintenance. If problem is observed, meter is sent out for repairs and a temporary meter is installed.

BACKUP SYSTEM:

A temporary meter can be installed if meter failure occurs. The average (Y.T.D) flow for the meter is used for any periods of missing data. This is reasonable given that flows are typically constant.

OTHER NOTES:

Finished meter is used for the LMO-3 reporting. The average flow at this site is approximately 0.24 to 0.29 MGD. Historically, the weir has experienced surcharge conditions due to back up in the City of Chicago's storm sewer. Corrective measures by the City of Chicago have alleviated the problem and surcharge has not been experienced since.

DIRECT DIVERTER: Acme Steel--Furnace Plant

CONTACT: David Holmberg
10730 S. Burley Avenue
Chicago, IL
(708) 841-8383 Ext. 2438

METER INFORMATION:

DESIGN: Finished -primary device - 2.0 ft rectangular weir with end contractions with a Isco bubble meter (model 4230)

CONDITION: Very good. Isco meter installed in 1998.

DATA COLLECTION PROCEDURES:

Data collected on a strip chart and a fixed mechanical totalizer. LMO-3 flows are read directly off the totalizer. System includes a rapid transfer device that downloads data into the plant computer system.

METER CALIBRATION:

Monthly in field calibrations and annual factory authorized calibration.

METER MAINTENANCE:

No scheduled routine maintenance. If problem is observed, meter is sent out for repairs and a temporary meter is installed.

BACKUP SYSTEM:

A temporary meter can be installed if meter failure occurs. The average (Y.T.D) flow for the meter is used for any periods of missing data. This is reasonable given that flows are typically constant.

OTHER NOTES:

Finished meter is used for the LMO-3 reporting. The average flow at this site is approximately 0.94 to 1.38 MGD. Historically, the weir has experienced surcharge conditions due to back up in the City of Chicago's storm sewer. Corrective measures by the City of Chicago have alleviated the problem and surcharge has not been experienced since.

DIRECT DIVERTER: Village of Glencoe

CONTACT: Tom Weathers
675 Village Ct.
Glencoe, IL
(847) 835-4183

METER INFORMATION:

DESIGN: Raw - Two 16" Water Specialties steel flanged propeller tube meters (model ML-04-5G, 150 psi)
Finished - Two 16" Water Specialties steel flanged propeller tube meters (model ML-04-5G, 150 psi)

CONDITION: Good. All four meters were installed between 1991 and 1994.

DATA COLLECTION PROCEDURES:

Each unit is equipped with a local and remote totalizer of 0-6 MGD. Daily flow rates are read off the remote indicator and monthly LMO-3 flows are read off the actual meter totalizer.

METER CALIBRATION:

Meters are sent out every 4 years to the manufacturer for calibration. Meters are rotated such that calibration is performed on each meter every four years. Additionally, remote indicator totalizer is calibrated by comparing its readings to the meter totalizer's readings.

METER MAINTENANCE:

Meters are placed on the plant's "preventive maintenance" schedule. This includes an annual visual inspection of all the mechanical parts and a calibration of the remote indicator totalizer.

BACKUP SYSTEM:

Rarely are both lines in operation. Therefore, if the "active" line fails, the "inactive" meter can be used. No temporary meters are kept on site. Filter meters can also be used as a cross check.

OTHER NOTES:

Raw water meter is used for the LMO-3 reporting. The WY94 flow at this site was 1.77 MGD.

DIRECT DIVERTER: City of Highwood

CONTACT: Keith Nelson
17 Highwood Ave
Highwood, IL
(847) 432-3730

METER INFORMATION:

DESIGN: Raw - Great Lakes Instruments (Exact type unknown)
Finished - Water Specialties 12" turbine meter

CONDITION: Good. Finished meter was installed in 1998. Installation date of the raw meter is unknown.

DATA COLLECTION PROCEDURES:

Data is read daily off the finished water meter's totalizer. The City plans on installing a SCADA system.

METER CALIBRATION:

No regular calibration schedule. Finished water meter is calibrated, as necessary. Raw water meter is not calibrated.

METER MAINTENANCE:

No regular maintenance schedule. Meters are maintained as needed. Finished water meter is designed for underwater use and to be maintenance free until failure.

BACKUP SYSTEM:

Finished water meter is battery operated. However, no pumping occurs during power outages. No temporary meters are kept on-site. Cross checks include comparing the values from the finished water meters with the flows through the filters and the flows reported in City water sales.

