090211

VISTA POND WATERSHED
HYDROLOGIC AND HYDRAULIC ANALYSIS
VILLAGE OF LOMBARD, DUPAGE COUNTY, ILLINOIS

Prepared For:

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CBBEL PROJECT No. 08-712

June 2009

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EXECUTIVE SUMMARY

Christopher B. Burke Engineering, Ltd. (CBBEL) has completed a hydrologic and hydraulic analysis for the Vista Pond Watershed, which is located in the Village of Lombard, DuPage County, Illinois, as shown on Exhibit 1. The Vista Pond Watershed has approximately 300 acres of area, consisting of primarily residential area, which is directly tributary to the Vista Pond detention basin. The pond fills with stormwater from the watershed and is drained by a pump station into a storm sewer system that ultimately flows into Gatz Pond.

Several homes adjacent to Vista Pond were flooded during the heavy rains of September 2008. Approximately 7.2" of rain fell in a 24-hour period during the September storm, compared to a hypothetical 100-year, 24-hour rainfall depth of 7.58". The Village contracted CBBEL to expand its ongoing study of the Gatz Pond combined sewer watershed to explicitly model Vista Pond, and to develop improvement scenarios that would improve or eliminate the flooding experienced at Vista Pond.

To accomplish that goal, an existing conditions XP-SWMM model of the watershed and Vista Pond was created. This model was run to simulate the rainfall experienced during the September 2008 storm event, and was calibrated to match the known maximum elevation recorded at Vista Pond. After the model was calibrated, a 100-year critical duration analysis was completed. A critical duration analysis uses hypothetical "design storms" of various durations to determine which duration produces the greatest runoff. These existing conditions models show that the 100-year, 24-hour for Vista Pond was slightly greater than the September storm, as expected. It also indicated that a 6-hour storm produces the same peak elevation in Vista Pond due to the combination of a high rainfall amount (5.7") and the high inflow rates resulting from a shorter duration storm.

Several models were run to analyze the existing performance of the basin and develop alternatives to reduce the potential for flooding. The goal of the alternatives was to lower the 100-year peak elevation to 705.6', which is 0.5' below the lowest adjacent low-entry elevation. ***The analysis concluded that for the higher intensity 6-hour storm, none of the alternatives meet this goal.*** For this storm, runoff enters the pond at too high of a rate to feasibly be conveyed to or by the receiving combined sewer system. Other than excavating a larger basin, which was not considered possible, the only long term solution is a separate storm sewer system with outfall to the East Branch DuPage River. ***However, for longer duration storms such as the 24-hour event, there are potential improvements that will create substantial benefits and meet the target elevation for Vista Pond.***

The report details each alternative, and the last sections of this report summarize our conclusions and recommendations in bullet point form. The recommendations are summarized below:

- Lower the Normal Water Level of Vista Pond to the maximum extent possible. It appears the controlling factor will be the aesthetics of the smaller pond footprint and not the wet well or intake structure elevation.

- Replace the 24" storm sewer between Chase and Highland Avenues with a 48" sewer at a flatter slope. Construct a 24" overflow sewer from Vista Pond to the new 48" storm sewer on Chase Avenue. In conjunction with this project, the outlet structure from Gatz Pond into the combined sewer system would have to be enlarged.

- Reinstate the 18" overflow pipe to the combined sewer on Chase Avenue, and install a manually operated gate valve so that the flow to the sanitary/combined sewer can be controlled. The gate would normally be closed and would be used as a secondary overflow in extreme situations.

INTRODUCTION

Christopher B. Burke Engineering, Ltd. (CBBEL) has completed a hydrologic and hydraulic analysis for the Vista Pond Watershed, which is located in the Village of Lombard, DuPage County, Illinois, as shown on Exhibit 1. The Vista Pond Watershed has approximately 300 acres of tributary area, consisting of primarily residential area which is directly tributary to the Vista Pond detention basin. Vista Pond is bounded on the north, south and east by residential area and there is playground equipment located on the west side of the basin.

Background

Vista Pond is an existing Lombard Park District property located north of the intersection of Westwood Avenue and Prairie Avenue. Under existing conditions, the only outlet from Vista Pond is a pump station with a design capacity of 2.2 cfs. There is a backup pump which provides an additional 2.2 cfs capacity. The pump discharges through a force main that ties into a storm structure located on the south side of the Chicago and Northwestern railroad tracks. Once the pond exceeds elevation 704.9 (NGVD 1929), the pond overtops its banks southwardly towards the railroad tracks. However there is no overland flow outlet once the pond exceeds elevation 704.9. Previously there was an 18" storm sewer that conveyed flow via gravity from Vista Pond south to the existing combined sewer located along Chase Avenue, but this sewer has since been abandoned.

In addition to the +/- 300 acres of area directly tributary to Vista Pond, there is also overflow toward Vista Pond from the Terrace Pond located east of Vista Pond within the Village of Villa Park. When the capacity of this pond is exceeded, the overflow goes both east into Villa Park and west toward Vista Pond along the northern side of a berm that parallels the railroad tracks to the south. There is a catch basin located at the western end of the berm with an 18" corrugated metal pipe (CMP) that conveys the overflow into the storm sewer system tributary to Vista Pond.

The storm sewer system that the Vista Pond forcemain discharges to drains south into Gatz Pond, located downstream on Maple Avenue between Highland Avenue and Westmore-Meyers Road. Gatz Pond is a detention basin that stores runoff from the Chase-Highland-Ahrens-Western Avenue neighborhood, the Westmore Woods Park District property, and the Vista Pond outflow. The watershed draining into Gatz Pond has separated storm and sanitary sewers; however Gatz Pond discharges into a combined sewer on Maple Avenue. The combined sewer system drains south and west, eventually becoming a 108" on Hickory Street. At the intersection of Hickory and Vance Streets, a diversion structure sends low dry-weather flows into the North Regional Interceptor, which conveys sanitary flows into the Glenbard Sanitary District's treatment plant along the East Branch DuPage River at 22nd Street. Stormwater flows that bypass the NRI are conveyed to the Lombard Combined Sewer Treatment Facility, located along the East Branch DuPage River at Hill Avenue.

The areas adjacent to Vista Pond have experienced flooding in the past and most recently in September 2008 and December 2008. The purpose of this study was to

analyze the existing function of the pond and all work that has been performed to the basin and its outlets since 1988. The other purpose of the study was to determine what measures can be taken to reduce future flooding in the adjacent residential areas.

The following are the goals of this study:

- Complete an existing conditions analysis of Vista Pond;
- Determine the impact that the removal of the 18" gravity overflow sewer had on the high water level (HWL) of Vista Pond during the September 2008 storm event;
- Evaluate a temporary supplemental pumping plan developed by the Village for Vista Pond;
- Determine the impact that the Terrace Pond overflow has on Vista Pond;
- Determine if there are benefits from lowering the NWL of Vista Pond;
- Create a proposed improvement plan that provides 100-year protection and freeboard to the adjacent homes;
- Identify any impacts that any proposed alternatives have on Gatz Pond or the downstream combined sewer system.

Study Methodology

The XP-SWMM Stormwater and Wastewater Management Model was used to analyze both existing and proposed conditions. The rainfall depths used in the hydrologic analysis were obtained from the Illinois State Water Survey (ISWS) Bulletin 71. These rainfall depths in conjunction with the Huff distributions were used to develop the inflow hydrographs for the existing subareas. Table 1 summarizes the rainfall depths used in the hydrologic analysis.

Table 1
Summary of ISWS Bulletin 70 Rainfall Depths

Storm Event	Rainfall Depths (inches) Duration					
	2-hr	3-hr	6-hr	12-hr	18-hr	24-hr
100-yr	4.47	4.85	5.68	6.59	6.97	7.58

Storm and combined sewer information was obtained from both the Village and atlases and from limited topographic survey. Other sources of information used in the study are:

- Demolition and Proposed Grading Plans, labeled "As-Built" for the Vista Pond Stormwater Detention Facility prepared by Clark Dietz, Inc., dated December 18, 1990.

- "Village of Lombard Preliminary Report Kenilworth and Chase Avenues Flooding Alleviation Study" prepared by Clark Dietz, Inc., dated August 1991.

- Engineering Plan titled "Pond Area Grading Plan" for the Kenilworth Ave. Sewer Separation and Stormwater Management Improvements prepared by Clark Dietz, Inc., dated May 1994.

- "Village of Lombard Draft Report East St. Charles Road Sewer Separation" prepared by CTE Engineers, Inc., dated April 1996.

- "Westmore Woods Detention Study Conceptual Park/Detention Pond Design Options" prepared by CTE Engineers, Inc., dated September 1997.
- Engineering Plan titled "Proposed Site Plan and Grading" for the Westmore Woods Detention Improvements prepared by CTE Engineers, Inc., dated May 15, 1998.

- Engineering Plan titled "Proposed Drainage Plan and Profile" for the Westmore Woods Detention Improvements prepared by CTE Engineers, Inc., dated May 15, 1998.

- Memorandum with subject "CHAW/Vista Pond Drainage Investigation Results and Recommendations" prepared by Clark Dietz, Inc., dated August 16, 1999.

- "Lift Station/Pump Station Project" and associated engineering plans for the Vista Pond Lift Station prepared by Burns & McDonnell, dated February 2000.

