2011 Comprehensive Stormwater Study

for the

Village of Mount Prospect
Mount Prospect, Illinois

Project Number 63568

February 2012

Burns & McDonnell
SINCE 1898

TABLE OF CONTENTS

Page No.

EXECUTIVE SUMMARY ES-1

1.0 INTRODUCTION 1-1
- 1.1 Purpose 1-1
- 1.2 Scope 1-1

2.0 SUMMARY OF COMPLETED WORK 2-1
- 2.1 Public Outreach 2-1
- 2.2 Field Reconnaissance 2-5
- 2.3 Hydraulic Modeling of Areas with Highest Concentration of Impact 2-9
- 2.4 Cost-Benefit Assessment & Determination of Solutions 2-10

3.0 BACKGROUND INFORMATION 3-1
- 3.1 July 23rd, 2011 Storm Event 3-1
- 3.2 History of Village Mount Prospect Sewer System 3-2
  - 3.2.1 Weller Creek and Feehanville Creek Drainage Districts 3-4
  - 3.2.2 Combined Sewers 3-4
  - 3.2.3 MWRDGC Relief Sewers 3-5
  - 3.2.4 Separate Sanitary Sewers 3-6
  - 3.2.5 MWRDGC TARP System 3-8
  - 3.2.6 Infiltration/Inflow Corrective Action Plan (ICAP) 3-12
  - 3.2.7 Flood of 1987 3-13
  - 3.2.8 1990 Comprehensive Stormwater Management Report 3-14
  - 3.2.9 Combined Sewer Evaluation Study 3-19
  - 3.2.10 Overhead Sewer and Footing Tile Disconnection Program 3-20
  - 3.2.11 The Lessons of History 3-22
- 3.3 Typical Design Criteria 3-22
- 3.4 Village Ordinances 3-23
- 3.5 Ongoing Village Maintenance 3-24

4.0 EVALUATION 4-1
- 4.1 Sanitary Back-Ups 4-7
- 4.2 Sump Pump Failure 4-11
- 4.3 Basement Seepage 4-13
- 4.4 Surface Flooding 4-16
- 4.5 Overall Flood Survey Summary 4-20

5.0 METHOD OF ASSESSMENT & FINDINGS 5-1
- 5.1 Hydraulic Modeling 5-1
  - 5.1.1 Basin SS11 and Basin SS08 - Hatlen Heights Subdivision 5-1
  - 5.1.2 Basin CS18 - Highland Street Sewer System 5-3
  - 5.1.3 Basin CS21 - Isabella Street Area 5-4
  - 5.1.4 Basin CS31 Lonnquist Boulevard Area 5-4
  - 5.1.5 Basin SS21 – Tower Drive Area 5-5

TABLE OF CONTENTS (CONTINUED)

Page No.

5.1.6 Basin SS32 – Cherrywood Drive Area 5-5
5.1.7 Basin SS41 – Catalpa Area 5-5
5.1.8 Basin SS45 – Beechwood Drive and Grace Drive Area 5-6
5.1.9 Illinois American Area 5-6

6.0 POTENTIAL SOLUTIONS – PUBLIC SECTOR IMPROVEMENTS 6-1
6.1 Increase Collection and Conveyance Capacity 6-2
6.1.1 Increase Pipe Sizes and Inlet Capacities 6-2
6.1.2 Repair and Maintain System Outfalls 6-6
6.1.3 Additional Detention and Retention Improvements 6-6
6.1.4 Combined Sewer Separation 6-7
6.2 Summary of Public Sector Improvements 6-7

7.0 POTENTIAL SOLUTIONS – PRIVATE SECTOR IMPROVEMENTS 7-1
7.1 Site Grading 7-1
7.2 Site Discharge Improvements 7-2
7.3 Overhead Plumbing and Backup Prevention Systems 7-2
7.4 Sump Pump Upgrades 7-5
7.5 Best Management Practices 7-6
7.6 Summary of Private Sector Improvement Costs 7-6

8.0 COST BENEFIT ASSESSMENT 8-1
8.1 Example Case – Basin SS14 8-1
8.2 General Cost Assessment 8-2
8.3 Localized Flooding 8-3

9.0 RECOMMENDATIONS 9-1
9.1 Private Sector Improvements 9-1
9.2 Public Sector Separate and Combined Sewer Basin Improvements 9-4
9.3 Recommendations for Additonal Study of Localized Public Sector Flooding Areas 9-4
9.4 Summary 9-4

APPENDIX A – DETAILED FLOODING RESULTS

APPENDIX B – XPSWMM MODELING RESULTS

* * * * *

LIST OF TABLES

Table No. **Page No.**

Table 2.1 Flooding Questionnaire Results 2-6
Table 4.1 Combined and Separate Storm Sewer Basins without Reported Flooding 4-3
Table 4.2 Flooding Questionnaire Results 4-4
Table 4.3 Flooding Questionnaire Results in Combined Sewer Area 4-6
Table 4.4 Flooding Questionnaire Results in Separate Sewer Area 4-6
Table 4.5 Flooding Questionnaire Results in Other Basins 4-7
Table 4.6 Basins with Sanitary Back-Ups 4-8
Table 4.7 Basins with Sump Pump Failures 4-11
Table 4.8 Basins with Seepage 4-14
Table 4.9 Basins with Surface Flooding 4-16
Table 5.1 Rainfall Data 5-1
Table 6.1 Summary of Public Sector Improvements 6-8
Table 9.1 Sewer Basins that Reported Private Sector Flooding 9-1
Table 9.2 Summary of Recommended Stormwater Management Improvements 9-5

LIST OF EXHIBITS

Exhibit No.

1 Flood Damage Assessment
2 Basin Locations
3 Drainage Area Boundaries
4 1952 & 1987 Aerials
5 Mount Prospect Combined Relief Sewers Constructed 1947-1957
6 Basin SS08 & SS11 Existing Sewer Network (Hatlen Heights System)
7 Basin CS18 Existing Sewer Network (Highland System)
8 Basin CS21 Existing Sewer Network (Isabella System)
9 Basin CS31 & SS18 Existing Sewer Network (Lonnquist System)
10 Basin SS32 Sewer Network (Cherrywood Drive System)
11 Basin SS41 Sewer Network (Catalpa Lane System)
12 Basin SS45 Sewer Network (Beechwood Drive and Grace Drive System)
13 Illinois American Basin Sewer Network (Ironwood Drive System)
14 Illinois American Basin Sewer Network (Park Drive System)
15 Basin SS08 & SS11 Recommended Improvements (Hatlen Heights System)
16 Basin CS21 Recommended Improvements (Isabella System)
17 Basin CS31 & SS18 Recommended Improvements (Lonnquist System)

* * * * *

EXECUTIVE SUMMARY

The Village of Mount Prospect (Village) contracted Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) to determine the reasons for the significant impacts to the Village that occurred with the July 23, 2011 storm event and identify potential improvements to the Village's stormwater management system that would help to diminish the impact that a future storm of this magnitude would generate. The Village provided storm flood survey information to Burns & McDonnell which was gathered from the residents through an extensive public outreach program. This outreach program included having Village employees and Burns & McDonnell representatives visiting residents' homes or contacting them via telephone to gather information regarding the magnitude and type of flooding experienced by each affected resident.

Further, the intent of the study was to quantify and analyze the various drainage basins within the Village based on the findings of the flood surveys. Using the information gathered, areas that experienced the highest density of flooding were selected to be studied in greater detail using hydraulic modeling software. Basins that were not modeled were analyzed based on the types of flooding reported in each area. This study is intended to serve as a tool to assist the Village in evaluating and prioritizing capital improvements and in maintaining its storm and combined sewer system, as well as its separate sanitary sewer system.

It is important to emphasize that the July 23rd storm was an extreme rain event in terms of rainfall intensity and quantity. According to the hourly rainfall data obtained from the rain gauge at Chicago O'Hare International Airport, a total of 6.78 inches of rain fell during the peak 3 hours of the storm. Over a 24 hour period, a total of 8.27 inches of rain fell over the area. The storm can be classified as approximately a 400-year storm (or a storm that has a probability of occurring once every 400 years) based on the 3-hour peak intensity and volume of rainfall. Current industry standard is to design a typical storm sewer system to handle a 10-year storm event using Bulletin 70 Rainfall Data. Much of the Mount Prospect storm and wastewater collection system was constructed prior to when these standards were implemented, and as such, may have a lower conveyance capacity. This circumstance is typical for older communities including the City of Chicago and most "inner ring" suburbs. Therefore, flooding of the local conveyance system during a storm with a magnitude like that of the July 23rd, 2011 storm is unavoidable.

A low end conservative estimate of the capital cost to mitigate the flooding from an event similar to the July 23rd storm using public sector improvements only is in excess of $200,000,000. This cost would include the construction of relief storm sewers, combined relief sewers, underground detention, sanitary relief stations and other related improvements. Purchasing property to create additional detention would increase these costs further. Additional operation and maintenance costs would also be incurred by the Village. Even with all these improvements, protection against sewer backups from a storm event similar to the July 23rd, 2011 event would not be as reliable as private property improvements such as installing overhead plumbing or backup prevention systems.

The Village performs a very thorough maintenance and flood relief effort on an ongoing basis. Inspections of the stormwater system outfalls at detention basins and creeks are made on a twice a year

basis. In addition each of the Village's wastewater collection system basins is inspected and maintained on a regular and systemic basis. Further, since 1990, the Village has spent over $25,000,000 in flood relief improvements, and has significantly reduced infiltration and inflow of stormwater runoff to its separate sanitary sewer system. These efforts have provided a significant benefit to the Village; greatly reducing the frequency and magnitude of flooding incidents. Nevertheless, sanitary backups and surface flooding occurred in many of the areas where improvements have been made simply due to the magnitude of the July 23rd, 2011 storm event.

While there are areas where frequent surface flooding can be diminished by upgrading the public conveyance systems, the most effective solution to minimize sanitary backup is to make private sector improvements. Making strictly public sector improvements is cost prohibitive, and there are likely structural integrity and capacity issues in private sector piping that would still remain problematic even if the public sector sewer main could accept all of the water. Further, the MWRDGC receiving system has a limited capacity. Increasing the capacity of the Village's sewers may be rendered ineffective by restrictions caused by the MWRDGC receiving system. **It is important to note that neither public nor private sector improvements will alleviate all flooding should an event similar to the July 23rd rainfall occur**.

Private sector improvements that can be made to mitigate flooding impacts include the following:

- Disconnection of foundation drains and installation of overhead plumbing in 379 buildings/homes that reported sanitary backup.
- Inspection and repair of foundation walls through which seepage occurred in 177 buildings/homes.
- For the 203 properties that experienced surface flooding during the July 23rd storm event, inspection of property drainage including all gutters, downspouts and locations of sump pump discharge to make sure that surface drainage is directed away from the residence. This may also help minimize seepage.
- For the 142 properties where sump pump failure was experienced inspection of the sump pump system to make sure that it is working and has adequate capacity. After completion of the inspection install a secondary sump pump, if needed, and a battery backup and/or emergency generator if system.

The budgetary cost for the disconnection of foundation drains and the installation of overhead plumbing in 379 buildings/homes is $9,475,000, based on an average cost of $25,000 per building/home.

Development of costs for mitigating flooding resulting from sump pump failures through the installation of a secondary sump pump and an emergency battery backup and/or emergency generator for the 142 buildings/homes that reported sump pump was not determined as part of this study. It is recommended that each property owner contact a company that specializes in providing sump pump inspections and emergency generator installation to mitigate sump pump failures.

Cost for mitigating flooding from seepage and private sector surface flooding in these basins was not determined as part of this study. It is recommended that each property owner contact a company that specializes in mitigating basement flooding caused by seepage.

Based on the results of the flooding questionnaires, additional assessment and hydraulic modeling was performed for several areas where the most severe and geographically concentrated amount of flooding occurred. Based on this additional assessment improvements to upgrade the capacity of the existing combined and separate sewer systems were developed. Budgetary costs for implementing these public sector improvements are $14,440,000.

Several separate sewer areas were also identified for additional assessment. These areas have a relatively low occurrence of reported flooding; however several localized areas of concentrated flooding were reported. A budgetary cost for completing the recommended evaluations is $28,000.

Cost Summary

The total budgetary cost to implement the recommendations presented in this study is $23,943,000. A breakdown of these costs is presented in the following table.

Summary of Recommended Stormwater Management Improvements

Area	Type of Improvement	Improvement	Budgetary Cost
Hatlen Heights Subdivision	Public Sector	Storm Sewer Improvements for 25-year Level of Service	$1,500,000
Hatlen Heights Subdivision	Public Sector	Sanitary Sewer Improvements for 25-year Level of Service	$105,000
Isabella Street Area	Public Sector	Combined Sewer Improvements for 25-year Level of Service	$12,500,000
Lonnquist Boulevard Area	Public Sector	CS31 Combined Sewer Improvements for 25-year Level of Service	$200,000
Lonnquist Boulevard Area	Public Sector	Adding Inlets and Televising	$135,000
Village-wide	Private Sector	Disconnection of 379 Foundation Drains with Overhead Plumbing	$9,475,000
Further Investigation and Additional Analysis		Basin SS21, Basin SS41, Basin SS45 and Illinois American Basin	$28,000
Total			**$23,943,000**

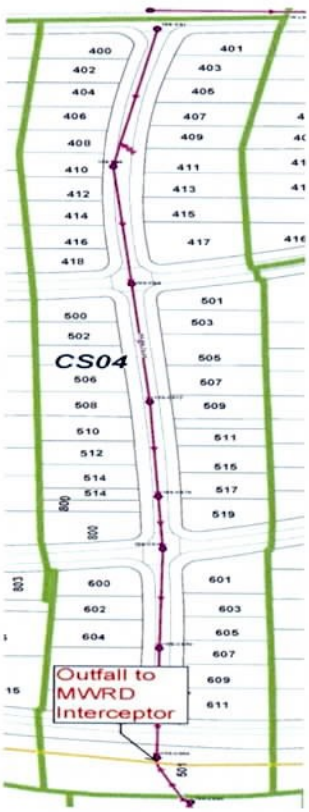
* * * * *

1.0 INTRODUCTION

1.1 PURPOSE

On July 23rd, 2011 the Village of Mount Prospect experienced an historical rain event, which caused widespread flooding and disruption throughout the Village. In the aftermath of the storm, the Village hired Burns & McDonnell to assist with and review field reconnaissance data from Village-wide surveys, quantify the flooding impact, determine the cause of flooding, evaluate potential solutions, develop cost-effective recommendations to mitigate flooding and complete a cost-benefit analysis regarding the feasibility of implementing public and private sector solutions.

As part of the study each of the 107 combined and separate sewer basins (individual drainage areas with one outfall to a receiving stream or Metropolitan Water Reclamation District interceptor sewer) within the Village were to be analyzed for causes and patterns of flooding and drainage issues. Recommendations for managing flooding for each Village resident that responded to the Village-wide survey were to be made. Detailed hydraulic modeling performed for several combined and separate stormwater basins that experienced significant flooding as a result of the July 23rd, 2011 storm event (July 23rd storm event) was to be performed to assist in the development of potential solutions for mitigating flooding. The scope of work, findings, and recommendations developed as part of the 2011 Comprehensive Stormwater Study are presented in the following sections of this document.



Typical Sewer Basin

1.2 SCOPE

The detailed scope of the project includes the following:

- Public Outreach – Analyzing the results of the phone and home to home surveys performed. Organizing and presenting public meetings to discuss and educate the Village Board and general public about stormwater management in general and specifically the intricacies of Mount Prospect's stormwater management system.
- Field reconnaissance and observation – this includes walking identified areas of drainage concern, inspecting structures, outfalls, and evaluating the overall drainage condition of the Village.
- Quantifying the July 23rd storm event and evaluating its impact on the Village.
- Developing recommendations, whenever practical, for residents impacted by the July 23rd storm event.
- Detailed hydraulic modeling of stormwater basins with severe flooding, including modeling the July 23rd storm and several standard design storms in stormwater basins that experienced severe flooding.
- Modeling of proposed public sector solutions for areas where the level of service of the existing stormwater management system is deemed severely inadequate.

- Cost/benefit analysis to illustrate the suitability and feasibility of proposed solutions. Based on this analysis, recommend capital improvement projects to improve the stormwater management capabilities of the areas of concern.
- Report the findings of the project.

* * * * *

2.0 SUMMARY OF COMPLETED WORK

Within 4 weeks of the July 23rd storm, the Village contracted Burns & McDonnell to begin its analysis of the Village's stormwater management system. The first step was to meet with the Village to understand the stormwater system and the historical frequency of flooding that various neighborhoods had experienced within the Village limits. In an effort to gain additional insight into the impact of the July 23rd storm event and historical flooding, the Village Department of Public Works requested that affected residents contact the Village to register their flood complaints and schedule an in-person flood meeting to complete a flooding questionnaire so that the details of the July 23rd and historical flooding could be assessed for each property. The following sections provide an overview of the work completed as part of this project.

2.1 PUBLIC OUTREACH

The Village received approximately 200 unsolicited calls from residents on July 23rd, 2011 during and following the storm. The Village Department of Public Works immediately responded to the calls and made initial site visits on July 23rd to each resident who called. Within days of the event, the Village made a concerted effort to solicit detailed responses from residents to determine the scope and type of flooding experienced by each resident. This included developing an on-line flooding questionnaire, placing it on the Village's web-site and sending requests for information electronically via e-mail to Village residents. After soliciting information, the Village received surveys and phone calls from approximately 700 additional residents.

In response to the surveys and phone calls, the Village scheduled site interviews and conducted field interviews with each resident willing to participate so that a better understanding of the type and potential cause of the flooding could be determined. Interviews officially began on August 5, 2011 and were completed in early December, 2011. A total of 510 interviews were conducted and the results were catalogued. A standard building inspection form and flooding questionnaire was completed for each resident that was interviewed.

A total of 148 residents declined site inspections, but participated in completion of the flooding questionnaire by phone. Approximately 240 residents who contacted the Village regarding flooding declined to participate in either the site investigation or phone survey.

An example building inspection form and flooding questionnaire are presented on the following pages.

Mount Prospect Public Works Department

PRIVATE BUILDING INSPECTION

Inspection #: [redacted] Inspection Date: 8/10/2011 5:55:00PM

Address:

GENERAL

1. Property Type: SFR
2. Sanitary Plumbing Type: GRAVITY
3. Foundation Type: BASE
4. Has the property experienced a sewer backup? Y

COMMERCIAL PROPERTY

5. Does the property have an inspection manhole? N
6. Does the property dispose of fats, oils or grease down the drain? N
7. Does the property have grease traps? N
8. Does the property have any evidence of grease? N
   8a. If yes, describe location of grease:
9. Is there a log of grease trap cleanings within the last 90 days? N

DOWNSPOUTS

10. Does the property have internal downspouts? N
11. Are there any above ground downspouts? Y
    11a. Downspouts discharge less than 5' from foundation? Y
    11b. Downspouts discharge more than 5' from property line? N
12. Are there any underground downspouts? Y
    12a. Are there visible discharge points? Y
    12b. Popups or discharge points are less than 5' from foundation? N
    12c. Popups or discharge points are more than 5' from property line? N

OUTSIDE DRAINS

13. Does the property have outside drains? N
    13a. If outside drains exist, record each type:

    N Area drain
    N Driveway drain
    N Patio drain
    N Stairwell drain
    N Window well drain

14. Do all outside drains discharge overland? N

Village of Mount Prospect Private Building Inspection Form (Continued)

Printed on: 9/29/2011 2

EJECTOR PUMP

15. Does the property have an ejector pump? N
16. Is the ejector pit sealed? N
17. Where does the ejector pump discharge?

N To ground
N To sanitary
N Unknown

CLEARWATER SUMP

18. Does the property have a clearwater sump? N
19. Are there any observable drain connections entering the clear water sump? N
20. Where does the clearwater sump discharge?

N Sanitary Sewer
N To ground less than 5' from foundation
N To ground less than 5' from property line
N Unknown
N To ground greater than 5' from foundation
N To ground greater than 5' from property line

21. Identify the type of drains entering the clearwater crock:

N Floor drain
N Footing drain
N Laundry drain
Other, identify:

22. Is the bottom of the clearwater crock open? N

INSIDE PIPING AND FLOOR DRAINS

23. Is there a direct connection between sanitary and clearwater piping? Y
24. Are there observable diverters? N
25. Are there floor drains? Y
26. Where does the floor drain discharge?

Y Gravity
N Sump pump
N Ejector pump

RESULTS

27. Was a dye test performed? N
28. Was the dye test positive? N
29. Is there a suspected footing tile connection? Y
30. Footing tile connection confirmed? N

COMMENTS

Village of Mount Prospect
Public Works Department

FLOODING QUESTIONNAIRE

Work Order # [redacted]

Address:

Incident Date:

What type of Flooding did you have?

- N Surface Induced
- Y Sanitary Backup
- Y Seepage
- N Sump Pump Failure

Which floors were affected?

- Y Crawl Space
- Y Basement
- N First Floor
- N Second Floor

If flooding was surface induced where did the water come from?

- Y Rear/Side yard drainage
- Y Street Flooding

Comments:

ALL OF THE BACK,SIDE, STREET AND FRONTYARD WAS UNDER WATER

How did the water enter your home?

- N Door or other Opening
- N Window Well
- N Sump Pump
- Y Floor Drain
- Y Toilet, Shower, Tub
- N Wall or Floor Crack
- Y Garage

Comments

FOOTING TILE IS CONNECTED TO SANITARY LINE. MOST OF THE WATER ENTERED THE BASEMENT THRU FLOOR DRAIN AND THE WINDOWS.
10" IN GARAGE.

What time did the flooding Start? 7/23/2011 12:00:00AM What time did the flooding recede? 7/23/2011 2:00:00PM

Depth of water at deepest point of flooding: 5.00 FEET

Do you have a sump pump? N

Have you experienced previous flooding? N How many times? 0

Please describe previous flooding:

List dates of previous flood events:

After the flooding questionnaires were completed an overall flood location map was prepared. This map was used to review and assess the Village-wide impact of the July 23rd storm event.

Table 2.1 summarizes the results of the flooding questionnaires.

Exhibit 1 shows the locations where flooding information was acquired resulting from residents participating in the field investigations. Exhibit 2 shows the locations of each combined sewer basin and separate sewer basin in Village.

2.2 FIELD RECONNAISSANCE

After study and analysis of the information obtained during the public outreach phase of the project, areas experiencing the most significant impact were identified These areas showed a significant pattern, with a relatively high percentage of homes affected by surface flooding and sanitary backups. While flooding throughout the entire Village was studied and certainly given equal importance, the areas of highest impact included the Hatlen Heights subdivision in Basin SS08 and SS11, the Isabella Street residential area in Basin CS21, the Lonnquist Boulevard residential area in Basins SS18 and CS31, and the Highland Street residential area in Basin CS18 (see Exhibit 3 for locations of these areas). Once identified, Burns & McDonnell performed field reconnaissance of these areas. This entailed performing a limited survey of selected rims and inverts of drainage structures within each basin to determine the size and slope of existing storm and combined sewer infrastructure. Inlet grate sizes and locations were noted as were overland flow paths, low points and any other features that may affect the drainage within the area. The outfalls were also inspected for erosion, blockage, deterioration or failure.



Structure Inspected during Field Reconnaissance

Field reconnaissance is an essential part of the analysis of each basin. For each basin, structures were opened and inspected for sanitary and storm sewer connections, flow, pipe size, and any other information that could aid in the construction of a useful and accurate model of the area.

Table 2.1: Flooding Questionnaire Results

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
CS01	12	10	2	2	0	1	1
CS02	4	1	2	1	0	0	1
CS03	1	0	1	0	0	0	1
CS04	7	7	2	0	0	0	0
CS05	5	2	1	3	0	1	2
CS06	0	0	0	0	0	0	0
CS07	0	0	0	0	0	0	0
CS08	0	0	0	0	0	0	0
CS09	5	3	0	0	0	0	1
CS10	3	2	2	0	0	0	0
CS11	1	0	0	0	0	0	0
CS12	0	0	0	0	0	0	0
CS13	1	0	0	1	0	0	0
CS14	1	0	1	0	0	0	0
CS15	2	1	0	1	0	0	0
CS16	19	10	9	2	0	3	4
CS17	2	0	0	2	0	0	0
CS18	27	20	9	3	1	4	11
CS19	1	1	1	0	0	0	1
CS20	3	1	1	2	0	0	1
CS21	98	79	20	6	12	13	15
CS22	5	3	2	1	0	0	1
CS23	5	4	1	1	0	2	0
CS24	6	0	4	1	0	1	3
CS25	21	18	6	3	1	0	4
CS26	2	2	0	0	0	1	0
CS27	8	5	2	1	2	0	2
CS28	14	6	6	3	3	1	3
CS29	31	26	8	3	0	4	4
CS30	5	3	1	1	1	2	1
CS31	26	17	10	4	1	7	3
CS32	8	7	3	0	3	1	1
CS33	6	6	2	1	2	0	0
CS34	3	1	0	1	0	0	1
DESPLAINES	2	0	1	1	0	2	0
EGT	5	0	1	4	0	2	1
IL AMER	46	20	10	10	4	13	7

Table 2.1: Flooding Questionnaire Results (continued)

Village of Mount Prospect Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
OTHER	1	0	0	0	0	0	1
S04A	2	0	0	0	0	1	1
SS01	5	1	2	4	1	0	0
SS02	0	0	0	0	0	0	0
SS03	0	0	0	0	0	0	0
SS04	2	0	2	2	1	0	0
SS05	0	0	0	0	0	0	0
SS06	0	0	0	0	0	0	0
SS07	1	0	0	1	0	0	1
SS08	8	1	1	7	2	3	1
SS09	1	0	0	1	0	0	0
SS10	3	0	1	3	0	0	2
SS11	51	31	17	14	26	7	4
SS12	8	5	3	1	0	0	4
SS13	2	2	1	0	0	1	0
SS14	8	6	1	0	1	2	3
SS15	5	2	1	1	0	1	2
SS16	20	9	6	11	2	1	3
SS17	0	0	0	0	0	0	0
SS18	2	0	2	1	0	0	0
SS19	4	3	2	1	0	1	1
SS20	1	0	0	1	0	0	0
SS21	11	8	3	2	1	6	0
SS22	1	0	1	0	0	0	0
SS23	0	0	0	0	0	0	0
SS24	2	1	0	0	0	0	0
SS25	6	4	5	0	0	0	1
SS26	8	4	1	1	0	1	2
SS27	16	14	4	2	1	2	1
SS28	8	7	2	0	1	2	0
SS29	9	6	0	2	1	1	1
SS30	4	4	0	1	0	0	0
SS31	6	6	1	0	1	0	0
SS32	3	1	1	1	1	1	0
SS33	0	0	0	0	0	0	0
SS34	0	0	0	0	0	0	0

Table 2.1: Flooding Questionnaire Results (continued)

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
SS35	0	0	0	0	0	0	0
SS36	0	0	0	0	0	0	0
SS37	1	0	0	0	0	0	1
SS38	0	0	0	0	0	0	0
SS39	0	0	0	0	0	0	0
SS40	1	1	0	0	1	0	0
SS41	25	10	5	8	7	3	5
SS42	5	1	3	4	4	0	1
SS43	0	0	0	0	0	0	0
SS44	10	7	2	1	2	4	1
SS45	16	5	1	3	4	5	2
SS46	0	0	0	0	0	0	0
SS47	0	0	0	0	0	0	0
SS48	1	0	0	1	0	0	0
SS49	2	0	0	2	2	0	0
SS50	0	0	0	0	0	0	0
SS51	0	0	0	0	0	0	0
SS52	0	0	0	0	0	0	0
SS53	0	0	0	0	0	0	0
SS54	0	0	0	0	0	0	0
SS55	4	0	0	4	1	0	0
SS56	0	0	0	0	0	0	0
SS57	4	2	0	2	2	0	0
SS58	0	0	0	0	0	0	0
SS59	0	0	0	0	0	0	0
SS60	0	0	0	0	0	0	0
SS61	0	0	0	0	0	0	0
SS62	0	0	0	0	0	0	0
SS63	1	0	0	1	0	1	0
SS64	0	0	0	0	0	0	0
SS65	0	0	0	0	0	0	0
SS66	0	0	0	0	0	0	0
SS67	1	1	1	0	0	0	0
SS68	4	2	0	1	4	0	0
Totals	**658**	**399**	**177**	**142**	**96**	**101**	**107**

SSXX – Separate Sanitary Sewer Basin

CSXX – Combined Sewer Basin

In each basin, 50 to over 140 structures were inspected and catalogued by Burns & McDonnell engineers as well as numerous outfalls for each system. Pipe routing, condition, and other observations were also used in the analysis of each basin.

In addition to the inspection and observation of relevant structures in the field, overland flow routes were assessed, basin boundaries were outlined and depressional storage areas were identified.

2.3 HYDRAULIC MODELING OF AREAS WITH HIGHEST CONCENTRATION OF IMPACT

Areas identified as having a relatively significant number and high percentage of homes affected by surface induced flooding were chosen to have a computerized hydraulic model prepared in order to better quantify the performance of the existing system and determine the types of improvements that could be made to better serve the community. Based on Village-provided utility atlases and field reconnaissance, the model was built to simulate the actual performance of the existing stormwater management system. Rim elevations and inverts were input to provide accurate pipe slopes and, using one-foot contour maps, each area tributary to a run of pipe was delineated. This process was performed for each designated critical area, these areas being Hatlen Heights Subdivision, Isabella Street Area, Lonnquist Boulevard Area, and Highland Street Area.

These areas were analyzed in depth using the XP-SWMM commercial hydraulic modeling software to determine the existing level of service of the system. XP-SWMM is an industry standard software package that can accurately model hydraulic systems, including storm and sanitary sewers. The rainfall from the July 23rd storm was modeled and the results compared with what residents reported to the Village. After modeling the July 23rd storm event and calibrating the model, additional design storms were modeled for each system. These storms consisted of the 1-year, 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year recurrence interval storms. Once the data was collected, a determination for each area modeled was made regarding the existing level of service provided by the system. Based on this analysis and the recommended level of service in the area, several alternatives were analyzed for improving the stormwater management situation in each area. These alternatives are discussed in more detail in Chapter 6 of this study.

In addition to those areas where a high percentage of homes reported surface induced flooding, there were several localized areas where multiple homes located in very close proximity to each other reported street flooding. These areas included:

- Basin SS21 where a concentration of street flooding was identified along Tower Lane, Tower Drive and Sunset Road.
- Basin SS32 where a concentration of street flooding was identified at the intersection of Cherrywood Drive and West Palm Drive.
- Basin SS41 where a concentration of street and yard flooding was identified along Magnolia Lane, Pheasant Trail, and Catalpa Lane.
- Basin SS45 where a concentration of street and yard flooding was identified along Beechwood Drive and Grace Drive.

- Illinois American Area where a concentration of street flooding was reported in the 1400 block of Park Drive and the 1100 block of Ironwood Drive.

Hydraulic modeling consisting of a combination of tabular and computer modeling was performed in these areas. Alternatives developed for improving stormwater management in these areas is discussed further in Chapter 6 of this study.

One of the concerns brought to the Village's attention was that there was a possibility of a high groundwater table contributing to the large amounts of surface flooding experienced throughout the Village. While groundwater can be encounter at relatively shallow depths in the Village (less than 15 feet below ground surface) there is no reliable information or historical data base that can be used to accurately determine at what depth groundwater will be encountered in the Village. This is due to changes in geology or how quickly rain water will drain through the ground as a result of changes in the types of soil that can occur on a home by home basis. Groundwater elevations also fluctuate seasonally depending on the amount of rainfall and snowmelt that occurs over a given period of time. While high groundwater can have an impact, particularly on the amount of seepage that can enter a building through cracks in foundations and how often and long sump pumps operate, groundwater is not the cause of surface flooding or sanitary backups which were the most prevalent and significant types of flood impact resulting from the July 23rd storm event. Localized pockets where a high groundwater table exists typically are easy to recognize during the excavation of a foundation for a building because the excavation fills up with water. Seepage caused by groundwater fluctuations and areas where high groundwater tables exist can be managed by water proofing and installation of appropriately sized sump pumps or dewatering systems.

2.4 COST-BENEFIT ASSESSMENT & DETERMINATION OF SOLUTIONS

Based on the flood survey results, field reconnaissance and the hydraulic analysis, solutions were determined for each property that reported a flooding concern. In general these solutions where grouped together by basin, or drainage zone. Some basins had multiple solutions to improve flooding concerns. In these cases, a cost-benefit assessment was performed to determine which solutions had the most positive impact on residents on a per dollar basis. A cost-estimate for each solution was developed, along with a determination of how many properties that reported flooding would be positively impacted by the improvement.

Based on this information a cost per property was assigned to each proposed improvement. Once this number was attained it was modified based on the anticipated benefit that a particular improvement would have. For example, installing a large diameter relief sewer may increase the level of service that a public sector improvement will have for an area, but it typically will not provide as significant of a level of protection as installation of overhead plumbing for a specific resident.

Once the cost-benefit analysis was finalized, a list of recommendations, prioritized projects, and solutions for each drainage basin was compiled. The cost-benefit analysis is the basis for determining the recommended private and/or public improvement projects is discussed in Chapter 8 of this study.

Each individual property that reported flooding was evaluated for potential improvements. Appendix A presents detailed information regarding each reported occurrence of yard, home or building flooding and presents potential solutions for each property that completed a flooding questionnaire. Recommendations for public sector improvements that would be anticipated to benefit a particular property are also included in Appendix A.

* * * * *

3.0 BACKGROUND INFORMATION

The Village of Mount Prospect has already experienced most of its population growth. The census data for the year 2000 sets the Village's population at 56,265. The Chicago Metropolitan Agency for Planning (CMAP) projects that by the year 2030, this population will grow to 58,049. However, from 2000 to 2010 the population has declined 6 percent. Generally, a total population growth of 3.2% over a 30 year period means that the urbanization of the Village is nearly complete. As a result of this, very little additional stormwater runoff is expected to be generated by new development over the next thirty years.