OTHER NOTES:

Finished water is used for the LMO-3 reporting. The WY94 flow at this site was 0.63 MGD. City is planning on upgrading the plant's system in the near future.

DIRECT DIVERTER: Village of Kenilworth

CONTACT: Ben Mercieri
419 Richmond Rd.
Kenilworth, IL
(847) 251-1666

METER INFORMATION:

DESIGN: Finished - 10" Venturi with Bristol Babcock transmitter

CONDITION: Good. Venturi installed in 1928 and transmitter in 1999.

DATA COLLECTION PROCEDURES:

Flow data is read off of totalizer twice daily and recorded on daily log sheets. The metering system also includes a chart recorder.

METER CALIBRATION:

The pressure transmitter and chart recorder are calibrated annually by a service engineer from Acco Bristol Babcock company. The venturi was wet calibrated in March, 2000, but this is not a regularly scheduled occurrence.

METER MAINTENANCE:

Meter maintenance consists of calibration at regular time intervals.

BACKUP SYSTEM:

If transmitter or recorder fails, water pumpage can be determined by reading off the high lift pump charts.

OTHER NOTES:

Finished meter is used for LMO-3 reporting. The average flow at this site is approximately 0.4 to 0.5 MGD.

DIRECT DIVERTER: LTV Steel Company

CONTACT: William C. Mozes
11600 S. Burley Ave.
Chicago, IL
(773) 933-4108

METER INFORMATION:

DESIGN: Finished - Sigma Ultrasonic flow meter

CONDITION: Very good. Meter installed either in late 1998 or early 1999.

DATA COLLECTION PROCEDURES:

The meter is read weekly by plant personal and monthly by a contractor.

METER CALIBRATION:

A monthly calibration is preformed by a contractor.

METER MAINTENANCE:

Meter maintenance occurs on a monthly basis.

BACKUP SYSTEM:

The meter has no backup power source should the electricity fail. However, an alarm is sounded. Pump charts are used to estimate any missing data. A spare meter sensor is kept on site since the sensor is submerged and prone to failure. The contractor is able to provide any temporary flow meters within a very short time frame. No continuous cross checks exist, however, a 7-day low flow study with the water district is performed biannually. In 1995, a water budget was also performed on the plant.

OTHER NOTES:

The finished water meter is used for the LMO-3 reporting. The average flow at this site is 1.2 MGD.

DIRECT DIVERTER: Lake County Public Water District

CONTACT: Phillip Fragassi
500 17th St.
Zion, IL
(847) 746-2052

METER INFORMATION:

DESIGN: Raw - two Polysonics/Peek ultrasonic meters
Finished - one Polysonics/Peek ultrasonic meter
Waste Flow - one Fischer & Porter magnetic meter

CONDITION: Very good. Meters installed in 1994 and 1995.

DATA COLLECTION PROCEDURES:

Daily readings are taken from the totalizer at the meters. Data is also read to a direct digital control (installed in 1980).

METER CALIBRATION:

Wet calibrations are performed every few months. All four meters are also calibrated annually by a contractor.

METER MAINTENANCE:

Meters are maintained one to two times per year and when meter malfunction is suspected.

BACKUP SYSTEM:

If a meter fails, a portable meter is installed, temporarily. In case of missing data, the average flow per pump hour for the last 2 to 3 months is multiplied by the pump hours of the outage.

OTHER NOTES:

Meter totalizer readings for the finished and waste meters are used for the LMO-3 reporting. The average flow at this site is approximately 3.0 MGD.

DIRECT DIVERTER: City of Lake Forest

CONTACT: Bill Hensel
100 E. Laurel
Lake Forest, IL
(847) 615-4277

METER INFORMATION:

DESIGN: Raw - Bailey-Fischer & Porter 24" magnetic flow meter
Finished - one Bristol Babcock 20" venturi (north line)
(to be replaced with magnetic flow meter in future)
Finished - one 24" Bailey-Fisher & Porter 24" magnetic flow
meter (south line)
Finished - one 16" Sparling propeller meter (only operates when
filters are backwashed)
Finished - one 24" Honeywell venturi

CONDITION: Good. The magnetic meters were installed in 1997. The 20"
venturi was installed in 1934 and the 16" propeller meter in 1979.
The 24" venturi was installed in 1984.