- Memorandum with subject "Report on September 12-13 Rain Storm" prepared by the Village of Lombard, dated October 7, 2008.

- Vista Pond Area Flood Questionnaire Results, Depths and Wet Well Levels during the August 2007 and September 2008 rainfall events, received from the Village of Lombard January 27, 2009.

- Proposed Supplemental Pumping Plan for Vista Pond, received from the Village of Lombard February 17, 2009.

- Village of Lombard Sanitary and Storm Sewer Atlases

- DuPage County 2' aerial topography

Datum Correlation

This study uses several sources of information, completed over several years, which creates issues of datum correlations. The XP-SWMM modeling used in this study is an expansion of the model created for the Gatz Pond watershed study. This model was built using rim and invert elevations surveyed in 2008. This survey was completed on the NAVD 1988 datum using NGS benchmarks, which is typical of today's standards. The NAVD88 datum also allows for consistency with the newest DuPage County aerial

topography, which was expected to be released at some point during the Gatz Pond watershed study. However, NAVD88 is not consistent with the currently available topography, which uses the NGVD 1929 datum, which is ±0.3' higher than NAVD88. Furthermore, the datum used for the 2000 Vista Pond Pump Station Improvements could not be verified, and it was suspected to be neither NAVD88 nor NGVD29. All reporting for Vista Pond by the Village's SCADA system, including the normal water elevation, peak elevation, etc., is based on the wet well elevation from the 2000 plans.

To deal with these inconsistencies, CBBEL staff identified rims and inverts shown on the 2000 plans in the field and determined their elevations relative to known elevations from the Gatz Pond surveying. The closest structures were combined sewer manholes located on Highland and Maple Avenues. This exercise indicated that the 2000 Vista Pond plans were 0.9' higher than NAVD88, or 0.6' higher than NGVD29.

All modeling completed in this study has been done using NAVD88 elevations. Any information obtained from old plans has been converted to this datum prior to use in the model. However, all elevations presented in this study have been converted to NGVD29 so that they can be presented consistently using the DuPage County topography. ***Therefore, all topography, invert elevations, water surface elevations, etc. indicated in the tables, text, and exhibits of this report are presented on the NGVD29 datum.***

EXISTING CONDITIONS

The XP-SWMM model for the Gatz Pond watershed that was previously being developed by CBBEL was enhanced to explicitly model the Vista Pond. The Village provided CBBEL with rainfall data from the July 2008 and September 2008 storms and Vista Pond HWL from the September 2008 storm. There were also two flow monitors from the Gatz Pond watershed study that were in place during these events. The monitors were located in the combined sewer system at the intersections of North Broadway and Fairfield Avenue and South Broadway and Highland Avenue.

Calibration

A base model was created using the sources of information, which were used to determine the watershed boundary, the hydrologic input parameters, existing drainage patterns and all surrounding sewers. The model was initially set up with typical SCS Curve Number hydrology parameters. However, it was determined that the use of SCS methodology was not appropriate to calibrate the hydrologic model. When using SCS methodology, it is common practice to reduce the Runoff Curve Number (RCN) to calibrate a hydrologic model. However, when calibrating to the September 2008 storm event, the RCN was reduced below 65, which is not reasonable for a residential area. While this may have calibrated to the September storm, it would not accurately reflect the runoff in smaller storm events. Therefore, Horton's Infiltration was used as it allows for the infiltration capacity to be regenerated. The model was calibrated to the September 2008 storm event, where the pond reached a maximum elevation of 706.6. This calibrated model was confirmed by the flow monitors downstream that also

measured the flow during the July 2008 storm event. This calibrated model was used as the existing conditions baseline model which was used for all further analyses.

Using the calibrated model, CBBEL performed a critical duration analysis. At the Village's direction, this analysis assumed that both the primary and backup pumps were operating at Vista Pond for a total pump capacity of 4 cfs. Although there are typically two pumps operating, during the September 2008 storm event there was only one pump in operation. It was determined that the 100-year, 6-hour is the critical storm. The 24-hour storm elevation is only 0.1' lower than the 6-hour, and is higher than the elevation that Vista Pond reached in the September 2008 storm event. This is consistent with the slightly higher rainfall amount (7.2" vs 7.58"). Table 2 summarizes the critical duration analysis.

Table 2
Summary of 100-year Critical Duration Analysis

Location	Storm Duration (hours)	Peak Elevation[1]
Vista Pond	1	704.5
	2	705.8
	3	706.1
	6	**706.6**
	12	706.4
	18	706.0
	24	706.5
Terrace View Pond[2]	**1**	**710.2**
	2	710.2
	3	710.2
	6	710.1
	12	710.0
	18	709.9
	24	709.8
Gatz Pond	1	702.7
	2	703.7
	3	703.9
	6	**704.3**
	12	703.8
	18	703.5
	24	704.0
66-inch Combined Sewer along Maple Avenue[3]	**1**	**707.9**
	2	707.9
	3	707.6
	6	704.6

	12	700.9
	18	699.7
	24	699.2
78-inch Combined Sewer at Emerson and Chase Avenues[4]	1	**708.4**
	2	707.6
	3	707.0
	6	704.0
	12	700.6
	18	699.4
	24	698.8

1 All elevations are NGVD 1929.

2 Terrace Pond in Villa Park overflows towards Vista Pond at elevation 709.4.

3 Combined sewer at this location is 66" with invert = 696.3 and rim = 707.6

4 Combined sewer at this location is 78" with invert = 695.4 and rim = 710.9

Proposed Conditions

During the September 2008 storm event, six houses surrounding Vista Pond reported overland flooding damages. The Village reported that Vista Pond reached a peak elevation of 706.6, which is the highest elevation the pond has reached since 1987. The Village also obtained low water entry elevations for the ten lowest homes adjacent to Vista Pond. Of these ten homes, the lowest low entry was found to be at elevation 706.1. **The goal of the alternatives analysis was to develop a plan that will lower the 100-year HWL of Vista Pond to 0.5' below this low entry, or 705.6'.**

In February 2009, the Village proposed and later implemented a supplemental pumping plan for Vista Pond. The plan was implemented to help with anticipated spring storm events, and was analyzed prior to construction to verify that it would not create problems downstream of Vista Pond. This analysis was also included as part of this report. Several scenarios were analyzed to reduce the flooding in the Vista Pond neighborhood with the goal of providing 0.5' of freeboard to the lowest adjacent home and not adversely affecting Gatz Pond or the downstream combined sewer system. The scenarios are summarized in Table 3.

Table 3
Summary of Scenarios Analyzed

Scenario	Description
1	Reinstate the 18-inch gravity storm sewer and evaluate September 2008 event
2	Village's supplemental pumping plan
3	Comparison of Vista ond HWL with and without Terrace Pond overflow
4	Lowering Vista Pond NWL to increase storage
5A	Gravity overflow into downstream storm system; lower NWL to increase storage
5	Increase pumpage rate into downstream storm system; lower NWL to increase storage
6	Gravity overflow into downstream combined system; lower NWL to increase storage

[1] All elevations are NGVD 1929.

Scenario 1

Prior to 2000, when the 18" storm sewer along Westwood Avenue was bulkheaded, Vista Pond had two primary outflows: the pump station and 18" gravity overflow sewer that tied into the combined sewer system on Chase Avenue. To access the gravity sewer, the pond elevation must overtop a small weir at elevation 701.45. As part of the Chase, Highland, Ahrens and Western Avenues sewer separation plan this 18" gravity sewer was bulkheaded and abandoned because it drained to the combined sewer at the north end of Chase Avenue. To determine what impact the removal of this storm sewer had on the Vista Pond HWL, the abandoned overflow sewer was added to the calibrated existing conditions model for the September 2008 storm event. The existing 30" combined sewer was also modeled from the north end of Chase Avenue, where the 18" overflow sewer connects, downstream to where it ties into the 78" combined sewer at Emerson and Chase Avenues. Table 4 summarizes the water surface elevations at different locations within the system.

Table 4
Summary of Scenario 1 Water Surface Elevations
at Various Locations

Elevation Without 18-inch (NGVD, ft)	Elevation with 18-inch (NGVD, ft)	Change in Elevation[1] (ft)
Vista Pond		
706.5	706.1	-0.4
Gatz Pond[2]		
702.9	702.9	0.0
Chase and Emerson Avenues		
699.0	699.0	0.0

[1] All elevations are NGVD 1929.

[2] Gatz Pond elevations reflect only one pump operating from Vista Pond

As shown in Table 4, had the 18" pipe been in place, it would have been able to convey an additional 3.2 cfs (as determined by the hydraulic model) to the combined sewer. The model predicts that the additional outlet would have lowered the flood elevation in the September 2008 storm event by 0.4 feet, which is approximately equal to the lowest adjacent low-entry elevation.

Scenario 2

In February 2009, the Village proposed a supplemental pumping plan for Vista Pond. The plan included the installation of two manholes on both ends of the bulkheaded 18" overflow sewer. Flow would be pumped by portable gas-powered pumps to the existing 18" sewer downstream of the bulkhead on Westwood Avenue and would drain by gravity to the south side of the railroad tracks. From there, the new manhole on the 18" line at the north end of Chase Avenue would direct the flow to the east through an 18" pipe to the existing storm structure. This is the structure that the Vista Pond forcemain discharges into, and is tributary to Gatz Pond. The portable pumps were assumed to have a maximum capacity of 2 cfs, and the pump station was assumed to be operating at 4 cfs capacity. The scenario also assumes that all pumps, including the temporary pumps, run continuously throughout the duration of the storm until the basin is dewatered to the NWL. This may not be reasonable and may over-estimate the benefits

of the temporary pumps. Scenario 2 analyzed the benefits that this additional pumping has on Vista Pond during a 100-year storm and verifies that the elevation of Gatz Pond is not significantly increased. Table 5 summarizes the water surface elevations at different locations within the system.