The existing Village storm sewer system was primarily built in the 1940's, 1950's and 1960's; the population of the Village during this time period was approximately 1,720 in the 1940's, 4,009 in the 1950's and 18,906 in the 1960's. When compared to the 2000 population of 56,265 the Village's population has increased by approximately 3,300 percent since the 1940's, 1,400 percent since the 1950's, and 300 percent since 1960's.

This type of population growth also means growth within the Village in the form of new buildings, additional roads, parking lots, and general development all of which increased the total impervious (paved) area in the Village, thereby increasing stormwater runoff. Consequently, certain areas of the Village system are overtaxed, providing conveyance for up to ten times the amount of flow they were originally designed for. Exhibit 4 shows two aerial views of the Village, and compares the amount of development between 1952 and 1987. As can be seen, the amount of impervious area drastically increased during this time period.

3.1 JULY 23RD, 2011 STORM EVENT

According to the hourly rain gauge at Chicago O'Hare International Airport, during a three-hour window starting at 1:00 AM on July 23rd, 2011, 6.78 inches of rain fell in the Village of Mount Prospect area. This intense rainfall was added to the 1.29 inch total that fell the day earlier to bring the cumulative precipitation total for the event to 8.27 inches over a twenty-four hour period. This event caused basement flooding, front and rear yard flooding and street flooding. A unique characteristic of the July 23rd storm event was that it was concentrated over a small area that included the Village of Mount Prospect (see Figure 3.1 on the following page). The high intensity, short duration and time at which the storm occurred made it especially difficult to respond to for the residents as well as Village personnel. The current criterion for the design of new storm sewers is that they be designed for a 10-year level of service. This would translate into a quantity of rain of approximately 2.8 inches in three hours. When compared to the 6.78 inches over the same time frame that the July 23rd storm produced it can easily be understood why the Village sewers were unable to handle such an event. When put in the context of "level of service", in order for any given combined sewer or storm sewer system to have been able to convey the volume of stormwater produced by the July 23rd storm event it would have to have a 400-year or greater level of service. While technically attainable, the resulting downstream impacts on current Village outfalls including MWRDGC interceptors and receiving streams would be significant and extremely difficult if not impossible to permit without significant storage such as above or below grade detention/retention facilities. The cost of such a system would be exorbitant.

According to the data gathered during the Village's flooding questionnaires and discussion with Village personnel other historical events that have caused flooding within the Village occurred on June 10th, 1967, with 3.09 inches in a day; August 14th, 1987, with 9.35 inches in a day; May 9th, 1996, with 2.10 inches in a day; and September 13th, 2008, with 6.64 inches in a day. Each of these events was continuously mentioned during the flood surveys that were performed in the wake of the July 23rd, 2011 storm event.

Of these events, only the 1987 storm event produced a higher quantity of rainfall in a 24-hour period (9.35 inches), than the July 23rd event. **However, the most intense rainfall ever recorded over a three-hour period in the vicinity of the Village (6.78 inches) occurred during the July 23rd, 2011 storm.** During all of the referenced historical events the highest 3-hour rainfall total was 3.32 inches during the 1987 storm, half of the July 23rd 2011 storm total. Approximately a 25-year level of service would need to have been provided by the Village combined and separate stormwater systems to mitigate the 1987 storm event. It should be noted that in November, 1990 the Village completed a Comprehensive Stormwater Management Report to reduce flooding that occurred in the Village as a result of the 1987 storm event. Recommendations for storm sewer and combined sewer improvements made in the Comprehensive Stormwater Management Report (1990 Report) were designed and constructed to provide a 25-year level of service. Recommendations for separate sanitary sewer improvements made in the 1990 Report were designed and constructed to provide a 10-year level of service. Figure 3.2 presents a comparison of rainfall for intense historical storms experienced in the Village of Mount Prospect.

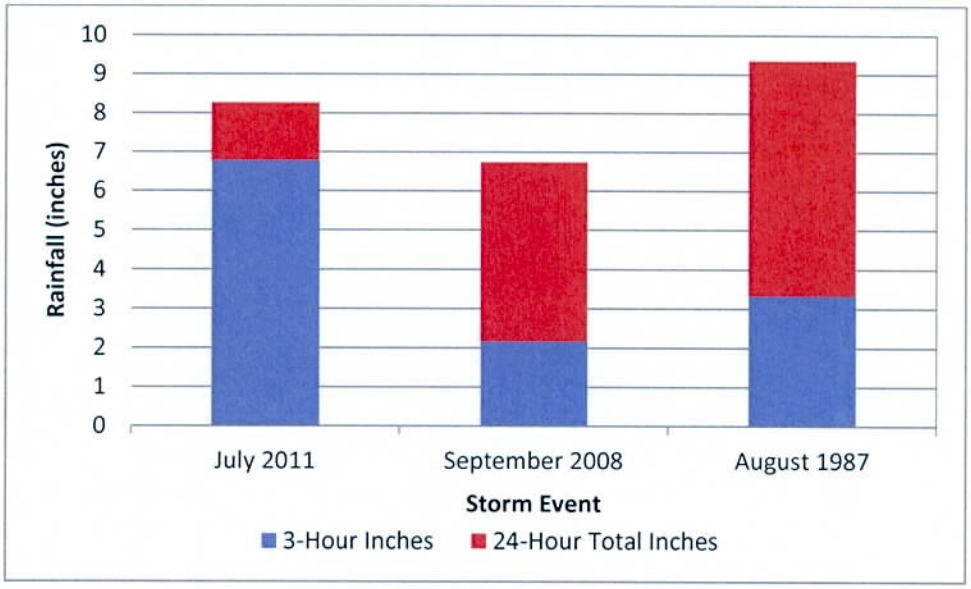


Figure 3.2: Comparison of Rainfall for Intense Historical Storms

3.2 HISTORY OF VILLAGE MOUNT PROSPECT SEWER SYSTEM

When the Chicago area was initially settled by pioneers in the early 1800s, outdoor privies were utilized for sanitation and drinking water was pumped from shallow wells. However, due to the flat topography of the area, and the sandy soil near Lake Michigan, settlers were soon plagued by waterborne diseases caused by privy water contaminating nearby drinking water wells. To correct this problem, settlers decided to start drinking water from the lake.

The separation of drinking water from wastewater was an elegant solution that worked well for a few years. However, the early settlers were also plagued by large rainstorms and frequent flooding; as is the case until this day. After all, most of early Chicago was constructed on an area that had formerly been marsh land. To solve the flooding problem, early Chicagoans laid sewers that drained the marsh areas and discharged to the Chicago River. At that time, the Chicago River discharged into Lake Michigan.

The new sewers worked extremely well. They not only drained the land, they also drained the outdoor privies as well. However, by that time, Chicago had grown so much that outdoor privies were no longer tolerated. Instead, homes and buildings were simply connected to the new sewers. All wastewater (both sanitary and industrial), as well as all storm water, was discharged to the local river system via sewer pipes. These first sewers were "combined" sewers; both sanitary waste and storm run-off were collected and conveyed in the same pipe.

Certainly, city leaders of the time realized that their new sewer system was ultimately discharging into the source of their drinking water (Lake Michigan). However, they embraced a common belief of the time that "dilution was the solution" to avoid contamination of their drinking water. That is, they believed that the large volume of fresh water in Lake Michigan, along with the curative characteristics of sunlight, would cleanse their wastewater flows. Unfortunately, this belief was proven misplaced time and again resulting in frequent outbreaks of waterborne diseases such as cholera, typhoid, and dysentery.

In the mid-1800s, quite by accident, city workers discovered that pumps installed to pull water into the Illinois and Michigan Canal from the Chicago River were also pulling sanitary waste and pollution into the canal. The Illinois and Michigan Canal was constructed in the 1840s for the purpose of providing a maritime link between the Great Lakes (Lake Michigan) and the Illinois River. Since the Illinois River is tributary to the Mississippi River, and the Great Lakes stretch all the way to New York, this man-made waterway played an important early role in the establishment of the Chicago area as a major transportation hub.

The Illinois and Michigan Canal was the brainchild of explorer Louis Joliet who noted its potential during an 1816 expedition. However, the canal wasn't placed into service until 1848. The canal required mechanical pumps to periodically pull water uphill from the Lake Michigan basin over a drainage divide that runs north and south in the general location of present-day Harlem Avenue. The pumps were effective at "reversing" flow from the Chicago River during dry weather but they were easily overpowered by nominal rains. As a result, pollution of Lake Michigan drinking water remained a persistent problem.

By the late 1800s, as the city rebounded from the Great Chicago Fire of 1871, a plan was drawn to separate wastewater from drinking water by more effectively reversing the flow of both the Chicago and Calumet Rivers. This plan resulted in the construction of the Sanitary and Ship Canal as well as the Calumet Sag Channel. These waterways utilized a series of locks to climb and descend the drainage divide. They permanently reversed the flow of both the Chicago River and the Calumet River. The project was extremely innovative requiring the development of new techniques and equipment. Much of what was learned during the construction of these channels was later applied to the excavation of the Panama Canal.

To manage these massive projects, and operate the expansive sewer and drainage systems associated with them, the Illinois legislature created the Sanitary District of Chicago in 1889. This agency would become known as the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC). Although its name implies association with the City of Chicago, it is actually a creature of state government. Today, in addition to operating the canals, the MWRDGC is responsible for wastewater treatment and flood management throughout most of Cook County.

The Sanitary and Ship Canal, along with the Calumet Sag Channel, was officially opened for business in 1900. These waterways remained in operation, effectively collecting raw wastewater and storm water from the City of Chicago, and depositing it in the Illinois River until 1925. Although the channels continue to operate until this day, the practice of dumping raw sewage into the Illinois River was discontinued in 1925 as a result of a U.S. Supreme Court ruling. Interestingly, the ruling had nothing to do with concerns about environmental impacts or effects on downstream communities (such as St. Louis). Rather, the practice of discharging raw sewage into the Illinois River was halted because the process was drawing too much water from Lake Michigan. It took a great deal of fresh water to dilute and flush away the growing volume of waste generated by the burgeoning city.

In response to the Supreme Court ruling, the MWRDGC began constructing wastewater treatment plants. One of the first plants constructed was the "north side" plant situated on the Skokie/Chicago border. This plant began operating in 1928. To feed this plant, the MWRDGC constructed large diameter transmission sewers to intercept existing local sewers just before they discharged into waterways. On dry days, these "interceptors" carried most of the wastewater to treatments plants. When it rained, the interceptors would quickly fill and the local sewers would discharge directly into local waterways as they had for decades.

This was the state of affairs when the first sewers were constructed in the Village of Mount Prospect during the 1920s. Finger-like interceptor sewers stretched out from the MWRDGC Skokie plant and intercepted Mount Prospect sewers just before they discharged into Weller Creek and the Feehanville Ditch.

3.2.1 Weller Creek and Feehanville Creek Drainage Districts

Flooding has been a problem in the Mount Prospect area long before the first homes and businesses were constructed. So much so that the early farmers settling the area organized specialized drainage districts to construct sewers for the specific purpose of draining their fields following the area's frequent heavy rains. The Weller Creek and Feehanville Creek drainage districts installed drainage tiles and excavated the creek channels in an effort to better drain their fields and minimize the damage wrought by flood waters. However, these early sewers were insufficient to serve the rapidly growing settlement. Consequently, one of the earliest tasks of the Village's founding fathers was to commission the construction of a local sewer system.

3.2.2 Combined Sewers

The local sewer system serving early Mount Prospect was comprised entirely of combined sewers. Today, combined sewers constitute approximately 34% of the Village-owned sewer system.

In the 1920s, as was typical of the time, both storm water and wastewater were conveyed using the same pipe. That is, homes and street inlets were connected to the same pipe. Initially, these pipes discharged both stormwater and sanitary wastewater into area creeks. When the MWRDGC interceptor system was constructed, wastewater was transported to the treatment plant in Skokie. During rain events, stormwater and sanitary wastewater flows usually over-taxed the interceptor pipes and were discharged to the creeks. Figure 3.3 presents a combined sewer system.

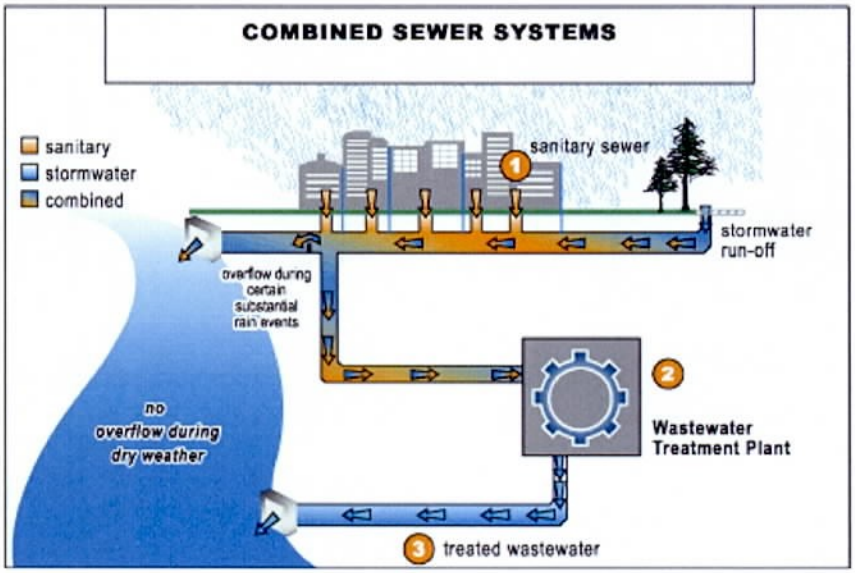


Figure 3.3: Combined Sewer System

Typically, homes and buildings were connected to the combined sewer by means of gravity (no sump pumps or ejector pumps). Some homes also had "catch basins" installed on their service lines (the pipe that connects the home to the main sewer). These catch basins were designed to collect solid wastes while allowing liquids and stormwater to travel through to the main sewer. Periodically, the catch basins would have to be cleaned to prevent backup of wastewater into the home. Footing tiles, downspouts, and yard drains were also connected directly to the combined sewer mains. A prevailing thought at the time, was that numerous sources of fresh water (i.e. street inlets, downspouts, footing tiles, and yard drains) were desirable because the additional fresh water helped to "flush" sanitary wastes downstream and control odor problems. Typically, buildings serviced by combined sewers do not have overhead sewers and are more susceptible to flooding through floor drains and toilet backups.

3.2.3 MWRDGC Relief Sewers

The MWRDGC "interceptor" system helped to reduce the amount of sanitary discharges in local waterways but did not prove to be an effective solution; there were still hundreds of sanitary discharges to the creeks each year. Additionally, the Village was plagued by persistent flooding problems. Homes and streets flooded on a regular basis. In fact, homes, buildings, and roads throughout the Chicago area were routinely subjected to flood waters. Drenching rains in 1949, 1953, and 1955 prompted a flood study which recommended the construction of relief sewers throughout the Village-owned sewer system.

Unfortunately, the Village lacked the financial resources at the time to fund these improvements. To solve this problem, the Village deeded title of its local combined sewer system to the MWRDGC in 1955.

The MWRDGC then issued $2 million in revenue bonds to finance the construction of a series of relief sewers in the Mount Prospect sewer system. The MWRDGC would retain ownership of the Village's local combined sewer system until the debt from the revenue bonds was retired in 1980.

The relief sewers were large diameter pipes designed to fill during rain events. The pipes would temporarily store combined sewer flows during a storm surge and release them to the interceptor sewers after the rain subsided. A series of six (6) relief sewers were constructed in Mount Prospect between 1955 and 1957. In total, 35,575 feet of pipes ranging in size from 21" in diameter to 58" x 91" rectangular conduit were installed. Exhibit 5 denotes the locations of these projects. Similar relief sewers were constructed in other locations throughout the MWRDGC service area; the flooding problem was not unique to Mount Prospect. The goal of these relief sewer projects was to provide protection from a "5-year" recurrence storm event.

Unfortunately, despite the millions of dollars spent on intercepting sewers, treatment plants, and relief sewers, structure and surface flooding remained a persistent problem in Mount Prospect and throughout Cook County.

3.2.4 Separate Sanitary Sewers

During the 1960s, developers and municipalities began to realize that the idea of collecting and conveying sanitary and storm water in the same pipe was problematic. During this time, the Village's first separate sanitary sewer systems were installed. Separate sanitary sewer systems collect and convey sanitary waste in one pipe and storm water in a completely separate, unconnected, pipe. The separate sanitary sewers discharge to the MWRDGC interceptor system which, in turn, conveys the wastes to a treatment plant. The storm sewers discharge directly to area creeks.

The oldest separate sanitary sewer systems were different than those constructed today. Most notably, the first separate sanitary sewer systems featured primarily gravity connections (no sump pumps, ejector pumps, or overhead plumbing) and several sources of rain water inflow. Footing tiles and area drains were directly connected to the house service line allowing rain water to enter the separate sanitary sewer system. Later design iterations included a combination sump pump that collected storm water from footing tiles and yard drains or exterior stairwell drains along with sanitary wastes generated in the basement level of the home and pumped it into the separate sanitary sewer. It is likely that these clear water sources were permitted because of an affinity for the idea that some clear water in the sewer helped to flush and control odors.

Today, sanitary sewer design features a complete separation of sanitary and storm flows. Ejector pumps collect sanitary wastes and pump them up to a sanitary sewer service line that exits the home at an elevation just below the basement rafters. In most cases, these elevated or "overhead" sewer services virtually eliminate the potential for sewer backup through floor drains or basement sanitary facilities; sewage will back-up through street manholes before backing up inside a home. Sump pumps perform a

similar function for clear water collected by footing tiles and area drains. However, sump pumps discharge outside the home at grade rather than discharging to the sanitary sewer.

Generally, the outlying, or newer, areas of the Village are served by separate storm and sanitary sewers. Today, approximately 66 percent of the Village is served by separate sanitary and separate storm sewers. All new developments utilize separate sanitary and storm sewer systems. Homes in these areas typically do not experience floor drain backups unless the floor drain or sump pump is directly connected to the sanitary sewer system or if there is a high amount of stormwater infiltration into the sanitary sewer system. Sewer backups are rarely experienced in these areas where overhead plumbing is utilized. For example, Bonita Court, Semar Court, Thomas More, and the Brentwood subdivision are all newer residential developments constructed utilizing overhead sewers, separate storm and sanitary sewer systems, and stormwater detention ponds. No structure flooding was reported in any of these areas following the July 23rd storm. Figure 3.4 presents a typical separate sewer system.

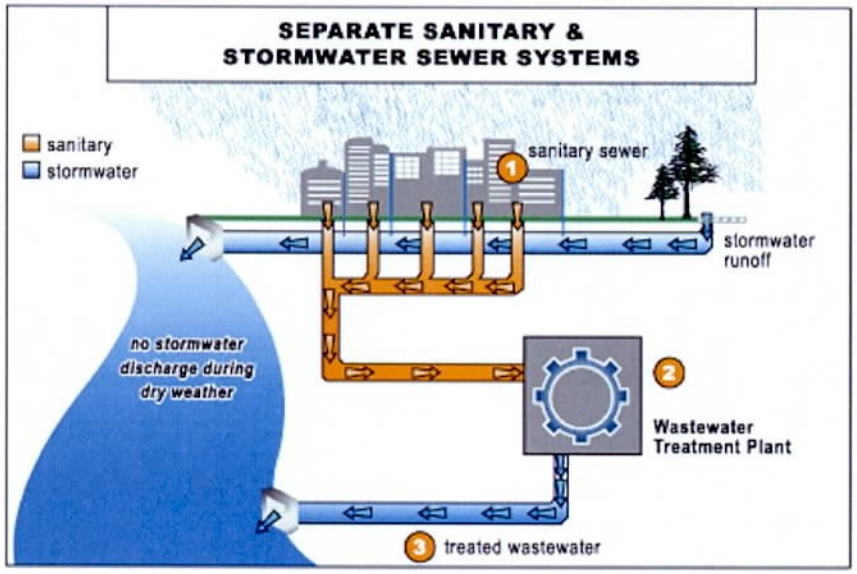


Figure 3.4: Separate Sewer System

Unfortunately, the evolution of separate sanitary sewer systems did not prove to be a panacea for the Village's flooding problems. A heavy storm in 1966 caused widespread flooding and resulted in the construction of a number of sewer relief pumping stations throughout the separate sanitary sewer system.

Relief pumping stations are pumps that work primarily during rain events and force wastewater into the MWRDGC interceptors under pressure. Relief stations were constructed on Cottonwood Drive in 1966, George Street (south) in 1968, George Street (north) and Louis Street in 1971 and William Street in 1972.

Despite the improvements to date, heavy flooding revisited the Village in 1967 resulting in a number of additional flood relief projects including construction of the Crumley and Clearwater detention basins, and the construction of a relief storm sewer in the Hatlen Heights subdivision,

Additionally, the Village also enacted ordinances to limit construction within flood plains and assure new construction projects included current designs for sewer construction and storm water management.

Most notably, the 1967 storm prompted the creation of the Mount Prospect Drainage and Clean Streams Commission. This commission was an ad hoc group of Village officials, residents, and engineering consultants tasked with assessing the causes of flooding and recommending proposed solutions.

The commission identified a number of capital improvement projects to alleviate flooding including the construction of storm sewers on Lonnquist and Can Dota; installation of a relief pumping station on Lincoln Street to serve the Hatlen Heights subdivision; grading modifications at [redacted]; storm water improvements in the Wedgewood Terrace subdivision; and stabilization of the Weller Creek banks. Ultimately, all of these projects were completed by the Village.

Interestingly, the commission also attributed some of the flooding experienced by the Village to stormwater run-off from private property development. To that end, they heralded the enactment of new ordinances requiring on-site stormwater detention for new developments as an important part of the solution to flooding woes.

Additionally, the commission pinned hopes for an ultimate solution to the Village's flooding problems on a major new public works endeavor advocated by the MWRDGC. The commission referred to this endeavor as the "Chicago Underflow Plan" (CUP) but it would soon become commonly known as the "Deep Tunnel".

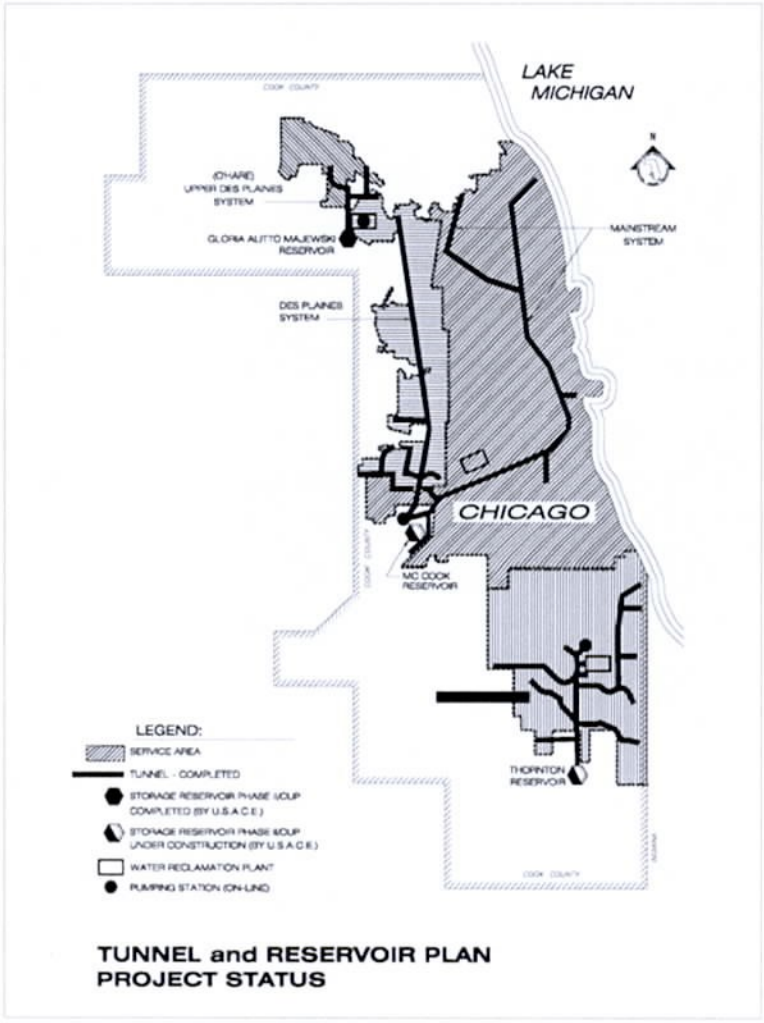
3.2.5 MWRDGC TARP System

The 1960s, and early 1970s, were also a time of heightened awareness of the environment. As a consequence, the persistent flooding problems, along with the frequent discharges of raw sewage to local waterways, become a matter of national importance. Rainfall-induced combined sewer flows overwhelmed the capacity of the treatment plants at least 100 times per year resulting in direct sewage discharges to local waterways. On several occasions each year, the Chicago River swelled with so much untreated sewer flow that its water level was 3-1/2 feet higher than the water level of Lake Michigan. Inevitably, this hydraulic disparity resulted in the opening of the locks that were installed to separate the Chicago River from Lake Michigan when the river's flow was reversed. The open locks facilitated the discharge of sewage into Lake Michigan; which had now become the potable water source for millions of residents in the metropolitan area.

During this time, the MWRDGC, along with experts from the United States Environmental Protection Agency and a host of consulting engineers, incubated the idea of creating a new underground river, deep in the dolomite bedrock beneath the metropolitan area, to temporarily store combined sewer overflows that would otherwise discharge into surface waters. This idea came to be known as the "Deep Tunnel".

The "Deep Tunnel", or as it is more formally known - the Tunnel and Reservoir Plan (TARP), was adopted by the MWRDGC in 1972. The proposed system was Chicagoland's plan to comply with federal and state water quality standards in the areas served by *combined* sewer systems. The primary goals of the TARP system were to protect Lake Michigan, improve the water quality of local streams and bodies of water, and to provide an outlet for floodwaters to reduce street and basement sewage backup and flooding.

Phase 1 of the TARP plan includes four distinct tunnel systems: the Mainstream, Des Plaines, Calumet, and O'Hare (Upper Des Plaines). The configuration of the tunnel system is shown at right. During an intense storm event, combined sewer overflows (CSO's) are directed into the tunnel and are stored until after the event. Pumping stations then dewater the tunnels and direct the water to identified water reclamation plants as capacity becomes available. Construction of the Phase 1 tunnel systems began in 1975, and portions of the tunnel system were in operation by 1985. By 2006, all of Phase 1 was completed and in operation. In total, the system contains 109.4 miles of large diameter deep rock tunnels that provide 2.3 billion gallons of storage volume to capture overflow. The total construction cost of all Phase I tunnels (Mainstream, Des Plaines, Calumet, and O'Hare) was over $4.4 billion. Phase 1 of the TARP plan includes those improvements that impact the Village of Mount Prospect.



MWRDGC Tunnel and Reservoir Configuration

Mount Prospect is served by the O'Hare tunnel. The O'Hare tunnel is comprised of 6.6 miles of pipe ranging in size from 9 feet to 20 feet in diameter at depths approaching 300 feet. It has the capacity to hold approximately 70 million gallons of combined sewer flows.

Since the tunnels were completed, more than 950 billion gallons of CSO have been captured and treated; including more than 900 million pounds of biochemical oxygen demand and 1.7 billion pounds of solids that otherwise would have overflowed to area waterways. In all, the tunnel system has captured and enabled treatment of about 85 percent of the CSO pollution loading from TARP's service area.

Phase 2 of the TARP system will increase the total flood storage of the system to 17.5 billion gallons, and will consist of the construction of three large reservoirs throughout the Chicago metropolitan area. Portions of this system have been constructed, portions are in the process of construction, and some portions have yet to be constructed. In all, the overall Phase 2 system is scheduled for completion in 2023.

Mount Prospect is directly served by the Majewski reservoir. This reservoir is located southwest of the Route 83 bridge over Interstate 90. This facility was completed in 1998 and has the capacity to store over

350 million gallons of combined sewer flow. It was constructed at a cost of $45 million. It is dewatered and treated by the Kirie Wastewater Treatment Plant on Oakton Street in Des Plaines.

As mentioned previously, the Village of Mount Prospect wastewater collection system consists of both combined and separate sanitary sewer systems. These combined systems convey wastewater to Metropolitan Water Reclamation District of Greater Chicago (MWRDGC interceptors and the TARP Facilities. Wastewater generated within the Village is ultimately treated at the MWRDGC Kirie Wastewater Reclamation Plant (WWRP) in Des Plaines, Illinois. Mount Prospect wastewater can also be directed to the Northside WWRP located in Skokie, Illinois via the MWRDGC interceptor system.

Completed in May 1980, the Kirie Plant is the MWRDGC's newest facility. The Kirie Plant serves a predominantly residential area which includes Arlington Heights, Mount Prospect, Elk Grove Village, Prospect Heights, Wheeling, Buffalo Grove and parts of Rolling Meadows and Des Plaines. The Kirie Plant has a design capacity of 72 million gallons of wastewater per day. The Kirie Plant has its own tunnel and reservoir plan (TARP), which is independent of the Mainstream, Des Plaines and Calumet systems. The Kirie TARP is designed with the dual purpose of conveying dry weather flows to the plant and storing excess flows during rainstorms.

The main portion of the Northside Water Reclamation Plant began operation in 1928. The Plant serves over 1.3 million people residing in a 141 square mile area which includes the City of Chicago, north of Fullerton Avenue and the northern Cook County suburbs. The North Side Plant removes pollutants from wastewater through a series of physical and biological processes. The North Side Plant has a design capacity of 333 million gallons per day.

During storm events in the Kirie TARP service area, flows that exceed the capacity of MWRDGC interceptors overflow into the O'Hare tunnel. Once the O'Hare tunnel is full, the Majewski TARP Reservoir fills. When the Majewski TARP Reservoir fills to capacity, combined sewer overflows can occur with wet weather flow being discharged directly into area waterways and tributaries including the Des Plaines River, the Chicago River, and ultimately, Lake Michigan. During and immediately after the July 23rd storm, there were overflows recorded in Weller Creek, Feehanville Ditch, the Des Plaines River, the Chicago River, and Lake Michigan. The location of the Kirie Plant and Tarp System is shown on Figure 3.5. A graphic depicting how the Kirie TARP system works is presented in Figure 3.6.

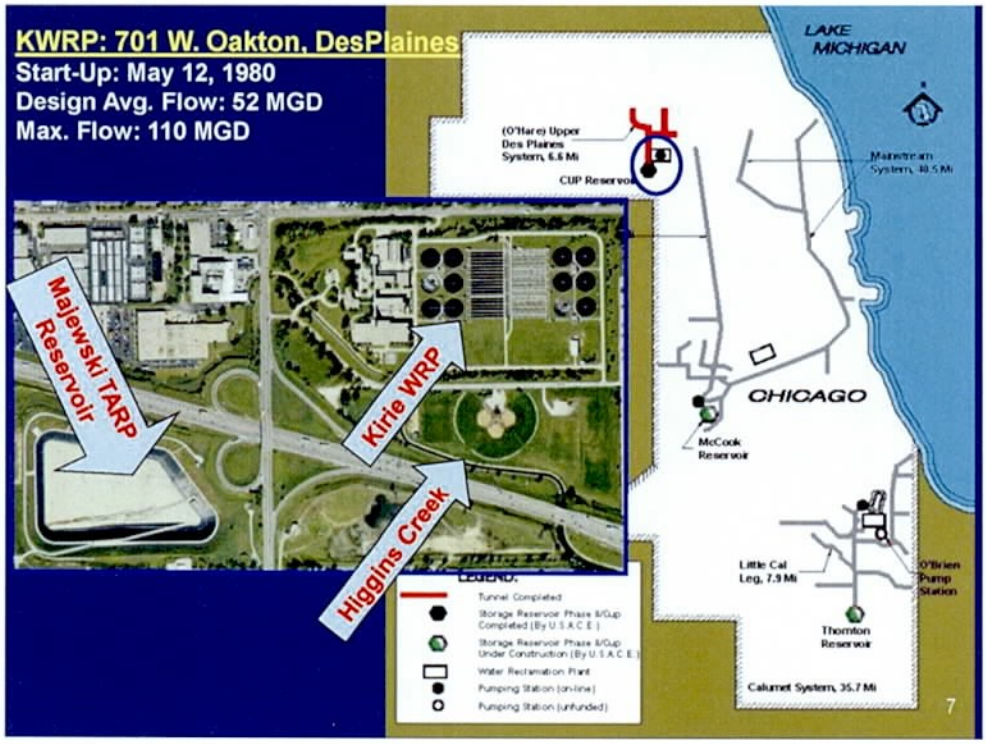


Figure 3.5: Location of the Kirie Plant and TARP System

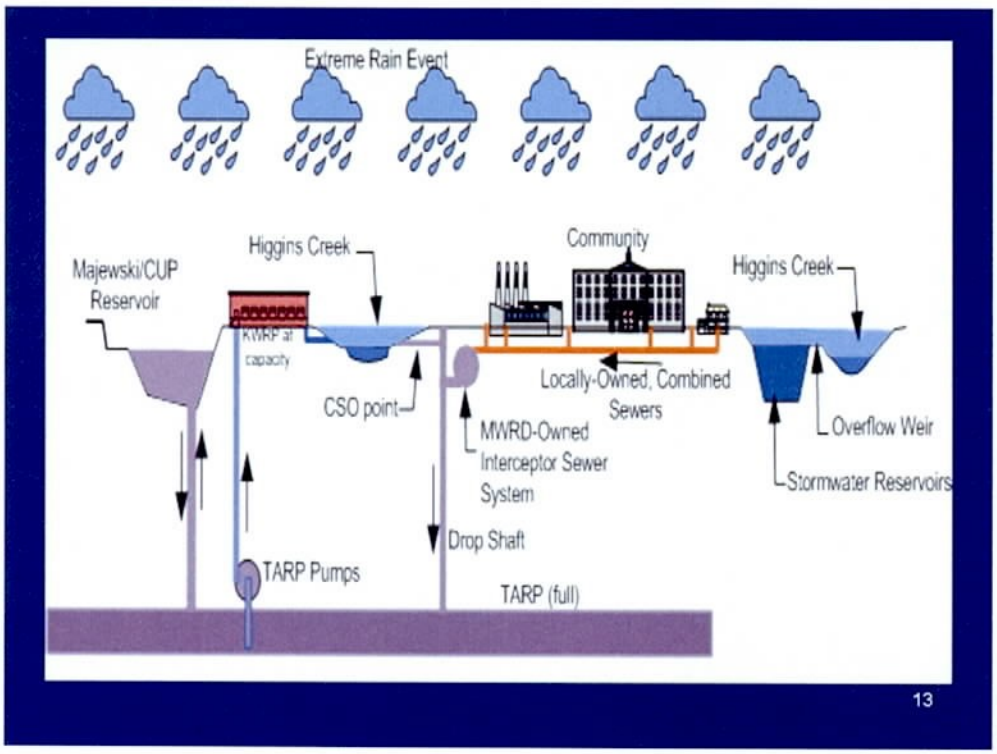


Figure 3.6: Kirie TARP System Schematic

3.2.6 Infiltration/Inflow Corrective Action Plan (ICAP)

In 1985, the MWRDGC adopted the Infiltration/Inflow Corrective Action Plan (ICAP). This initiative was the result of a realization that separate sanitary sewers were also contributing to the area's flooding problems. In theory, separate sanitary sewers were not supposed to collect and convey rain water. However, the reality was that many separate sanitary sewer systems featured numerous sources of rain water inflow, such as downspout connections or sump pump connections. Additionally, most of the separate sanitary sewers installed before 1985 were constructed of clay tile that had the tendency to develop cracks or other defects. These defects enabled the infiltration of groundwater or rainwater. Ultimately, these inflow and infiltration sources allowed a great deal of clear water (rain water or ground water) to enter the separate sanitary sewer system. This clean water would then be conveyed to area water reclamation plants for treatment. Engineers realized that this additional clean water, which did not need require treatment, was creating an unnecessary and expensive demand on the area's treatment plant capacity.