DATA COLLECTION PROCEDURES:

Flows are recorded daily. For all the finished meters with the exception of the 16" venturi meter, the data is read directly off the meter although it is also remotely displayed on the control panel in the lab. The 16" meter is read off the display in the lab.

METER CALIBRATION:

The magnetic meters have not been calibrated since their installation in 1997 since neither the city or its contractor has yet to obtain the necessary calibration equipment. The 16" propeller meter has not been calibrated. All other meters are calibrated annually.

METER MAINTENANCE:

Annual maintenance schedule.

BACKUP SYSTEM:

The plant has generator backup should the power fail and hasn't had any missing data since the equipment upgrade in 1984. Should either the north or south line's metering fail, the 24" venturi can be used for data recording.

OTHER NOTES:

The finished meters are used for the LMO-3 reporting. The average flow at this site is 4 to 6 MGD. The City is planning a plant upgrade which will include changing the 20" venturi to a magnetic meter.

DIRECT DIVERTER: City of North Chicago

CONTACT: John A. Patterson, Jr.
1850 Lewis Ave.
North Chicago, IL
(847) 578-7780

METER INFORMATION:

DESIGN: Raw - Sparling 24" Ultrasonic Meter
Finished - 24" Orifice Plate with Bailey differential pressure transmitter
Finished - 16" Venturi with Rosemount differential pressure transmitter

CONDITION: Very good. The 24" orifice plate was installed in 1961 and the 16" venturi at an earlier, unknown date. The pressure transmitters were installed in 1998.

DATA COLLECTION PROCEDURES:

Data is transmitted to a Wonderware SCADA system (1999). Data is read hourly from the SCADA system and recorded on the daily record sheets.

METER CALIBRATION:

Flow meters are calibrated annually by either the contractor or manufacturer.

METER MAINTENANCE:

A maintenance check on the the meters and computer is performed quarterly by a contractor. Meters are physically inspected monthly to replace desiccant used to reduce moisture damage, and immediately when there appears to be a meter error.

BACKUP SYSTEM:

There would be no pumping during a power outage. If a meter fails, the monthly average flows are used for missing data. The finished water values can be compared to the metered water values as a cross check. There are three temporary meters available if a meter should fail, however they would have to be reprogrammed so the plant would likely just wait for the original meter to be repaired.

OTHER NOTES:

The raw water metering (minus the service and backwash water usage) is used for the LMO-3 reporting. The average flow for this site is 6 MGD.

DIRECT DIVERTER: Village of Winnetka

CONTACT: Patrick Freely
510 GreenBay Rd.
Winnetka, IL
(847) 501-6012

METER INFORMATION:

DESIGN: Raw - Foxboro 20" Magnetic flow meter (2820 series)
Finished - BIF 30" Venturi with Foxboro DP cells
Service Water - Rockwell International 4" turbo meter

CONDITION: Good. The 20" Magnetic meter was installed in 1985. The 30" venturi meter was installed in the early 1930's. The DP cells were installed in 1989.

DATA COLLECTION PROCEDURES:

Data is totaled at the meter and sent to a SCADA system. If the SCADA system is recording incorrect values, the SCADA system is reset to match the metered values.

METER CALIBRATION:

The DP cells and the magnetic flow meter were calibrated in July of 2000. The service water meter was not calibrated. Calibration is planned for the raw and finished meters every couple years, or more frequently if a problem is noticed. A flow profile was completed for the venturi meter in the late 1980's.

METER MAINTENANCE:

No regular maintenance schedule. Maintenance occurs when problems are observed.

BACKUP SYSTEM:

In cases of missing data, the flow can be estimated by flow through filters and water contained in storage tanks. No backup meters are on-site.

OTHER NOTES:

Finished water totals are used for the LMO-3 reporting. The average flow for this site is 3 MGD. The village is in the process of adding metering to each of the four pumps to provide a cross check with the finished meter values.

Laura Morland

Enclosed is THE
REPORT ON THE MASTER
METER TESTS DONE BY
PITOMETER ON FEBRUARY
23, 2000

JM

RECEIVED

.III. 05 2000

MEAD and HUNT, INC.

Kenilworth

March 2, 2000

Mr. Ben Mercieri
Superintendent of Water
Village of Kenilworth
419 Richmond Road
Kenilworth, Illinois 60043-1140

Dear Sir:

Attached are the results of the Pitometer tests completed on the venturi master meter at the Water Treatment Plant in Kenilworth on February 23, 2000. The meter tested within allowable limits of accuracy at all flow rates except the lowest flow rate. This may indicate a minor buildup or obstruction in the leads to the differential pressure cell. It is recommended the leads be thoroughly flushed and cleaned.