Table 5
Summary of Scenario 2 Water Surface Elevations
at Various Locations

Storm Event	Without Supplemental Pumping (NGVD, ft)	With Supplemental Pumping (NGVD, ft)	Change in Elevation (ft)
Vista Pond			
6-hour	706.6	706.5	-0.1
24-hour	706.5	706.3	-0.2
Gatz Pond			
6-hour	704.3	704.5	0.2
24-hour	704.0	704.6	0.6
Maple Avenue Combined Sewer			
6-hour	704.6	704.6	0.0
24-hour	699.2	699.2	0.0

As shown by Table 5, the supplemental pumping plan does increase the 100-year elevation of Gatz Pond. This plan was previously evaluated, and it was reported that Gatz Pond would increase an acceptable 0.2'. However, that analysis assumed only 2.2 cfs from Vista Pond, or a total pump rate of 4.2 cfs. Based on Table 5, if both pump station pumps are running and the temporary pumps have 2 cfs capacity, Gatz Pond could raise to unacceptable levels. It is recommended that if the supplemental pumping occurs during a storm event, the elevation of Gatz Pond should be carefully monitored.

Scenario 3

Terrace Pond is located east of Vista Pond in the Village of Villa Park, as shown on Exhibit 3. Per discussions with the Village, it was reported that overflow from Terrace Pond was flowing west towards Westwood Avenue during the September storm. CBBEL performed a field reconnaissance to determine the outflow from Terrace Pond so that it could be added to the model.

Based on the DuPage County topography, there is approximately 70 acres tributary to Terrace Pond. There is a 12" pipe outlet to a storm sewer system that flows east into Villa Park that controls the low flow. It was determined by surveying the overland flow routes that when the capacity of the Terrace Pond is exceeded, the basin will overtop both east towards Villa Park and west toward Vista Pond along the northern side of a berm that parallels the railroad tracks to the south. There is a catch basin located at the western end of the berm with an 18" CMP that is tributary to Vista Pond.

The existing condition model was run for the 100-year storm with and without the Terrace Pond overflow. Significant grading modifications would be needed to eliminate the Terrace Pond overflow. Table 6 summarizes the water surface elevations at Vista Pond for both conditions.

Table 6
Summary of Scenario 3 100-year
Water Surface Elevations at Vista Pond

Storm Event	Elevation of Vista Pond with Terrace Pond (ft, NGVD)	Elevation of Vista Pond without Terrace Pond (ft, NGVD)	Change in Elevation (ft)
6-hour	706.6	706.4	-0.2
24-hour	706.5	706.5	0.0

As shown in Table 6, the Terrace Pond does have an impact on the Vista Pond. However, even without the Terrace Pond overflow, the 100-year flood elevation of Vista Pond overtops its banks.

Scenario 4

The first option proposed to reduce the 100-year elevation of Vista Pond to the target HWL of 705.6 by increasing the storage volume of Vista Pond. Expanding the footprint of the pond was not considered to be feasible by the Village. The only other option for increasing the storage is to lower the normal water level (NWL) of the pond. Although the 1990 as-built grading plan shows that the invert of the basin is 688.4 (NGVD 1929),

and the 2000 pump station plans show the bottom of the wet well to be 691.2 (NGVD 1929), there is a practical limit to the amount the NWL can be lowered. In September 2008, the NWL was set at elevation 697.1' (NGVD 1929). Lowering the NWL by 2' would leave a 6-7' deep permanent pool and begin to expose the safety shelf of the pond. Lowering the NWL any further may not be preferred from an aesthetic viewpoint.

The following scenario has analyzed the benefits of lowering the NWL to elevation 695.1'. We understand that the Village has already lowered the NWL by 1' to 696.1' since the September storm, however this has not been considered in any of the analyses. Table 7 summarizes the water surface elevations for this scenario at different locations within the system.

Table 7
Summary of Scenario 4 Water Surface Elevations
at Vista Pond

Storm Event	Elevation of Vista Pond without lowering NWL (NGVD, ft)	Elevation of Vista Pond with lowering NWL (NGVD, ft)	Change in Elevation (ft)
6-hour	706.6	706.3	-0.3
24-hour	706.5	706.2	-0.3

Table 7 shows that lowering the NWL provides significant benefits but does not quite meet the target HWL elevation. However, it is a low-cost option that is easy to implement and provides measurable benefits. Therefore, it will be incorporated into the remaining proposed improvement scenarios.

Scenario 5

Without providing additional stormwater storage beyond Scenario 4, the outflow from Vista Pond will need to be increased to lower the HWL to the target elevation of 705.6'. Increasing the outflow from Vista Pond into the storm sewer system will increase the HWL of Gatz Pond, which is not acceptable due to adjacent properties in close proximity to the basin. Increasing the footprint of Gatz Pond to provide more storage and maintain the HWL was not an acceptable option. Therefore, the release rate from Gatz Pond into the Maple Avenue combined sewer would have to be increased.

Any scenario that increases the outflow from Vista Pond into the storm sewer system was evaluated to verify that the 24- and 48" storm sewers from Vista Pond to Gatz Pond had sufficient capacity. Within the range of scenarios considered, the additional flow into the storm sewer system did not cause surcharging that would result in surface flooding. Another consideration was to verify that increasing the outflow from Gatz Pond does not

impact the existing combined sewer outlet located along Maple Avenue. The combined sewer system was studied in detail in the Gatz Pond watershed study.

The existing 8" outlet of Gatz Pond was designed for a 100-year release of 3 cfs. Village staff indicated that providing additional storage within Gatz Pond is not feasible. Therefore, our analysis included modifying the existing outlet to accommodate the additional discharge from Vista Pond. The tributary area to Gatz Pond is +300 acres and therefore it is reasonable to increase the release rate beyond existing conditions, provided that the existing system along Maple Avenue has capacity to convey this flow. This analysis assumed that the outlet restrictor would be increased from 8" to 15", however this outlet design would be finalized in conjunction with the Gatz Pond watershed study.

To increase the outflow from Vista Pond, two options were considered. The first option, Scenario 5A, would add a gravity outlet to the storm sewer outlet. The closest connection point is the 24" storm sewer at the north end of Chase Avenue, which has an invert of 700.9'. This elevation limits the diameter of the overflow pipe to approximately 15" due to cover limitations on Westwood Avenue. Multiple iterations were run, but it was determined that an overflow connection at this location could not meet the target HWL for any 100-year storm event. Therefore, ***any gravity overflow scenario to the storm sewer must also replace the section between Chase and Highland Avenue.*** Replacing the 24" storm sewer with a 48" sewer set at a flatter slope will provide greater overflow capacity at a lower elevation.

The second option to increase the outflow from Vista Pond was to simply increase the pump capacity sufficiently until the target 100-year HWL was met. This option is referred to as Scenario 5B and uses a 10cfs pump station capacity. For this scenario, the target storm was the 100-year, 24-hour event; Meeting the criteria for a 6-hour event was found to be impractical. Both Scenario 5A and 5B assumed that the NWL of Vista Pond was lowered as described in Scenario 4. Tables 8 and 9 summarize the water surface elevations at different locations within the system for both Scenario 5A and 5B, respectively.

Table 8
Summary of Scenario 5A Water Surface Elevations
at Various Locations

Storm Event	Elevation without Gravity Outlet (NGVD, ft)	Elevation with Gravity Outlet (NGVD, ft)	Change in Elevation (ft)
Vista Pond			
6-hour	706.6	706.2	-0.4
24-hour	706.5	705.4	-1.1
Gatz Pond			
6-hour	704.3	704.3	0.0
24-hour	704.0	703.7	-0.3
Maple Avenue Combined Sewer			
6-hour	704.6	704.6	0.0
24-hour	699.2	699.5	0.3

Table 9
Summary of Scenario 5B Water Surface Elevations
at Various Locations

Storm Event	Elevation without Increased Pump Rate (NGVD, ft)	Elevation with Increased Pump Rate (NGVD, ft)	Change in Elevation (ft)
Vista Pond			
6-hour	706.6	706.2	-0.4
24-hour	706.5	705.4	-1.1
Gatz Pond			
6-hour	704.3	704.3	0.0
24-hour	704.0	702.6	-1.3
Maple Avenue Combined Sewer			
6-hour	704.6	704.6	0.0
24-hour	699.2	699.6	0.4

Table 8 shows that adding the gravity storm sewer does lower the peak elevation at Vista Pond for a 6-hour storm, although not to the target elevation, which is met for the 24-hour storm. Table 9 shows that a 10 cfs pump is required to meet the target HWL for the 24-hour storm. However, the inflow to the basin during a 6-hour storm is too great for a gravity sewer or pump to handle. Meeting the target HWL for the 6-hour storm would require increasing the pump capacity to the range of 30 cfs, which was not considered feasible.