The objective of ICAP was to identify sources of rainfall and groundwater that were entering the separate sanitary sewer collection system and have them removed by the local municipality to reduce the amount of rainwater and groundwater being conveyed and treated by the MWRDGC; thereby reducing wet weather induced overflows into local receiving streams and Lake Michigan.

Actually, the 125 municipally-owned separate sanitary sewer systems tributary to the MWRDGC system were initially offered two compliance alternatives of which ICAP was one of the options. The other option was the "150" program. Under this program, excessive infiltration and inflow was considered any separate sanitary sewer flow that exceeds 150 gpcpd (gallons per capita per day). 150 gpcpd was a calculated value determined to be the amount of water an average person would use in a day plus a buffer to allow for nominal infiltration and inflow.

Under the ICAP option, excessive infiltration and inflow is defined as the quantity of clear water that can be economically eliminated from the sanitary sewer system by rehabilitation. The actual amount of water to be eliminated was determined by a cost-effectiveness analysis that compares the costs for rehabilitating the local sewer system against the cost of transporting and treating the excess flow.

The vast majority of MWRDGC communities selected the ICAP option. Most communities, with older sewer systems and private plumbing, considered the 150 gpcpd goal unattainable.

As part of ICAP, municipalities were required to perform extensive sewer system investigations including flow monitoring, smoke testing, manhole inspections, dyed water flooding of sewers, internal television inspection of separate sanitary sewers and external and internal building inspections to identify sources of rainwater and groundwater entering the sanitary sewer system. A cost effective analysis was required as part of the ICAP to determine what sources of inflow and infiltration were cost-effective to remove from the separate sanitary sewer system. The Village of Mount Prospect completed its ICAP in 1987. Cost-effective sources of inflow were identified and removed from the Village's separate sanitary sewer system. These included removal of public sector sources such as indirect and direct connections between the storm sewer system and separate sanitary sewer system, repair of leaking manholes and sanitary sewer pipes; and private sector sources such as directly connected downspouts, window well drains, yard drains,

storm water sump pump connections and other miscellaneous area drains. Foundation drains were not found to be cost-effective to remove in the Village's ICAP. Foundations drains were also not found to be cost-effective to remove in all of the other municipalities required to complete ICAPs.

Since foundation drains were not cost-effective to remove based on the results of the ICAP, they typically remain connected to the separate sanitary sewer system. However, each foundation drain can introduce 3 to 4 gallons per minute (gpm) of inflow into the separate sanitary sewer system. A typical 8-inch-diameter sanitary sewer has a capacity of approximately 300 gallons per minute. It is not uncommon for 8-inch-diameter sewers to be designed to flow at least 30 percent full during peak usage in dry weather. In fully developed areas like the Village of Mount Prospect it is not uncommon for these sewers to be 50 percent to 70 percent full during peak usage. Based on this information, using an average 3.5 gpm, it takes only 30 to 60 directly connected foundation drains to fill up an 8-inch-diameter sewer. If the sewer were completely empty it would take approximately 90 foundation drains to completely fill an 8-inch-diameter sewer. Based on review of data from the Village, approximately 56 out of 69 separate sanitary sewer basins have the equivalent of over 100 homes located in them with foundations drains connected. With this many foundation drains connected it is not a surprise that sanitary sewer backups occurred in the areas of the separate sanitary sewer system as a result of the July 23rd storm event.

As part of ICAP the Village was required to complete post-rehabilitation flow monitoring of its separate sewer systems. Based on the post-rehabilitation flow monitoring the Village was able to achieve a Village wide post-rehabilitation flow rate of 673 gallons per capita per day based on the MWRDGC 3-year, 2-hour, 4 hour maximum average storm criteria. This rate was established in July, 1991.

Also as part of ICAP, the Village entered into a Long Term Operations and Maintenance Agreement with the MWRDGC. In this agreement, the Village agreed to an on-going, perpetual maintenance schedule designed to maintain or reduce the post-rehabilitation flow rate (673 gpcpd). That is, the Village was tasked with keeping the overall flow from its separate sanitary sewer basins at or below 673 gpcpd.

Maintenance activities required by this agreement included closed circuit TV inspection and assessment of separate sanitary sewer mains and manholes, continued flow monitoring of separate sanitary sewer basins, as well as continued inspections of private buildings to assure that improper clear water connections (sump pumps, etc.) were not re-established.

This information was to be utilized to assess the need for repairs to the separate sanitary sewer system. The Village used this information to prioritize manhole replacements, sewer replacements, and cured-in-place (CIPP) lining work. In the past 20 years, almost 40% of the Village-owned separate sanitary sewer system has been rehabilitated with CIPP. As a result of these programs the Village's current 3-year recurrence interval, 2-hour duration, peak 4-hour flow rate (post-rehabilitation flow rate) is 209 gpcpd; a reduction of approximately 69% percent.

3.2.7 Flood of 1987

In August 1987, the Village was tormented by a storm so devastating that it would ultimately set the course of the Village's storm water management efforts for the next two decades.

For the second time in less than a year, a deluge of water fell on the northwestern suburban Chicago area. The rains started during the early morning hours of August 14, 1987 and before they let up some twelve hours later, nearly ten inches of rain had fallen on the area. The volume of water was so great that retention/detention areas quickly overflowed their banks, creeks and waterways were swollen into vast lakes, and the MWRDGC's "Deep Tunnel" was filled to capacity.

The results were devastating. Cars were stranded on highways as interchanges and underpasses flooded, O'Hare International Airport became an island with roads in and out impassable, and thousands of basements were flooded. Many families who were still recovering from the flood of 1986 were hit with a double whammy by this second rainfall.

In Mount Prospect, the results were much worse than in 1986 when the Des Plaines River overflowed its banks and flooded approximately 200 homes. This time the flooding was Village-wide with an estimate of several thousand homes being flooded. Fortunately, the flood waters subsided quickly and by Saturday, August 15, 1987, most of the roads were again passable.

However, the damage had been done and Village residents faced a massive cleanup. The cleanup started immediately and by Monday morning, parkways were heaped with furniture, carpeting, appliances and other items ruined by the flood. During that week, Village crews and refuse contractors hauled an estimated 9,000 tons of flood-damaged goods from the residents' homes.

The devastation from this storm prompted a comprehensive stormwater management study that resulted in a final report delivered in November, 1990.

3.2.8 1990 Comprehensive Stormwater Management Report

The 1990 Comprehensive Stormwater Management Report encompassed most of the Village. The areas included in the study were the Weller Creek Drainage Area, Feehanville Drainage Area, and Des Plaines River Drainage Area.

The scope of the stormwater management studies consisted of 1) collection and review of existing data pertaining to existing drainage facilities, contour maps, soil types, floodplain data, reported flooding problems and previous flood control reports, 2) computerized simulation of storm and sanitary hydraulics and existing drainage facilities data, 3) evaluation of existing drainage facilities for adequacy during selected storm events, 4) development and analysis of various alternatives for providing an increased level of flood protection, 5) development and analysis of various alternatives for providing erosion control in selected areas of the Weller Creek Channel, 6) determination of the most practical level of storm protection, 7) recommendation of a plan for increased flood protection, 8) recommendation of a plan for erosion control in selected areas of the Weller Creek Channel, 9) preparation of preliminary costs and scheduling for implementation of the recommended plan. The intent of the stormwater management studies and subsequent improvements was to mitigate surface flooding and sanitary backup resulting from 10-year to 25-year storm events. **Based on the review of the flooding questionnaires the areas in which improvements were made reported significantly less surface flooding and sanitary backup than what was reported during field reconnaissance following the August 1987 rainfall event.**

Weller Creek Drainage Area

The Weller Creek Drainage Area included improvements in Basins SS11, SS15, SS16, SS22, SS42 and CS31. The areas were referred to as the See-Gwun/Golf Flooding Area, the See-Gwun/Milburn Sanitary Area, the Maple/Berkshire Sanitary Area, the Catalpa/Birch Flooding Area, the Hatlen Heights Flooding Area, the Clearwater Flooding Area, the Melas Detention Basin, the Crumley Detention Basin, and Weller Creek. A brief discussion of each of these areas is presented below.

The See-Gwun and Golf Flooding Area is located in Basin CS31. This area had a level of service of less than 2-years along See-Gwun Avenue and Sunset Road. The recommended improvement in the November 1990 Comprehensive Stormwater Management Report (1990 Report) consisted of a separate relief storm sewer system installed along Sunset Road from We-Go Trail to Na-Wa-Ta Avenue and north along Na-Wa-Ta- Avenue to Lonnquist Boulevard. This improvement was constructed with the intent of increasing the capacity of the storm sewer system to a 25-year level of service. During the July 23, 2011 storm only eight occurrences of street flooding were reported in Basin CS31. It is believed that the primary reason for the street flooding was the result of the magnitude of the July 23rd storm event (approximately 400 year event). The cost of the improvement made in the See-Gwun and Golf Flooding Area was $616,000. Work was completed in 1996.

The See-Gwun/Milburn Sanitary Area is located in Basin SS15. The recommended plan was to provide 10-year level of service against sanitary backups through construction of sanitary relief sewer and an underground storage facility at Lincoln Junior High School. As part of the work in Basin SS15 a sanitary relief sewer and sanitary relief station were constructed to mitigate sanitary backups. Only two occurrences of sanitary backup were reported in Basin SS15. The work completed by the Village in this area has proven to highly successful in mitigating flooding from extreme storm events. The cost of the improvements made in Basin SS15 was $1,209,000. Work was completed in 1997.

The Maple/Berkshire Sanitary Area is located in Basin SS22. The recommended plan was similar to the general design for the See Gwun/Milburn project but differed in construction means and methods. The project was designed provide a 10-year level of service against sanitary backups and included a relief pumping station. Only one home in the Maple/Berkshire service area reported flooding following the July 23rd storm. Work was completed in 1999 at a cost of $1,800,000.

The Catalpa and Birch Flooding Area is located in Basin SS42. Analysis completed in 1990 determined that there was a less than 2-year level of service along Catalpa Lane and Fern Drive. The recommendation for this area was to construct approximately 700 feet of relief storm sewer west along Catalpa Lane from Birch Drive to Fern Drive and then north along Fern Drive from Catalpa Lane to Willow Lane to provide a 25-year level of protection. During the July 23, 2011 storm, four occurrences of street flooding were reported in Basin SS42. Only one of these occurrences was in the vicinity of Catalpa Lane and Fern Drive. The improvement made as a result of the 1990 Comprehensive Stormwater Management Report has proven to be highly successful in mitigating surface flooding in Basin SS42. The cost of the improvement made in Basin SS42 was $252,561. Work was completed in 1995.

The Hatlen Heights Flooding Area is located in Basin SS11. The analysis completed in 1990 depicts Hatlen Avenue as having between less than a 1-year to 2-year level of service. The recommended

improvements to improve stormwater conveyance in this area were to provide a 25-year level of service through construction of approximately 2,650 feet of relief storm sewer, including inlets and manholes, from the low points in the flooding area to the existing 72- inch-diameter storm sewer interceptor that discharges into the Crumley Detention Basin. The recommendations to reduce sanitary backups included construction of a sanitary relief sewer to provide a 10-year level of service. The storm sewer improvements were not implemented because of a policy decision to place higher priority on projects that alleviated sanitary backups as opposed to street or surface flooding. The recommended sanitary improvements, including a new sanitary relief station were constructed in Basin SS11. During the July 23rd storm event, 31 residents experienced sanitary backups, 17 experienced seepage in their basement or crawl space, 14 had sump pump failures, and 33 reported street flooding. It is important to note that a significant power outage was reported in Basin SS11 during the July 23rd storm event. Basin SS11 was selected for additional analysis as part of this study. The cost of the sanitary sewer relief sewer improvement made in Basin SS11 was $1,947,357. Work was completed in 1994.

The Clearwater Flooding Area as defined in the 1990 Report is bounded on the west by Algonquin Road, on the south by Dempster Street, on the north by Lincoln Street and on the east by Busse Road. Recommendations for this area were to install a relief storm sewer along Hatlen Avenue from Lonnquist Boulevard to Estate Drive with a proposed junction chamber, outlet pipe and headwall. The relief sewer would then discharge into the Mount Prospect Golf Course. The objective of this project was to improve the performance of Clearwater Detention Basin and prevent it from overtopping and flooding adjacent areas for a 100-year recurrence interval, 12-hour duration storm event. Based on the Illinois State Water Survey Bulletin 70 the total rainfall that would occur for a 100-year recurrence interval, 12-hour duration storm event is 6.59 inches. The July 23rd, 2011 storm event produced 6.78 inches of rain in a 3-hour duration. Based on review of the flooding questionnaires areas of the Village that would have been affected by the Clearwater Detention Basin overtopping did not report any significant surface flooding. The improvements made as a result of the 1990 Comprehensive Stormwater Management Report provided a significant benefit in the operation of the Clearwater Detention Basin. The cost of the improvements made to the Clearwater Detention Basin was $755,112. Work was completed in 1992.

The 1990 flood study included recommendations to mitigate flooding along Central Road west of Northwest Highway (Route 14). These recommendations included the installation of new separate storm relief sewer from Central Road south along Wa-Pella Avenue to Busse Avenue; west along Busse Avenue to Can Dota Avenue; and south on Can Dota to Weller Creek. No surface flooding was reported along Central Road during or following the July 23rd, 2011 event between We Go Trail and Northwest Highway. Only one occurrence of surface flooding was reported in the area served by the separate storm relief sewer on Wa-Pella Avenue and Hi-Lusi Avenue. Portions of Basin CS01, Basin CS24 and Basin CS10 were served by this separate storm relief sewer. The improvements made as part of the Central and Wa-Pella Area project were highly successful in mitigating surface flooding. The cost of the separate storm relief sewer improvements constructed as part of the Central and Wa-Pella Area project was $3,071,156. Work was completed in 1992.

The Crumley Detention Basin improvements included hydraulic cleaning, televising, and replacement of the underdrain system as well as improvements to the inflow and outfall structures. Work was completed in 2003 at a cost of $38,627.

Similar improvements were slated for the Melas Detention Basin. These improvements were completed in 2002 at a cost of $112,273.

Weller Creek was also evaluated as part of the 1990 Comprehensive Stormwater Management Report. Recommendations were made to stabilize the creek bank and mitigate hydraulic restrictions. These improvements included armoring portions of the creek with interlocking concrete block, steel sheet piling, installation of riprap, gabion protection and bio-engineering treatments to improve the conveyance of stormwater within the creek banks. The cost of these improvements was $4,297,619. Work was completed in multiple phases starting in 1998 and culminating in 2002.

Feehanville Drainage Area

The Feehanville Drainage Area included improvements in Basin SS03, Basin SS44 and CS18. The areas include in the Feehanville Drainage Area were referred to as the Stevenson and Thayer Flooding Area, the Fairview Gardens Sanitary Area, the North Main and Prospect Manor Flooding Area, and the Wedgewood Flooding Area. A brief discussion of these areas is presented below.

The Stevenson and Thayer Flooding Area is located in Basin SS44. Stormwater discharges into the Feehanville Ditch. Based on the analysis completed in 1990 the main storm sewer interceptor located along Lowden Lane had a level of service ranging from less than 2-years to 10-years. The recommendations for this area consisted of increasing the capacity of the existing stormwater conveyance system through construction of relief storm sewer to provide a 25-year level of service. This improvement included stormwater relief connections and a new relief sewer installed along Stevenson Lane and Lowden Lane. During the July 23rd storm, this basin reported minimal surface flooding. Only six occurrences of street flooding were reported in Basin SS44. These occurrences were generally widespread throughout the basin. The improvements made as a result of the 1990 Comprehensive Stormwater Management Report provided a significant benefit in Basin SS44. The cost of these stormwater improvements was $1,029,000. Work was completed in 1994.

Based on the 1990 report, the Fairview Gardens Sanitary Area which is located in Basin SS44 had a less than a 1-year level of service along the sanitary line at Horner Lane and Thayer Street. Recommendations included increasing the conveyance of the existing sanitary sewer system to provide a 5-year level of service through construction of a parallel relief sewer and improvements to the existing lift station on Horner Lane in front of [redacted]. During the July 23rd storm, seven occurrences of sanitary backup were reported in Basin SS44. There were no occurrences of sanitary backups reported along Horner Lane and Stevenson Lane. The improvements made as a result of the 1990 Comprehensive Stormwater Management Report provided a significant benefit in Basin SS44. The cost of these sanitary improvements was $656,966. Work was completed in 1993.

The North Main and Prospect Manor Flooding Area is located in Basin CS18. Based on the modeling completed in 1990, the level of service of the combined sewer interceptor along Highland Street was determined to be less than a 2-year storm. The recommendation made in the 1990 Report were to increase the capacity of the existing Highland Street combined sewer system through construction of approximately 7,800 feet of combined relief sewer ranging from 15 inches to 66 inches in diameter. The

combined relief sewers were constructed from the lowest point in the Prospect Manor Flooding Area to the MWRDGC TARP drop shaft located northwest of the intersection of Isabella Street and Rand Road. Only five occurrences of street flooding were reported as a result of the July 23rd storm in Basin CS18. A total of 20 occurrences of sanitary backup were reported. It is important to note that the North Main and Prospect Manor Flooding Area was identified by the Village as having a higher incidence of flooding as a result of the 1987 storm event than the area served by the combined sewer interceptor located on Isabella Street (Basin CS21). Basin CS21 reported 79 occurrences of sanitary backup, 25 occurrences of street flooding and 27 occurrences of yard flooding, significantly more than reported in Basin CS18 as a result of the July 23rd, 2011 storm event. The improvements made as a result of the 1990 Comprehensive Stormwater Management Report provided a significant benefit in Basin CS18. The cost of these combined sewer improvements were $4,055,260. Work was completed in 1993.

The Wedgewood Flooding area is comprised of single-family homes in the area bounded by Rand Road, Route 83, and Euclid Avenue in Basin SS03. Improvements included culvert replacements, ditch regarding, and storm sewer improvements. The work was completed in 2002 at a cost of $242,375. Only two homes reported flooding following the July 23rd storm.

Des Plaines River Drainage Area

The Des Plaines River Drainage area encompasses a stormwater drainage basin in the northeast section of the Village immediately adjacent to the Des Plaines River. The Illinois American Water Company provides sanitary service in this area. The Village provides stormwater collection and conveyance. This area was analyzed as part of the 1990 report and it was determined that it had a 2-year level of service some areas. The recommendations from 1990 report consist of constructing a levee and pumping facilities east of River Road. The primary purpose of this project was to mitigate surface flooding caused by the Des Plaines River overtopping its banks and preventing positive discharge of stormwater from the area. Construction of the levee is slated for completion in 2012. The total cost of the project is approximately $30 million.

Backwater valves were also installed to prevent the river from backing up through the storm sewer system and flooding the area; which was the primary cause of the 1986 flood. The backwater valves were installed in 1991 at a cost of $318,803. The backwater valves have worked effectively throughout the years since they were installed; allowing adjacent homeowners to avoid flood waters on several occasions. The backwater valves continue to be an integral part of the levee system.

During the July 23rd storm 20 occurrences of sanitary backup, 10 occurrences of seepage, 10 occurrences of sump pump failure, 17 occurrences of street flooding and 11 occurrences of yard flooding were reported following the July 23rd, 2011 storm event. Flooding was generally spread across this area and not highly concentrated. The area with the highest concentration of reported occurrences was located along Park Drive where four residents reported surface flooding and one resident reported sanitary back-up. The surface flooding in this area primarily occurred at residences with garages with floor elevations lower than the street and surrounding ground surface.

3.2.9 Combined Sewer Evaluation Study

At the turn of the 21st century, routine inspections of combined sewer mains utilizing closed-circuit television began to reveal a number of structural pipe defects. Staff began to harbor concerns about the structural integrity of the Village's oldest sewers.

Subsequently, in December 2002, the Village Board awarded an engineering contract to provide specified data collection, data analysis, and other support services necessary to develop a comprehensive assessment of the Village's combined sewer system. Specifically, a consulting engineering firm was asked to inventory and map all sewer mains, manholes, inlets, catch basins, and other structures in the combined sewer service area. Additionally, they were also asked to review and evaluate recorded closed circuit television observations of main sewer interiors obtained by a third-party contractor.

This study revealed that the Village-owned combined sewer system is comprised of approximately 3,200 structures (manholes, catch basins, inlets, etc.) connected by almost 260,000 linear feet of sewer mains ranging in size from 8" diameter to 72" diameter. A final report was presented to the Village Board in September, 2004. Following is a summary of the initial condition assessment of these sewers:

- Approximately 8% were in severe structural condition (Category 5) and should have been repaired within one (1) to two (2) years. The estimated cost to repair sewers in this classification was $2,481,600.
- 10% were in poor structural condition (Category 4) and should have been repaired within the next three (3) to four (4) years. The estimated repair cost for sewers in this classification was $2,547,600.
- 20% had moderate structural defects (Category 3) requiring rehabilitation within the next five (5) to ten (10) years. The estimated repair cost for sewers in this classification was $4,957,920.
- 34% had minor structural defects (Category 2) that did not require repairs; but should be periodically re-examined. The estimated cost to repair these defects, if and when necessary, was $4,158,000.
- 24% were in very good condition (Category 1). No discernible defects were observed. No repairs were recommended.
- The total cost to repair all observed defects was $14,145,120.

Rehabilitation work began in 2005 and continues to the current day. Rehabilitation work has primarily included sewer pipe replacements and installation of cured-in-place-pipe (CIPP). To date, 100% of the Category 5 defects have been repaired; 95% of the Category 4 defects have been repaired; 17% of the Category 3 defects have been repaired; and 5% of the Category 2 defects have been repaired. The work completed to date has cost $7,500,000.

Presently, the Village's combined sewer system is in good condition; capable of effectively conveying combined wastewater flows. Nevertheless, a majority of the sanitary backup, structure and surface flooding complaints received following the July 23rd storm emanated from areas served by combined sewer systems.

3.2.10 Overhead Sewer and Footing Tile Disconnection Program

In 2008, yet another large storm caused extensive flooding for 20 homes situated in a distinct separate sanitary sewer basin (Basin SS14). Subsequent interviews with these homeowners revealed that they were enduring basement backups during rather nominal wet weather events. The Village subsequently initiated a sewer system investigation and began considering options to mitigate the problem.

Basin SS14 consists of approximately 8,400 lineal feet of 8-inch diameter sanitary sewer constructed primarily of clay pipe. Storm sewer service is provided in a separate system. The sanitary sewage collected in Basin 14 predominantly flows north to south before discharging to the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) interceptor located along Lincoln Street.

As part of the Village's investigation into the problem, building inspections were performed at each home. During building inspections, approximately 152 foundation drains were observed to be tied to the sanitary sewer system. The estimated inflow contribution rate of foundation drains in Basin SS14 during a MWRDGC three-year, four-hour maximum average rainfall event ranged from 660,000 to 875,000 gpd. Smoke testing revealed that other typical sources of private property inflow were also entering building foundation drains, further contributing to the problem. These included leaking service laterals and cleanouts, sump pump discharges and window well drain connections.

Evaluation of the public sector and private sector sources of I/I resulted in concluding that rehabilitation of identified public and private sector sources of I/I would have little impact on reducing overall wet weather flows without the elimination of foundation drains.

Additionally, flow monitoring was completed by installing a continuously recording flow meter in the outfall of Basin SS14. The objective was to monitor the basin for a significant storm event (one inch of rainfall in a 24-hour period). **Based on the results of the flow monitoring, it was determined that the majority of the inflow entering the system was the result of foundation drain discharge and that Basin SS14 had less than a two-year level of protection against system surcharging.**

Based on the conclusions of the sewer study, the Village considered the following alternatives to achieve better wet weather flow protection in Basin SS14:

- Alternative 1: Underground detention of wet weather flows
- Alternative 2: Installation of back-up control
- Alternative 3: Disconnection of foundation drains and installation of overhead plumbing
- Alternative 4: Installation of a sanitary relief station

The Village elected to pursue disconnection of footing tile drains and the installation of overhead sewers on private property as a pilot project.

Disconnecting foundation drains and routing the drainage to a storm sump for discharge onto the ground surface would remove a significant source of inflow (up to 875,000 gpd) benefiting the sanitary sewer system as a whole. Construction of overhead plumbing would eliminate basement backups by raising the height of the sanitary sewer service located inside the residence to an elevation above the manhole rims on the sanitary sewer main. Installation of overhead plumbing will not improve the structural integrity of the existing sanitary sewer system, but it will provide protection for those homes susceptible to backups.

There are approximately 152 foundation drains in Basin SS14, and approximately 20 homes reporting basement backups. The best case scenario considered in the alternative evaluation consisted of disconnecting the foundation drains and installing overhead plumbing only at the 20 homes reporting backups; the worst case considered in the evaluation consisted of performing the work at all 152 locations. It was anticipated that far fewer than 152 foundation drains would actually need to be disconnected to mitigate flooding not caused by MWRDGC surcharging in Basin SS14.

In July 2009, the Village Board sanctioned the Basin SS14 Footing Tile Disconnect/Overhead Sewer Install Program. All single-family residential homeowners in Basin SS14 were sent detailed information about the purpose and need for the Program and the requirements to qualify for the improvements. Twenty-three applications were received, and 18 homes were subjected to detailed inspections by Public Works staff. Footing drain connections and evidence of past basement flooding by sanitary sewer surcharges were verified at all 18 homes.

The Village Board waived the procedural rules for public bidding to avoid the daunting task of giving multiple bidders access to 18 private homes. Instead, the Building Division of the Community Development Department recommended three contractors with a history of quality workmanship in Mount Prospect and reasonable rates. To further streamline the process, the 18 homes were split into three categories and a "model home" was selected from each group for bidding purposes:

1. Colonial style homes with sewer stacks near the front of the home
2. Split-level homes with a crawl space
3. Colonial style homes with sewer stacks near the middle of the home

The three pre-qualified contractors were asked to provide a bid to complete the scope of work at each of the three model homes. The Village provided a detailed set of specifications and contract documents and set appointments for each contractor to meet with the model homeowners individually. The Village plumbing inspector, electrical inspector, and a Public Works representative also attended each homeowner meeting to answer questions and ensure adherence to the project scope. The lowest-cost contractor was selected and executed the work at a rate of two homes per week from June –September 2010. This modified bidding process allowed the Village to award a single contract for all construction associated with this project, leveraging economies of scale without the need for widespread coordination.

Once a firm price was established for each home, the Village, the winning contractor, and each individual property owner became party to a project agreement incorporating a not-to-exceed price. In addition, each property owner signed loan and grant agreements with the Village, which were recorded against the property title in the office of the Cook County Recorder of Deeds. The Village provided 50 percent of the actual funding for each individual property in the form of a grant, on the condition that the homeowner would repay the other 50 percent either as a balloon lump sum upon the sale of the home, or as a loan with 3 percent simple interest accruing on the principal of the loan amount each year until the loan is repaid. The maximum cap was $18,000 per home (combined grant and loan), with the homeowner responsible for any additional costs. Only costs associated with the removal of the footing tile connections and installation of overhead sewers were eligible, along with minor landscaping restoration. Interior restoration costs were not eligible.

Work was completed at 12 of the 18 homes, with the remaining six dropping from the program for various reasons. The total cost of the program was less than $250,000.

Despite the extra coordination required to perform work on private properties, public/private solutions for managing localized basement backups associated with sanitary sewer surcharges should not be overlooked. Partial cost reimbursement provided more affordable, direct relief for homeowners experiencing backups. For the Village of Mount Prospect, this approach resulted in the lowest cost solution with the least on-going maintenance; a win-win scenario for the Village and its residents.

The 12 homes that participated in this program performed exceptionally well during the July 23rd storm event. Only one (1) house received flood water as a result of a failed clear water sump pump. None of the homes were subjected to sanitary sewer backups.

3.2.11 The Lessons of History

Flooding, and the Village's response to flooding events, has been a prominent theme in the Village's history. It is a theme that predates the Village's incorporation and has plagued each intervening decade. A thorough knowledge of this history, and an appreciation for the impacts of flood relief and stormwater management decisions made in the past, is essential to the formulation of an effective future flood fighting strategy that adequately considers the vagaries of nature and increasingly limited fiscal resources.

As noted by the American philosopher George Santayana, "those who cannot remember history are doomed to repeat it". This sage advice succinctly states the case that there is something to be learned from the successes and failures of the Village's flood fighting history.

What is this lesson? We submit that the lesson to be gleaned from our trials is that the singular pursuit of a "build a bigger pipe" solution can be a fickle affair. Quite simply, Mother Nature can inevitably conjure a bigger storm, or create a set of circumstances, that thwart our best laid plans.

3.3 TYPICAL DESIGN CRITERIA

Over the years as development has continued and stormwater management has evolved, so have the typical design criteria stormwater systems. When much of the Village was developed in the 1960's and 1970's, storm sewers were typically designed for an event with the likelihood of occurring once every ten years, or 10 percent in any given year. This event was labeled the "10-year storm". This 10-year storm is still the minimum design criteria for new storm sewer design in the Village of Mount Prospect and it is a current industry standard adopted by most governmental entities. Due to an increase in impervious surface caused by rapid development, the amount of stormwater runoff expected during the 10-year event has increased dramatically over time. In addition, the definition of a 10-year event has evolved over time as more real data has become available. A 10-year event based on TP-40 (1940) consisted of 4.05 inches in a 24-hour period. Based on Illinois State Water Survey Bulletin 70 it now consists of 4.49 inches in a 24-hour period. The rapid development in communities like the Village of Mount Prospect, prior to national and regional stormwater management ordinances, and coupled with the updated definition of a 10-year storm has caused many existing storm sewer systems to provide only 10 to 50 percent of the level of service that they were originally intended to provide.

As development increased and the amount of stormwater along with it, it was realized that stormwater would have to be stored and released at a slower rate so as not to cause widespread flooding in heavily inhabited areas. Due to this realization, detention basins began to be constructed to keep peak flood flows low enough to prevent flooding. Over the years many different criteria have evolved and different communities have chosen to adopt several different variations of a detention ordinance. Typically, a detention basin is designed to store stormwater runoff volume from a 100-year storm of 24-hour duration. Generally in the Chicagoland area, this translates to 7.58 inches of rain in a 24 hour period. At a minimum, the detention basins are designed to constrict outflow to a rate equal to the runoff generated from the area tributary to the detention basin prior to it being developed. In many cases, local ordinances have made the allowable release rate even more restrictive in order to compensate for the development that occurred before the implementation of detention basins was prevalent.

Areas that are located near waterways where overland flooding during the 100-year event is expected are designated as floodplains. These areas contain additional development restrictions designed to limit further development within the floodplain. Flood insurance is a requirement for any structure with a foundation elevation below the 100-year floodplain elevation. In addition, new developments may not cause a net loss of stormwater storage volume within the floodplain. Further, most streams within northeastern Illinois have designated floodways. Floodways are defined as areas within the floodplain that must be maintained in order to avoid increases in the base flood elevation. Development of habitable structures within floodways is strictly prohibited.

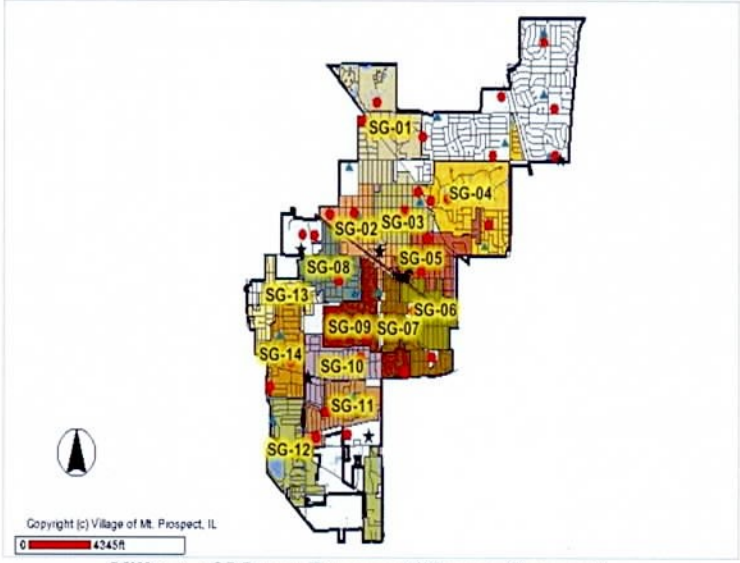
3.4 VILLAGE ORDINANCES

The Village of Mount Prospect has a stormwater and floodplain ordinance to regulate development and ensure that it does not cause adverse effects upstream or downstream of the site being developed. As with many documents of its nature, it has evolved over the years. In 1971 the Village stormwater ordinance required residential developments of 5 acres or more to provide stormwater detention onsite with a post-development release rate equal to the runoff rate of the site during the natural, undeveloped state. By 1995 the ordinance had been revised to require residential developments of 2 acres or more to provide stormwater detention with a release rate of 0.2 cfs per acre. Currently, all developments 1 acre or greater in size are required to provide stormwater detention and developments less than an acre are required to pay the Village a fee in-lieu of detention. Cook County has prepared a Draft Countywide Stormwater Ordinance that is currently undergoing a lengthy approval process. When compared to the Draft Cook County Stormwater Management Ordinance (CCSMO), the Mount Prospect ordinance is more stringent. The current Metropolitan Water Reclamation District of Greater Chicago ordinance requires residential developments of over 10 acres to provide detention and other developments of greater than 5 acres or more to provide detention. The Draft CCSMO recommends stricter requirements of 5 acres and greater for residential developments and 3 acres and greater for other types of developments.