At the present time there does not appear to be a need to replace the current master meter. It is recommended that the meter be tested at some regular interval, possibly annually or biennially, to ensure continued accuracy.

We appreciate the opportunity to be of service to you.

Sincerely,

THE PITOMETER ASSOCIATES



Robert B. Nelson
District Manager

RBN:wc

Treatment Plant

Meter Data

| | | |
|---------------|---|------------------|
| Manufacturer | - | Simplex |
| Size of Meter | - | 10-inch x 6-inch |
| Number | - | Venturi |
| Size of Pipe | - | 12-inch |

Test No. 1 Data

| | | |
|-------------------|---|---------------------|
| Date of Test | - | February 23, 2000 |
| Length of Test | - | 15 minutes |
| Condition of Test | - | East pump operating |

Results of Test No. 1

| | | |
|------------------------|---|---|
| Pitometer Rate of Flow | - | 950,000 gpd. |
| Metered Rate of Flow | - | <u>970,000 gpd.</u> |
| Difference | - | 20,000 gpd. |
| Percentage Difference | - | 2 % over-registration Meter registers within allowable limits of accuracy |

Test No. 2 Data

| | | |
|-------------------|---|---------------------|
| Date of Test | - | February 23, 2000 |
| Length of Test | - | 15 minutes |
| Condition of Test | - | West pump operating |

Results of Test No. 2

| | | |
|------------------------|----|----------------------------|
| Pitometer Rate of Flow | -- | 620,000 gpd. |
| Metered Rate of Flow | -- | <u>540,000 gpd.</u> |
| Difference | -- | 80,000 gpd. |
| Percentage Difference | -- | 13 % under-registration |

Treatment Plant cont.

Test No. 3 Data

| | | |
|-------------------|---|-----------------------|
| Date of Test | - | February 23, 2000 |
| Length of Test | - | 15 minutes |
| Condition of Test | - | Center pump operating |

Results of Test No. 3

| | | |
|------------------------|----|-----------------------|
| Pitometer Rate of Flow | -- | 1,300,000 gpd. |
| Metered Rate of Flow | -- | <u>1,330,000 gpd.</u> |
| Difference | -- | 30,000 gpd. |
| Percentage Difference | -- | 2 % |

over-registration
Meter registers within
allowable limits of
accuracy

Test No. 4 Data

| | | |
|-------------------|---|----------------------|
| Date of Test | - | February 23, 2000 |
| Length of Test | - | 15 minutes |
| Condition of Test | - | South pump operating |

Results of Test No. 4

| | | |
|------------------------|---|-----------------------|
| Pitometer Rate of Flow | - | 1,350,000 gpd. |
| Metered Rate of Flow | - | <u>1,370,000 gpd.</u> |
| Difference | - | 20,000 gpd. |
| Percentage Difference | - | 1 % |

over-registration
Meter registers within
allowable limits of
accuracy

LTV Steel

BOILER HOUSE WATER FLOW PROJECT 1998

LTV
Annual calibration

| TAG | TRANSMITTER/MODEL | TRANSMITTER S/N | PROCESS VARIABLE | PROCESS DESCRIPTION | CALIBRATION/NOTES | CALIBRATED & COMMISSIONED |
|-------|-------------------------------------|-----------------|------------------|--------------------------------------|--------------------------------|---------------------------|
| FT001 | YOKOGAMA EJA110A-DLS4B-92EVA/FEI/DI | F5706A824-11807 | 0 - 2000 GPM | 24" SERVICE H2O FLOW FILTER RM | 0 TO 10.00 IN H2O / SQ PT EXT | May-98 |
| FT002 | YOKOGAMA EJA110A-DMS4B-92EB/FEI/DI | JEJASB261 | 0 - 2500 GPM | 10" FIRE PUMP H2O FLOW BH GND FLR | 0 TO 08.44 IN H2O / SQ RT EXT | May-98 |
| FT003 | YOKOGAMA EJA110A-DMS4B-92EB/FEI/DI | JEJASB236 | 0 - 800 GPM | 6" BH SERVICE H2O FLOW GND FLR | 0 TO 134.34 IN H2O / SQ RT EXT | May-98 |
| FT004 | YOKOGAMA EJA110A-DMS4B-92EB/FEI/DI | JEJASB239 | 0 - 400 GPM | 4" BH CITY H2O FLOW OUTSIDE | 0 TO 107.53 IN H2O / SQ PT EXT | May-98 |
| FT005 | YOKOGAMA EJA110A-DMS4B-92EB/FEI/DI | JEJASB262 | 0 - 100 GPM | 2" BH FLUE SUMP FLOW GND FLR | 0 TO 211.04 IN H2O / SQ PT EXT | May-98 |
| FT006 | YOKOGAMA EJA110A-DMS4B-92EB/FEI/DI | JEJASB245 | 0 - 200 GPM | 4" SERVICE H2O FLOW CP OFFICE | 0 TO 54.47 IN H2O / SQ PT EXT | May-98 |
| FT007 | YOKOGAMA EJA110A-DMS4B-92EB/FEI/DI | JEJASB242 | 0 - 200 GPM | 4" SERVICE H2O FLOW STR BRY/ENGR BLD | 0 TO 54.50 IN H2O / SQ PT EXT | May-98 |