Both options would require the size of the Gatz Pond outlet to be increased. The receiving combined sewer on Maple Avenue is already surcharged for high intensity, low-duration storms. However, the model shows the increase in discharge from Gatz Pond would not significantly increase the hydraulic gradeline in Maple Avenue. For longer duration storms, the gradeline elevation on Maple Avenue is low enough that increasing flow is not an issue. Therefore, increasing the Gatz Pond outlet is reasonable but is a judgement call for the Village.

Another consideration is that the Village is pursuing a sewer separation program that will provide a storm sewer outfall for Gatz Pond. This storm sewer could be sized to include

the additional outflow from Gatz Pond. The storm sewer outfall from Gatz Pond was not included in this analysis.

Scenario 6

The final scenario proposed to increase the outflow from Vista Pond by reinstating the existing 18" gravity overflow sewer into the combined sewer system. This scenario was evaluated assuming the NWL of Vista Pond was lowered according to Scenario 4. The overflow pipe was originally abandoned to completely separate Vista Pond from the combined sewer system. While reinstating stormwater flow to the combined system is not desirable, there are other factors to consider that make this option worth considering.

First, prior to the sewer separation project in the Chase-Highland-Ahrens-Western Avenue (CHAW) neighborhood, any stormwater flow from Vista Pond could contribute to surcharging of the combined sewer system. Surcharging frequently caused basement backups, and any surface flooding would require reporting to the Illinois Environmental Protection Agency. However, since the CHAW separation, there are only sanitary flows being conveyed by the 30" sewer on Chase Avenue which the 18" overflow sewer ties into. Therefore, the risk of surcharging the system is low.

A second consideration is that due to the Gatz Pond watershed study, we now have better information on the capacity of the downstream combined sewer system. The modeling shows that the downstream capacity is at or above capacity for many high intensity storms, but for longer duration storms there is available capacity in the system. Additional considerations in support of Scenario 6 are that the overflow would only be used infrequently during extreme storm events, and could be controlled by a manually operated gate valve if downstream surcharging was a concern.

Table 10
Summary of Scenario 6 Water Surface Elevations
at Various Locations

Storm Event	Elevation without Gravity Outlet to Combined Sewer (Gate Closed) (NGVD, ft)	Elevation with Gravity Outlet to Combined Sewer (Gate Open) (NGVD, ft)	Change in Elevation (ft)
Vista Pond			
6-hour	706.6	706.2	-0.4
24-hour	706.5	705.6	-0.9

Gatz Pond			
6-hour	704.3	704.3	0.0
24-hour	704.0	704.0	0.0
Chase and Emerson Avenues			
6-hour	704.0	704.0	0.0
24-hour	698.8	699.0	0.2

Table 9 shows that Scenario 6 creates significant benefits to Vista Pond and lowers the 24-hour HWL elevation by 0.9 feet. There is also a reduction for the 6-hour storm, although to a lesser extent. This is due to surcharging in the downstream combined sewer system which prevents a free overflow from Vista Pond. In fact, a backflow prevention valve would be required to keep stormwater from backflowing into Vista Pond.

If this option were selected, we would recommend televising the combined sewer on Chase Avenue to identify all sanitary service tie-in locations and elevations. An inventory of overhead and gravity plumbing would also be recommended. This will allow the model to be enhanced so that the maximum allowable overflow rate from Vista could be determined.

Conclusions

CBBEL analyzed six scenarios using the XP-SWMM hydraulic model to evaluate Vista Pond. Three scenarios include proposed improvements that would lower the HWL elevation of Vista Pond. Our key points and conclusions are summarized below:

- XP-SWMM modeling shows that the September 2008 flooding would have been less severe (0.4' lower) if the 18" overflow to the combined sewer system was not abandoned. The hypothetical lower elevation would have been equal to the low-entry elevation of the lowest adjacent home.

- The Village implemented a supplemental pumping plan to be used until a permanent solution for Vista Pond is found. The plan does not require any modifications to the downstream system (Gatz Pond). The modeling shows insignificant decreases to the 100-year HWL of Vista Pond due to the plan, however there are numerous potential "real-world" scenarios that will be improved due to the ability to dewater the pond faster.

- The overflow from Terrace Pond into Vista Pond that was witnessed during the September storm was verified by the XP-SWMM modeling. This overflow increases the Vista Pond flooding by 0.2' in a 100-year storm.

- The lowest adjacent low water entry elevation was determined by the Village to be 706.1'. The proposed improvements were evaluated to achieve a 0.5' freeboard from this elevation to the HWL. Therefore, the target HWL for Vista Pond is 705.6'.

- The storage volume of Vista Pond was increased by lowering the NWL by 2' (from September 2008 level) to 695.1'. The lowering of the NWL could be achieved by changing the pumping parameters. It did not seem feasible from an aesthetic standpoint to lower the NWL further. This option lowered the HWL by 0.3' but did not meet the target HWL.

- The additional Vista Pond storage (from lowering the NWL) is not sufficient to meet the target reduction in HWL. Since additional outflow capacity is needed, two options were evaluated. A 24" overflow storm sewer could be run south from Vista Pond, connecting to a proposed 48" storm sewer at the north end of Chase Avenue. The proposed 48" sewer would replace the existing 24" sewer between Chase and Highland Avenues. In combination with lowering the Vista Pond NWL, this option meets the target HWL for the 24-hour event. A second option would involve increasing the pump station capacity in lieu of an overflow sewer. It was determined that a total pump capacity of 10 cfs would be required to meet the target HWL for a 24-hour event. The existing forcemain capacity was not evaluated but may not be sufficient for this flow rate.

- Another option for increasing the Vista Pond outflow capacity is reinstating the overflow to the combined sewer system on Chase Avenue. This option reaches the target HWL for the 24-hour storm but not for the 6-hour storm due to higher hydraulic gradeline elevations in the combined sewer on Emerson Avenue. Overflowing to the combined system carries a risk of surcharging the residential sanitary sewer connections, although the modeling shows this risk is low. The risk could be further mitigated by installing a manually operated gate valve so that the overflow could be controlled.

- The storm sewer between Highland Avenue and Gatz Pond has adequate capacity for the increase in outflow from Vista Pond within the range of scenarios considered in this report. The section between Chase and Highland would have to be increased from 24" to 48" to increase capacity and lower the invert of a gravity overflow.

- In the long term, a sewer separation program will allow an increase in the Gatz Pond discharge, as well as eliminating runoff from the combined sewer system, both which will improve conditions for Vista Pond.

Recommendations

Our recommendations are as follows:

- The Normal Water Level of Vista Pond should be lowered to the maximum extent possible. It appears the controlling factor will be the aesthetics of the smaller pond footprint and not the wet well or intake structure elevation.

- Replace the existing 24" storm sewer between Chase and Highland with a 48" sewer at a flatter slope, and construct a 24" overflow sewer from Vista Pond to the new 48" storm sewer. We estimate that the invert of the overflow would be approximately 700.0' at Vista Pond. In conjunction with this project, the outlet structure at Gatz Pond would have to be enlarged. This project would best be completed in conjunction with a separation of the combined sewer system downstream of Gatz Pond, since it has the potential to increase flow into a surcharged system under some storm conditions. However, the model shows the increase in flow does not significantly increase hydraulic gradeline elevations.

- Reinstate the 18" overflow pipe to the combined sewer on Chase Avenue. Chase Avenue was separated, therefore the 30" sewer only conveys sanitary flows. A manually operated gate valve should be installed on the 18" overflow pipe so that the flow to the sanitary/combined sewer can be controlled. The gate would normally be closed and would be used as a secondary overflow in extreme situations.

- Because this study pulls from multiple sources of information from several different projects in recent years, and because there appears to be an inconsistent datum between the Vista Pond wet well and the DuPage topography, we recommend that a detailed topographic survey be completed for Vista Pond and all important storm or combined sewers. The survey should be tied to NAVD88 to be consistent with the survey completed for the Gatz Pond study as well as the forthcoming aerial topography from DuPage County. This survey will allow for verification of the elevations in this study before final design of any selected projects is completed.