For storm sewer design the Village of Mount Prospect ordinance specifies that a ten-year design storm shall be used to size new sewer systems. This is a typical current industry standard for storm sewer design.

3.5 ONGOING VILLAGE MAINTENANCE

The Village of Mount Prospect is progressive and pro-active when it comes to maintaining their existing combined, storm, and sanitary sewer systems. The Village of Mount Prospect annually inspects its combined, sanitary, and storm sewers to assess their condition and need for repair and maintenance. In order to systematically and efficiently complete this effort the Village was divided into 14 Village-designated "super groups". A "super group" is a collection of basins that will be televised and inspected each year by the Village for defects. All manholes are inspected and sewer televised within one designated "super group" per year; this equates to approximately 75,000 to 100,000 lineal feet of sewer inspected, cleaned, rodded and flushed each year. Based on the findings of these studies the next year's spot relays, manhole rehabilitation, sewer lining with Cured-in-Place-Pipe (CIPP), and other capital improvements are determined; on average, the Village has spent in excess of $1 million dollars per year on such repairs.



Village of Mount Prospect "Super Groups"

By continually inspecting the designated groups on a yearly basis the Village is often able to identify areas of concern prior to them deteriorating to the point of failure.

The Village has also implemented a flow monitoring program, performed in conjunction with, and based on the results of, the television inspection. The flow monitoring program analyzes the amount of stormwater that infiltrates into a sanitary (non-combined) sewer during a significant (1 inch or more during a 24-hour period) rain event. By identifying areas of significant infiltration and inflow, steps can be taken to remove these sources from the system and improve its overall health by increasing available capacity and reducing the load on the downstream Kirie Wastewater Treatment Plant. Infiltration and inflow can be a significant cause of sanitary backups and the Village's television inspection and flow monitoring programs are an important counter-measure to maintain the sanitary and storm sewer systems.

Finally, since 1990, the Village has continuously performed inspections of private buildings for the purpose of detecting and eliminating private sector sources of clear water infiltration and inflow into separate sanitary sewer systems. Typical sources of infiltration and inflow discovered during these inspections include sump pumps and downspouts directly connected to the sanitary sewer system. These inspections are usually conducted in conjunction with planned water meter replacements in order to minimize disruption to customers and improve the efficiency of work crews.

* * * * *

4.0 EVALUATION

In the Village of Mount Prospect, the combined sewer and storm sewer systems operate at various levels of service depending on when they were constructed. Newer sewers would generally be expected to provide a greater level of service than older sewers. As discussed previously, since the Village's combined and storm sewers have been constructed, their level of service has decreased because of several factors. One factor is the continual development of the Village. When forest or fields are developed into parking lots or subdivisions, it decreases the ability of stormwater runoff to soak into the ground. Therefore there is more stormwater that needs to be collected and conveyed by a combined or separate storm sewer system. Another factor is that the definition of a level of service has changed as more rainfall data is collected and statistically analyzed. The amount of rainfall produced by a designated recurrence interval storm event has increased over time. For example a 10-year storm event as defined by the ISWS Bulletin 70 produces 4.47 inches in a 24 hour period, while a 10-year storm event prior to Bulletin 70 (TP-40) was defined to produce 4.1 inches of rain in a 24 hour period. This means that a sewer designed for a specified level of protection prior to the issuance of Bulletin 70 will not provide that level of service today. In fact, if additional statistical analysis were performed today, it likely that rainfall amounts for a specified level of protection would be higher than those in Bulletin 70. We simply do not have enough data to accurately predict how much rainfall will occur, when it will occur and where it will occur.

It is also important to note that as a result of the 1987 storm event, the Village has completed $25 million in comprehensive stormwater capital improvements to provide a minimum 25-year level of service in combined and separate storm sewer areas and 10-year level of service in separate sanitary areas identified as experiencing the most significant flooding following the heavy rains in August 1987. While these improvements have proven to be highly successful, all of these areas experienced some degree of flooding as a result of the July 23, 2011 storm event.

Approximately 34 percent of the sewer systems in the Village of Mount Prospect are combined systems. This means that sanitary wastewater and stormwater flow in the same sewer. Increased development leads to an increase in the amount of water flowing through the combined sewers, thereby decreasing the capacity of the sewer. This can result in both surface flooding and sanitary sewer backups. In some cases surface flooding can be extensive enough to cause flooding of streets resulting in impeded vehicle access and reach elevations where it floods buildings and homes. It is important to note that foundation drains from buildings and homes are typically connected to the combined sewers. These foundation drains, while acceptable in the combined sewer areas, utilize a significant amount of the sewer capacity during rainfall events. Overland flooding and sewer backups were experienced in the Village combined sewer area as a result of the July 23rd, 2011 rainfall event.

Approximately 66 percent of the sewer systems in the Village of Mount Prospect are separate storm and sanitary sewer systems. In these areas separate sewers were installed to convey stormwater and wastewater. As with combined sewers, increased development leads to an increase in the amount of stormwater collected and conveyed by the separate storm sewers. Overland flooding resulting from storm sewers that are not large enough to convey stormwater produced by a given storm can result in surface flooding of public and private sector areas. In some cases it can be extensive enough to cause flooding of streets resulting in impeded vehicle access and reach elevations where it floods buildings and homes.

Overland flooding was experienced in the Village separate sewer area as a result of the July 23rd, 2011 rainfall event.

In separate sanitary sewer areas increased development can result in additional buildings being connected to the separate sanitary sewer. This increases the amount of wastewater required to be carried by the separate sanitary sewer system; however this additional wastewater loading is not typically the cause of sewer backups and surface flooding in these areas. As discussed in Chapter 3, the Village completed an extensive program for removal of clean water sources from its system as part of its ICAP and has been aggressively maintaining its separate sanitary sewer system. Even though it is no longer acceptable to connect foundation drains directly to a separate sanitary sewer system, many private sector foundation drains were connected prior to them being defined as unacceptable per Village ordinance. These foundation drains consume a significant portion of the Village's separate sanitary sewer system capacity during rainfall events. Sewer backups were experienced in the Village separate sewer area as a result of the July 23rd, 2011 rainfall event and can be directly correlated to buildings with connected foundation drains.

The July 23rd storm produced a rainfall of 6.78" in 3 hours. This storm is classified as a 400-year storm, or a storm that has the probability of occurring once every 400 years. Another way of saying this is that it has a 0.25% chance of occurring once in any given year. Given the fact that this massive storm occurred over such a short period of time, it caused widespread flooding and significant impact to residents of the Village of Mount Prospect.

Even if the Village system were brand new, and designed and constructed according to today's standards, it still would not be able to convey the runoff generated from a storm of this magnitude without flooding. The experience and feedback of the Village's residents has greatly assisted the Village in being able to evaluate the existing conditions of the system, and providing a means to reduce the amount of future flood occurrences throughout the Village.

Overall flood questionnaire results

Within days of the July 23rd rainfall event, the Village began detailed site visits and gathering feedback from the residents of the Village of Mount Prospect. These site visits and questionnaires evaluated the types of flooding experienced by each resident who initially responded to the Village's call for information. A total of 658 out of approximately 900 (73%) individuals that called the Village regarding the July 23, 2011 rainfall event responded and completed questionnaires. A total of 510 of these respondents (57%) participated in completion of the flooding questionnaire during a field interview. Repeated attempts were made by the Village Department of Public Works to contact those residents who called but did not complete questionnaires. A total of 148 of the respondents who completed the questionnaire declined to participate in the field interviews.

No reports of flooding were received for 33 (31%) of the 107 combined and separate stormwater basins located in the Village. **This is significant in the fact that the infrastructure in these basins has demonstrated the capability of handling an extreme storm event like the July 23rd event.** Unless there is significant development in these basins ongoing maintenance similar to what the Village currently performs should be sufficient to manage stormwater in these areas. Table 4.1 presents a summary of those basins in which flooding was not reported. Table 4.2 presents a summary of the of respondents who

reported flooding and the types of flooding that occurred in each basin based on the results of flooding questionnaire

Table 4.1: Combined and Separate Storm Sewer Basins without Reported Flooding

Village of Mount Prospect							
Flooding Questionnaire Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
CS06	0	0	0	0	0	0	0
CS07	0	0	0	0	0	0	0
CS08	0	0	0	0	0	0	0
CS12	0	0	0	0	0	0	0
SS02	0	0	0	0	0	0	0
SS03	0	0	0	0	0	0	0
SS05	0	0	0	0	0	0	0
SS06	0	0	0	0	0	0	0
SS17	0	0	0	0	0	0	0
SS23	0	0	0	0	0	0	0
SS33	0	0	0	0	0	0	0
SS34	0	0	0	0	0	0	0
SS35	0	0	0	0	0	0	0
SS36	0	0	0	0	0	0	0
SS38	0	0	0	0	0	0	0
SS39	0	0	0	0	0	0	0
SS43	0	0	0	0	0	0	0
SS46	0	0	0	0	0	0	0
SS47	0	0	0	0	0	0	0
SS50	0	0	0	0	0	0	0
SS51	0	0	0	0	0	0	0
SS52	0	0	0	0	0	0	0
SS53	0	0	0	0	0	0	0
SS54	0	0	0	0	0	0	0
SS56	0	0	0	0	0	0	0
SS58	0	0	0	0	0	0	0
SS59	0	0	0	0	0	0	0
SS60	0	0	0	0	0	0	0
SS61	0	0	0	0	0	0	0
SS62	0	0	0	0	0	0	0
SS64	0	0	0	0	0	0	0
SS65	0	0	0	0	0	0	0
SS66	0	0	0	0	0	0	0

Table 4.2: Flooding Questionnaire Results

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
CS01	12	10	2	2	0	1	1
CS02	4	1	2	1	0	0	1
CS03	1	0	1	0	0	0	1
CS04	7	7	2	0	0	0	0
CS05	5	2	1	3	0	1	2
CS09	5	3	0	0	0	0	1
CS10	3	2	2	0	0	0	0
CS11	1	0	0	0	0	0	0
CS13	1	0	0	1	0	0	0
CS14	1	0	1	0	0	0	0
CS15	2	1	0	1	0	0	0
CS16	19	10	9	2	0	3	4
CS17	2	0	0	2	0	0	0
CS18	27	20	9	3	1	4	11
CS19	1	1	1	0	0	0	1
CS20	3	1	1	2	0	0	1
CS21	98	79	20	6	12	13	15
CS22	5	3	2	1	0	0	1
CS23	5	4	1	1	0	2	0
CS24	6	0	4	1	0	1	3
CS25	21	18	6	3	1	0	4
CS26	2	2	0	0	0	1	0
CS27	8	5	2	1	2	0	2
CS28	14	6	6	3	3	1	3
CS29	31	26	8	3	0	4	4
CS30	5	3	1	1	1	2	1
CS31	26	17	10	4	1	7	3
CS32	8	7	3	0	3	1	1
CS33	6	6	2	1	2	0	0
CS34	3	1	0	1	0	0	1
DESPLAINES	2	0	1	1	0	2	0
EGT	5	0	1	4	0	2	1
IL AMER	46	20	10	10	4	13	7
OTHER	1	0	0	0	0	0	1
S04A	2	0	0	0	0	1	1
SS01	5	1	2	4	1	0	0
SS04	2	0	2	2	1	0	0
SS07	1	0	0	1	0	0	1
SS08	8	1	1	7	2	3	1
SS09	1	0	0	1	0	0	0

Table 4.2: Flooding Questionnaire Results (continued)

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
SS10	3	0	1	3	0	0	2
SS11	51	31	17	14	26	7	4
SS12	8	5	3	1	0	0	4
SS13	2	2	1	0	0	1	0
SS14	8	6	1	0	1	2	3
SS15	5	2	1	1	0	1	2
SS16	20	9	6	11	2	1	3
SS18	2	0	2	1	0	0	0
SS19	4	3	2	1	0	1	1
SS20	1	0	0	1	0	0	0
SS21	11	8	3	2	1	6	0
SS22	1	0	1	0	0	0	0
SS24	2	1	0	0	0	0	0
SS25	6	4	5	0	0	0	1
SS26	8	4	1	1	0	1	2
SS27	16	14	4	2	1	2	1
SS28	8	7	2	0	1	2	0
SS29	9	6	0	2	1	1	1
SS30	4	4	0	1	0	0	0
SS31	6	6	1	0	1	0	0
SS32	3	1	1	1	1	1	0
SS37	1	0	0	0	0	0	1
SS40	1	1	0	0	1	0	0
SS41	25	10	5	8	7	3	5
SS42	5	1	3	4	4	0	1
SS44	10	7	2	1	2	4	1
SS45	16	5	1	3	4	5	2
SS48	1	0	0	1	0	0	0
SS49	2	0	0	2	2	0	0
SS55	4	0	0	4	1	0	0
SS57	4	2	0	2	2	0	0
SS63	1	0	0	1	0	1	0
SS67	1	1	1	0	0	0	0
SS68	4	2	0	1	4	0	0
Totals	**658**	**399**	**177**	**142**	**96**	**101**	**107**

SSXX – Separate Sanitary Sewer Basin

CSXX – Combined Sewer Basin

A total of 399 (61%) of the respondents to the flooding questionnaire experienced sewer backups as a result of the July 23rd storm. A total of 177 (27%) respondents experienced seepage through their foundation or basement, 142 (22%) experienced sump pump failures, 96 (15%) experienced street and yard flooding, 101 (15%) experienced street flooding with no yard flooding and 107 (16%) experienced yard flooding with no street flooding.

A total of 332 (50%) of the 658 flooding questionnaires were completed in the combined sewer areas. In the combined sewer areas 235 (71%) of the respondents experienced sewer backups, 96 (29%) experienced seepage through their foundation or basement, 43 (13%) experienced sump pump failures, 26 (8%) experienced street and yard flooding, 41 (13%) experienced street flooding only and 61 (18%) experienced yard flooding only. A summary of the combined sewer area survey results is presented in Table 4.3.

Table 4.3: Flooding Questionnaire Results in Combined Sewer Area

Result	Total
Number Completed	332
Sanitary Backups	235 (71%)
Seepage	96 (29%)
Sump Pump Failure	43 (13%)
Street and Yard Flooding	26 (8%)
Street Flooding Only	41 (13%)
Yard Flooding Only	61 (18%)

A total of 272 (41%) out of the 658 flooding questionnaires were completed in the separate sanitary sewer areas. In the separate sanitary sewer areas a total of 144 (53%) of the respondents experienced sewer backups, 69 (25%) experienced seepage through their foundation or basement, 84 (30%) experienced sump pump failures, 66 (24%) experienced street and yard flooding, 43 (16%) experienced street flooding only and 37 (14%) experienced yard flooding only. A summary of the separate sanitary sewer survey results is presented in Table 4.4

Table 4.4: Flooding Questionnaire Results in Separate Sewer Area

Result	Total
Number Completed	272
Sanitary Backups	144 (53%)
Seepage	69 (24%)
Sump Pump Failure	84 (31%)
Street and Yard Flooding	66 (24%)
Street Flooding Only	43 (16%)
Yard Flooding Only	37 (14%)

A total of 54 (8%) out of the 658 flooding questionnaires were completed in basins where the Village either provides only stormwater system service or areas located outside the Village limits. These areas include the Des Plaines Basin, the Elk Grove Township Basin and the American Water Basin. In these basins a total of 20 (37%) of the respondents experienced sewer backups, 12 (22%) experienced seepage through their foundation or basement, 15 (28%) experienced sump pump failures, 4 (7%) experienced

street and yard flooding, 17 (31%) experienced street flooding only and 9 (17%) experienced yard flooding only. A summary of these areas is presented in Table 4.5.

Table 4.5 Flooding Questionnaire Results in Other Basins

Result	Total
Number Completed	54
Sanitary Backups	20 (37%)
Seepage	12 (8%)
Sump Pump Failure	15 (28%)
Street and Yard Flooding	4 (7%)
Street Flooding Only	17 (31%)
Yard Flooding Only	9 (17%)

Based on review of the flooding questionnaire results the following observations can be made:

- Based on geographical area, flooding was more prevalent in the combined sewer area than the separate sanitary sewer area.
- Sanitary backups were more prevalent in the combined sewer area than the separate sewer area. This is expected because combined sewer systems are designed to collect and convey stormwater and separate sanitary sewer systems are not; therefore combined sewer systems are directly influenced by rainfall whereas separate sanitary sewer systems are indirectly influenced by rainfall.
- There were higher incidences of sump pump failure in the separate sewer area than the combined sewer area. This would be expected because it is likely there are more sump pumps in the separate sewer area.
- Street and yard flooding was more prevalent in the separate sewer area than the combined sewer area. This is primarily because of the significant amount of street and yard flooding that was experienced in the Hatlen Heights Subdivision in Basin SS11.

4.1 SANITARY BACK-UPS

When the combined sewer system or separate sanitary sewer system becomes surcharged, the water level in the sewer system may become higher than the lowest drain (toilet, shower drain, sink, etc.) in a building or house. If a check valve is not provided this typically results in water backing up through this drain and into the building or house. Figure 4.1 presents a typical plumbing configuration in a house in separate sewer area without overhead plumbing.

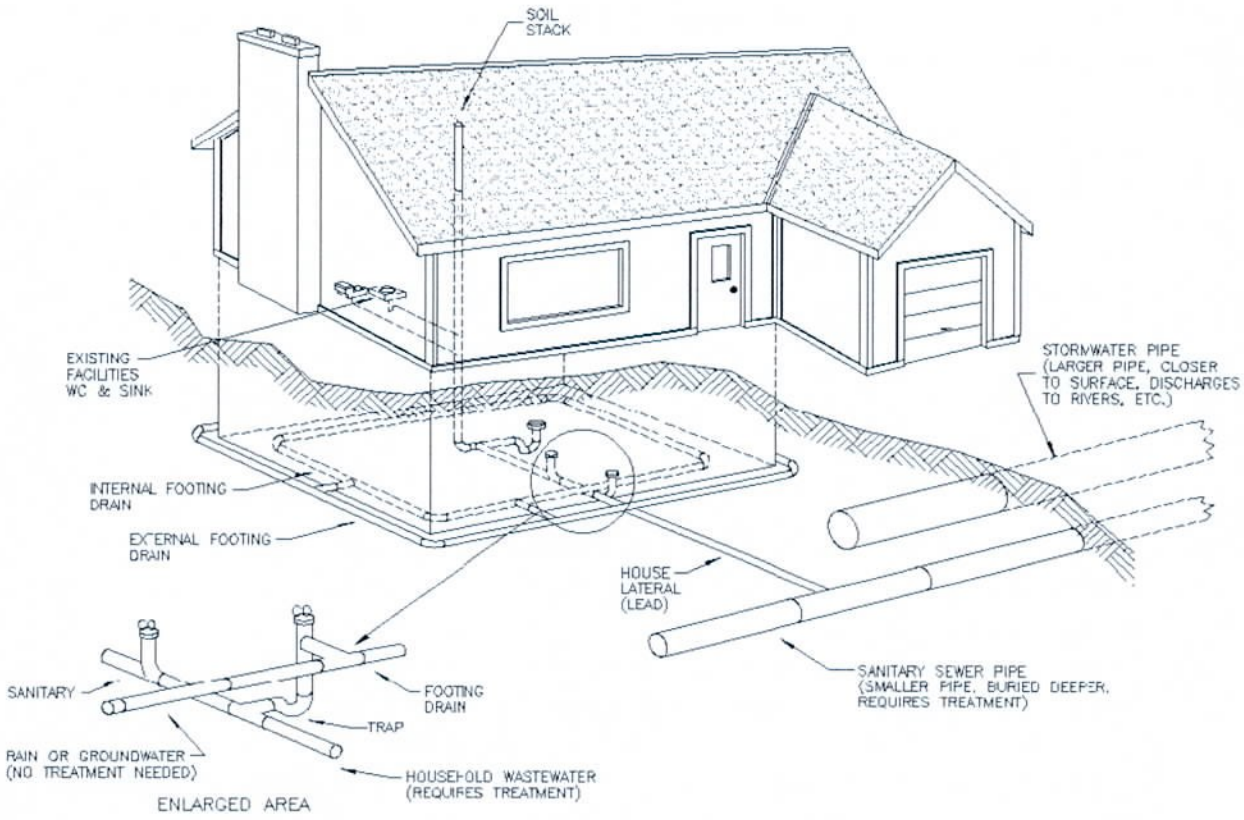


Figure 4.1: Example of Household Foundation Drain

A total of 52 out of the 107 drainage basins reported sanitary back-ups. Only 23 of the basins reported more than five sanitary backups. Basins that reported sanitary backups are presented in Table 4.6.

Table 4.6 Basins with Sanitary Backups

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
CS02	4	1	2	1	0	0	1
CS15	2	1	0	1	0	0	0
CS19	1	1	1	0	0	0	1
CS20	3	1	1	2	0	0	1
CS34	3	1	0	1	0	0	1
SS01	5	1	2	4	1	0	0
SS08	8	1	1	7	2	3	1
SS24	2	1	0	0	0	0	0
SS32	3	1	1	1	1	1	0

Table 4.6 Basins with Sanitary Backups (Continued)

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
SS40	1	1	0	0	1	0	0
SS42	5	1	3	4	4	0	1
SS67	1	1	1	0	0	0	0
CS05	5	2	1	3	0	1	2
CS10	3	2	2	0	0	0	0
CS26	2	2	0	0	0	1	0
SS13	2	2	1	0	0	1	0
SS15	5	2	1	1	0	1	2
SS57	4	2	0	2	2	0	0
SS68	4	2	0	1	4	0	0
CS09	5	3	0	0	0	0	1
CS22	5	3	2	1	0	0	1
CS30	5	3	1	1	1	2	1
SS19	4	3	2	1	0	1	1
CS23	5	4	1	1	0	2	0
SS25	6	4	5	0	0	0	1
SS26	8	4	1	1	0	1	2
SS30	4	4	0	1	0	0	0
CS27	8	5	2	1	2	0	2
SS12	8	5	3	1	0	0	4
SS45	16	5	1	3	4	5	2
CS28	14	6	6	3	3	1	3
CS33	6	6	2	1	2	0	0
SS14	8	6	1	0	1	2	3
SS29	9	6	0	2	1	1	1
SS31	6	6	1	0	1	0	0
CS04	7	7	2	0	0	0	0
CS32	8	7	3	0	3	1	1
SS28	8	7	2	0	1	2	0
SS44	10	7	2	1	2	4	1
SS21	11	8	3	2	1	6	0
SS16	20	9	6	11	2	1	3

Table 4.6 Basins with Sanitary Backups (Continued)

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
CS01	12	10	2	2	0	1	1
CS16	19	10	9	2	0	3	4
SS41	25	10	5	8	7	3	5
SS27	16	14	4	2	1	2	1
CS31	26	17	10	4	1	7	3
CS25	21	18	6	3	1	0	4
CS18	27	20	9	3	1	4	11
IL AMER	46	20	10	10	4	13	7
CS29	31	26	8	3	0	4	4
SS11	51	31	17	14	26	7	4
CS21	98	79	20	6	12	13	15
Totals	**616**	**399**	**163**	**116**	**92**	**94**	**96**

Basin CS18, Highland Street Area experienced a high volume of sanitary backups. Twenty-seven residents completed the questionnaire and 20 experienced sanitary backups. The Highland Street Area was selected for detailed analysis.

Basin CS21, Isabella Street Area experienced 79 sanitary backups. The Isabella Street Area reported the highest number of sanitary backups and was selected for additional detailed analysis.

Basin CS31, Lonnquist Boulevard Area experienced 17 sanitary backups. Eleven of the sanitary backups were reported on South See-Gwun Avenue and South Na Wa Ta Avenue. The Lonnquist Boulevard Area was selected for additional detailed analysis.

Basin SS11 which is part of the Hatlen Heights Subdivision reported 31 sanitary backups. Residents in this area reported sanitary backups that resulted in 1 to 5 feet of flooding in their basements. The Hatlen Heights Subdivision was selected for additional detailed analysis.

Basin CS29, at Evergreen Avenue and Edward Street experienced 26 sanitary backups. A total of 18 sanitary backups were also reported in Basin CS25. Basins CS29 and CS25 were not selected for detailed analysis at this time. This was primarily due to the fact that these basins reported less surface induced flooding that those basins selected for further analysis. It is expected that the sanitary backups in these basins can be mitigated through the installation of overhead plumbing or backup prevention systems on private sector service laterals. The assessment that sanitary backups can be mitigated through overhead

plumbing or backup prevention systems on private sector service lateral is also the case for all basins experiencing sanitary backups.

The Illinois American Basin reported 20 sanitary backups. Sanitary backups in this basin were fairly widespread. This basin was not analyzed further for sanitary backups because sanitary service is provided by Illinois American Water, not the Village of Mount Prospect.

4.2 SUMP PUMP FAILURE

Sump pump failures often result in basement flooding. Failure of sump pumps can be caused by loss of power or lack of capacity. Often sump pumps do not have a battery or generator back-up system that will supply power to operate the pump in the event of a power outage. Another issue that can occur and often results in basement back-ups is a sump pump with insufficient capacity to keep up with the amount of water that is produced by building foundation drains.

A total of 52 out of the 107 drainage basins reported sump pump failures. Basins that reported sump pump failures are presented in Table 4.7.

Table 4.7 Basins with Sump Pump Failures

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
CS13	1	0	0	1	0	0	0
CS24	6	0	4	1	0	1	3
DESPLAINES	2	0	1	1	0	2	0
SS07	1	0	0	1	0	0	1
SS09	1	0	0	1	0	0	0
SS18	2	0	2	1	0	0	0
SS20	1	0	0	1	0	0	0
SS48	1	0	0	1	0	0	0
SS63	1	0	0	1	0	1	0
CS02	4	1	2	1	0	0	1
CS15	2	1	0	1	0	0	0
CS34	3	1	0	1	0	0	1
SS32	3	1	1	1	1	1	0
SS15	5	2	1	1	0	1	2
SS68	4	2	0	1	4	0	0

Table 4.7 Basins with Sump Pump Failures (Continued)

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
CS22	5	3	2	1	0	0	1
CS30	5	3	1	1	1	2	1
SS19	4	3	2	1	0	1	1
CS23	5	4	1	1	0	2	0
SS26	8	4	1	1	0	1	2
SS30	4	4	0	1	0	0	0
CS27	8	5	2	1	2	0	2
SS12	8	5	3	1	0	0	4
CS33	6	6	2	1	2	0	0
SS44	10	7	2	1	2	4	1
CS17	2	0	0	2	0	0	0
SS04	2	0	2	2	1	0	0
SS49	2	0	0	2	2	0	0
CS20	3	1	1	2	0	0	1
SS57	4	2	0	2	2	0	0
SS29	9	6	0	2	1	1	1
SS21	11	8	3	2	1	6	0
CS01	12	10	2	2	0	1	1
CS16	19	10	9	2	0	3	4
SS27	16	14	4	2	1	2	1
SS10	3	0	1	3	0	0	2
CS05	5	2	1	3	0	1	2
SS45	16	5	1	3	4	5	2
CS28	14	6	6	3	3	1	3
CS25	21	18	6	3	1	0	4
CS18	27	20	9	3	1	4	11
CS29	31	26	8	3	0	4	4
EGT	5	0	1	4	0	2	1
SS55	4	0	0	4	1	0	0
SS01	5	1	2	4	1	0	0
SS42	5	1	3	4	4	0	1
CS31	26	17	10	4	1	7	3
CS21	98	79	20	6	12	13	15

Table 4.7: Basins with Sump Pump Failures (Continued)

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
SS08	8	1	1	7	2	3	1
SS41	25	10	5	8	7	3	5
IL AMER	46	20	10	10	4	13	7
SS16	20	9	6	11	2	1	3
SS11	51	31	17	14	26	7	4
Totals	**590**	**349**	**155**	**142**	**89**	**93**	**96**

Only 6 of the basins reported more than five sump pump failures.

Basin CS21, Isabella Street Area reported 6 sump pump failures. The Isabella Street Area was selected for additional detailed analysis.

Basins SS08 and SS11 which are part of the Hatlen Heights Subdivision reported 21 sump pump failures. Reports of power outages were also received in Basin SS11. The Hatlen Heights Subdivision was selected for additional detailed analysis.

Basin SS41 reported 8 sump pump failures and 10 basement backups. Basin SS16 reported 11 sump pump failures. The Illinois American basin reported 10 sump pump failures. In almost all of the cases where sump failures occurred, sanitary backups also occurred. It is generally recommended that respondents whose sump pumps failed determine why the pump failed and consider procurement of an emergency battery operated sump pump and/or generator with and automatic transfer switch that will supply power to the sump pump in the case of a power outage.

4.3 BASEMENT SEEPAGE

Basement seepage occurs when rainwater and/or groundwater enters a building through cracks or holes in basement walls or floors. This occurs most frequently during rainfall events when water is not able to drain away from the building as a result of poor site grading or foundation drains not operating properly. A total of 51 out of the 107 drainage basins reported seepage. Basins that reported seepage are presented in Table 4.8

Table 4.8 Basins with Seepage

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
CS03	1	0	1	0	0	0	1
CS14	1	0	1	0	0	0	0
SS22	1	0	1	0	0	0	0
CS19	1	1	1	0	0	0	1
SS67	1	1	1	0	0	0	0
SS13	2	2	1	0	0	1	0
SS14	8	6	1	0	1	2	3
SS31	6	6	1	0	1	0	0
DESPLAINES	2	0	1	1	0	2	0
SS32	3	1	1	1	1	1	0
SS15	5	2	1	1	0	1	2
CS30	5	3	1	1	1	2	1
CS23	5	4	1	1	0	2	0
SS26	8	4	1	1	0	1	2
CS20	3	1	1	2	0	0	1
SS10	3	0	1	3	0	0	2
CS05	5	2	1	3	0	1	2
SS45	16	5	1	3	4	5	2
EGT	5	0	1	4	0	2	1
SS08	8	1	1	7	2	3	1
CS10	3	2	2	0	0	0	0
CS04	7	7	2	0	0	0	0
SS28	8	7	2	0	1	2	0
SS18	2	0	2	1	0	0	0
CS02	4	1	2	1	0	0	1
CS22	5	3	2	1	0	0	1
SS19	4	3	2	1	0	1	1
CS27	8	5	2	1	2	0	2
CS33	6	6	2	1	2	0	0
SS44	10	7	2	1	2	4	1
SS04	2	0	2	2	1	0	0
CS01	12	10	2	2	0	1	1

Table 4.8 Basins with Seepage (Continued)

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
SS01	5	1	2	4	1	0	0
CS32	8	7	3	0	3	1	1
SS12	8	5	3	1	0	0	4
SS21	11	8	3	2	1	6	0
SS42	5	1	3	4	4	0	1
CS24	6	0	4	1	0	1	3
SS27	16	14	4	2	1	2	1
SS25	6	4	5	0	0	0	1
SS41	25	10	5	8	7	3	5
CS28	14	6	6	3	3	1	3
CS25	21	18	6	3	1	0	4
SS16	20	9	6	11	2	1	3
CS29	31	26	8	3	0	4	4
CS16	19	10	9	2	0	3	4
CS18	27	20	9	3	1	4	11
CS31	26	17	10	4	1	7	3
IL AMER	46	20	10	10	4	13	7
SS11	51	31	17	14	26	7	4
CS21	98	79	20	6	12	13	15
Totals	**603**	**376**	**177**	**120**	**85**	**97**	**100**

Reports of more than five occurrences of seepage were made in only 10 of the basins in the Village.

Basin CS18, Highland Street Area reported 9 occurrences of seepage. The Highland Street Area was selected for detailed analysis.

Basin CS21, Isabella Street Area reported 20 occurrences of seepage. The Isabella Street Area was selected for additional detailed analysis.

Basin CS31, Lonnquist Boulevard Area reported 10 occurrences of seepage. The Lonnquist Boulevard Area was selected for additional detailed analysis.

Basin SS11 which is part of the Hatlen Heights Subdivision reported 17 occurrences of seepage. The Hatlen Heights Subdivision was selected for additional detailed analysis.

Seepage was reported at 9 locations in Basin CS16, 8 locations in Basin CS29, and 6 locations in Basins SS16, CS28 and Basin CS25. Seepage was reported at 10 locations in the Illinois American basin. These basins were not selected for detailed analysis at this time because of the fact that these basins reported less surface induced flooding that those basins selected for further analysis.

4.4 SURFACE FLOODING

Surface flooding

Surface flooding is defined as ponding of rainfall runoff on the ground. Surface flooding can be generally categorized into two categories:

- Street Flooding which occurs when street inlets do not have enough capacity to convey runoff into the sewer systems quickly enough; when the amount of rainfall exceeds the capacity of the storm sewer system which results in the sewers overflowing; and/or when the outfall of a sewer system is restricted because of downstream flooding or capacity limitations.
- Private Sector (Yard) Surface Flooding – which is overland flooding that happens on private properties, including in yards, window wells, driveways, etc.

A total of 59 out of the 107 drainage basins reported surface flooding consisting of 96 reports of street and yard flooding, 101 reports of street flooding only and 107 reports of yard flooding only. Basins that reported surface flooding are presented in Table 4.9.

