130288

DISTRICT ALL

VILLAGE OF LOMBARD
REQUEST FOR BOARD OF TRUSTEES ACTION
For Inclusion on Board Agenda

_____	Resolution or Ordinance (Blue) _____Waiver of First Requested
___X___	Recommendations of Boards, Commissions & Committees (Green)
_____	Other Business (Pink)

TO: PRESIDENT AND BOARD OF TRUSTEES

FROM: David A. Hulseberg, Village Manager

DATE: August 28, 2013 (B of T) **Date:** September 5, 2013

TITLE: Water System Network Analysis

SUBMITTED BY: Department of Public Works

BACKGROUND/POLICY IMPLICATIONS:

The Public Works Committee transmits for your consideration the Water System Network Analysis report. Representatives from Alfred Benesch & Company presented their model, demonstrated its capabilities, discussed their analysis of the water system's condition, and provided some short and long term recommendations for system improvements.

FISCAL IMPACT/FUNDING SOURCE:

None

Review (as necessary):

Village Attorney X_____Date_____
Finance Director X_____Date_____
Village Manager X_____Date_____

NOTE: All materials must be submitted to and approved by the Village Manager's Office by 12:00 noon, Wednesday, prior to the Agenda Distribution.

Legistar: 130288

To:	Village President and Board of Trustees
Through:	David A. Hulseburg, Village Manager
From:	Carl S. Goldsmith, Director of Public Works CG
Date:	August 28, 2013
Subject:	Water System Network Analysis; PWC Recommendation

The Department of Public Works requests the Water System Network Analysis report be forwarded to the Village Board of Trustees for inclusion on their September 5, 2013agenda. The report explains the results of an extensive hydraulic model of the Village's water distribution system, identifies modeling scenarios, and provides suggestions for short and long term system improvements. Attached are the documents' Introduction and Final Summary for review. (A full report, along with appendices, is available upon request.)

After a presentation by and an open discussion with Ms. Laura McGovern, representing Alfred Benesch & Company, the Public Works Committee voted unanimously to recommend the Board of Trustees accept the report and consider moving forward with similar modeling efforts in no more than ten (10) years.

Attachments: Water Network Analysis Report, Parts I and V

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FINAL

WATER SYSTEM NETWORK ANALYSIS

PREPARED FOR THE:

VILLAGE OF LOMBARD, ILLINOIS

August 2, 2013

benesch
engineers · scientists · planners

INTRODUCTION

The Village of Lombard engaged the services of Alfred Benesch to complete an evaluation of the Village's water distribution system. This report represents the findings of this study. The evaluation was completed via collection of extensive physical data regarding the Village's water system, and then assembling this information into a computer model to simulate the operations of the system.

This report consists of six sections as follows:

Introduction
This section provides a general overview of the system, the history of previous studies, the purpose of this study and the scope of this report.

Part I Existing Water Distribution System
This section provides a summary of the system facilities. Tables of each of the system components are provided for pump stations and storage facilities.

Part II Population and Water Demand Projections
This section contains data and graphs depicting historical and future population and water demand projections.

Part III Model Development and Hydraulic Analysis
This section contains a discussion of development of the computer model and the field calibration efforts.

Part IV Analysis and Recommended Improvements
This section addresses recommendations in the areas of water supply, water storage and distribution system improvements.

Part V Final Summary
This section provides a general synopsis of the results and recommendations of this report.
A standalone companion document entitled "WaterCAD Modeling Results" provides the Village with a printout of the analyses completed, along with a graphical representation of the system headlosses associated with each analysis, and a tabular summary of each computer run.