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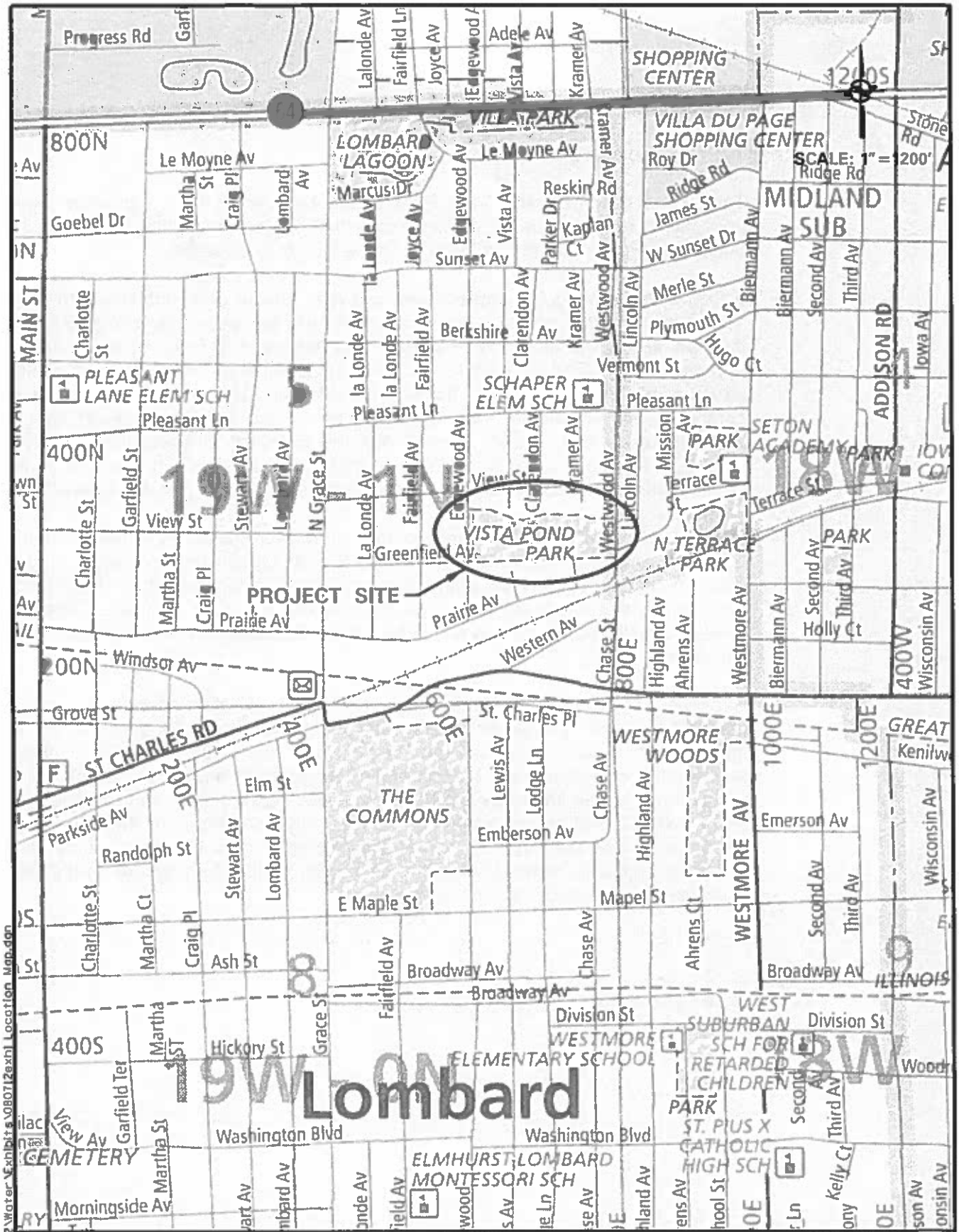
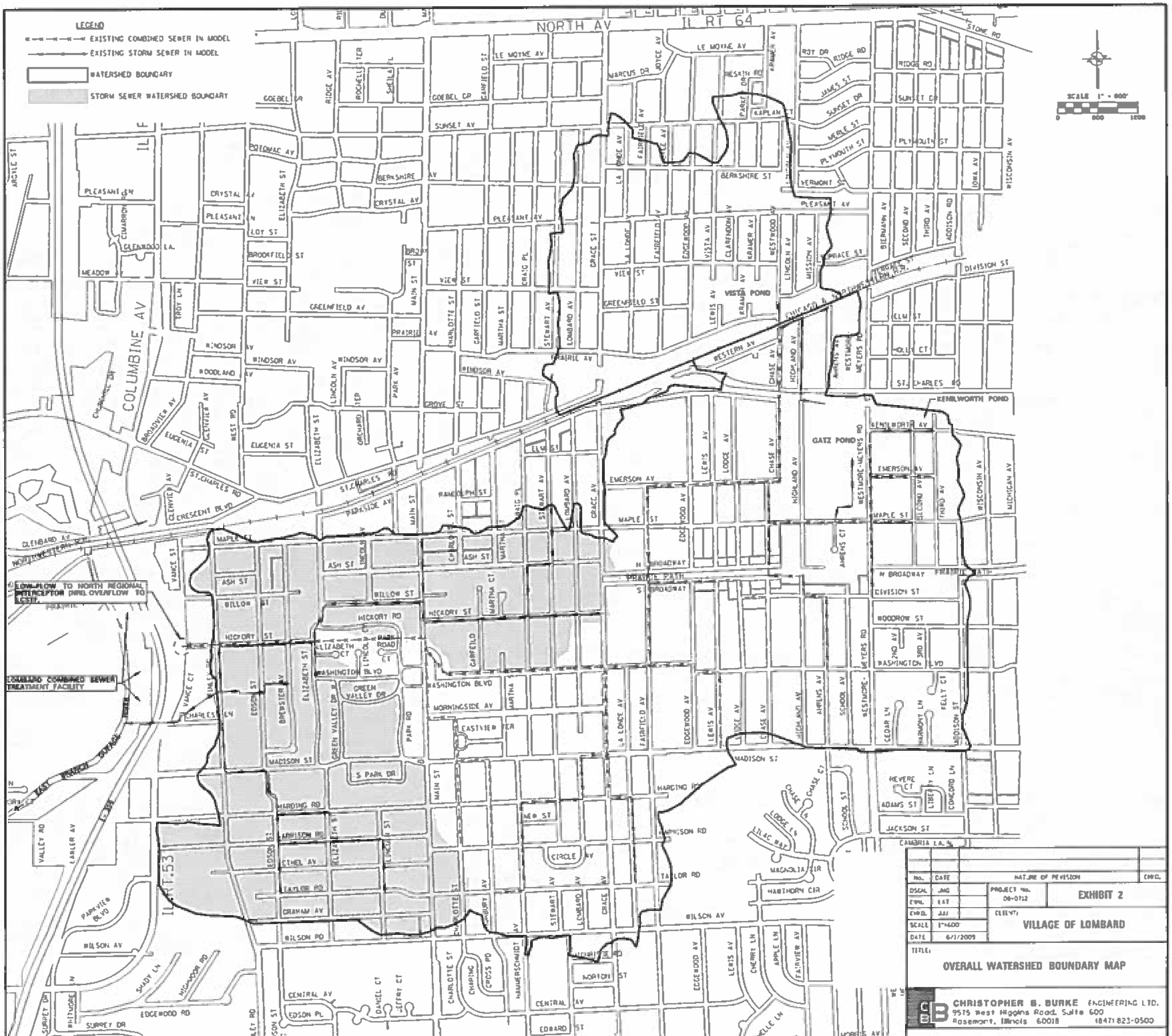


CHRISTOPHER B. BURKE ENGINEERING LTD. 9575 West Higgins Road, Suite 600 Rosemont, Illinois 60018 (847) 823-0500	CLIENT: VILLAGE OF LOMBARD	PROJECT NO. 08-0712
	LOCATION MAP	DATE 6/1/2009
		EXHIBIT 1

N:\Lombard\08071\2\Water\Exhibits\080712exhl Location Map.dgn


LEGEND
EXISTING COMBINED SEWER IN MODEL
EXISTING STORM SEWER IN MODEL
WATERSHED BOUNDARY
STORM SEWER WATERSHED BOUNDARY
SCALE 1" = 600'
0 600 1200
LOW-FLOW TO NORTH REGIONAL INTERCEPTOR (NRI) OVERFLOW TO LSST.
LOMBARD COMBINED SEWER TREATMENT FACILITY
VISTA POND
GATZ POND
KENILWORTH POND
NORTH AV
IL RT 64
IL RT 53
COLUMBINE AV
No. | DATE | NATURE OF REVISION | CHKD.
DSGN. JMG
DWN. EAT
CHKD. JJJ
SCALE 1"=600'
DATE 6/1/2009
PROJECT No. 08-0712
EXHIBIT 2
CLIENT:
VILLAGE OF LOMBARD
TITLE:
OVERALL WATERSHED BOUNDARY MAP
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Rosemont, Illinois 60018
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CLIENT: VILLAGE OF LOMBARD		TITLE: SEPTEMBER, 2008 INUNDATION MAP	DSGN: JMG
PROJECT NO. 08-0712	SCALE: 1"=300'		DRN: EAT
			DATE: 6/1/2009
			EXHIBIT 3