Table 4.9 Basins with Surface Flooding

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
BASIN	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
CS02	4	1	2	1	0	0	1
CS03	1	0	1	0	0	0	1
CS09	5	3	0	0	0	0	1
CS19	1	1	1	0	0	0	1
CS20	3	1	1	2	0	0	1
CS22	5	3	2	1	0	0	1
CS34	3	1	0	1	0	0	1
OTHER	1	0	0	0	0	0	1
SS07	1	0	0	1	0	0	1
SS25	6	4	5	0	0	0	1
SS37	1	0	0	0	0	0	1
SS10	3	0	1	3	0	0	2
SS12	8	5	3	1	0	0	4

Table 4.9 Basins with Surface Flooding (Continued)

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
BASIN	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
CS26	2	2	0	0	0	1	0
SS13	2	2	1	0	0	1	0
SS63	1	0	0	1	0	1	0
CS01	12	10	2	2	0	1	1
S04A	2	0	0	0	0	1	1
SS19	4	3	2	1	0	1	1
CS05	5	2	1	3	0	1	2
SS15	5	2	1	1	0	1	2
SS26	8	4	1	1	0	1	2
CS24	6	0	4	1	0	1	3
CS23	5	4	1	1	0	2	0
DESPLAINES	2	0	1	1	0	2	0
EGT	5	0	1	4	0	2	1
CS16	19	10	9	2	0	3	4
CS29	31	26	8	3	0	4	4
SS01	5	1	2	4	1	0	0
SS04	2	0	2	2	1	0	0
SS31	6	6	1	0	1	0	0
SS40	1	1	0	0	1	0	0
SS55	4	0	0	4	1	0	0
CS25	21	18	6	3	1	0	4
SS32	3	1	1	1	1	1	0
SS29	9	6	0	2	1	1	1
SS28	8	7	2	0	1	2	0
CS30	5	3	1	1	1	2	1
SS27	16	14	4	2	1	2	1
SS14	8	6	1	0	1	2	3
CS18	27	20	9	3	1	4	11
SS21	11	8	3	2	1	6	0
CS31	26	17	10	4	1	7	3
CS33	6	6	2	1	2	0	0
SS49	2	0	0	2	2	0	0
SS57	4	2	0	2	2	0	0
CS27	8	5	2	1	2	0	2
SS16	20	9	6	11	2	1	3
SS08	8	1	1	7	2	3	1

Table 4.9 Basins with Surface Flooding (Continued)

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
BASIN	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
SS44	10	7	2	1	2	4	1
CS32	8	7	3	0	3	1	1
CS28	14	6	6	3	3	1	3
SS68	4	2	0	1	4	0	0
SS42	5	1	3	4	4	0	1
SS45	16	5	1	3	4	5	2
IL AMER	46	20	10	10	4	13	7
SS41	25	10	5	8	7	3	5
CS21	98	79	20	6	12	13	15
SS11	51	31	17	14	26	7	4
Totals	**628**	**383**	**168**	**133**	**96**	**101**	**107**

Reports of more than five occurrences of surface flooding were made in only 18 basins in the Village.

Reports of more than five occurrences of street flooding (both street flooding only plus street and yard flooding reports) were made in only 10 basins in the Village. A discussion of each of the basins in which five or more reports of street flooding (street flooding only plus street and yard flooding reports) were reported and several basins identified with concentrated localized flooding is presented in the following paragraphs.

Basin SS11 which is part of the Hatlen Heights Subdivision reported 26 occurrences of street and yard flooding, 7 occurrences of street flooding only and 4 occurrences of yard flooding only. This area was identified as one of the basins in the Village that experienced the most severe surface flooding. The Hatlen Heights Subdivision was selected for additional detailed analysis.

Basin SS08, which is also part of the stormwater drainage area served by the sewers in Basin SS11 reported 2 occurrences of street and yard flooding, three occurrences of street flooding only and one occurrence of yard flooding only. Basin SS08 is included in the additional detailed analysis of the Hatlen Heights Subdivision.

Basin SS21 is located in the center section of the Village along Golf Road. One occurrence of street and yard flooding and 6 occurrences of street flooding only were reported in this basin. Based on review of the flooding questionnaire results, a concentration of street flooding was identified along Tower Lane, Tower Drive and Sunset Road. . Basin SS21 was selected for additional detailed analysis.

Basin SS32 was selected for additional detailed analysis based on reports of street flooding at the intersection of Cherrywood Drive and West Palm Drive.

Basin SS41 is located in the southwest section of the Village along South Busse Road. Twenty-five flooding questionnaires were received from this basin. Of these, 7 reported street and yard flooding, 3 reported street flooding only and 5 reported yard flooding only. Based on review of the flooding questionnaire results, a concentration of street and yard flooding was identified along Magnolia Lane, Pheasant Trail, and Catalpa Lane. Basin SS41 was selected for additional detailed analysis.

Basin SS44 is located in north of Central Road at southeast corner of the Village. One occurrence of street and yard flooding and 6 occurrences of street flooding only were reported in this basin. Based on review of the flooding questionnaire results, flooding was not concentrated in any specific area in this basin. This basin is not recommended for further detailed evaluation or analysis.

Basin SS45 is located in the south section of the Village along Golf Road. Sixteen flooding questionnaires were received from this basin. Of these, 4 reported street and yard flooding, 5 reported street flooding only and 2 reported yard flooding only. Based on review of the flooding questionnaire results, a concentration of street and yard flooding was identified along Beechwood Drive and Grace Drive. Basin SS45 was selected for additional detailed analysis.

Basin CS18, Highland Street Area reported 1 occurrence of street and yard flooding, 4 occurrences of street flooding only and 11 occurrences of yard flooding. Basin CS18's mainline sewer flows along Highland Street, Elmhurst Avenue, Fairview Avenue, Maple Court, Wille Street, and Highland Street. Severe street and yard flooding was reported in all of these areas. The primary type of surface flooding reported in Basin CS18 was private sector flooding in yards. The Highland Street Area was selected for detailed analysis.

Basin CS21, Isabella Street Area reported 12 occurrences of street and yard flooding, 13 occurrences of street flooding only and 15 occurrences of yard flooding only. The Isabella Street Area was identified as one of the basins in the Village that experienced the most severe surface flooding. Basin CS21's mainline sewer is located along Isabella Street. It intersects Elm Street, Emerson Street, Main Street, Maple Street, Pine Street, Russell Street, and Wille Street. One resident reported that the street flooded up to 3 feet. Another reported street flooding in the right-of-way up to the sidewalk. Basin CS21 was selected for additional detailed analysis.

Basin CS31, Lonnquist Boulevard Area reported 1 occurrence of street and yard flooding, 7 occurrences of street flooding and 3 occurrences of yard flooding. Seven of the reports of street flooding were concentrated along South Na Wa Ta Avenue and South See Gwun Avenue. The drainage area tributary and downstream of South Na Wa Ta Avenue and South See Gwun Avenue in the Lonnquist Boulevard Area was selected for additional detailed analysis.

The Illinois American Basin, reported 4 occurrences of street and yard flooding, 13 occurrences of street flooding only and 7 occurrences of yard flooding only. Based on review of the flooding questionnaires and site investigation it appears that a significant number of the surface flooding occurrences involved street flooding and flooding of garages with garage floors below the street elevation and surrounding ground surface. These garages typically have drains and sump pumps to keep them dry. The amount of stormwater produced by the July 23rd storm event likely resulted in producing more water than what the garage drains and sumps could manage. In some cases street and yard flooding may have contributed to

the garage flooding. Flooding in the Illinois American Basin was very widespread with the exception of a concentration of reported flooding on Park Drive. There we also two reports of street flooding along Ironwood Drive with one reported incident of severe street flooding that resulted in flooding a garage with a floor below street level. The Park Drive Area and Ironwood Drive Area were selected for additional detailed analysis. Garage flooding did occur in other basins in the Village, but not to the extent that it did in the Illinois American Basin.

In addition to the above, parking garage flooding was experienced at [redacted]. [redacted] is located in Basin CS23. It experienced significant clear water flooding at the lowest level of its underground parking garage. An on-site inspection of the site with a [redacted] representative indicated that rain water accessed the subterranean garage space via the access ramp. Reportedly, water over-ran the trench drain at the bottom of the garage door. Once passed the garage door, water flowed by gravity to the lowest point in the garage where it accumulated; causing damage to several parked vehicles. Staff observed floor drains in the parking garage. However, the drains were very small and clearly not intended to convey stormwater. The [redacted] expressed concerns that flooding occurred because the inlet in the Village-owned parking lot adjacent to their north property line would not accept the rainwater. They asserted that the subsequent ponding of rainwater influenced the amount of water that was retained in their courtyard and the amount of water that was conveyed down their parking garage ramp into their parking garage.

The Village separated the combined sewer in this area as part of the Pine/Wille Improvements Project to facilitate construction of [redacted]. As part of this project additional stormwater management capacity was provided through the construction of new 60-inch-diameter storm sewer from Northwest Highway to Central Road. The intention of the 60-inch-diameter sewer in this area was to provide additional detention needed for the construction of [redacted]. The [redacted] was not required to provide on-site detention when it was constructed. Consequently, the property contributes a considerable volume of run-off to the local combined sewer system. Based on the review of the flooding questionnaires the parking garage flooding at the [redacted] property appears to be an infrequent incident and a consequence of the storm's magnitude.

Basin CS23, in which [redacted] is located, was not selected for additional analysis. A limited hydraulic assessment of the [redacted] property indicates that the detention provided by the 60-inch-diameter sewer provides approximately a 5-year level of service. Additional analysis of the [redacted] since it is a private property is beyond on the scope of services included in this study.

Basins in which five or less occurrences of street flooding (street flooding only plus street and yard flooding) were not selected for additional analysis because of the relatively low number of public sector surface flooding occurrences.

4.5 OVERALL FLOOD SURVEY SUMMARY

The Village-wide surveys greatly aided Burns & McDonnell in analyzing each basin in the Village. While flooding occurred throughout the Village, after compiling the data and reviewing the results of the flooding questionnaire, several areas exhibited major flooding issues. These areas include the Hatlen Heights Subdivision which is primarily comprised of Basins SS08 and SS11, Basin CS18 which is the Highland Street Area, Basin CS21 referred to as the Isabella Street Area and the Lonnquist Boulevard

Area which consists of Basin SS18 and Basin CS31. These areas were selected for additional detailed modeling as part of this study and are shown on Exhibit 3.

Localized surface flooding was identified in Basin SS21, Basin SS32, Basin SS41, Basin SS45 and the Illinois American Basin. These basins are shown in Exhibit 2.

* * * * *

5.0 METHOD OF ASSESSMENT & FINDINGS

5.1 HYDRAULIC MODELING

As discussed in Chapter 4, several areas were identified for further analysis as part of this study. These areas include the Hatlen Heights Subdivision which is primarily comprised of Basins SS08 and SS11, Basin CS18 which is the Highland Street Area, Basin CS21 the Isabella Street Area, and the Lonnquist Boulevard Area which consists of Basin SS18 and Basin CS31. These areas are shown on Exhibit 3.

Computerized modeling of these areas was performed to determine the level of protection provided by the combined and storm sewer systems in these areas. XPSWMM, an industry standard model, was the model used for the hydraulic analyses performed in these areas. Based on the results of the modeling and information obtained through field investigation potential improvements to mitigate flooding in each of these areas was developed. As part of the modeling, each system was evaluated using the rainfall data for the July 23rd storm. The results of these models were compared with the Village wide survey data that was gathered to calibrate the models. Once the models were calibrated, the systems were analyzed for their capability to handle flows generated from 1-year, 2-year, 5-year, 10-year, 25-year, and 100-year recurrence interval storm events with a 3-hour duration. The 1-year storm represents a storm that has approximately a 99 percent chance to occur once in any given year. A 2-year storm has a probability of occurring once every 2 years. The modeled storm events have the probability of occurring once every 5-years, 10-years, 25-years, 50-years or 100-years based on their recurrence interval.

Localized areas in Basin SS21, Basin SS32, Basin SS41, Basin SS45 and the Illinois American Basin were also hydraulically modeled using a combination of computerized and tabular methods. Since these areas of flooding were generally confined to a localized area; detailed modeling with XPSWMM was not performed.

Table 5.1 presents the rainfall data (in inches) for each recurrence interval for a 3 hour duration storm.

Table 5.1 Rainfall Data

Village of Mount Prospect						
Rainfall Data In Inches for Northern Illinois (3-hour Storm Duration)						
Storm	**1 - Year**	**2 – Year**	**5 - Year**	**10 - Year**	**25 - Year**	**100 - Year**
Rainfall	1.6	1.94	2.43	2.86	3.53	4.85

It should be noted that these rainfall amounts are based on a statistical analysis of historical data. Any of these storms can occur at any number of times in any given year. The classifications refer to the likelihood of each storm occurring in any given year.

5.1.1 Basin SS11 and Basin SS08 - Hatlen Heights Subdivision

One of the most heavily impacted areas during the July 23rd storm was the Hatlen Heights Subdivision. The Hatlen Heights Subdivision is primarily residential consisting of approximately 400 homes, and when it was constructed, it was part of unincorporated Cook County. The storm sewer system that collects and conveys stormwater in this area is located in separate sewer Basin SS11 and separate sewer Basin SS08 which are generally bounded by Meier Road on the west, Bonita Avenue to the north, Busse

Road to the east, and Lincoln Street to the south. There is also an area north of these basins located in the Village of Arlington Heights that drains into the Hatlen Heights Subdivision. The total area tributary to the Hatlen Heights Subdivision is approximately 213 acres.

Stormwater in the Hatlen Heights Subdivision is conveyed by a mainline sewer that ranges from 42-inches to 72-inches in diameter and ultimately empties into the Crumley Detention Basin. The Crumley Detention Basin discharges into Weller Creek. Weller Creek discharges to the Des Plaines River, which flows to the Illinois River and ultimately merges with the Mississippi River. The locations of the mainline sewer, Crumley Detention Basin and primary storm sewer mains serving the Hatlen Heights Subdivision are shown on Exhibit 6.

A total of 59 flooding questionnaires were completed in Basins SS08 and SS11. Thirty-two sewer backups, 18 occurrences of seepage, 21 sump pump failures, 28 occurrences of street and yard flooding, 10 occurrences of street flooding only and 5 occurrences of yard flooding only were reported. Reported flooding was concentrated near the intersection of Lincoln Street and Meier Road, the intersection of Meier Road and Grindel Drive, the intersection of Bonita Avenue and Hatlen Avenue, the intersection of Hatlen Court and Hatlen Avenue, and along Verde Drive. Based on review of the questionnaires, flooding in this area was further complicated by the reported loss of electrical power ranging from two to 14 hours. Locations of reported flooding are shown on Exhibit 1.

It was reported that the Crumley Detention Basin overflow weir overtopped during the July 23rd storm. In addition to the overflow weir, this detention basin has two main outfalls consisting of a 12- inch-diameter and a 24- inch-diameter pipe. A flap gate is installed on the 24-inch-diameter outfall. This gate is intended to prevent Weller Creek from backing up into the detention basin. Depending on the relative elevations of the water in the detention basin and Weller Creek the outfalls from the detention basin can be hydraulically restricted. Based on the modeling results and the observations made by local residents during the July 23rd storm the detention basin's discharge capacity was restricted by the elevation of Weller Creek, which resulted in the basin filling up, in turn restricting the ability of stormwater to be conveyed out of the Hatlen Heights Subdivision. This is attributed to the fact that the water level in Weller Creek was higher than the principal outfall of the Crumley Detention Basin.

The Hatlen Heights mainline sewer, major inlets and the Crumley Detention Basin were modeled using the rainfall data from the July 23rd storm event and 1-year, 2-year, 5-year, 10-year, 25-year, 50-year and 100-year recurrence interval events with a three hour duration. Results of the model are consistent with the data obtained from the flooding questionnaires.

Based on the modeling results the stormwater management system in Basin SS11 does not have sufficient capacity to convey stormwater out of the Hatlen Heights Subdivision without flooding. Some areas within this basin, particularly in the areas of the intersection of Hatlen and Beverly, as well as along East Hatlen Avenue provide less than a 1-year level of protection. Exhibit 6 depicts the existing system within the Hatlen Heights Subdivision, and shows the sewer structures that are predicted to experience flooding during a 25-year storm event. Results of the modeling showing 1-year, 2-year, 5-year, 10-year, 25-year, 100-year, and the July 23, 2011 storm events are shown on Table I. in Appendix B.

5.1.2 Basin CS18 - Highland Street Sewer System

The Highland Street Area experienced a significant amount of sewer backups and surface flooding as a result of the July 23rd, 2011 storm event. Basin CS18 is primarily residential with approximately 383 homes served by a combined sewer system. The Highland Street Area is generally bounded on the north by Kensington Road, the west by Forest Avenue, the south by Highland Street and the east by Rand Road. The total drainage area in this system is approximately 135 acres. The delineation of the drainage area is shown on Exhibit 3.

Combined wastewater generated in the Highland Street Area is collected and conveyed by a combined sewer that begins at Forest Avenue and conveys combined wastewater easterly along Highland Street to Rand Road. As the result of a comprehensive stormwater management study completed for the Village in 1990 the conveyance capacity of the existing system was upgraded by installing a parallel relief sewer in the 1990s with the intent of increasing the capacity of the combined sewer system to a 25-year level of service. The interceptor and parallel relief sewer discharge into a MWRDGC interceptor near the intersection of Rand Road and Business Center Drive.

The construction of this parallel relief sewer dramatically improved surface flooding concerns in this area. Even given the intensity of the July 23rd storm, surface flooding reports were reduced when compared to previous storms. However, there were still substantial amounts of sanitary backups. This emphasizes the fact that private sector improvements are tantamount to reducing flooding sanitary backups for storm events similar to the July 23rd event.

A total of 27 flooding questionnaires were completed in Basin CS18. Twenty sewer backups, 9 occurrences of seepage, 3 sump pump failures, 1 occurrence of street and yard flooding, 4 occurrences of street flooding only and 11 occurrences of yard flooding only were reported in this basin. Locations of reported flooding are shown on Exhibit 1.

When Basin CS18 was modeled for the July 23rd storm, flooding was simulated along Forest Avenue, Pine Street, Wille Street, Prospect Manor, Eastwood Avenue, Elmhurst Avenue, Russell Street, and Maple Court. When Basin CS18 was modeled for 1-year, 2-year, 5-year, 10-year, and 25-year recurrence interval events with a three hour duration it was determined that, with the exception of Maple Court, Basin CS18 has the capacity to collect and convey combined wastewater from the Highland Street Area from over a 25-year storm event with a three hour duration. The Highland Street Area combined sewer system, with the exception of Maple Court provides a 25 year level of service.

Maple Court is currently served by an 8-inch-diameter sewer. Based on the modeling results, this sewer provides a 1 year level of protection. Maple Court is served by a private entity and the 8-inch-diameter sewer is not part of the Village's sewer system.

Exhibit 7 shows the sewer structures that are predicted to experience flooding for a 25-year storm event. As shown on the exhibit, the system has the capacity to convey combined wastewater from the site, with the exception of the Maple Court area. Results of the modeling showing 1-year, 2-year, 5-year, 10-year, 25-year, 100-year, and the July 23, 2011 storm events are shown on Table II in Appendix B. Results of

the detailed analysis for Basin CS18 confirm that the recommendations made in the 1990 Comprehensive Stormwater Management Report and implemented by the Village were effective.

5.1.3 Basin CS21 - Isabella Street Area

The Isabella Street Area experienced a significant amount of sewer backup and surface flooding as a result of the July 23rd, 2011 storm event. This area is primarily residential with approximately 789 homes served by combined sewer Basin CS21. The Isabella Street Area is generally bounded on the north by Highland Street, on the west by Eastwood Avenue and on the east by Rand Road. It is bounded on the south by Central Road from Main Street to Maple Street and Thayer Street from Elm Street to Louis Street. The total drainage area in this system is approximately 245 acres. The delineation of the drainage area is shown on Exhibit 3.

Combined wastewater generated in the Isabella Street Area is collected and conveyed by a combined sewer that begins at Elmhurst Avenue and conveys combined wastewater easterly along Isabella Street to Rand Road where it connects into the Rand Road sewer system and ultimately discharges into a MWRDGC combined sewer interceptor. The combined sewer overflow for this basin discharges to Feehanville Creek. Feehanville Creek discharges to the Des Plaines River.

A total of 98 flooding questionnaires were completed in Basin CS21. Based on the questionnaires 79 sewer backups, 20 occurrences of seepage, 6 sump pump failures, 12 occurrences of street and yard flooding, 13 occurrences of street flooding only and 15 occurrences of yard flooding only were reported in this area. No power outages were reported in this area. Therefore, it is believed that the sump pump failures in this area were due to a lack of capacity, rather than a lack of power. Locations of reported flooding are shown on Exhibit 1.

When Basin CS21 was modeled for the July 23rd storm the most severe flooding was evident along Russell Street, Pine Street, and Wille Street north of Isabella Street between Highland Street and Gregory Street and south of Isabella Street. These results were consistent with results of the flooding questionnaires. When Basin CS21 was modeled for 1-year, 2-year, 5-year, 10-year, and 25-year recurrence interval events with a three hour duration it was determined that it can convey combined wastewater generated by a 1-year storm event. This means that the sewer system in this basin has approximately a 1-year level of protection. Exhibit 8 shows the storm structures that are predicted to have flooding issues during the 25-year storm. Results of the modeling showing 1-year, 2-year, 5-year, 10-year, 25-year, 100-year, and the July 23, 2011 storm events are shown on Table III in Appendix B.

5.1.4 Basin CS31 Lonnquist Boulevard Area

The Lonnquist Boulevard Area experienced a significant amount of sewer backup and surface flooding as a result of the July 23rd, 2011 storm event. Eleven of the 17 sanitary backups were located on South Na Wa Ta Avenue and South See Gwun Avenue. Seven of the 8 reports of surface flooding were located on See Gwun Avenue and South Na Wa Ta Avenue. The remaining sanitary backups were fairly widely dispersed in throughout Basin CS31; therefore the drainage area tributary and combined and separate storm sewer systems downstream of South Na Wa Ta Avenue and South See Gwun Avenue were analyzed. Locations of reported flooding are shown on Exhibit 1.

Combined wastewater generated in the drainage area analyzed in Basin CS31 is collected and conveyed by a combined sewer that begins on South We Go Trail and conveys combined wastewater easterly along West Sunset Road to South Na Wa Ta Avenue where it turns east at West Lonnquist Boulevard and ultimately discharges into a MWRDGC combined sewer interceptor.

Historical flooding in this area resulted in the installation of a separate storm sewer system that begins at the intersection of South See Gwun Avenue and West Sunset Road that conveys stormwater easterly to South Na Wa Ta Avenue where it turns north and is ultimately discharged into Weller Creek.

When Basin CS31 was modeled for the July 23rd storm, the model showed flooding along South See Gwun Avenue. When the basin was modeled for 1-year, 2-year, 5-year, 10-year, and 25-year recurrence interval events with a three hour duration it was determined that the sewer system provided a 10 year level of service with the exception of segments of the combined sewer system along See Gwun Avenue which provided less than a 2-year level of service. Exhibit 9 shows the storm structures that are predicted to have flooding issues during the 25-year storm.

During the field investigation completed by Burns & McDonnell in Basin CS31 some of the residents along Na Wa Ta Avenue mentioned that their street and front yards flood on a frequent basis, even during storms of lower intensity. Based on their observations and the results of the modeling, it was determined that additional inlets along Na Wa Ta Avenue would improve drainage.

5.1.5 Basin SS21 – Tower Drive Area

Two reports of street flooding were received from residents living in the Tower Lane cul-de-sac and two reports of street flooding were received on Tower Drive between Country Lane and 916 Tower Drive. Two reports of street flooding were also received on Sunset Drive. Based on modeling of the storm sewer in this basin is believed that the localized flooding in this area is the result of the magnitude of the storm event that occurred on July 23rd, 2011. The storm sewers in this area are adequate to convey stormwater from a 10-year rainfall event.

5.1.6 Basin SS32 – Cherrywood Drive Area

Frequent street flooding was reported at the intersection of Cherrywood Drive and Palm Drive. Modeling results in this area indicated that the 18-inch-dimaeter storm sewer between Cherrywood Drive and South Oakwood Drive provides a 5-year level of protection. Exhibit 10 presents the storm sewers that would be predicted to have flooding issues for a 5-year or greater storm event.

5.1.7 Basin SS41 – Catalpa Area

Two occurrences of street flooding were reported on Catalpa Lane, two occurrences of street flooding were reported on Pheasant Trail and one report of street flooding was received from a resident on Magnolia Lane. Modeling results in this area indicate that the sewers on Pheasant Trail and Magnolia Lane have capacity to convey stormwater from a 10-year rainfall event. Modeling results in this area indicated that the 24-inch-diameter storm sewer on Lavergne Drive between West Catalpa Lane and West Willow Lane provides a 2-year level of protection. Exhibit 11 shows the storm sewer on Lavergne Drive that would be expected to have flooding issues for a 5-year or greater storm event.

5.1.8 Basin SS45 – Beechwood Drive and Grace Drive Area

Three occurrences of street flooding were reported on Beechwood Drive, two occurrences of street flooding were reported on both Cypress Drive and Grace Drive, and one report of street flooding was reported on both Willow Lane and Palm Drive. The storm sewers on Beechwood Drive and Grace Drive are tributary to a 27-inch-diameter storm sewer on West Ash Drive located between Grace Drive and Cypress Drive. Modeling results indicate that this 27-inch-diameter sewer on West Ash Drive and the storm sewer downstream of it provide a 5-year level of protection. Exhibit 12 shows storm sewer that would be expected to have flooding issues for a 10-year or greater storm event.

5.1.9 Illinois American Area

Seventeen residents in the Illinois American Area reported street flooding. The reported street flooding was dispersed throughout the area. Two primary localized areas of concern were identified in which street induced structure flooding occurred. These included the 1400 block of Park Drive and Ironwood Drive between Brentwood Lane and Westgate Road. Residents experienced flooding in low-lying garages with floor elevations below the surrounding surface areas. It was reported that this flooding occurred as a result of street flooding.

Modeling in the Ironwood Drive area indicated that 36-inch-diameter sewer located on Westgate Road that the 36-inch-diameter sewer Ironwood Drive discharges into has a 2 - year level of service. These sewers are shown on Exhibit 13. Modeling also indicated that a section of the 12-inch-diameter sewer and the 15-inch-diameter sewer on Park Drive north of the intersection of Park Drive and East Tano Lane have 2-year level of service. These sewers are shown on Exhibit 14.

* * * * *

6.0 POTENTIAL SOLUTIONS – PUBLIC SECTOR IMPROVEMENTS

Burns & McDonnell performed a broad overview of the potential cost to mitigate flooding from the July 23rd, 2011 storm event through public and private sector improvements only. Based on 74 out of the 107 combined and separate sewer basins reporting flooding from the July 23rd, 2011 event and the locations where the 658 flooding questionnaires were received, a low end conservative estimate of the capital cost to mitigate the flooding from an event similar to the July 23rd storm using public sector improvements only is in excess of $200,000,000. This cost would include the construction of relief storm sewers, combined relief sewers, underground detention, sanitary relief stations and other related improvements. Purchasing property to create additional detention would increase theses costs further. Additional Village operation and maintenance costs would also be incurred. Even with all these improvements, protection against sewer backups from a storm event similar to the July 23rd, 2011 storm event would not be as reliable as installing overhead plumbing or backup prevention systems.

Eliminating the 379 sewer backups reported by residents served by the Village through private sector only improvements consisting of the installation of overhead plumbing in separate sewer areas and overhead plumbing and combination back-up prevention systems in combined areas is estimated to cost approximately $10,000,000. It is important to note that neither public sector improvements nor installation of overhead plumbing and combination backup prevention systems will mitigate surface induced flooding caused by poor drainage or other factors on private property.

Based on Burns & McDonnell's experience and evaluation of the Village of Mount Prospect's stormwater management system it is believed that a combination of public and private sector improvements will result in a cost-effective solution to reduce the impact of storm events similar to the July 23rd, 2011 storm.

While it is cost-prohibitive to propose a stormwater management solution consisting of only public sector improvements that will prevent flooding during an event like the July 23rd, 2011 storm, it is important to review the Village system in areas that experienced flooding and identify areas that can be provided with a higher level of service. In residential neighborhoods that have experienced severe surface flooding and surcharging of stormwater structures, public sector improvements coupled with private sector sewer backup prevention will decrease the frequency and severity of flooding. For those residents that experienced only sewer backups and nuisance flooding during the July 23rd storm, the installation of overhead plumbing or backup prevention devices will virtually eliminate the sewer backups. One of the objectives of this report is to identify public sector improvement projects to upgrade the stormwater management system that are reasonable based on a cost benefit assessment.

Public sector improvements can include stormwater collection and conveyance improvements, stormwater detention, stormwater outfall improvements and best management practices. These improvements can include:

- Increasing the capacity of the stormwater conveyance system through the replacement of existing sewers with larger sewers;
- Increasing the capacity of the stormwater collection system through the installation of additional inlets and catch basins;

- Increasing the capacity of the stormwater conveyance and collection system through the separation of combined sewers;
- Increasing the capacity of parallel relief sewers;
- Providing additional detention through the expansion of existing detention facilities;
- Providing additional detention through the construction of new detention facilities;
- Increasing the capacity of outfalls to receiving streams and MWRDGC interceptors; and
- Continuing best management practices of ongoing maintenance of stormwater infrastructure.

The following sections discuss the potential solutions for public sector improvements in further detail.

6.1 INCREASE COLLECTION AND CONVEYANCE CAPACITY

The primary means by which the Village can improve the performance of its stormwater management system is to increase the collection and conveyance capacity of the system in areas where flooding has been reported.

6.1.1 Increase Pipe Sizes and Inlet Capacities

A total of 379 flooding questionnaire respondents located throughout 52 of the 107 combined and separate sewer basins in the Village reported sewer backups through basement floor drains, shower drain, and/or toilets. Many of these backups can be attributed to surcharging sewer systems associated with the extraordinary amount of rainfall that occurred on the July 23rd storm.

A total of 304 flooding questionnaire respondents located throughout 59 of the 107 combined and separate sewer basins in the Village reported some type of surface flooding. A total of 96 occurrences of street and yard flooding, 101 occurrences of street flooding only and 107 occurrences of yard flooding only were reported. In total 197 reports of street flooding were received. Much of the street flooding, while significant, did not prevent residents from entering and leaving their properties. Two areas were significantly affected by surface flooding. These were the Hatlen Heights Subdivision (Basin SS11) and Isabella Street Area (Basin CS21). The severe street flooding experienced in these areas and other areas can primarily be attributed to capacity of the separate storm or combined sewer collection and conveyance system not being large enough to collect and convey the stormwater produced by the July 23rd storm.

Overall, the Village's stormwater and wastewater conveyance system performed quite well given the severity of the storm. However, in some cases, such as in the Hatlen Heights Subdivision and Isabella Street Area, the capacity of the existing stormwater management system could be improved to provide an increased level of service that would benefit a significant number of properties.

Areas where the sewer system may not have the capacity to collect and convey stormwater produced by a 25-year event include all of the areas that were modeled as part of this study, with the exception of Basin CS18, as presented Chapter 5 of this report. It is important to note that five or less surface water flooding occurrences were reported as a result of the July 23rd storm event in 49 of the 59 basins that reported surface flooding. Those basins that reported more than five occurrences of flooding in the street included Basin SS08, Basin SS11, Basin SS21, Basin SS41, Basin SS44, Basin SS45, Basin CS18, Basin CS21, Basin CS31 and the Illinois American Basin.

Public sector stormwater collection system capacity and conveyance improvements can be made to reduce the magnitude and frequency of flooding in the areas that experience surface water flooding. Typically improvements would be made only in areas with a concentration of street and street and yard flooding that is the result of insufficient sewer system collection and conveyance of the public sector storm sewer system. The improvements would be designed to provide a 25-year level of service in the affected area. It is possible to design systems for a 50-year or greater level of service, however this often is not cost effective and very difficult to permit since an overall increase in stormwater discharge into receiving streams and interceptor sewers must be approved by the MWRDGC.

Best management practices that can improve collection can include replacing inlets susceptible to blockage, replacing inlets that do not have sufficient capacity to collect runoff from the design storm, and adding collection capacity by installing additional inlets and/or upgrading the capacity of existing inlets through the installation of grates with increased capacity. The Mount Prospect Public Works implements these practices on an ongoing basis.

Hatlen Heights Subdivision (Basin SS11): The results of the modeling analysis show that the areas along Bonita Avenue, Verde Drive and along Hatlen Avenue between Beverly Lane and Hatlen Court have less than a 5-year level of service; along Hatlen Avenue less than a 1-year level of service exists.



Hatlen Avenue

Based on the modeling efforts it was determined that a 25-year level of service can be provided along Hatlen Avenue by increasing the sizes of the storm sewers from 15-inch-diameter, 21-inch-diameter and 24-inch-diameer to 36-inch-diameter and 42-inch-diameter sewers. This would require the construction of approximately 1,850 feet of new storm sewer.

Along Verde Drive, a 25-year level of protection can be provided by upgrading 375 feet of existing storm sewer from 18-inches in diameter to 27 inches in diameter.

Along Busse Road, a 25-year level of protection can be provided by upgrading 400 feet of existing storm sewer from 30-inches in diameter to 36-inches in diameter.

Overall approximately 2,500 linear feet of new storm sewer are recommended to be installed in the Hatlen Heights Subdivision to provide a storm sewer system with a 25-year level of service. The budgetary cost for this is $1.5 million. Exhibit 15 shows the recommended storm sewer system improvements for a 25-year level of service in the Hatlen Heights Subdivision.

As part of the Village's response to the July 23rd storm event the Village contracted with Visu-Sewer to televise and inspect the sanitary sewer in the areas that were heavily impacted. One of the areas inspected was the Hatlen Heights Subdivision at Hatlen Avenue and Michael Street. The existing 12-inch-diameter sanitary sewer along this section of the subdivision was found to have severe sag and deteriorated pipe sections that would affect four residences along Hatlen Avenue. These residences reported to the Village that they experienced sanitary backup and surface induced flooding during the July 23rd storm event. Repair of this sewer would require a replacement for approximately 150 feet of existing sewer, reconnection of three services and addition of a sanitary manhole. The budgetary cost for replacement of the 150 linear feet sanitary sewer is $105,000.