CONTINUOUS - INTERMIX METER
MULTIPLY

FT007 - Totalizer - red
all others in boiler phase - attached to interphase screen
All to river outfall

North Chicago

FAX City Of North Chicago Water Department

Date: 5/9/00

To: Laura Morland

From: John A. Patterson Jr.,

Re: Information from vlst@North Chicago

Phone Number: 847-578-7780

Fax Number: 847-578-1242

Pages: 10 with cover

PROCEDURES FOR DATA COLLECTION: WATER ACCOUNTABILITY

Responsible Operator in Charge: Accountable for data and storage of all operational information collected concerning:

- Location, design, condition of all meters and meter readings related to the water treatment plant.
- Ensuring procedures, maintenance, and timely repairs/ replacements are followed
- Calibration records for each item related to meter reading
- Estimates of all flows during periods when meters are not in function

Location, Design, and Condition of Meters

- **Abbott Raw Water Meters 48" (3)**
Location: Located on east wall in raw water room.
Model: Compusonic Series 4500-3
Make: Badger
Serial No. Meter 1- 301781, Meter 3- 301782, Meter 2- 301783
Serviced: Meter 1- 1/1/99, Meter 3- 11/1/99, Meter 2- 11/1/99
- **Abbott Raw Water Meters 24" (1)**
Location: Located on south wall in south lower raw water room.
Model: F555-231
Make: Sparling Ultrasonic Flowmeter
Serial No: 6433
Serviced: 7/30/96
- **Service Water Meters (2)**
Location: Located on the east end of the high lift pump gallery.
Model: Recordall Compound 6"
Make: Badger
Serial No: Meter 1- 98298964, Meter 2- 94070260
Serviced: Meter 1- 4/1/00, Meter 5-4/1/00
- **Filter Flow Meters, no. 4 & 5**
Location: Located in filter gallery 4-7.
Model: 625/655
Make: Sparling Tiger Mag Meter
Serial No. Meter 4-h123674496, Meter 5- h122684396
Serviced: Meter 4-10/31/96, Meter 5-10/25/96
- **Filter Flow Meters, no. 8 - 11**
Location: Located in filter gallery 8-11.
Model: Sparling Ultrasonic Flowmeter
Make: F555-231
Serial No: 8-6500, 9-6305, 10-6306, 11-6307
Serviced: 8-11, 6/24/00

PROCEDURES FOR DATA COLLECTION: WATER ACCOUNTABILITY

- **Back wash Flow Meters (2)**

Meter 1

Location: Located in the hallway between the wash water pump gallery and the raw elbow.

Model: Sparling Ultrasonic Flowmeter

Make: F555-231

Serial No: New-6491

Serviced: 11/9/99

Meter 2

Location: Located on the south end of filter gallery 4-7 and the high lift room.

Model: Rosemount Smart Family

Make: F555-231

Serial No: Old-0406764

Serviced: 11/9/99

- **Finished Water Flow Meters (2)**

Meter 1

Location: Located at the east end of the high lift room.

Model: 1151DD4E22M2B1

Make: Rosemount

Serial No: East- 1526035

Serviced: 9/2/99

Meter 2

Location: Located on the southeast wall south of filter #3.

Model: PTSDDD1221101A1

Make: Rosemount, 0-13.3 range

Serial No: West- 108873

Serviced: 9/1/99

- **Split Flow Meter (1)**

Location: Located on the north end of filter gallery 8-11.