NO.	DATE	NATURE OF REVISION	CHKD.
DSGN.	JMC		
DWN.	EAT		
CHKD.	JJL		
SCALE	1"=200'		
DATE	6/1/2009		

PROJECT No. 08-0712

EXHIBIT 4

CLIENT: VILLAGE OF LOMBARD

TITLE: VISTA POND WATERSHED DRAINAGE NETWORK

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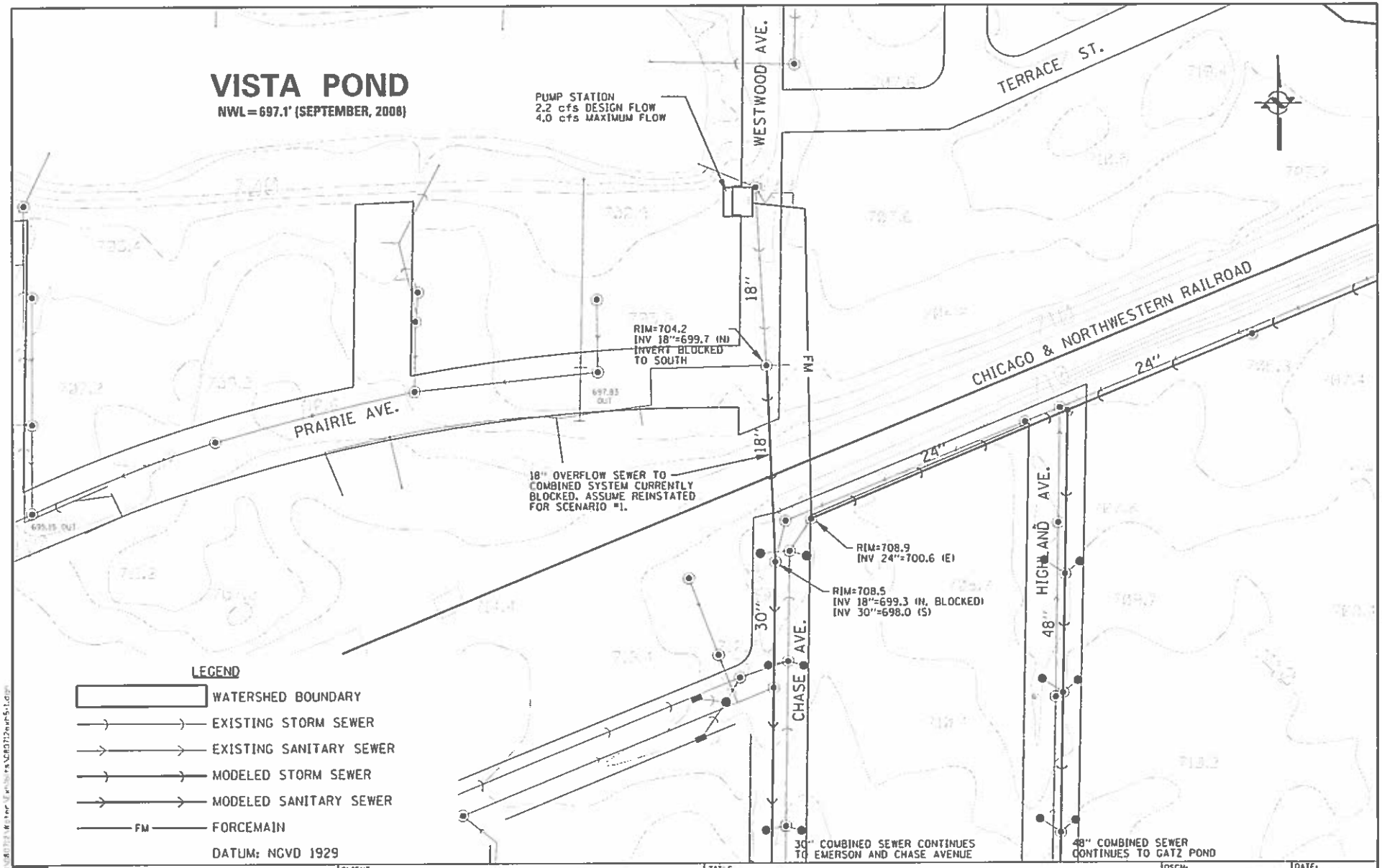

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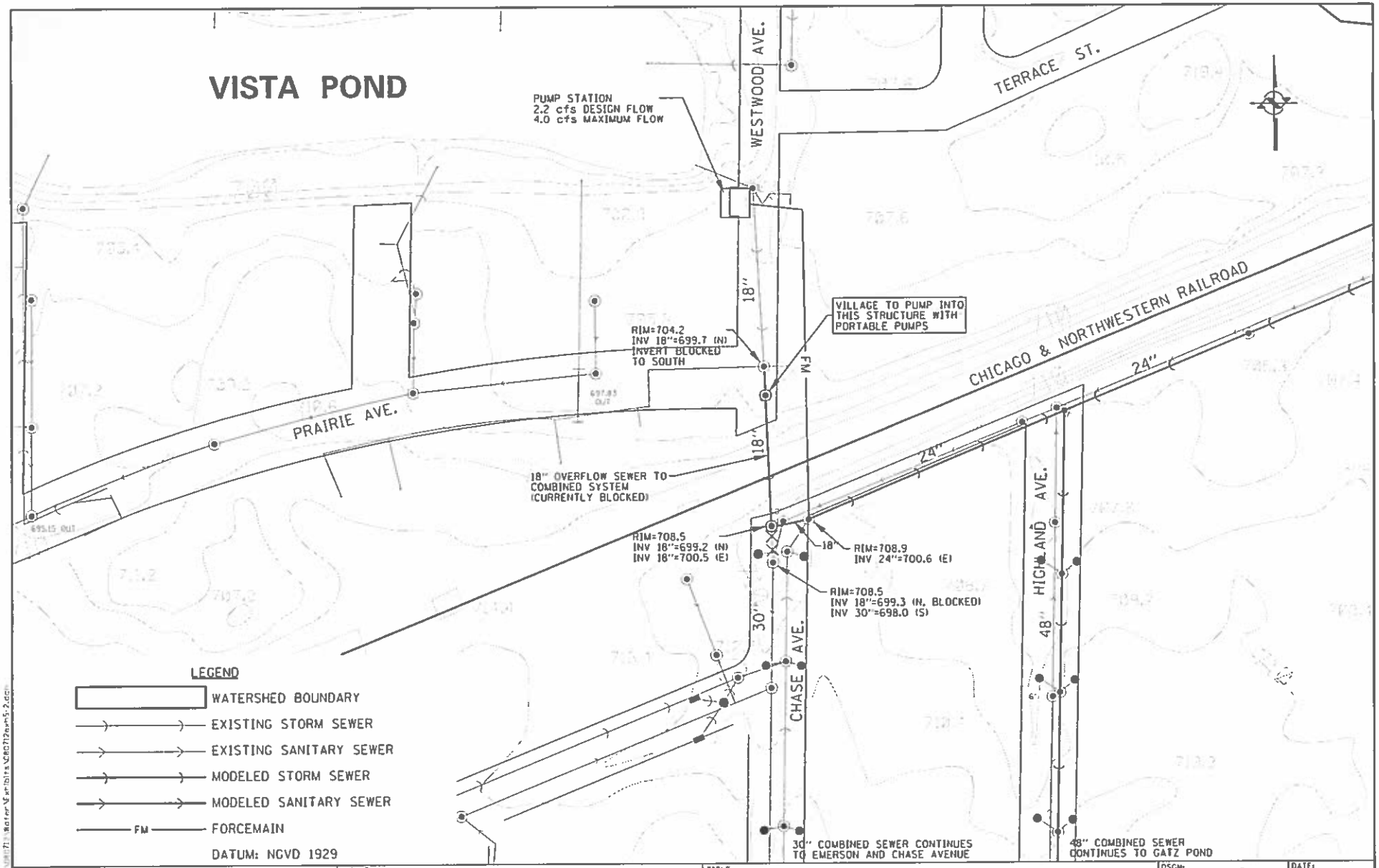
CLIENT: VILLAGE OF LOMBARD		TITLE: SCENARIO #1 – REVIEW OF BLOCKED 18" GRAVITY SEWER	DSGN: JMG
PROJECT NO. 08-0712	SCALE: 1"=100'		DWN: EAT
			DATE: 6/1/2009
			EXHIBIT 5-1



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CLIENT: VILLAGE OF LOMBARD		TITLE: SCENARIO #2 – SUPPLEMENTAL PUMPING PLAN	DSGN: JMG
PROJECT NO. 08-0712	SCALE: 1"=100'		DWN: EAT
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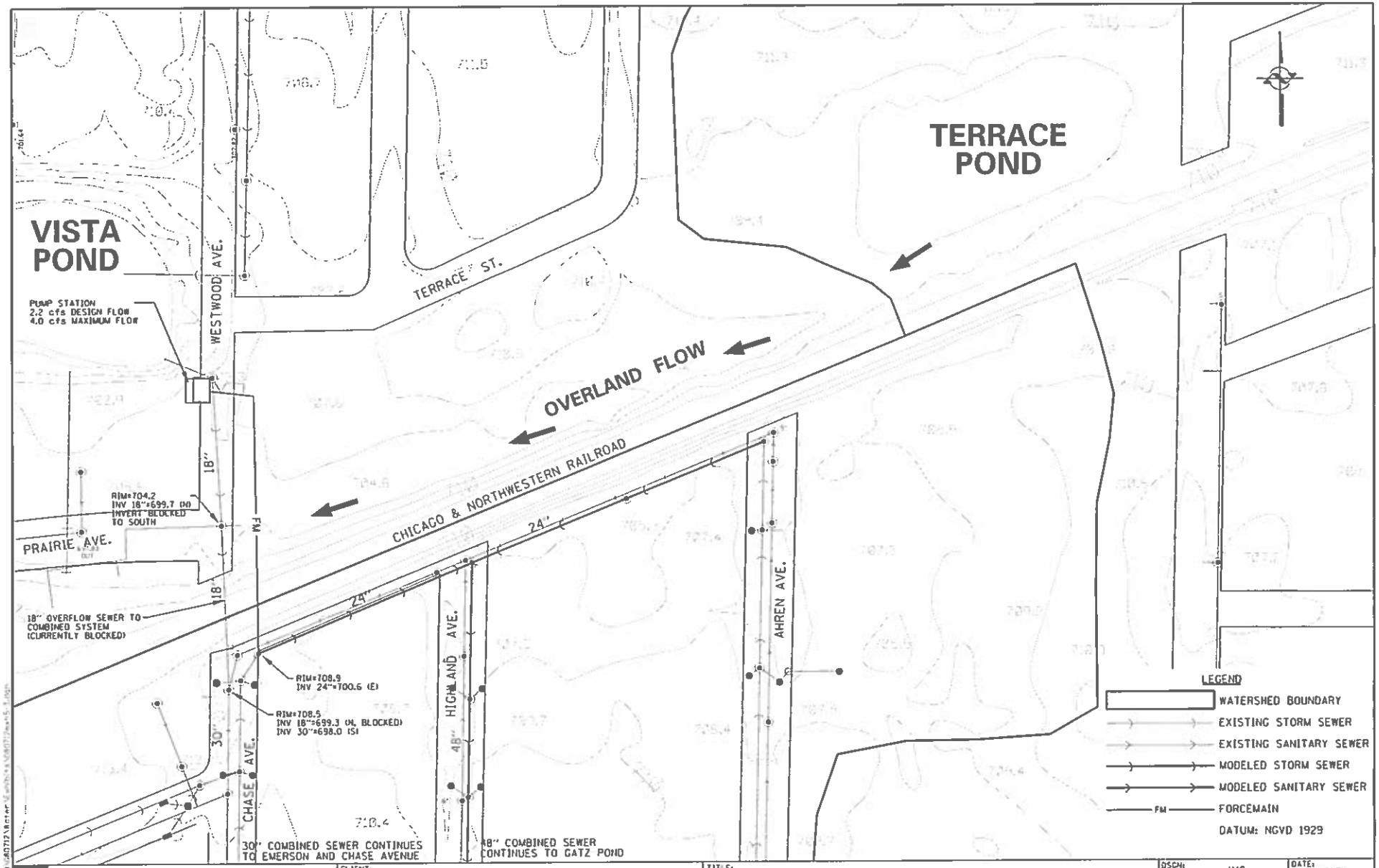