Highland Street Area (Basin CS18): Based on the results of the modeling the Highland Street Area public sector combined sewer system provided a 25-year level of service or better.

Isabella Street Area (Basin CS21): The Isabella Street Area which includes the Pine/Wille subdivision is tributary to the Isabella Street combined sewer interceptor. During the July 23rd rain event the area bounded by the Highland Street, Elmhurst Avenue, Central Road and Elm Street quadrant experienced widespread flooding of yards, homes, and streets.

An analysis of the combined sewer system showed that south of Isabella Street sections of sewer along of Russell Street, Pine Street, Wille Street, Main Street and Emerson Street only had sufficient capacity to provide a 1-year level of service. The size of the combined sewers along these streets would need to be increased to provide a 25-year level of service. Sewers along these streets south of Isabella would need to be increased from 15-inches, 18-inches, 24-inches, and 27 inches in diameter to 18-inches, 24-inches, 27-inches, and 30-inches in diameter. Approximately 6,600 linear feet of combined sewer along these streets would need to be increased in size or a parallel relief sewer constructed.

North of Isabella Street, there were areas along Russell Street, Pine Street, and Wille Street where the combined sewer system provides only a 2-year level of service. Sewers on Main Street, Emerson Street and Elm Street provided less than a 25-year level of service. The size of the combined sewers along these streets would need to be increased to provide a 25-year level of service. Approximately 4,700 linear feet of sewer along these streets would need to be increased from 12-inches, 15-inches, 18-inches, 21-inches, and 24-inches in diameter to 15-inches, 18-inches, 21-inches, 24-inches, and 27-inches in diameter respectively. A parallel relief sewer could also be installed.

In addition to the lateral sewers, the Isabella Street mainline sewer would need to be upgraded from 48-inches in diameter to 96-inches in diameter. An equivalent parallel relief sewer could also be installed. In total, approximately 3,500 feet of Isabella Street mainline sewer and 11,300 feet of sewer laterals would need to be replaced or an equivalent parallel relief sewer system would need to be installed. Improvements to the MWRDGC drop shaft connection would also be required. The budgetary cost for the improvements in the Isabella Street Area is $12.5 million. Exhibit 16 shows the recommended pipe system layout for the Isabella Street Area.

Lonnquist Boulevard Area (Basin CS31): The Lonnquist Boulevard Area experienced widespread flooding of yards, homes, and streets. Results of the modeling indicate that along South See Gwun

Avenue the combined sewers provide less than a 2-year level of service. Based on the model, the size of the 12-inch-diameter sewers on South See Gwun Avenue would need to be increased to 15-inches in diameter to provide a 25-year level of service. In total, approximately 600 feet of combined sewer would need to be upgraded. The budgetary cost for these improvements is $200,000.

In Basin CS31 significant surface flooding was reported along South Na Wa Ta Avenue from Golf Road to Lonnquist Boulevard. Although modeling these sewers indicates that they provide a 10-year or greater level of service, the impact of the storm was still significant. Surface flooding was experienced by many homes and reported by residents to the Village and Burns & McDonnell staff while onsite. During the field investigation it was observed that additional inlets along Na Wa Ta Avenue should be considered.

It should be noted that based on the modeling and observations made during the field investigations surface flooding experienced on South Na Wa Ta Avenue during the July 23rd storm may have been caused by the outfall to Weller Creek being restricted due to creek levels.

Recommended improvements for the Lonnquist Boulevard Area are shown on Exhibit 17.

Basin SS32 – Cherrywood Drive Area: Modeling results in this area indicated that the 18-inch-dimaeter storm sewer between Cherrywood Drive and South Oakwood Drive provides a 5-year level of protection. It is recommended that this sewer be increased in size to a 27-inch-diameter sewer to provide a 25-year level of service. In total approximately 400 feet of 18-inch-dimater sewer would need to be upgraded to 27-inch-diameter sewer. The budgetary cost for this improvement is $140,000. Exhibit 10 shows the 18-inch-diameter sewer that would be upgraded to a 27-inch diameter sewer near Cherrywood Drive.

Basin SS41 – Catalpa Lane Area: Modeling results in this area indicated that the 24-inch-diameter storm sewer on Lavergne Drive between West Catalpa Lane and West Willow Lane provides a 2-year level of protection. It is recommended that this sewer be increased in size to a 36-inch-diameter sewer from the intersection of Catalpa Lane and Lavergne Drive to the intersection of Lavergne Drive and West Willow Lane to provide a 25-year level of protection. In total approximately 350 feet of 24-inch-dimater sewer would need to be upgraded to 36-inch-diameter sewer. The budgetary cost for this improvement is $145,000. Exhibit 11 shows the storm sewer on Lavergne Drive that would be upgraded from 24-inch-diameter to 36-inch-diameter.

Basin SS45 – Beechwood Drive and Grace Drive Area: The storm sewers on Beechwood Drive and Grace Drive are tributary to a 27-inch-diameter storm sewer on West Ash Drive located between Grace Drive and Cypress Drive. Modeling results indicate that this 27-inch-diameter sewer and the storm sewer downstream of it provide a 5-year level of protection. Based on the results of the modeling approximately 600 feet of existing storm sewer along West Ash Drive from South Grace Drive to South Lancaster Avenue would need to be upgraded to 36-inches in diameter and approximately 1,700 feet of storm sewer from the intersection of West Ash Drive and South Lancaster Avenue to approximately Linneman Road would need to be upgraded to a 42-inch-diameter sewer to provide a 25-year level of protection. The budgetary cost for this improvement is $ 1,005,000. Exhibit 12 shows the storm sewer that would need to be increased in size to provide a 25-year level of protection.

Illinois American Area: Modeling in the Ironwood Drive area indicated that the 36-inch-diameter sewer located on Westgate Road that collects stormwater from the 36-inch-diameter sewer on Ironwood Drive has a 2-year level of service. Based on the modeling this would need to be increased to a 42-inch-diameter sewer to provide a 25-year level of service. Approximately 250 feet sewer would need to be increased to 42-inch-diameter sewer to provide a 25-year level of protection. The budgetary cost for these improvements is $113,000.

Modeling of the Park Drive Area indicated that the a section of the 12-inch-diameter sewer and the 15-inch-diameter sewer on Park Drive north of the intersection of Park Drive and East Tano Lane have 2-year level of service. Based on the modeling approximately 400 feet of 12-inch-diameter sewer would need to be increased to 18-inch-diameter sewer and 350 feet of 15-inch-diameter sewer would need to be increased to 24-inch-diameter sewer to provide a 25-year level of protection. The budgetary cost for these improvements is $185,000.

The proposed storm sewer improvements in the Illinois American Area are shown on Exhibit 13 and Exhibit 14.

6.1.2 Repair and Maintain System Outfalls

If a system outfall is undersized, blocked or damaged, it can cause a decrease in capacity of the upstream storm sewer system. These outfalls should be maintained on a regular basis to prevent them from falling into disrepair and to remove blockages. Repair and improvement of the outfall and area around the outfall can provide an improvement in system function. By televising or at least regularly inspecting the outfalls of combined and separate storm sewers in areas of concern, blockages and other issues can be identified and remedied. The Village's Public Works department currently inspects does inspect all of the outfalls on a Village-wide basis twice a year. This program should be continued.

In almost all cases increasing the size of the outfall is not allowed due to the increase in stormwater being discharged into a receiving stream or MWRDGC interceptor without significant study. Further, it is highly unlikely that MWRDGC will allow an increase in the size of any of the connections of the separate sanitary sewer system to its interceptors. This is further complicated by the fact that the MWRDGC's NPDES permit limits will be revised in the near future to limit the amount of wastewater allowed to discharge into MWRDGC interceptors to less than 150 gpcpd which is significantly less that the Village's currently allowable ICAP rate of 673 gpcpd.

6.1.3 Additional Detention and Retention Improvements

In areas where surface flooding and standing water cause severe floods within residential areas, detention basins can provide a location to store stormwater to minimize impact on the surrounding area. A significant challenge constructing new detention basins in fully developed areas like the Village of Mount Prospect is that there is usually not much available property on which to construct a new basin. In most cases properties would need to be purchased by the Village to allow for construction of a new above ground detention basin. Underground detention basins can be proposed but these are typically very expensive and costly to maintain. If an area is already being served by a detention basin, then improvement to the existing basin can be evaluated to help mitigate flooding.

While new detention basins can be costly, they are viable solutions to mitigate surface flooding and in limited cases reduce basement backups. New detention basins were not identified as feasible solutions for any of the areas modeled in this study. They should be considered if detailed analysis in other areas is performed.

Detention was considered for the locations that were modeled as part of this study. Providing detention in these areas would require the Village to purchase properties adjacent to each other and potentially demolish buildings to provide above ground detention. Underground detention was considered but was determined to be cost prohibitive for the areas evaluated.

Gregory Park and Busse Park were also evaluated for uses as potential detention areas. However, they are at higher elevations than the overall storm sewer systems in their area making them impractical to use.

6.1.4 Combined Sewer Separation

A widely reported source of flooding in the Village was lower level floor, shower and toilet drains backing up into the basements of homes and buildings. In combined sewer areas the sewer can become surcharged during rainfall events which can result in basement backups. Combined sewer separation was considered for the areas modeled as part of this study, however it was not found to be the most cost-effective solution. It is typically less expensive to install a parallel relief sewer or to make private sector improvements such as installation of overhead sewers or backup prevention systems. Combined sewer separation should be considered as a potential solution when evaluating potential flood mitigation alternatives in areas that were not modeled. However, it is widely recognized that combined sewer separation is typically not cost effective when compared to installation of a parallel relief sewer.

6.2 SUMMARY OF PUBLIC SECTOR IMPROVEMENTS

A summary of the public sector improvements identified as part of this study is presented in the following table.

Table 6.1 Summary of Public Sector Improvements

Village of Mount Prospect		
Area	**Improvement**	**Budgetary Cost**
Hatlen Heights Subdivision	Storm Sewer Improvements for 25-year Level of Service	$1,500,000
Hatlen Heights Subdivision	Sanitary Sewer Improvements for 25-year Level of Service	$105,000
Isabella Street Area	Combined Sewer Improvements for 25-year Level of Service	$12,500,000
Lonnquist Boulevard Area	CS31 Combined Sewer Improvements for 25-year Level of Service	$200,000
Lonnquist Boulevard Area	Adding Inlets and Televising	$135,000
Cherrywood Drive Area	SS32 Storm Sewer Improvements for 25-year Level of Service	$140,000
Catalpa Lane Area	SS41 Storm Sewer Improvements for 25-year Level of Service	$145,000
Beachwood Drive and Grace Drive Area	SS45 Storm Sewer Improvements for 25-year Level of Service	$1,005,000
Illinois American Area - Ironwood Drive	Storm Sewer Improvements for 25-year Level of Service	$113,000
Illinois American Area – Park Drive	Storm Sewer Improvements for 25-year Level of Service	$185,000
Total		$16,028,000

It is important to understand that implementation of the above recommended improvements will improve the capacity of the Village's existing stormwater management system; however it will not prevent surface flooding from storms similar to the July 23rd, 2011 storm event.

* * * * *

7.0 POTENTIAL SOLUTIONS – PRIVATE SECTOR IMPROVEMENTS

As discussed in Chapter 6, Burns & McDonnell performed a high level evaluation of the potential cost to mitigate flooding from the July 23rd, 2011 storm event through public sector improvements only. Based on 74 out of the 107 combined and separate sewer basins reporting flooding from the July 23rd, 2011 event and the locations where the 658 flooding questionnaires were received, a low end conservative estimate of the cost to mitigate the flooding using only public sector improvements is in excess of $200,000,000. Eliminating the 379 sewer back-ups reported by residents served by the Village through private sector improvements consisting of the installation of overhead plumbing in separate sewer areas and overhead plumbing and combination back-up prevention systems in combined sewer areas is estimated to cost approximately $10,000,000. Based on comparison, mitigation of the flooding caused by the July 23rd, 2011 event through public sector improvements only is not cost-effective or practical. It is important to note that neither public sector improvements nor installation of overhead plumbing and combination back-up prevention systems will mitigate surface induced flooding caused by poor surface drainage or other factors on private property. Based on Burns & McDonnell's experience and evaluation of the Village of Mount Prospect's stormwater management system it is believed that a combination of public and private sector improvements will result in a cost-effective solution to reduce the impact of storm events similar to the July 23rd, 2011 storm. This chapter focuses on those improvements that can be implemented in the private sector to mitigate flooding.

As presented in Chapter 6, the Village can implement public sector stormwater management projects to improve the public infrastructure and reduce the frequency and magnitude of flooding that occurs throughout the Village to a desired level of service; however it is cost prohibitive to mitigate the flooding caused by larger storm events similar to the July 23rd, 2011 event. Many of the flooding occurrences on private property and sewer backups that were experienced in the July 23rd storm can be mitigated by improvements and upgrades made by the individual property owners. These solutions include site grading, improving site discharge, installing overhead plumbing systems, installing backup prevention systems, sump pump upgrades, and implementing best management practices. Private sector improvements can provide cost-effective solutions to the individual property owners' flooding concerns and can address the majority of problems experienced within the Village. A discussion of private sector improvements that can be implemented in the Village is presented below.

7.1 SITE GRADING

When reviewing the results of the flooding questionnaires several Village-wide observations were made. Basement seepage through foundation walls, sump pump failure, floor drain backups, and significant rear-yard flooding were all seen throughout the Village. When these types of failures occur, a factor in their cause can be the drainage pattern specific to each individual lot. Depressional areas within a yard can collect water and cause overland flooding though window wells and basement doors. When stormwater runoff infiltrates into the ground around building foundations it is typically collected by foundation drains. As the foundation drains become overtaxed the local groundwater elevation around a building can rise causing seepage into a basement through cracks in the foundation and basement floor. Additionally, if the quantity of infiltration is significant enough it can exceed the capacity of sump pumps resulting in basement flooding.

A preventative measure to relieve some of the stormwater runoff impact is for the property owner to ensure that their property is properly graded. Depressional areas should be removed and runoff should be directed to sideyard swales and toward the public right-of-way. Runoff should not be directed toward house foundations, patios or window wells.

Where downspouts discharge overland the ground should be sloped away from adjacent foundations so rainwater does not infiltrate right next to the foundation or impact window wells.

7.2 SITE DISCHARGE IMPROVEMENTS

A primary cause of seepage into basements through foundation wall cracks and rising groundwater table impacts to basement floors is the inadequate layout of a home's discharge system. A typical discharge system serving a single family home consists of roof gutters, downspouts, sump pump discharge, footing drains, sideyard swales and sometimes yard drains. When these systems are configured incorrectly, unmaintained, or missing, it can cause significant impacts to site drainage.

For example, if the gutters of a house are clogged, rainwater will overflow the gutters and fall right next to the foundation of the house. This runoff infiltrates into the ground next to the foundation and can seep into the basement through wall cracks or increase the load on the footing drain causing it to fail. The same is true if the discharge point of downspouts is located right next to the foundation. Runoff from the roof that spills out right next to the foundation infiltrates and causes seepage and possible footing drain overloading. This can be remedied by making sure roof gutters are cleared out and maintained and/or by installing covers on the roof drains.

Downspouts should discharge away from the foundation and ideally the discharge point should be extended 3 to 5 feet from the adjacent foundation. Another common problem with site discharge is the location of a home's sump pump discharge line. On many properties, sump pumps discharge right next to the foundation which causes infiltration impacts to the foundation walls and footing drains. It is important that this runoff be directed away from foundations so that the sump pump does not have to continuously pump the same runoff out of its sump over and over. Sump pump discharges should be extended away from the foundation and discharge into sideyard swales.

If a yard's drainage is not already aided by sideyard drainage swales, consider improving grading to direct runoff from the rear yard around the house to side yard swales. Over time, existing swales can be blocked by plantings, landscaping or other obstructions. The property owner should conduct an assessment of their yard to identify areas where swales may be blocked and seek to improve them.

Installation of rain gardens could also be a consideration. Rain Gardens encourage infiltration of stormwater into the ground.

7.3 OVERHEAD PLUMBING AND BACKUP PREVENTION SYSTEMS

Of the 658 flooding questionnaires completed, 399 occurrences of sanitary backup were reported. These backups occurred in both separate and combined sewer areas. While public sector improvements can help mitigate sewer backups, public sector storm and combined sewer systems are typically not designed to convey stormwater flows in excess of those produced by a 10-year storm event. Separate sanitary sewer

systems are not designed to convey any significant stormwater inflow or infiltration. The most reliable defense against sewer backup is to eliminate the pathway for water from public sector sewers to enter a building. This can be accomplished by the installation of overhead plumbing or a sewer backup prevention system.

Overhead Plumbing: Overhead plumbing refers to the elevation (height) of a private sanitary sewer service when it exits a building. By installing overhead sewers the sanitary line exits the house at an elevation above the public sector separate sanitary or combined sewer that it drains into. Most homes built prior to the 1970's have gravity drained sanitary plumbing that exists through basement or crawl space floors and is directly connected into the separate sanitary or combined sewer system. Wastewater from these types of private sector sewer laterals exits below the basement crawl space floor, making the building home susceptible to basement backups when a public sewer is surcharged. If overhead sewers are installed, surcharging public sector sewers will typically bypass (spill) onto the ground before they reach the level of the overhead sewer. Even if the public sector sewer surcharge levels reach the elevation of the overhead plumbing, a properly installed system should prevent leakage into the house. Overhead plumbing is the most reliable way to prevent sewer backups for storm events of any size, even the July 23rd, 2011 storm event. Overhead plumbing is encouraged by the Village of Mount Prospect. The Village recently completed a pilot overhead sewer program in Basin SS14. An excerpt from the Basin SS14 pilot program that provides additional explanation of overhead plumbing is presented on the following page.

What Work is Involved? At each home that participates, a contractor will have to install a sump pump to collect the footing tile water and an ejector pump to collect wastewater from basement-level facilities. This work will involve coring two (2) crocks (pits) in your basement floor. It will also involve installing pumps and any necessary internal plumbing modifications necessary to discharge the sump pump outside your home and discharge the ejector pump to your sanitary sewer service line. In addition, it will also be necessary to excavate outside of your home to raise your sanitary sewer service line so that wastewater exits your home at a higher elevation. It may also be necessary to excavate a hole next to your home to facilitate a connection between your footing tiles and the new sump pump crock. Due to the nature of the tasks that must be performed, the work will necessarily be somewhat intrusive and inconvenient for most homeowners. However, we believe that the end result will be well worth the effort.

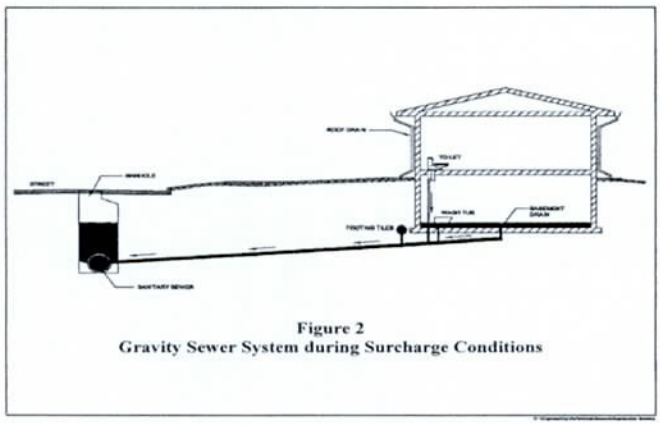


Figure 2
Gravity Sewer System during Surcharge Conditions

Who Will Pay for This Work? The Village's Footing Tile Disconnect Program is detailed in the box at lower right. Most homes in Basin 14 can be converted from Gravity Sewer Systems to Overhead Sewer Systems for less than $18,000. The Village will pay for this work through a grant and low-interest loan program. 50% of the cost will be paid in the form of a grant. The remaining 50% will be in the form of a loan that does not have to be repaid until the home is sold. The maximum aid cap will be $18,000 per home. However, if the work can be performed for less, the Village's aid package will be similarly structured. For example, if the work can be done for $10,000, the Village will offer a $5,000 grant and a $5,000 loan. Conversely, if costs exceed the $18,0000 cap, the homeowner must agree to pay the extra costs.

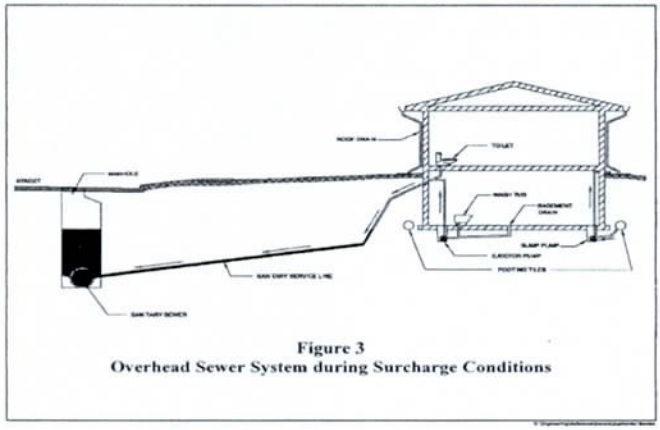


Figure 3
Overhead Sewer System during Surcharge Conditions

What Do I Have to Do? We do not plan to start any work until next year (2010). Right now, we are trying to determine how many Basin 14 homeowners are interested and eligible to participate in this project. **If you are interested, and feel you can satisfy the terms listed in the box at lower right, please complete the attached application form and return it to Public Works.** The form can be mailed, faxed, or e-mailed. All of our contact information can be found in the left-hand column on the front of this flyer. **Please respond prior to February 15, 2010.**

What are the Next Steps? Once we determine how many homes are interested in participating, we will need to verify that those homes do, in fact, have direct footing tile connections and otherwise satisfy the program terms. Typically, we are able to determine whether a home has direct footing tile connections by ponding colored dye water on the ground where it abuts an external foundation or basement wall. The colored water should seep into the ground and into the footing tiles. We then monitor the Basin 14 sewer system to see if the dye shows up downstream. If it does, the home has direct footing tile connections and is eligible to participate in this program. If the dye does not show up in the sewer, the home probably does not have direct footing tile connections, or does not discharge to the Basin 14 system. This entire process usually takes less than an hour. The colored dye is completely water soluble; it will not damage your home or landscaping and should dissipate very quickly.

Once we have compiled a list of interested and eligible homeowners, we will distribute additional information including necessary project participation agreements. Our goal is to be ready to start "turning wrenches" in Spring 2010.



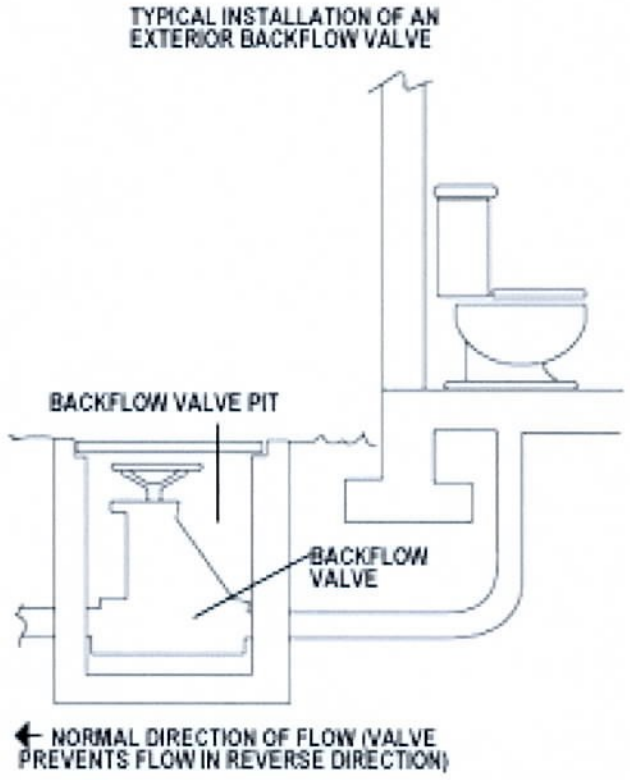
If you are interested,
Let us know before ...

February 15th!

Footing Tile Disconnect Program Terms

- Only homes tributary to Basin 14 are eligible.
- Only homes with gravity sewer systems are eligible.
- Participants must agree to permanently disconnect footing tiles *and* install overhead sewer systems.
- Homes with a verifiable history of basement sanitary back-ups will take precedence over other homes.
- The Village will provide aid in an amount not to exceed $18,000 per home.
- 50% of the Village aid (up to $9,000) will be in the form of a direct grant that does not have to be repaid.
- The remaining 50% of Village aid (up to $9,000) will be in the form of a low-interest loan repayable upon the sale of the home.
- 3% simple interest will be applied to the loan amount annually until repaid.
- Only costs directly associated with the disconnection of footing tiles and installation of overhead sewers are eligible.

Backup Prevention System: Backup prevention systems typically consist of a combined gate valve/flap valve combination that can be installed inline in the private sanitary sewer service of the residence. This valve is intended to work automatically but can often be operated manually by the property owner. Some systems come with a sump pump and basin that can be installed outside of the building to allow the home owner to continue to utilize building plumbing fixtures during a flooding event. Burns & McDonnell recommends that if used, backup prevention systems included a sump pump and basin. Should the backup prevention system fail wastewater can enter a building. While reliable if a sump pump is installed in most cases this system relies on mechanical and electrical components to prevent backups from public sector sewers. These mechanical and electrical components are not required in an overhead plumbing system to prevent backups from public sector sewers. Backup prevention systems are currently allowed by the Village. However, pumping wastewater around the backflow valve is only allowed in combined areas because the combined sewers are designed to convey wastewater and stormwater. Bypass pumping is not allowed in separate sanitary sewer areas because the sewer system is only allowed to accept domestic wastewater.



7.4 SUMP PUMP UPGRADES

When a structure has a basement or lower level, an integral part of its stormwater management is the sump pump. The sump pump collects and discharges stormwater and groundwater from footing drains and seepage and pumps it outside of the house to runoff into the public sewer system. Based on the flooding questionnaires, 142 homes cited a sump pump failure as one of the causes of flooding. Typically sump pump failures manifest themselves in one of two ways: there is a power outage and the sump pump ceases to work, or the flow into the sump pit exceeds the pump's capacity.

In order to protect against sump pump failure, building owners should have their sump pump equipped with a battery backup or have a generator to power the sump pump in the case of a power failure. Once equipped, the battery should be tested periodically to ensure that the battery backup still is functional. If the problem with the sump pump was not power outage related, it may be prudent to upgrade to a sump pump with a higher pumping capacity or install an additional sump pump.

7.5 BEST MANAGEMENT PRACTICES

An often overlooked potential for improving stormwater management is runoff reduction. As opposed to increasing conveyance or storage capacity by upgrading existing systems, areas of drainage concerns can be improved by reducing the amount of runoff generated by any given storm event. This can be achieved by implementing best management practices on site such as rain gardens, and dry wells among other methods.

Rain Gardens: Rain gardens are landscaped areas typically planted with deep-rooted plants on top of engineered soils. Engineered soils are more permeable than the typical native soils and allow runoff to infiltrate into the ground more quickly. These gardens reduce the amount of runoff that reaches Village storm sewers and are aesthetically pleasing. A drawback to rain gardens is that they require significant maintenance to remain properly operating. In addition, rain gardens function best during lower intensity rain events. During events such as the July 23rd, 2011 rainfall the benefits of rain gardens is negligible.

The Village sponsors a rear-yard drainage program that is designed to relieve rear yard flooding. This program has several components including installation of a rain garden with a pipe installed from the garden to the Village sewer main. This program is paid for by the Village and is often a requirement for new constructions within the Village. The program is paid for by monies procured through development of small parcels. Since development within the Village has been slow in light of the economic downturn, there are currently no funds available to construct the rain gardens. Residents can sign up and be placed on a waiting list for approval. However, the Village does maintain example plans and specifications for rain gardens that residents can obtain directly from the Village in order to install the rain gardens themselves.

Dry Wells: Dry wells are underground structures that collect stormwater runoff and disperse it into the ground through infiltration. Dry wells are designed to accept water very quickly, store it and then dissipate it over time. They are often used during development to maintain existing site runoff conditions. A drawback of drywells is that they require maintenance to continue to function and once their capacity is reached they no longer work as an effective runoff attenuation measure.

7.6 SUMMARY OF PRIVATE SECTOR IMPROVEMENT COSTS

Budgetary cost for implementing overhead plumbing for all of the 399 properties that reported sewer backups is $9,200,000.

Costs for mitigating flooding resulting from sump pump failures through the installation of a secondary sump pump and an emergency battery backup and/or emergency generator for the 142 buildings/homes that reported sump pump was not determined as part of this study. It is recommended that each property owner contact a company that specializes in providing sump pump inspections and emergency generator installation to mitigate sump pump failures.

Costs for preventing seepage and property specific site grading and drainage improvements are not included in this study. The total budgetary costs for implementing the private sector improvements identified in this study, excluding seepage and property specific grading and drainage, are $9,475,000.

* * * * *

8.0 COST BENEFIT ASSESSMENT

Prior to implementing any public or private sector improvement to mitigate flooding a cost benefit assessment should be made to evaluate whether capital is being spent efficiently. The cost benefit assessment should take into consideration the extent of flooding, type of flooding and proximity of properties to each other that report flooding. The cost of mitigating flooding should be evaluated to determine the most cost-effective flood mitigation or combination of flood mitigation measures that can be implemented regardless of whether the improvements are in the public sector or private sector. An example case that took into consideration cost benefit was completed by the Village in 2009 for separate sewer Basin SS14. This example case provides insight into the process of determining the most cost-effective and reliable solution to mitigating flooding. Conclusions derived from this example case can be directly applied to mitigating flooding experienced in the Village as a result of the July 23rd, 2011 storm. The Basin SS14 example case is presented in the following section.

8.1 EXAMPLE CASE – BASIN SS14

A cost benefit analysis of public and private sector solutions to mitigate sanitary backup in 12 homes that frequently experienced sanitary backup was completed by Burns & McDonnell in 2009. Four alternatives were analyzed for ease of implementation, reliability and cost-effectiveness. These alternatives included public sector and private sector improvements. The public sector improvements included the installation of an underground detention system and/or the installation of a sanitary relief station. The private sector improvements included disconnection of foundation drains from the storm sewer system and installation of overhead plumbing and installation of backup prevention systems. In summary it was determined that the most cost-effective and reliable solution to mitigate flooding was to disconnect the foundation drains from the sewer system and provide overhead plumbing to prevent sanitary backup. Relevant conclusions that were made as a result of the analysis were:

- Increasing the amount of wastewater that can be discharged into an MWRDGC interceptor in a separate sewer area above current discharge rates would not be permitted by the MWRDGC. This makes the installation of a sanitary relief station to pump the additional flow generated by a rainfall event into the MWRDGC interceptor impractical.
- Installation of underground detention to mitigate sanitary backup is not cost-effective when compared to the installation of overhead plumbing or sewer backup prevention systems. For Basin SS14 the cost to provide a 25–year level of service through the installation of underground detention was estimated to be $2.16 million. The cost to install overhead plumbing and disconnection of foundation drains to mitigate sanitary backup of the 12 homes that frequently experienced sanitary backup was less than $250,000.
- Private sector backup control provides protection against sanitary backup from storm events similar to the July 23rd, 2011 storm. It is not cost-effective or practical to complete a public sector improvement to mitigate flooding for storm events similar to the July 23rd, 2011 event. Currently public sector storm and combined sewer systems are designed for a 10-year level of protection.
- Installation of public sector improvements alone cannot provide the same level of reliability against sanitary backup as installation of private sector backup control.

Participation in the overhead plumbing program was voluntary. Only one of the twelve homes that participated in the program to disconnected foundation drains and install overhead plumbing in Basin SS14 reported flooding as a result of the July 23rd, 2011 storm event and this was the result of a sump pump failure, not wastewater backing up from the separate sanitary sewer system. These results demonstrate the effectiveness of overhead plumbing in preventing sanitary backup.

During the July 23rd, 2011 event, 6 sanitary sewer backups out of 171 residences in Basin SS14 were reported. All of these homes have foundation drains connected directly to the sanitary sewer. Disconnection of the foundation drains and installation of overhead plumbing for these 6 homes is estimated to cost $150,000. Based on this information, the total cost to provide protection against basement backup in Basin SS14, including those homes which previously participated in the Village program, is $400,000. This is significantly less than the $2.16 million public sector improvement that would provide less protection against sewer backup. These results support the conclusion that in areas where sanitary backup is the primary type of flooding, installation of private sector solutions such as elimination of foundation drains with overhead plumbing or backup prevention systems are the most cost-effective and reliable solution.

The cost to disconnect all of the foundation drains in Basin SS14 was estimated to be $2.43 million which is comparable to the $2.16 million public sector improvement. By disconnecting the foundation drains and installing overhead plumbing a much greater level of protection against sanitary backup could be provided not only for those residents that have experienced sanitary backup, but for the entire basin at a comparable cost. This further supports the conclusion that where sanitary backup is the primary type of flooding, installation of private sector solutions such as elimination of foundation drains with overhead plumbing or backup prevention systems are the most cost-effective and reliable solution

8.2 GENERAL COST ASSESSMENT

The cost of a public sector improvement to mitigate flooding in combined and separate sanitary sewer areas typically includes the installation of new sewer in the pavement or right-of-way and increasing the size of the sewer outfall. In the Village of Mount Prospect, the outfalls of the combined sewer systems are to MWRDGC interceptors. Outfalls of the separate storm sewer system are to local receiving streams. While increasing the size of a connection to an MWRDGC interceptor or the outfall to a receiving stream is technically feasible, there are significant challenges. Increasing the size of a connection to an MWRDGC interceptor or the size of an outfall to a local receiving stream would need to be permitted by the MWRDGC. In both cases it is not likely that MWRDGC would permit an increase in connection or outfall size to handle stormwater runoff produced by the July 23rd, 2011 or similar storm event. It also becomes cost prohibitive to construct a collection and conveyance system to convey a storm similar to the July 23rd, 2011 event. For this study, levels of service of 10-year and 25-year were evaluated.