A. General System Information and History

Historically, the Village of Lombard provided water to its customers from five deep wells and three shallow wells. In May of 1992, the Village began using Lake Michigan as their water source and since that time has maintained two deep and two shallow wells in standby mode. The Village of Lombard provides Lake Michigan water to its customers from four pressure adjusting stations (PAS) and two booster stations as needed. These stations are Highland Avenue Water Storage Facility (PAS 14-a), North Avenue Water Storage Facility (PAS 14-b), Central Station Reservoir Facility (PAS 14-c), Civic Center Reservoir Facility (PAS 14-d), South Booster Station and Main Street Booster Station. Each pressure adjusting station receives water from the DuPage Water Commission (DWC) and is equipped with chlorination equipment and a storage facility. The water distribution system is divided into two distinct pressure zones. Generally, the low pressure zone is located north of Roosevelt Road and the high pressure zone is located south of Roosevelt Road. South Booster Station and Main Street Booster Station transfer water between the high and low pressure zones when required by the system.

B. History of Distribution System Studies

In 2001, a comprehensive hydraulic analysis on the water system was prepared by Burns & McDonnell. A WaterCAD computer model of the Village's distribution system was created for that report. In 1988, a comprehensive report on the waterworks system was prepared by Howard, Needles, Tammen and Bergendoff (HNTB). Due to computer limitations at that time, a skeletonized computer model of the Village's distribution system was assembled for that report. The 2001 model included a full model of all pipes in the system. Both studies included an evaluation of areas of concern for watermain replacement, improvements for fire flow deficiencies, and recommendations for future system improvements. One major recommendation from the 2001 model that the Village implemented was the construction of a new inter-zone transfer station in the high pressure zone. This was booster station was constructed in 2009. The Village also implemented the following recommendations from the 2001 model, backup power supply at all their stations and seasonal variation of pressure for station operations. There were a few recommendations from the 2001 model that were deferred. These recommendations included, the construction of a new storage facility in the high pressure zone, ongoing replacement of aging and smaller sized water mains, and replacement of watermains in areas flagged with low pressure and fire flows.

The Village staff has compiled a manual that details the existing water system. This manual contains all pertinent information for the waterworks system. Included within this document are reports, historical improvements, station data and emergency operation procedures.

This current report includes a hydraulic analysis of the entire Lombard water system and recommendations for improvements. A graphical hydraulic computer model was developed utilizing the Village's geographic information system (GIS) data and water atlases. Similar to the 2001 model, the 2012 model is a simulation of all pipes in the Village's water system.

One of the driving forces behind the development of the model at this time is to provide the Village with an updated analysis of the existing water system to identify areas of reduced fire flow, undersized/failing watermains and storage deficiencies and to help plan for future growth and development.

C. Purpose

The purpose of this report is to evaluate the Village of Lombard's water distribution system with a computerized hydraulic model and to provide a planning document for future distribution system capital improvements. This report is intended to be used as a planning and budgeting document. The model is also to be used to size watermains for additional land development or land use changes as it occurs throughout the Village. Prior to construction of the recommended improvements, the actual operating conditions should be reviewed for comparison with the operating condition assumptions used in this report.

As with any future planning tool, a number of future growth assumptions were made. These assumptions should also be confirmed as future improvements are implemented. This includes assumptions regarding population projected growth, water usage patterns, future developments as identified by the Village, as well as hydraulic analysis criteria. These assumptions and values used for these components are discussed throughout the remainder of this text.

One of the driving forces for this effort at this time was the desire to examine the Roosevelt Road watermain system. An upgrade project was targeted to be completed, and up to date hydraulic information was desired to ensure proper sizing and system reconfiguration.

D. Scope

The scope of this report volume includes the following:

- Description of the existing water distribution system facilities and operations.
- Population and water demand projections.
- Development of a calibrated hydraulic model utilizing the WaterCAD modeling program from Bentley.
- Hydraulic analyses evaluating demand conditions for average day, maximum day, and maximum day plus fire demand for existing and future conditions.
- Evaluate the effect of tapping into transmission mains for water services, fire hydrants and small service mains.
- Analyze the Roosevelt Road corridor for hydraulic information on construction abandonment, and resizing of watermains.
- Recommend improvements including the need for a transmission main to serve South Booster Station from Civic Center Reservoir Facility.
- Recommendations for system improvements to correct system deficiencies and meet future water demands.