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CLIENT: VILLAGE OF LOMBARD		TITLE: SCENARIO #3 – OVERLAND FLOW FROM TERRACE POND	DSGN: JMG
PROJECT NO. 08-0712	SCALE: 1"=120'		DWN: EAT
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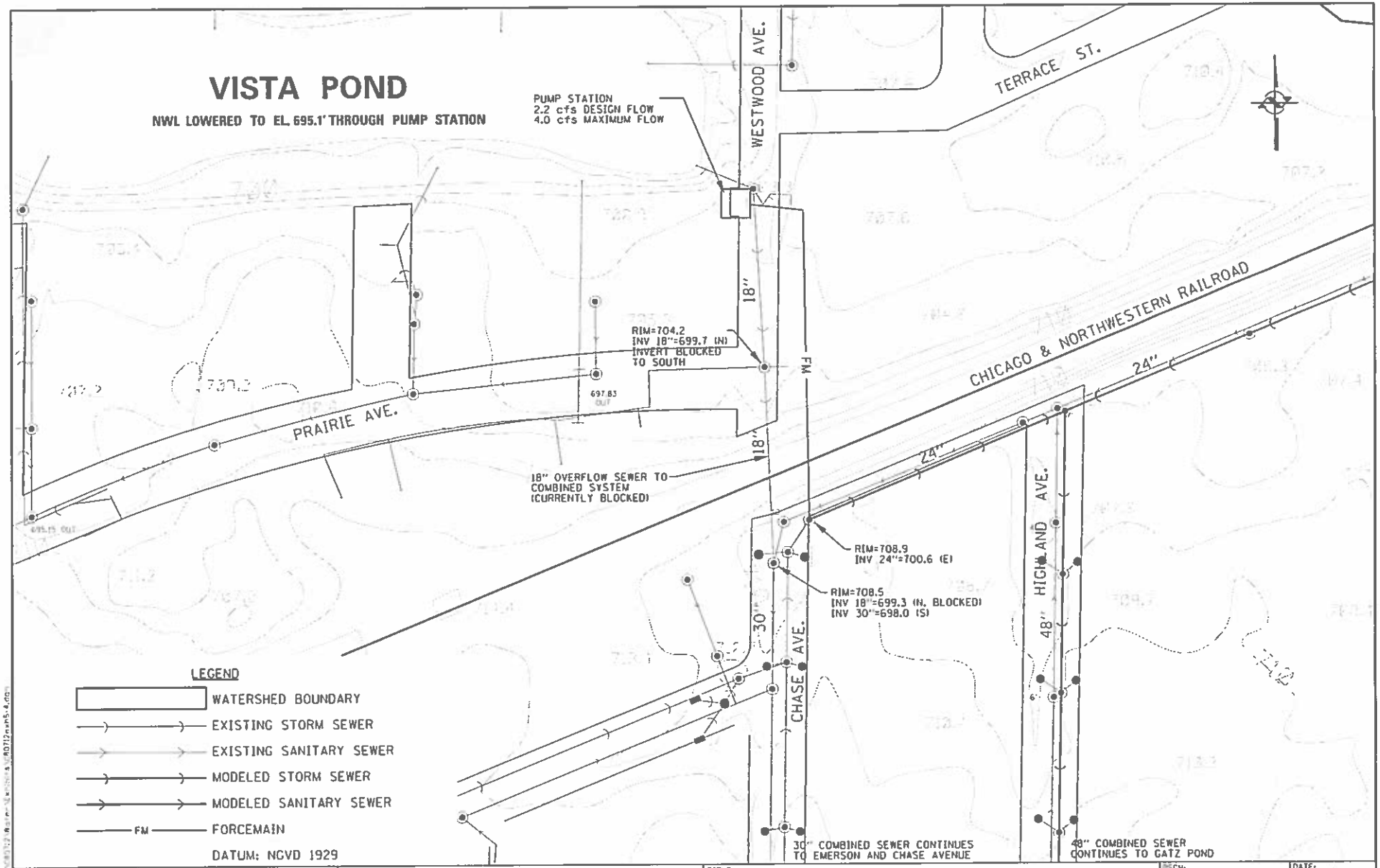

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CLIENT: VILLAGE OF LOMBARD		TITLE: SCENARIO #4 – LOWER NWL OF VISTA POND	DSGN: JMG
PROJECT NO. 08-0712	SCALE: 1"=100'		DWN: EAT
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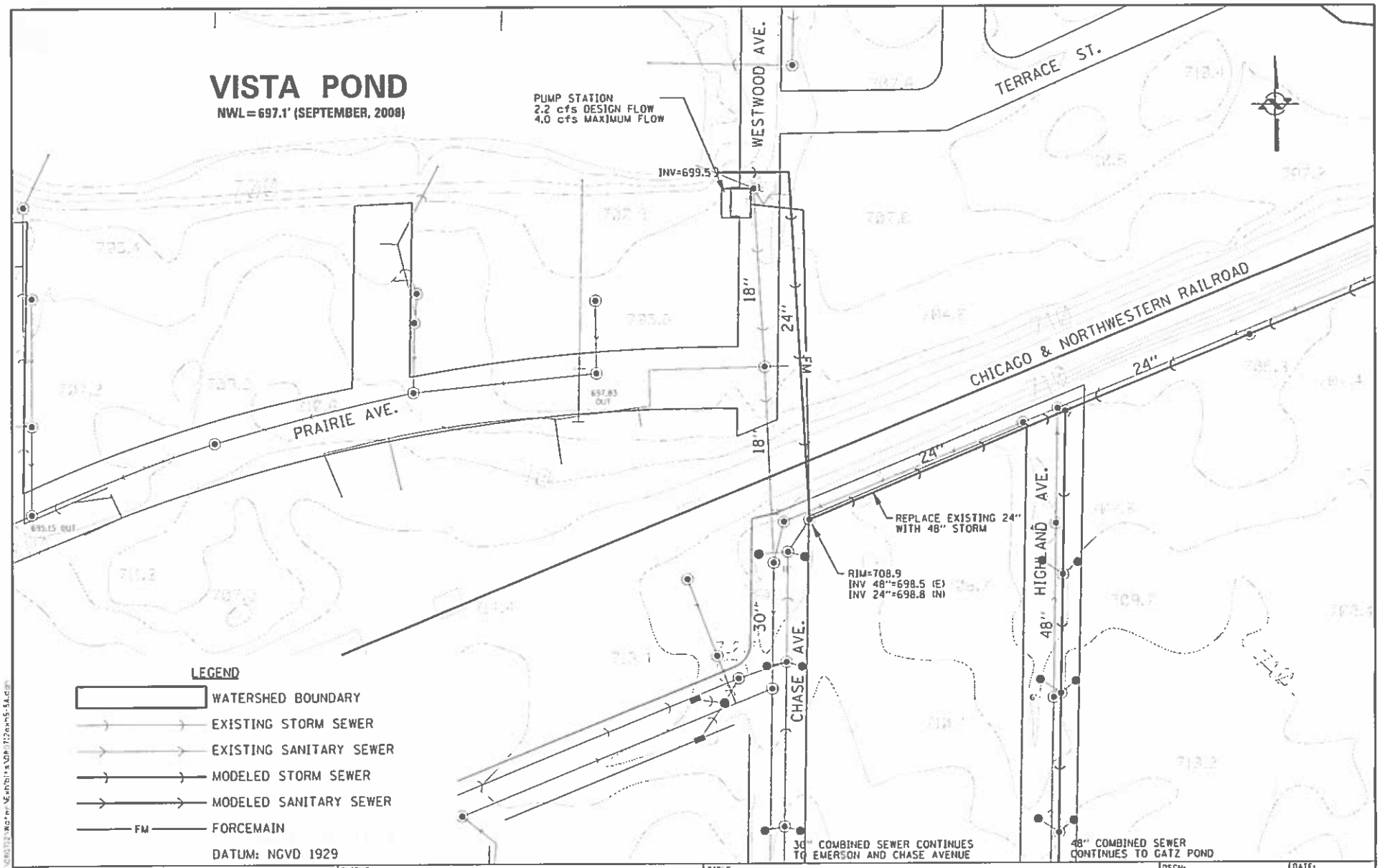