Sanitary Backups: A reasonable cost range for the design and installation of new large-diameter sewer is $300 to $600 per linear foot in developed areas similar to the Village of Mount Prospect. Using these costs, the cost to install approximately one block (660 feet) of new large diameter sewer ranges from $198,000 to $360,000. In areas where surface induced flooding was limited and sanitary backup was experienced, preventing basement backup through the installation of overhead plumbing or backup prevention systems will be the most cost-effective way to mitigate the impact of any significant rain event

in the Village; even one similar to the July 23rd, 2011 event. This is because 8 to 15 sanitary backups can be mitigated through the installation of overhead plumbing or sewer backup prevention systems per block of new sewer construction.

Surface Flooding: In those areas where widespread extensive surface flooding was experienced, the existing level of service should be determined and a cost to provide a minimum 25-year level of service should be considered. Those areas included the Hatlen Heights Subdivision, Isabella Street Area and Lonnquist Boulevard Area.

8.3 LOCALIZED FLOODING

There were several locations in the Village where flooding as result of the July 23rd event was reported as occurring in localized areas by multiple residents. Based on the review of the flooding questionnaires and subsequent evaluation presented in Chapter 6 public sector solutions for four localized flooding areas were developed. Discussion of these areas is presented below.

Basin SS32 – Cherrywood Drive Area: A public sector improvement to provide a 25-year level of service at the intersection of Cherrywood Drive and South Palm Drive was developed. The budgetary cost for this improvement is $140,000. Two reports of street flooding were reported in this area. While this improvement will benefit the general public, the cost of the improvement per resident that responded to the questionnaire is $70,000 per respondent. It is important to remember that the July 23rd, 2011 flooding event was a 400-year event. Consideration for implementing this improvement should be given to the overall cost-benefit.

Basin SS41 – Catalpa Lane Area: A public sector improvement to provide a 25-year level of protection to residents along Catalpa Lane was developed. The budgetary cost for this improvement is $145,000. Two reports of street flooding were reported on Catalpa Lane that would see an improved level of protection in this area. While this improvement will benefit the general public, the cost of the improvement per resident that responded to the questionnaire is $72,500 per respondent. It is important to remember that the July 23rd, 2011 flooding event was a 400-year event. Consideration for implementing this improvement should be given to the overall cost-benefit.

Basin SS45 – Beechwood Drive and Grace Drive Area: A public sector improvement to provide a 25-year level of protection on Beechwood Drive and Grace Drive. Eight reports of street flooding were reported in Basin SS45 by residents with storm sewers that would be tributary the improvement developed in this area. The budgetary cost for this improvement is $ 1,005,000. While this improvement will benefit the general public, the cost of the improvement per questionnaire respondent is approximately $126,000 per respondent. It is important to remember that the July 23rd, 2011 flooding event was a 400-year event. Consideration for implementing this improvement should be given to the overall cost-benefit.

Illinois American Area: A public sector improvement to provide a 25-year level of protection on Ironwood Drive between Brentwood Lane and Westgate Road. The budgetary cost for these improvements is $113,000. Two reports of surface induced structure flooding were reported from residents that are tributary to this improvement. While this improvement will benefit the general public, the cost of the improvement per resident that responded to the questionnaire is $56,500 per respondent. It

is important to remember that the July 23rd, 2011 flooding event was a 400-year event. Consideration for implementing this improvement should be given to the overall cost-benefit.

A public sector improvement to provide a 25-year level of protection on Park Drive between Tano Lane and Wood Lane. The budgetary cost for these improvements is $185,000. Five reports of surface-induced structure flooding were reported from residents that are tributary to this proposed improvement. While this improvement will benefit the general public, the cost of the improvement per resident that responded to the questionnaire is $37,500 per respondent. It is important to remember that the July 23rd, 2011 flooding event was a 400-year event. Consideration for implementing this improvement should be given to the overall cost-benefit.

Determining what is an acceptable cost-benefit for the Village is not part of this study. It is recommended that the Village consider the cost of the improvements in the localized areas evaluated in this study and assess whether or not the cost to provide an increased level of service in these areas is beneficial. A primary criterion would be how frequently does the flooding in a localized area actually occur. A key item to be considered it that it is likely that a significant amount of the combined and separate sewers in the Village will have an existing level of service of less than 10-year. This is primarily the result of increased development in the Village over time prior to development of current Village and regional ordinances and changes in the definition of how much rainfall is produced by a 10-year storm event.

* * * * *

9.0 RECOMMENDATIONS

Based on the results of this flooding assessment for each basin that reported flooding as a result of the July 23rd, 2011 storm, three primary recommendations have been developed for this report. These recommendations are based on the type of solutions identified to mitigate flooding in the Village and can be classified as recommendations for private sector improvements, recommendations for public sector improvements and recommendations for additional study of specific basins.

9.1 PRIVATE SECTOR IMPROVEMENTS

Based on the results of the flooding questionnaires 73 basins where stormwater is collected and conveyed by the Village reported flooding as a result of sanitary backup, seepage and/or sump failure. Three basins did not report any occurrences of sanitary backup, seepage or sump pump failure but did report one occurrence of yard flooding. Public sector improvements are recommended in four of these basins. Table 9.1 presents the sewer basins that reported private sector flooding.

Table 9.1: Sewer Basins that Reported Private Sector Flooding

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
CS01	12	10	2	2	0	1	1
CS02	4	1	2	1	0	0	1
CS03	1	0	1	0	0	0	1
CS04	7	7	2	0	0	0	0
CS05	5	2	1	3	0	1	2
CS09	5	3	0	0	0	0	1
CS10	3	2	2	0	0	0	0
CS13	1	0	0	1	0	0	0
CS14	1	0	1	0	0	0	0
CS15	2	1	0	1	0	0	0
CS16	19	10	9	2	0	3	4
CS17	2	0	0	2	0	0	0
CS18	27	20	9	3	1	4	11
CS19	1	1	1	0	0	0	1
CS20	3	1	1	2	0	0	1
CS21	98	79	20	6	12	13	15
CS22	5	3	2	1	0	0	1
CS23	5	4	1	1	0	2	0
CS24	6	0	4	1	0	1	3
CS25	21	18	6	3	1	0	4
CS26	2	2	0	0	0	1	0

Table 9.1: Sewer Basins that Reported Private Sector Flooding (Continued)

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
CS27	8	5	2	1	2	0	2
CS28	14	6	6	3	3	1	3
CS29	31	26	8	3	0	4	4
CS30	5	3	1	1	1	2	1
CS31	26	17	10	4	1	7	3
CS32	8	7	3	0	3	1	1
CS33	6	6	2	1	2	0	0
CS34	3	1	0	1	0	0	1
DESPLAINES	2	0	1	1	0	2	0
EGT	5	0	1	4	0	2	1
IL AMER	46	20	10	10	4	13	7
OTHER	1	0	0	0	0	0	1
S04A	2	0	0	0	0	1	1
SS01	5	1	2	4	1	0	0
SS04	2	0	2	2	1	0	0
SS07	1	0	0	1	0	0	1
SS08	8	1	1	7	2	3	1
SS09	1	0	0	1	0	0	0
SS10	3	0	1	3	0	0	2
SS11	51	31	17	14	26	7	4
SS12	8	5	3	1	0	0	4
SS13	2	2	1	0	0	1	0
SS14	8	6	1	0	1	2	3
SS15	5	2	1	1	0	1	2
SS16	20	9	6	11	2	1	3
SS18	2	0	2	1	0	0	0
SS19	4	3	2	1	0	1	1
SS20	1	0	0	1	0	0	0
SS21	11	8	3	2	1	6	0
SS22	1	0	1	0	0	0	0
SS24	2	1	0	0	0	0	0
SS25	6	4	5	0	0	0	1
SS26	8	4	1	1	0	1	2
SS27	16	14	4	2	1	2	1
SS28	8	7	2	0	1	2	0
SS29	9	6	0	2	1	1	1

Table 9.1: Sewer Basins that Reported Private Sector Flooding (Continued)

Village of Mount Prospect							
Flood Survey Results							
		Type of Flooding					
Basin	Total Respondents	Sanitary Backup	Seepage	Sump Pump Failure	Street & Yard Flooding	Street Flooding	Yard Flooding
SS30	4	4	0	1	0	0	0
SS31	6	6	1	0	1	0	0
SS32	3	1	1	1	1	1	0
SS37	1	0	0	0	0	0	1
SS40	1	1	0	0	1	0	0
SS41	25	10	5	8	7	3	5
SS42	5	1	3	4	4	0	1
SS44	10	7	2	1	2	4	1
SS45	16	5	1	3	4	5	2
SS48	1	0	0	1	0	0	0
SS49	2	0	0	2	2	0	0
SS55	4	0	0	4	1	0	0
SS57	4	2	0	2	2	0	0
SS63	1	0	0	1	0	1	0
SS67	1	1	1	0	0	0	0
SS68	4	2	0	1	4	0	0
Totals	**658**	**399**	**177**	**142**	**96**	**101**	**107**

SSXX – Separate Sanitary Sewer Basin CSXX – Combined Sewer Basin

Recommendations for mitigating private sector flooding are presented below. These recommendations do not include mitigating private sector flooding in the Illinois American Basins.

- Disconnection of foundation drains and installation of overhead plumbing in 379 buildings/homes that reported sanitary backup. The Village of Mount Prospect does not provide sanitary sewer service to the Illinois American Water area, therefore the disconnection of foundation drains and installation of overhead plumbing in this area is not included in the recommendations for the Village of Mount Prospect.
- Inspection and repair of foundation walls through which seepage occurred in 177 buildings/homes.
- For the 203 properties that experienced yard flooding during the July 23rd storm event, inspection of property drainage including all gutters, downspouts and locations of sump pump discharge to make sure that surface drainage is directed away from the residence. This may also help minimize seepage.
- For the 142 properties where sump pump failure was experienced inspection of the sump pump system to make sure that it is working and has adequate capacity. After completion of the

inspection install a secondary sump pump, if needed, and a battery backup and/or emergency generator if system.

The budgetary cost for the disconnection of foundation drains and the installation of overhead plumbing in 379 buildings/homes is $9,475,000, based on an average cost of $25,000 per building/home.

Cost for mitigating flooding from seepage and surface flooding in these basins was not determined as part of this study. It is recommended that each property owner contact a company that specializes in mitigating basement flooding caused by seepage.

9.2 PUBLIC SECTOR SEPARATE AND COMBINED SEWER BASIN IMPROVEMENTS

Based on the results of the flooding questionnaires and stormwater modeling, public sector improvements were recommended in sewer basins SS08 and SS11 - Hatlen Heights Subdivision, CS21 - Isabella Street Area and CS31 – the Lonnquist Boulevard Area. A summary of the budgetary costs for implementing these public sector improvements is $14,440,000. Locations of the proposed public sector improvements in these basins are shown on Exhibit 15, Exhibit 16 and Exhibit 17.

9.3 RECOMMENDATIONS FOR ADDITONAL STUDY OF LOCALIZED PUBLIC SECTOR FLOODING AREAS

The results of the flooding questionnaires were used to evaluate four additional areas including Basin SS32 – Cherrywood Drive Area, Basin SS41 – Catalpa Lane Area, Basin SS45 – Beechwood Drive and Grace Drive Area and the Illinois American Basin – Ironwood Drive and Park Drive. These areas were evaluated and improvements for providing a 25-year level of service were developed. The budgetary cost for implementing these improvements is $1,588,000. It is recommended that further evaluation be done in these basins prior to proceeding with the improvements to confirm that the improvements will have a significant impact for a 25-year storm, which is the level of service proposed for improvements in this study. A budgetary cost for completing the recommended evaluations is $28,000, based on $7,000 per basin.

In addition to the above recommendations the Village should continue its ongoing operation and maintenance efforts in its combined and separate sewer basins. It is recommended that those areas which reported the highest number of flooding occurrences by prioritized.

9.4 SUMMARY

The total budgetary cost to implement the recommendations presented in this study is $23,943,000. A breakdown of these costs is presented in Table 9.2.

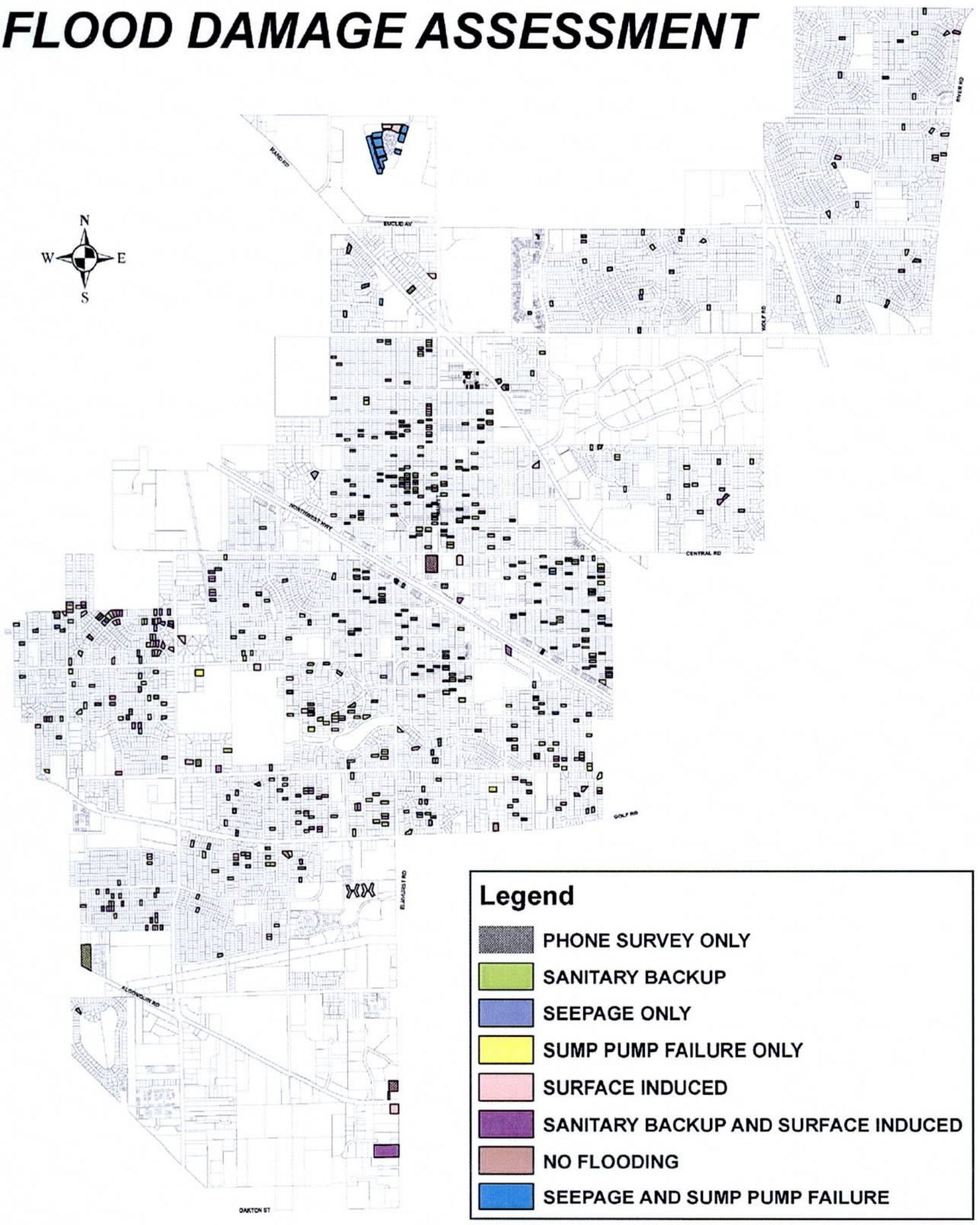
Table 9.2 Summary of Recommended Stormwater Management Improvements

Area	Type of Improvement	Improvement	Budgetary Cost
Hatlen Heights Subdivision	Public Sector	Storm Sewer Improvements for 25-year Level of Service	$1,500,000
Hatlen Heights Subdivision	Public Sector	Sanitary Sewer Improvements for 25-year Level of Service	$105,000
Isabella Street Area	Public Sector	Combined Sewer Improvements for 25-year Level of Service	$12,500,000
Lonnquist Boulevard Area	Public Sector	CS31 Combined Sewer Improvements for 25-year Level of Service	$200,000
Lonnquist Boulevard Area	Public Sector	Adding Inlets and Televising	$135,000
Village-wide	Private Sector	Disconnection of 379 Foundation Drains with Overhead Plumbing	$9,475,000
Further Investigation and Additional Analysis		Basin SS21, Basin SS41, Basin SS45 and Illinois American Basin	$28,000
Total			**$23,943,000**

* * * * *

COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.

FLOOD DAMAGE ASSESSMENT

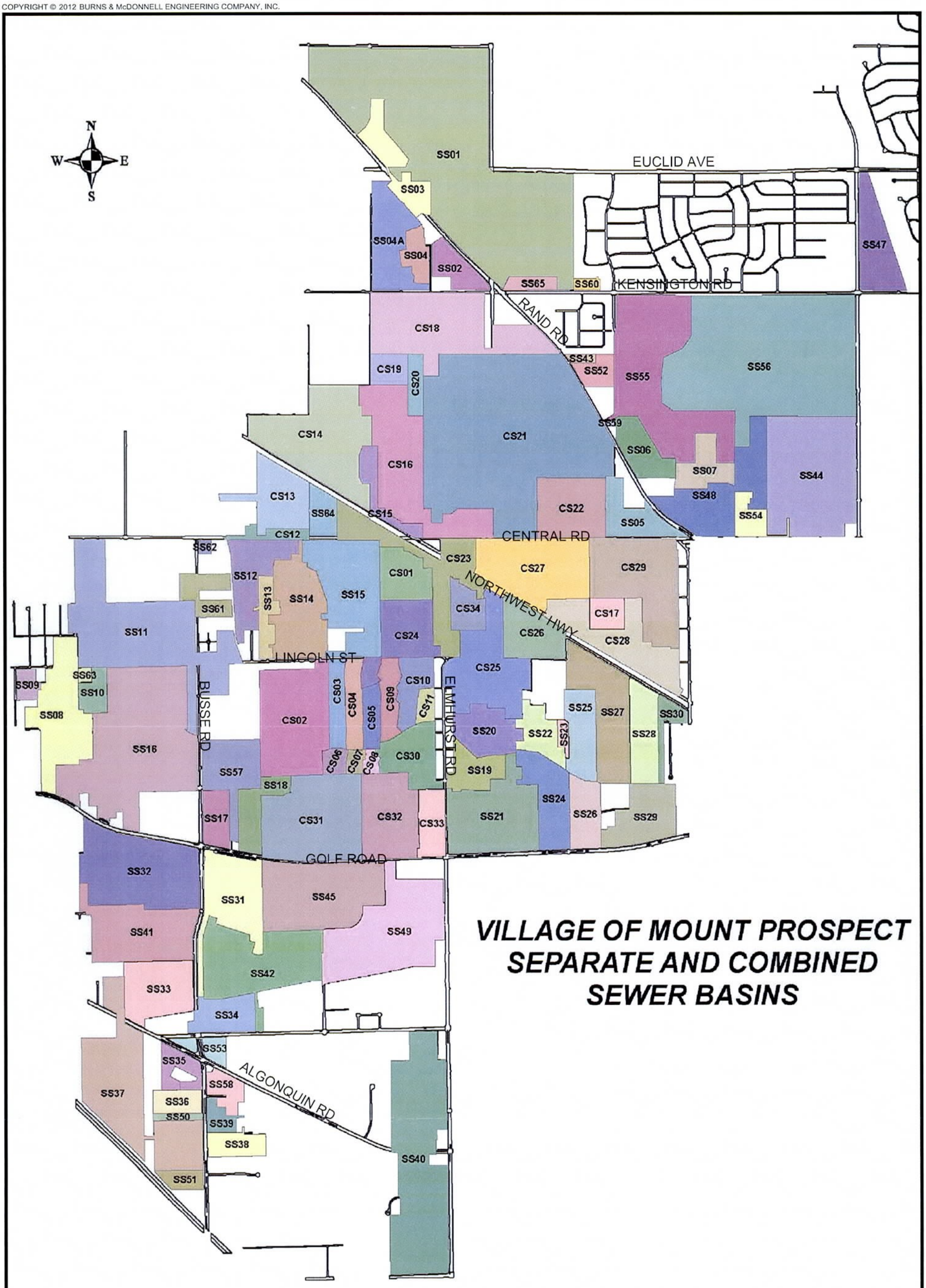


Map Info as of 12-30-11
Printed by JJP/PW
F:\Projects\STORM 2011\FLOOD RESPONSE\RESPONSE MAP.mxd

Burns & McDonnell
SINCE 1898

EXHIBIT 1
FLOOD DAMAGE
ASSESSMENT
MOUNT PROSPECT

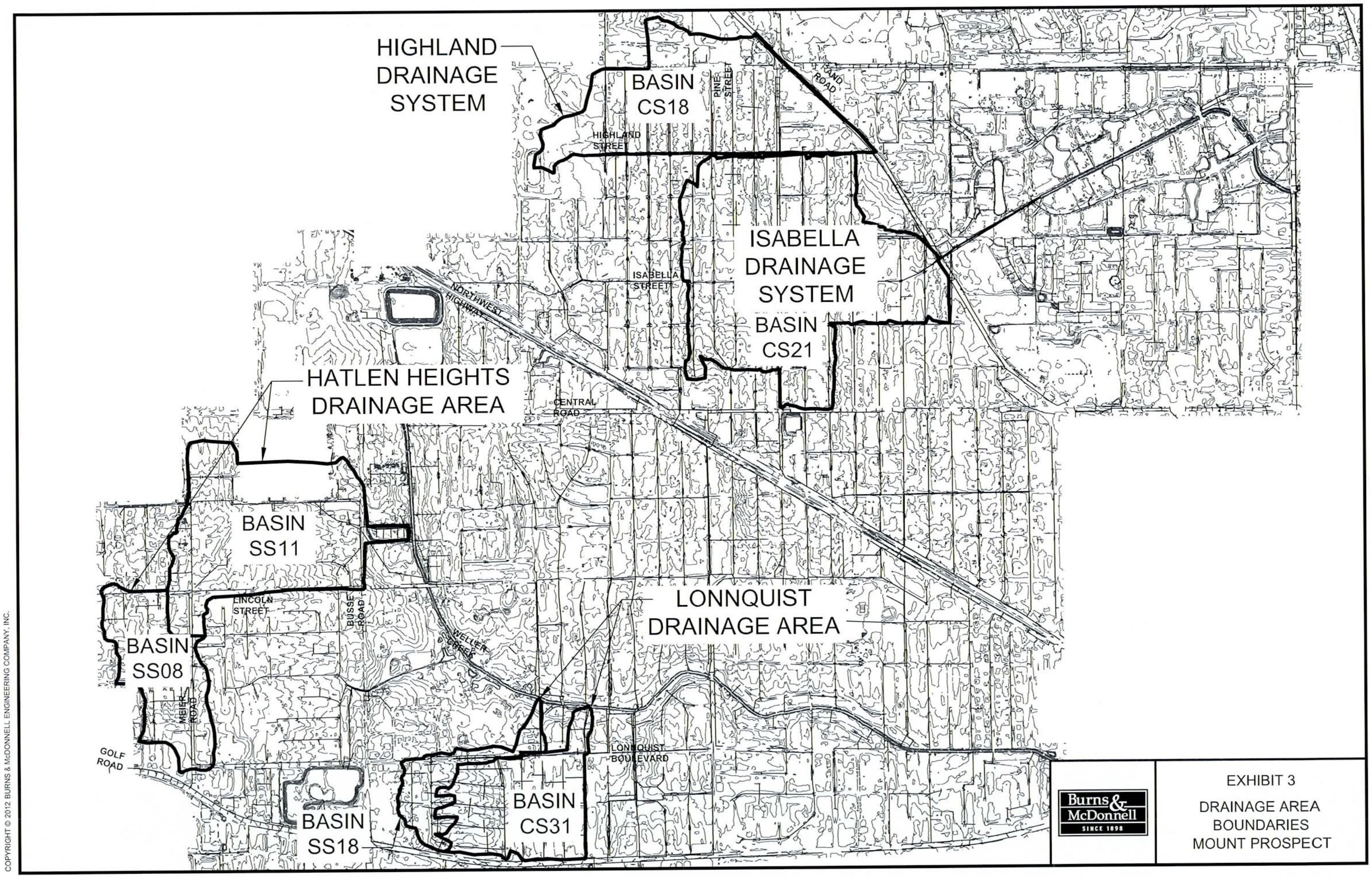
COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.



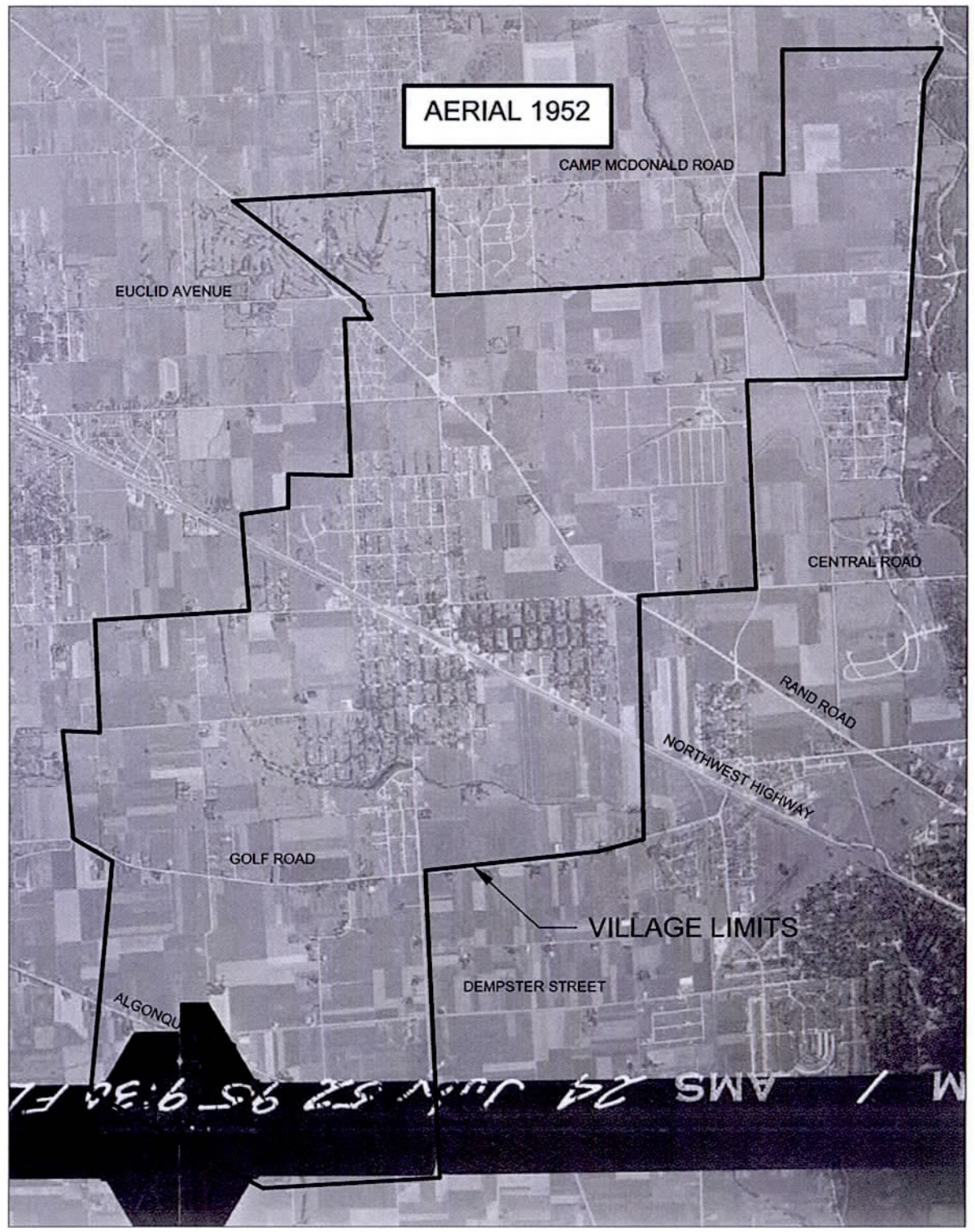
VILLAGE OF MOUNT PROSPECT
SEPARATE AND COMBINED SEWER BASINS

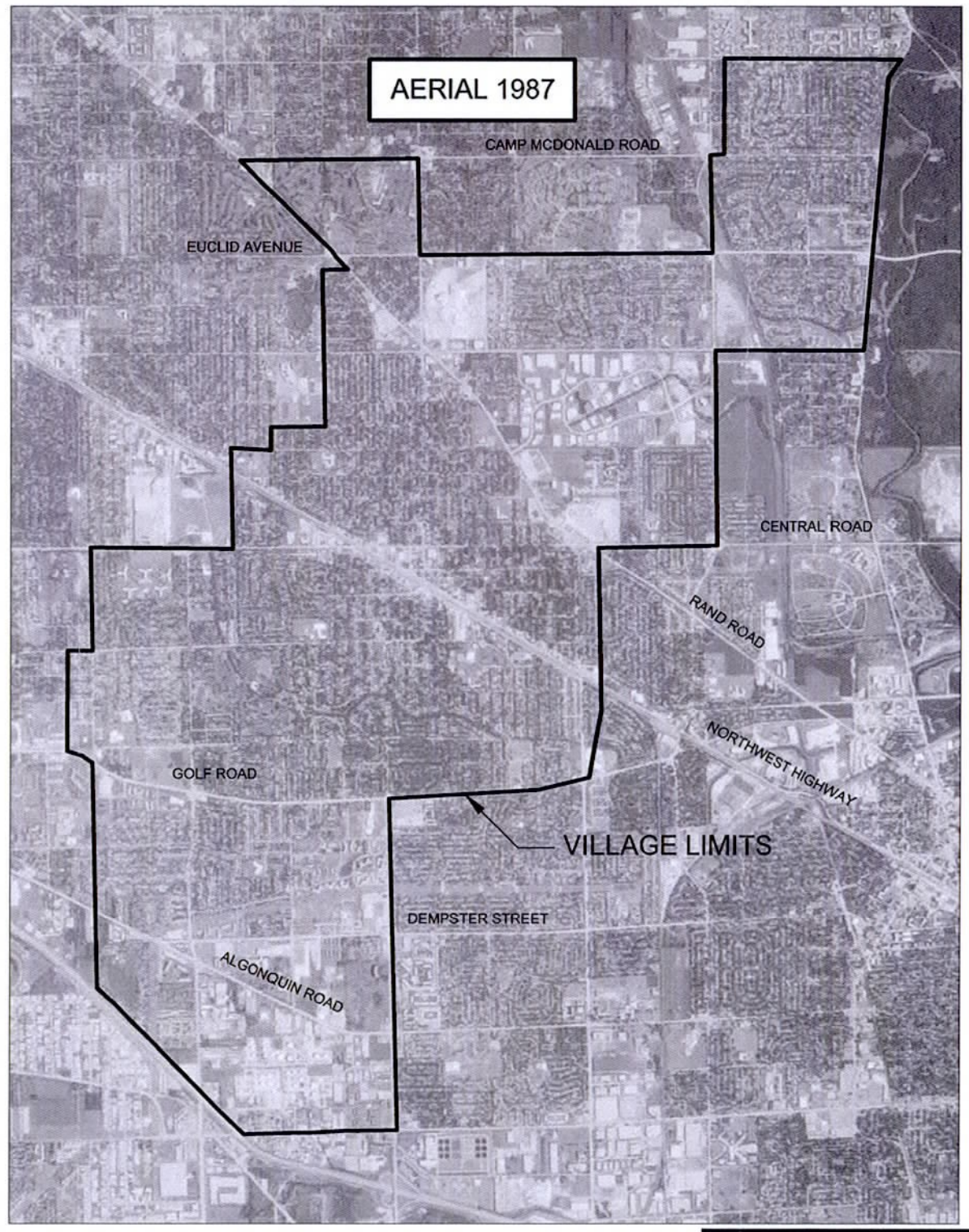
Burns & McDonnell
SINCE 1898

EXHIBIT 2
BASIN LOCATIONS
VILLAGE OF
MOUNT PROSPECT



COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.





COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.