Model: FM 655

Make: Sparling Ultrasonic Flowmeter

Serial No: 3730291

Serviced: 1/14/97

PROCEDURES FOR DATA COLLECTION: WATER ACCOUNTABILITY

Procedures and Schedule for Data Collection:

1. All water plant operator' record readings from each designated meter (per computer) each "*hour*" onto the daily operator log sheet.
2. At 23:00 hours each "*day*" the 3rd shift operator will collect the computer generated reports, and the operator's report and transfer the needed data for monthly reports to be generated.
3. The water plant foreman will collect this data "*daily*" and enter it onto the following reports: (flow related reports in bold/italic)
 - a. ***State EPA Chemical Feed Report***
 - b. RDC at Entry Point Monitoring Report
 - c. RDC Distribution Monitoring Report
 - d. Turbidity Monitoring Report
 - e. Fluoride Report
 - f. Finished Water Tap Report
 - g. ***City Council: Monthly Water Department Report***
 - h. ***IDNR LMO3 Monthly Pumpage Report***
 - i. State EPA Coliform Analysis Report
 - j. ***Monthly Abbott Raw Water Bill***
4. Each "*month*" the responsible operator in charge receives the above reports, and verifies the information.
5. Each "*month*" the responsible operator in charge records pertinent data for production of the annual IDNR LMO3, and water accountability reports into the "survey report".
6. Each "*month*" the responsible operator in charge will file the reports in the designated file for State reports.

Procedures and Schedules for Calibration and Maintenance

1. All flow meters for water treatment use (in-house) are to be calibrated *yearly* by the meter manufacturer, or through a service agreement with an equivalent certified specialist.
2. All flow meters are to be inspected *quarterly* by service agreement.
3. All programmed totalizers on the operator interface are inspected *quarterly*, or when problems occur through service agreement with software programming engineers
4. All meters will be physically inspected *once per month* to replace desiccant used reduce moisture damage
5. All meters will be physically inspected *immediately* when there appears to be a meter error on computer generated reports. If the problem can't be repaired (in-house) a service call will be made our programming engineers to troubleshoot the problem.

PROCEDURES FOR DATA COLLECTION: WATER ACCOUNTABILITY

Methods for Deriving Flows / Missing Data

1. If the (raw water, or finished flow meter) is out of service the monthly average for days it is out of service will be used, until the meter is replaced.
2. If the (backwash flow meter) is out of service the backwash flows will be estimated based on *gallons per minute rating of pump X actual minutes pumped*.
3. If the (service meter) is out of service then an estimate of the daily water usage for each process will be determined, and used as a standard for reporting service use.

Redundancy and Cross Checks within Water Supply System

1. *Finished Water Totals* will be compared to *Metered Consumption Totals* to determine percent difference between the amount pumped and the amount consumed.
2. *Finished Water Totals* will also be compared to *Raw Water Totals* to determine the amount of water remaining for service water usage. This total will be compared to actual meter reading totals from service water meter totals.

PROCEDURES FOR DATA COLLECTION: WATER ACCOUNTABILITY

Methods for Deriving Flows / Missing Data

1. If the (raw water, or finished flow meter) is out of service the monthly average for days it is out of service will be used, until the meter is replaced.
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ILLINOIS
DEPARTMENT OF
NATURAL RESOURCES
Office of Water Resources

310 South Michigan Avenue, Room 1806, Chicago 60604 George H. Ryan, Governor ● Brent Manning, Director

1999 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 1st through September 30th. This form must be submitted to the Department by December 28, 1999.

Section I - General Information

Name, address and phone number of Permittee:

John A. Patterson Jr.
1850 Lewis Ave.
North Chicago, IL 60064
Phone: 847-578-7780
Fax: 847-578-1242

County Lake

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

Authorized Official John A. Patterson Jr.

Title _____

Date 10/5/99

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

Results and recommendations of leak surveys conducted on the water distribution system including progress made in leak repair. (attach to back of form)

Population 18,950 Number of existing households 5,617

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, Central Management Services.