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CLIENT: VILLAGE OF LOMBARD		TITLE: SCENARIO #5A – ADDITION OF GRAVITY OVERFLOW SEWER	DSGN: JMG
PROJECT NO. 08-0712	SCALE: 1"=100'		DWN: EAT
			DATE: 6/1/2009
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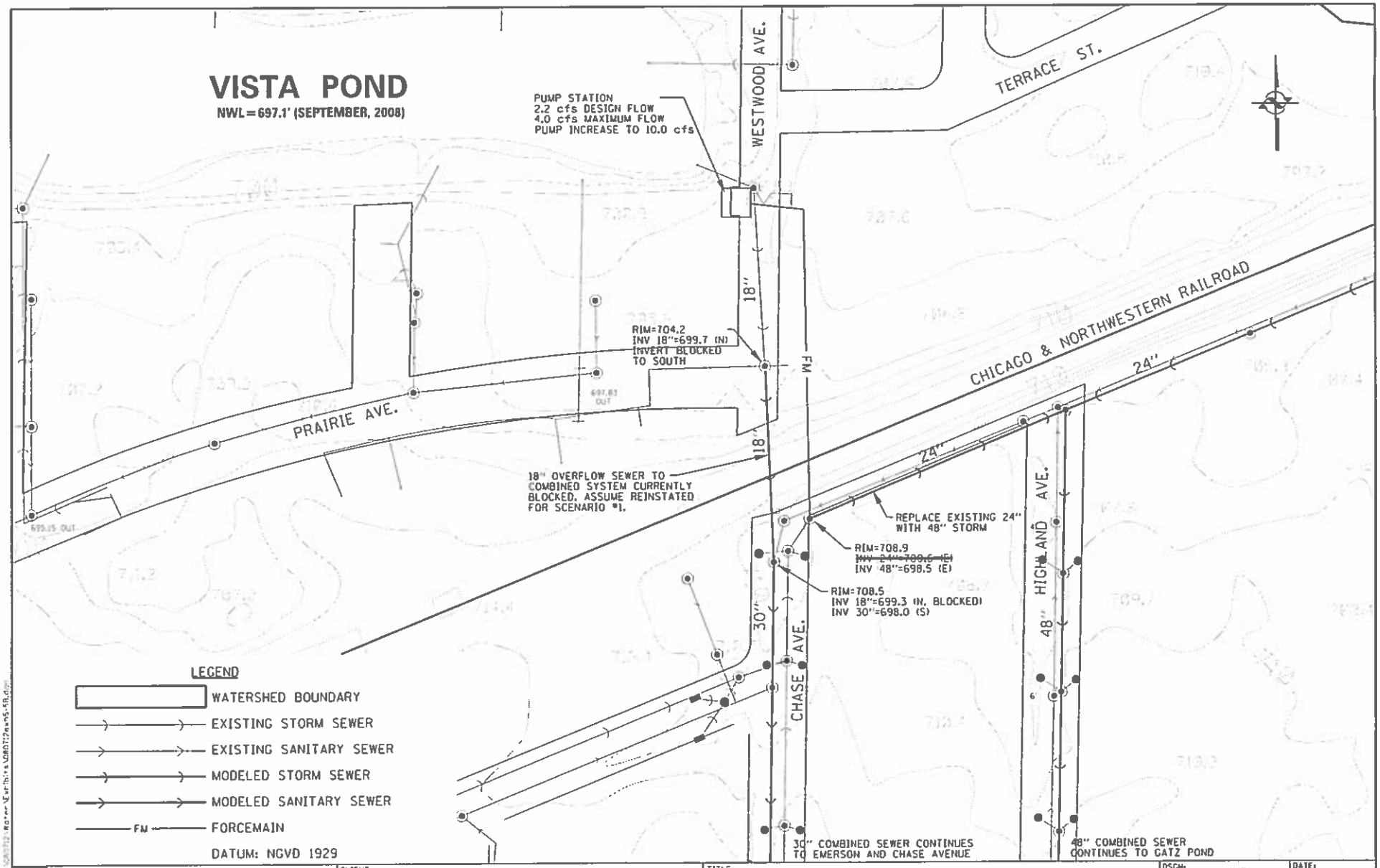

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CLIENT: VILLAGE OF LOMBARD		TITLE: SCENARIO #5B – INCREASE PUMPAGE RATE	DSGN: JMG
PROJECT NO. 08-0712	SCALE: 1"=100'		DWN: EAT
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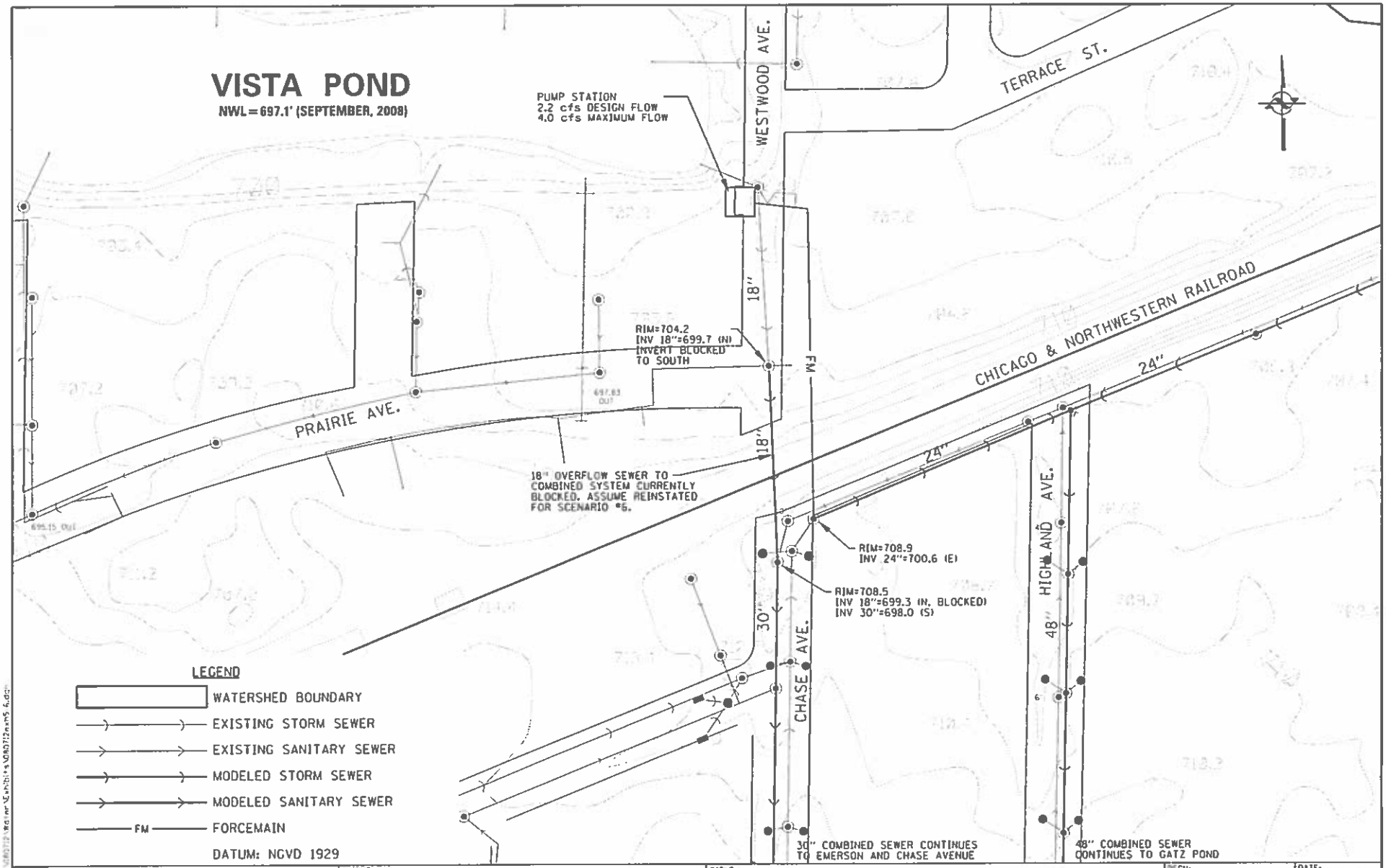

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CLIENT: VILLAGE OF LOMBARD		TITLE: SCENARIO #6 – REINSTATE 18" GRAVITY SEWER	DSGN: JMG
PROJECT NO. 08-0712	SCALE: 1"=100'		DWN: EAT
			DATE: 6/1/2009
			EXHIBIT 5-6