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PART V
FINAL SUMMARY

A. General

Part V of this report serves to summarize the recommendations outlined in Part IV, as well as to provide additional suggestions to the Village for future data maintenance and updates.

B. Recommended Actions

The following items are discussed in Part iV and are summarized here in tabular format for reference. They are as follows:

1. Transmission Main

Improvement	Cost	Date
New Transmission main from CCRF to South Booster Station	$2,750,000.00*	immediately

2. Operational Improvements

Improvement	Cost	Date
Fire Flow Improvements/Watermain Replacement	$500,000.00 per year	Immediately and ongoing
Implement Fire Flow Improvements Lodge Lane (west of Westmore Avenue and north of Wilson Avenue)	$160,000.00*	CIP project
Implement Fire Flow Improvements Fire District 501 (Craig Place and Stewart Avenue)	$3,930,000.00*	CIP Project
Seasonal Variation of System Pressure	In house	Begin 2013

*These budgetary costs include pavement restoration, trench backfill and water main installation

3. Additional Distribution System Improvements

The system is relatively strong, with very few systems exhibiting low pressures or flows, even during fire flows. However, the system is aging, and the C value testing indicates that the carrying capacity of your mains is degrading over time, and very old mains should be considered for replacement when the opportunity emerges. The Village should develop a flow testing program in locations of planned street improvements to determine the current C value of the main and assess whether or not the main should be replaced. C value testing is relatively quick and easy, so this would be a good investment in the future It is recommended that the Village continue to evaluate age and break history, and use this data to evaluate if a main makes sense to replace concurrent with road projects.

4. Future Growth Improvements

The Village has provided some areas of potential development. This information was input into the model to determine some suggested sizes to support these developments. These are shown

on Figure i-2. it is important to note that these are conceptual plan type recommendations and should be evaluated based on actual site plans and proposed water usage. We have made assumptions based on typical type users at these locations and if a high capacity water user were to be located there, these would need further evaluation:

a. <u>Commercial & Industrial (2 sections in low pressure zone, 1 in high pressure:</u>
   - Area 1: water main extension 600'-10", 500'-4" water service to building
   - Area 2: water main extension 650'-10", 500'-4" water service to building
   - Area 7: water main extension 550'-12", 300'-4' water service to building (HP)

b. <u>Residential/Multi-Family (3 in low pressure zone, 6 in high pressure zone):</u>
   - Area 3: 3,000'-8" water main, 18-1"-2" water service lines (LP)
   - Area 4: 5,000'-8" water main, 100- 1"-2" water service lines (LP)
   - Area 5: 6,500-8" water main, 98- 1"-2" water service lines (LP)
   - Area 6: 10,000-8" water main, 150-1"-2" water service lines
   - Area 8: 10-1-2" water service connections (mains already there)
   - Area 9: 17,500'-8" water main, 930-1"-2" water service lines (this is Highland Hills, they already have mains, but unsure if Village would use the existing ones) (HP)
   - Area 10: 5-1-2" water service connections (HP)
   - Area 11: 9-1-2" water service connections (HP)

C. **Other Recommendations**

In addition to the recommendations outlined above, there are a few other procedural recommendations that we suggest that will facilitate additional water system analysis and other department functions.

<u>Model Updates</u>

it is recommended that the Village plan a major update of the computer model every five to ten years to complete a big picture analysis of the system in operation. in addition, it is suggested that the Village establish a task order contract for on call assignments to evaluate potential additions and changes to the system. Several communities utilize this system, and in many cases back charge the developer for the cost of the sizing work.

D. **Summary**

Overall, the Village of Lombard's distribution system is very strong and healthy. The Village staff has done an excellent job of adding system enhancements of the proper size and location. It was a rewarding experience to have the opportunity to reevaluate a system 10 years after the completion of a major water system master plan, evaluating the impact of the improvements introduced and observe the impacts of ten years of aging. The improvements outlined have been implemented, and the system is operating even more efficiently than before. With the investment in the modeling tool, the Village continues to be positioned to evaluate future improvements on an ongoing basis.

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