Illinois State Water Survey

Main Office • 2204 Griffith Drive • Champaign, IL 61820-7495 • Tel (217) 333-2210 • Fax (217) 333-6540

Peoria Office • P.O. Box 697 • Peoria, IL 61652-0697 • Tel (309) 671-3196 • Fax (309) 671-3106

Illinois Water Inventory Program • Tel (217) 333-0239 • Fax (217) 244-0777



Please return form by Jan 15, 2000

09791250 NORTH CHICAGO
 JOHN PATTERSON, JR., WATER SUPERINTENDENT
 1850 LEWIS AVENUE
 NORTH CHICAGO IL 60064

SIC CODE 4941
 Contact person and title

 Phone (708)578-7780

We have records of the following wells/intakes. Please correct inaccuracies and add missing information on this form. Enter your water level information on back, if available. If reported amounts are not in gallons, please indicate units of measurement.

TOTAL GALLONS PUMPED

| Well or Intake | Status | Twp | Rge | Sec | Depth | Max Daily | Total Annual |
|-----------------------|--------|-------|-------|--------------|-------|-----------|------------------|
| Well #1 LAKE MICHIGAN | In Use | 44N | 12E | 03.1G | } → | _____ | 2, 352, 358, 000 |
| | | | | Both Intakes | | _____ | _____ |
| Well #2 LAKE MICHIGAN | In Use | 44N | 12E | 04.1G | | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | | _____ | _____ |

Please note that any purchased amount needs to be reported on the bottom half of the form in column **Total Gallons Purchased**. This amount is needed to indicate the water use for your location and your future needs.

If your facility is not equipped with meters to calculate total water pumpage, an estimated figure or other helpful information (such as staff population and visitors, acreage flooded, or time used at estimated pumping rate) is acceptable to help us calculate water usage at your facility.

| | Total Annual Gallons Purchased | Total Annual Gallons Withdrawn |
|---|-----------------------------------|---|
| 1. 1999 Total Pumpage | NONE PURCHASED | 2, 352, 358, 000 |
| 2. Supplier of PURCHASED GALLONS | _____ | |
| 3. Do you sell water to another public water supply system? | Yes _____ No <u>X</u> | |
| 4. Estimate population directly served inside corporate limits (retail) | _____, 18, 950 | |
| outside corporate limits | _____, _____, _____ | |
| 5. Number of residential services: | _____, 3, 593 | Annual gallons: _____, 407, 585, 000 |
| 6. Number of commercial services: (non-manufacturing) | _____, 177 | Annual gallons: _____, 38, 761, 000 |
| 7. Number of industrial services: (manufacturing) | _____, 85 | Annual gallons: _____, 1, 412, 226, 000 |

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Section IV - Conversion Table

Below are conversion calculations to convert the most commonly used units to units of million gallons per day (MGD).

To convert cubic feet per year (cf) to (MGD) use:

$$\text{cf} \times 7.48 \div 1,000,000 \div 365 = \text{MGD}$$

To convert gallons per year (g) to (MGD) use:

$$\text{g} \div 1,000,000 \div 365 = \text{MGD}$$

To convert gallons per day (g/d) to (MGD) use:

$$\text{g/d} \div 1,000,000 = \text{MGD}$$

To convert million gallons per year (mg) to (MGD) use:

$$\text{mg} \div 365 = \text{MGD}$$

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Facsimile Cover Sheet

To: *Laura D. Morland P.E.*
Company: *Mead & Hunt*
Phone:
Fax: *608-273-6391*

From: BILL HENSEL
Company: LAKE FOREST WATER PLANT
Phone: 847-615-4277
Fax: 847-735-1630

Date: *7/7/00*
Pages including this cover page: *(2)*

Comments:

Laura,
Sorry for the delay in getting this info. to you. If you need anything else let me know.
Bill

402
Lake Forest



Automatic Control Services

115 WEST ARTHUR ROSELLE, ILLINOIS 60172 (630) 529-8849

July 5, 2000

Lake Forest Water Dept.
1441 Lake Road
Lake Forest, Illinois 60045

Attention: Mr. Bill Hensel

Subject: Flow calibration

Dear Mr. Hensel:

The following flow transmitters were checked, calibrated and adjusted on April 10, 2000.

North 20" flow, 0-13.2 MGD, 0-114" of water.
South 20" flow, 0-13.2 MGD, 0-114" of water.
24" line flow low, 0-6 MGD, 0-21.47" of water.
24" line flow high, 0-18 MGD, 0-193.27" of water.

Calibration equipment consisted of the following:

Fluke RMS multimeter, Model 8060A, serial 4675385.
Meriam Instrument, Model LP2001, 0-200" of water, portable manometer.

Please advise if we can be of any additional service.

Yours truly,

David J. LaMontagne

DLB