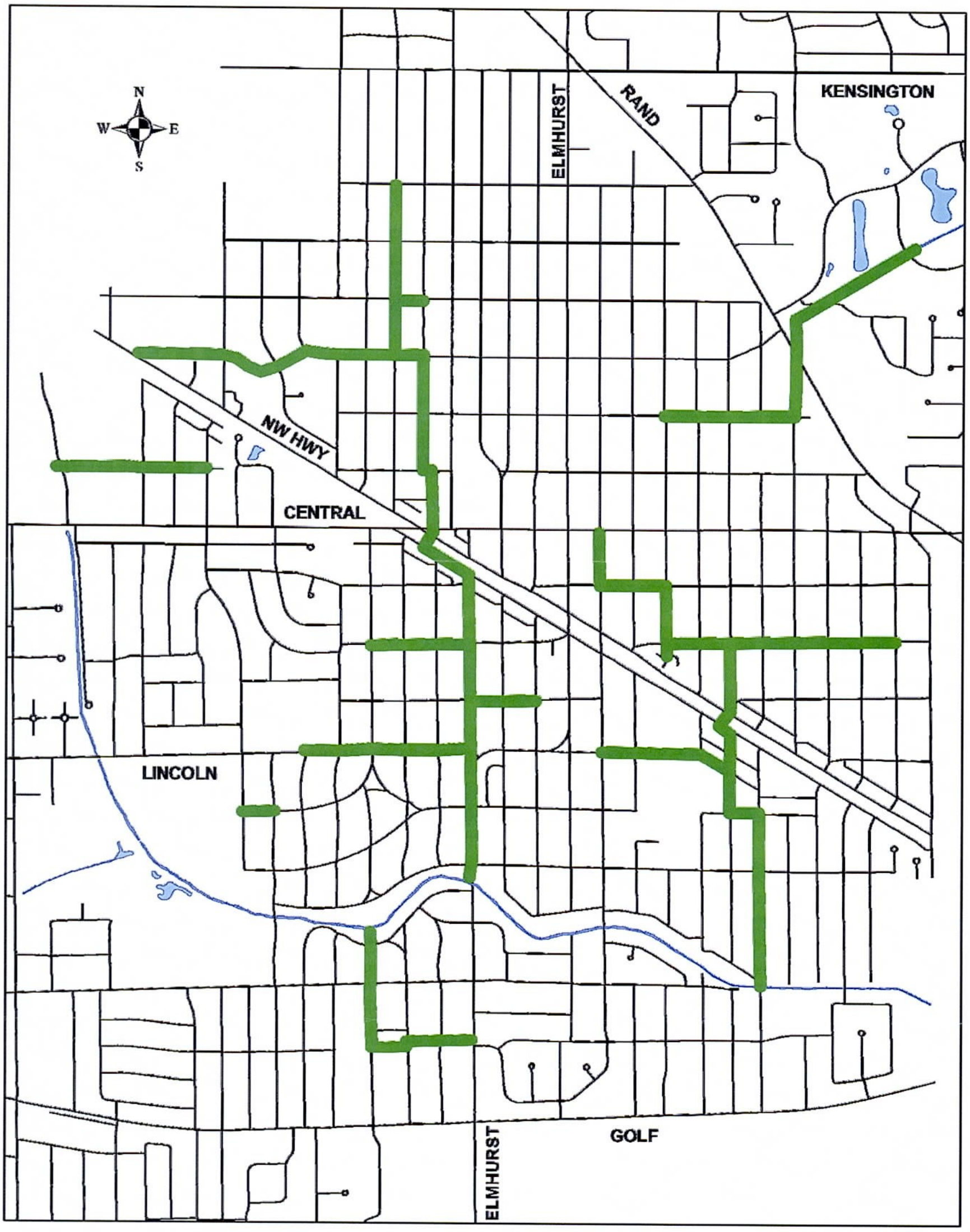
Burns & McDonnell SINCE 1898

EXHIBIT 4

1952 & 1987 AERIALS
VILLAGE OF
MOUNT PROSPECT

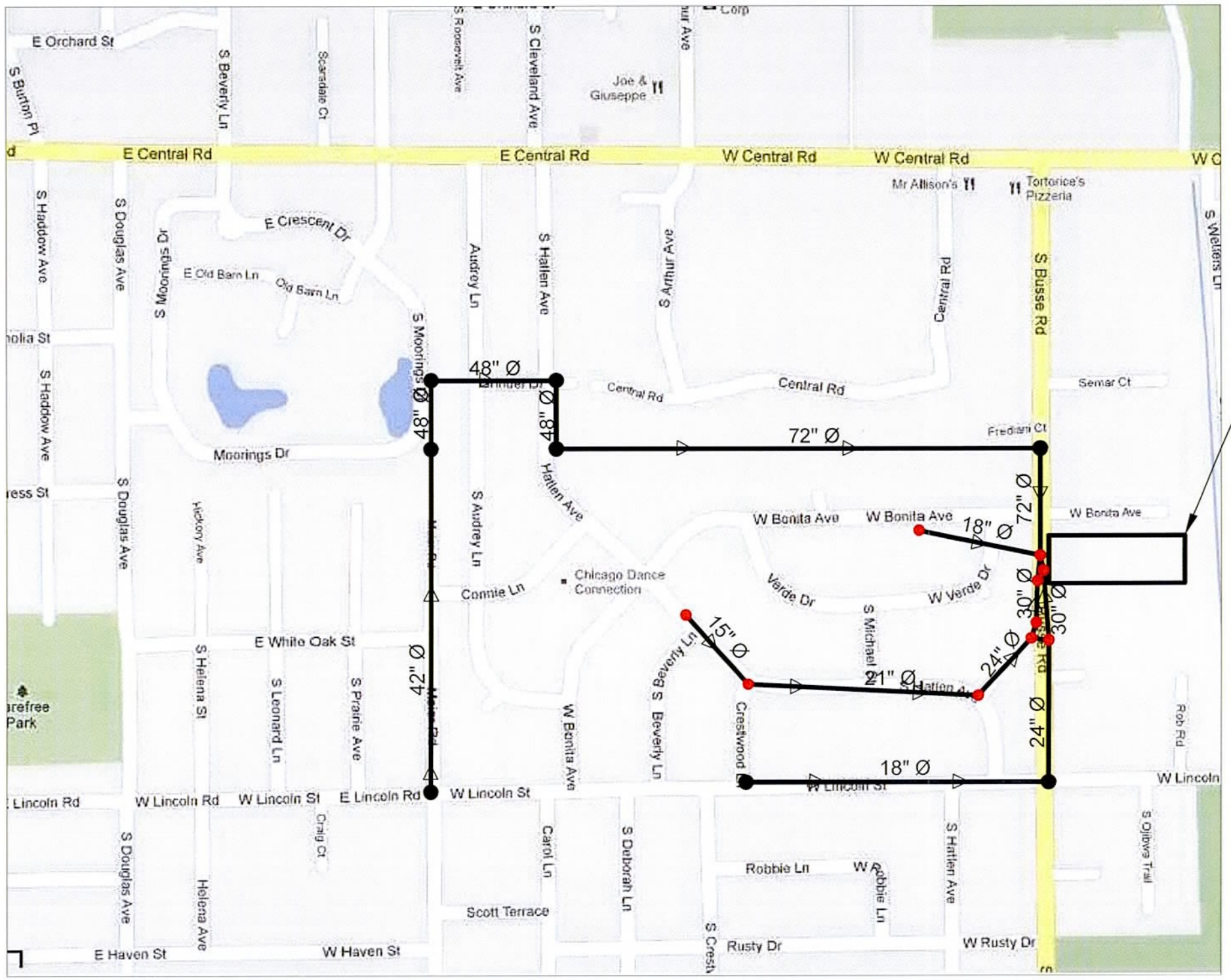
COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.

MOUNT PROSPECT COMBINED RELIEF SEWERS CONSTRUCTED BY MWRDGC 1947-1957



Burns & McDonnell
SINCE 1898

EXHIBIT 5
RELIEF SEWERS
VILLAGE OF
MOUNT PROSPECT

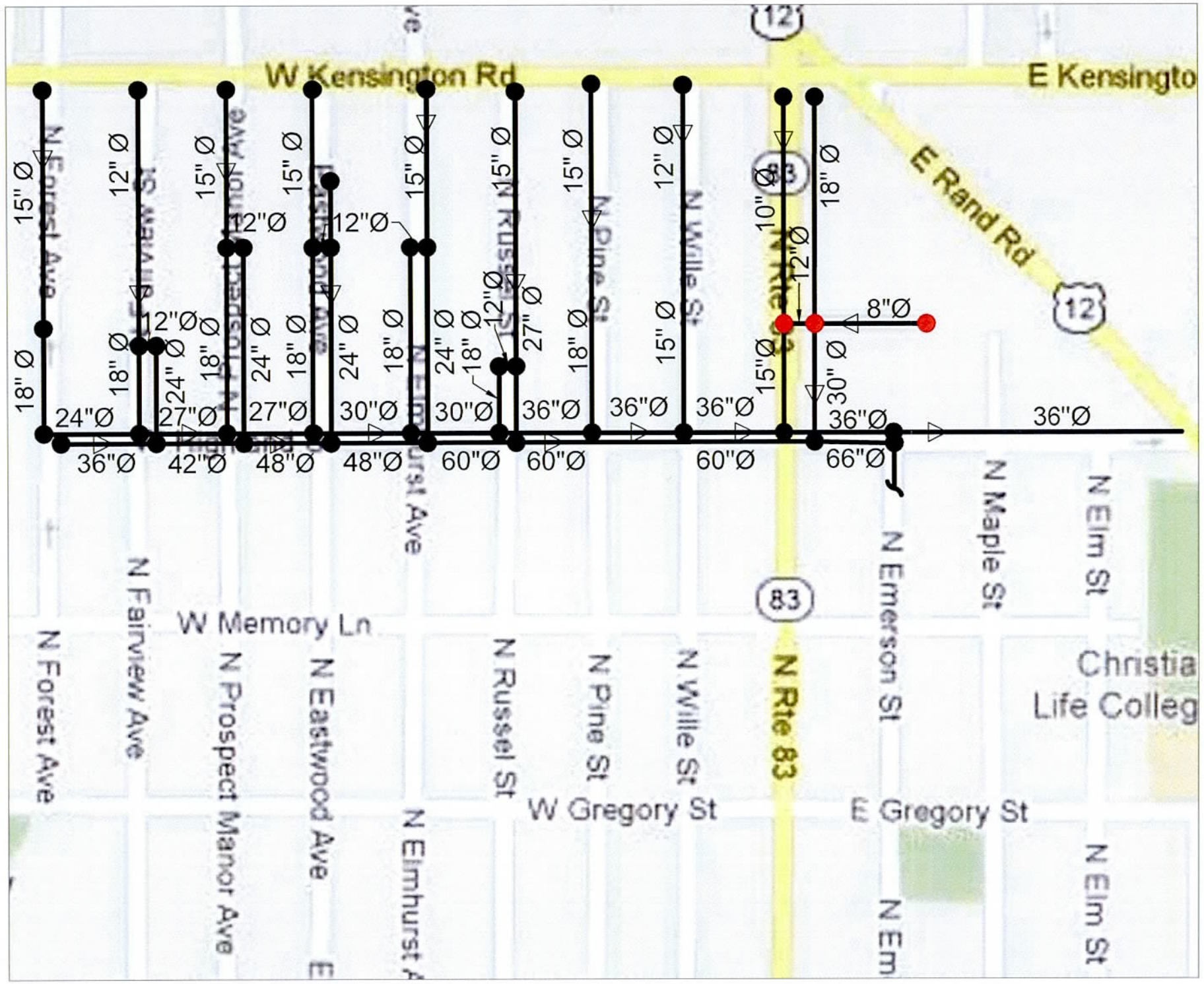


COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.

Burns & McDonnell SINCE 1898

EXHIBIT 6

BASINS SS08 & SS11
EXISTING SEWER NETWORK
25-YEAR STORM EVENT



NORTH

LEGEND

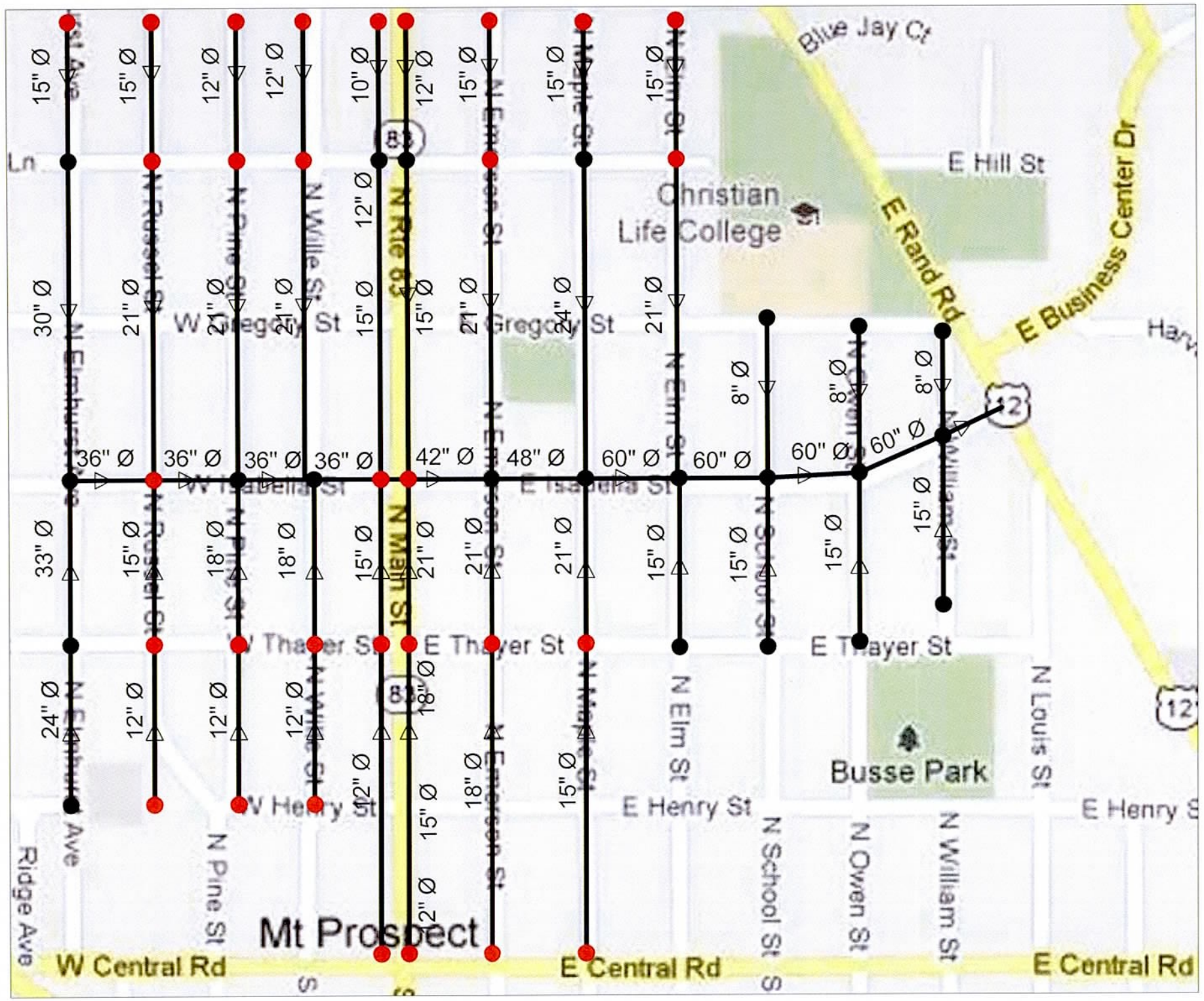
- EXISTING STORM SEWER
- MODELED NODE - WITH FLOODING
- MODELED NODE - NO FLOODING

COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.

Burns & McDonnell SINCE 1898

EXHIBIT 7

BASIN CS18
EXISTING SEWER NETWORK
25-YEAR STORM EVENT



NORTH

LEGEND

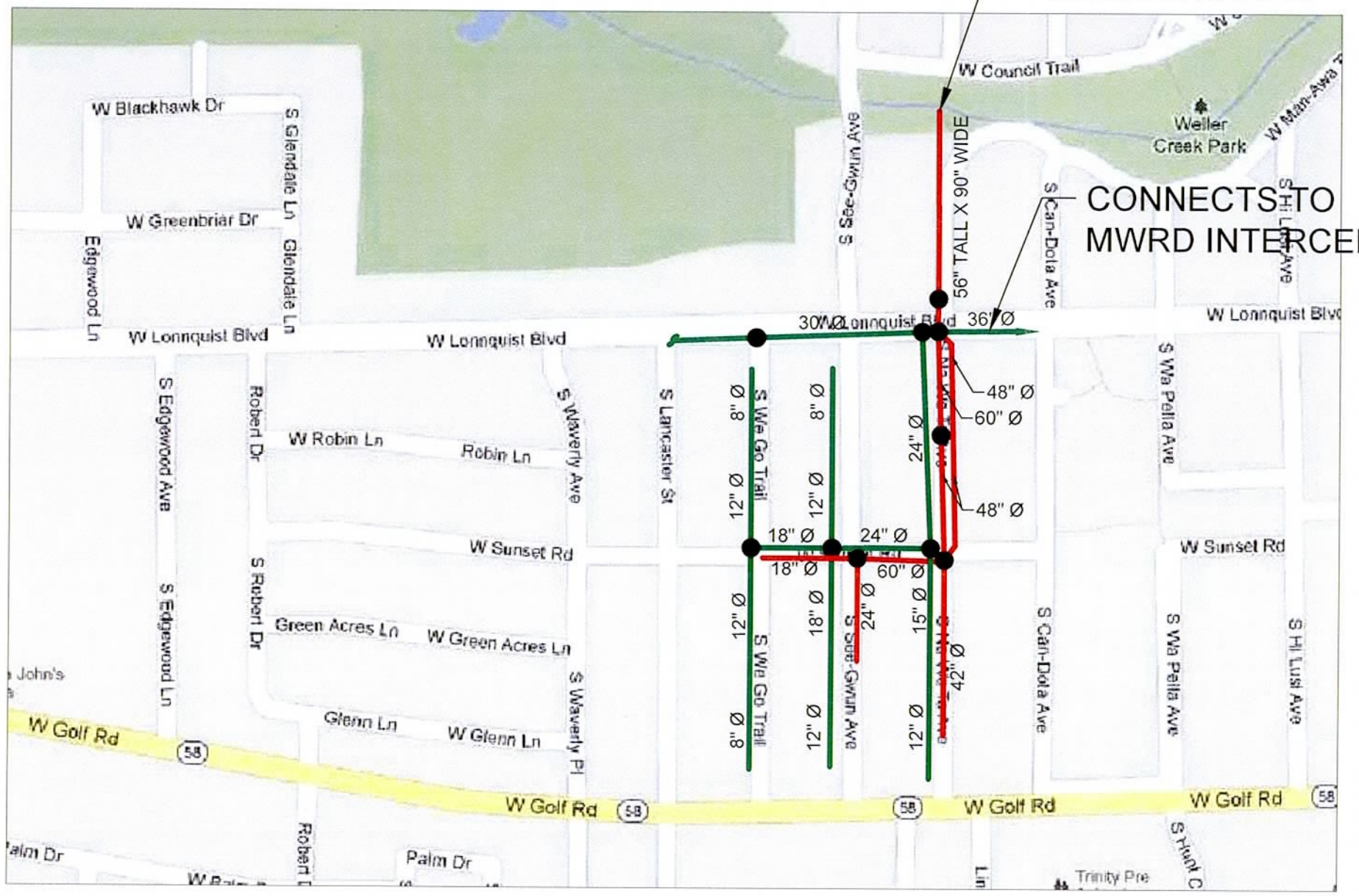
- EXISTING COMBINED SEWER
- MODELED NODE - WITH FLOODING
- MODELED NODE - NO FLOODING

COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.

Burns & McDonnell SINCE 1898

EXHIBIT 8

BASIN CS21
EXISTING SEWER NETWORK
25-YEAR STORM EVENT

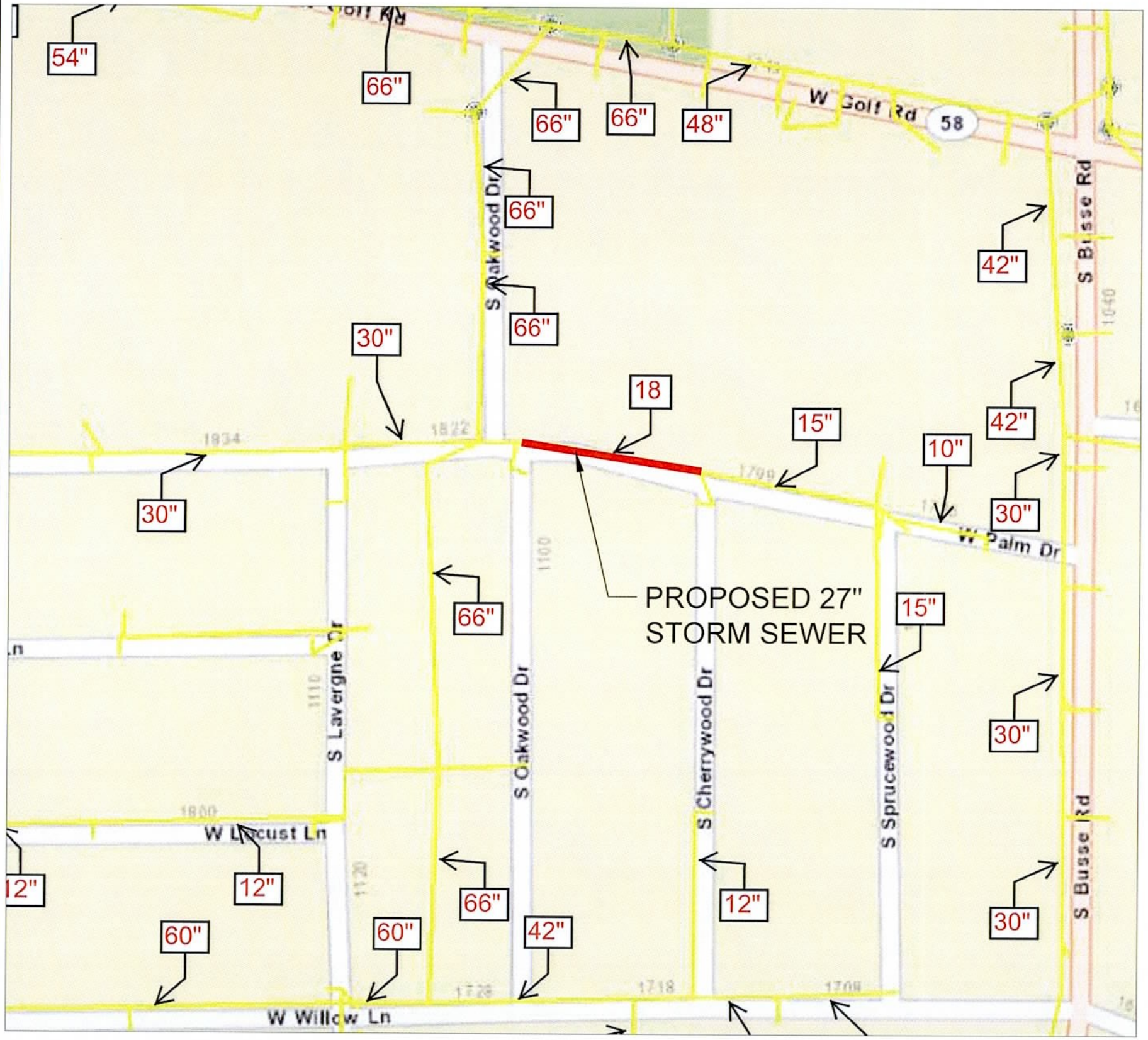


COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.

Burns & McDonnell
SINCE 1898

EXHIBIT 9

BASIN CS31
EXISTING SEWER NETWORK
25-YEAR STORM EVENT



NORTH

LEGEND

EXISTING STORM SEWER

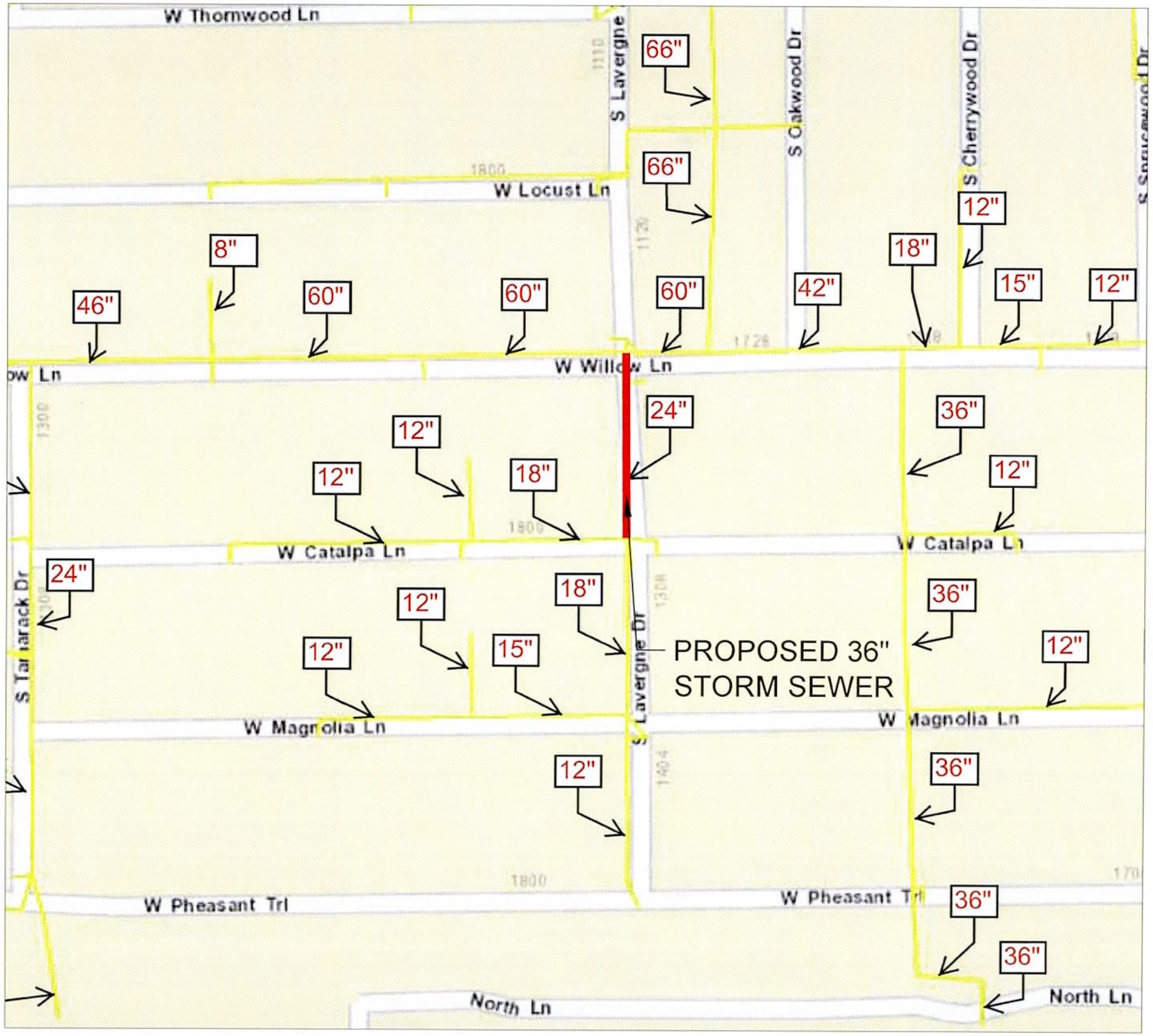
STORM SEWER REPLACEMENT

COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.

Burns & McDonnell SINCE 1898

EXHIBIT 10

BASIN SS32
RECOMMENDED
IMPROVEMENTS



NORTH

LEGEND

EXISTING STORM SEWER

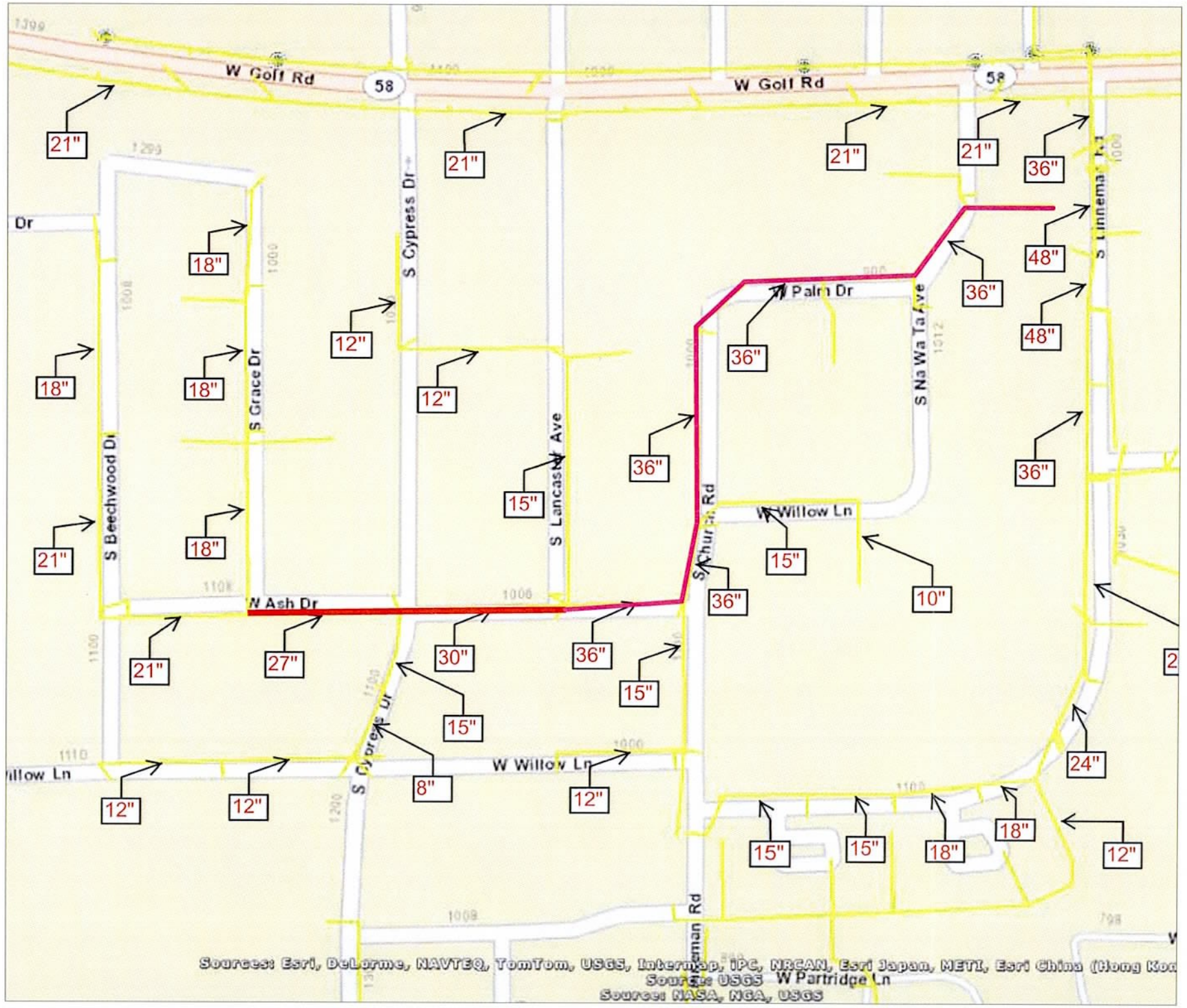
STORM SEWER REPLACEMENT

COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.

Burns & McDonnell SINCE 1898

EXHIBIT 11

BASIN SS41
RECOMMENDED
IMPROVEMENTS



NORTH

LEGEND

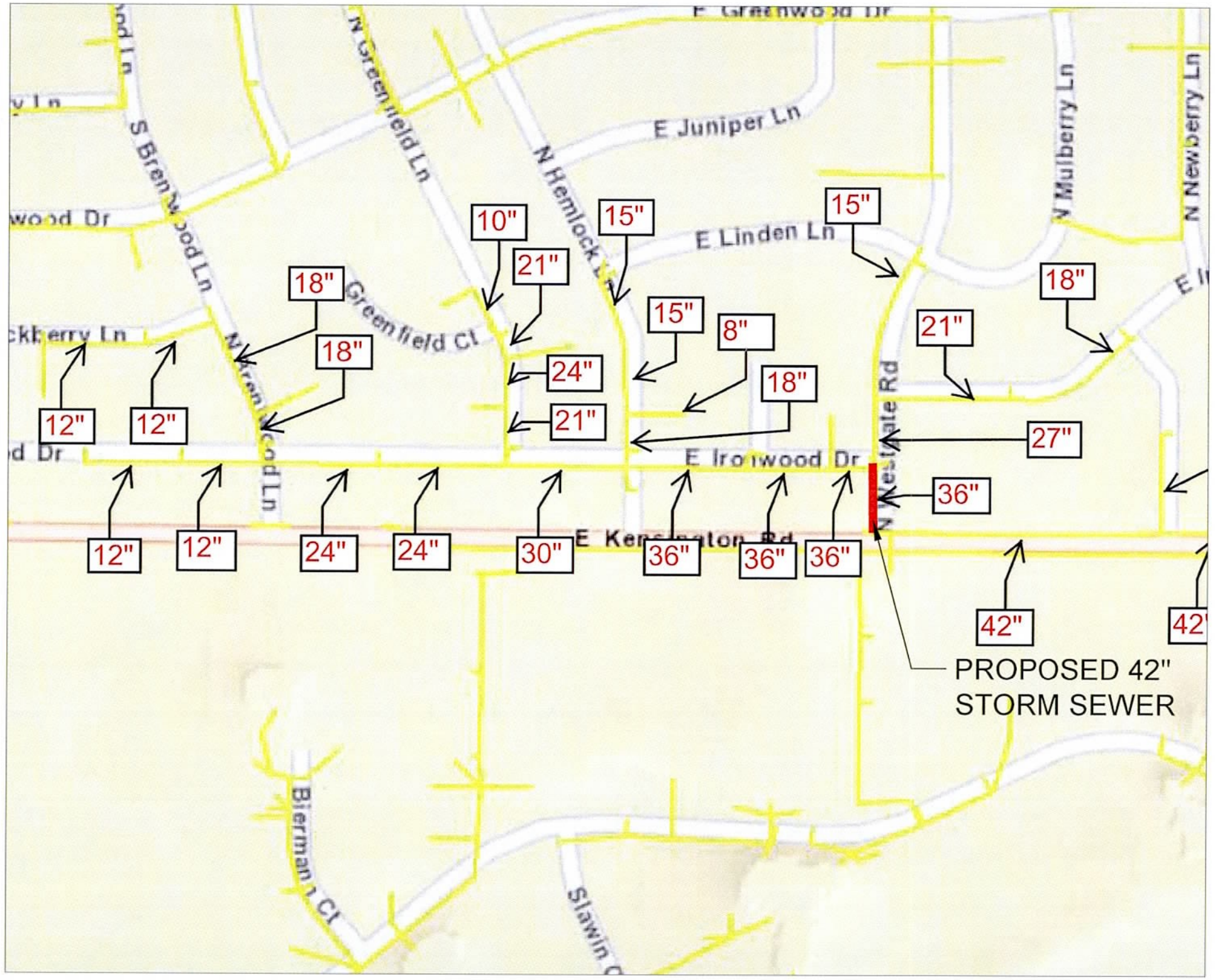
- EXISTING STORM SEWER
- STORM SEWER REPLACEMENT - 36"
- STORM SEWER REPLACEMENT - 42"

Burns & McDonnell SINCE 1898

EXHIBIT 12

BASIN SS45
RECOMMENDED
IMPROVEMENTS

COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.



NORTH

LEGEND

EXISTING STORM SEWER

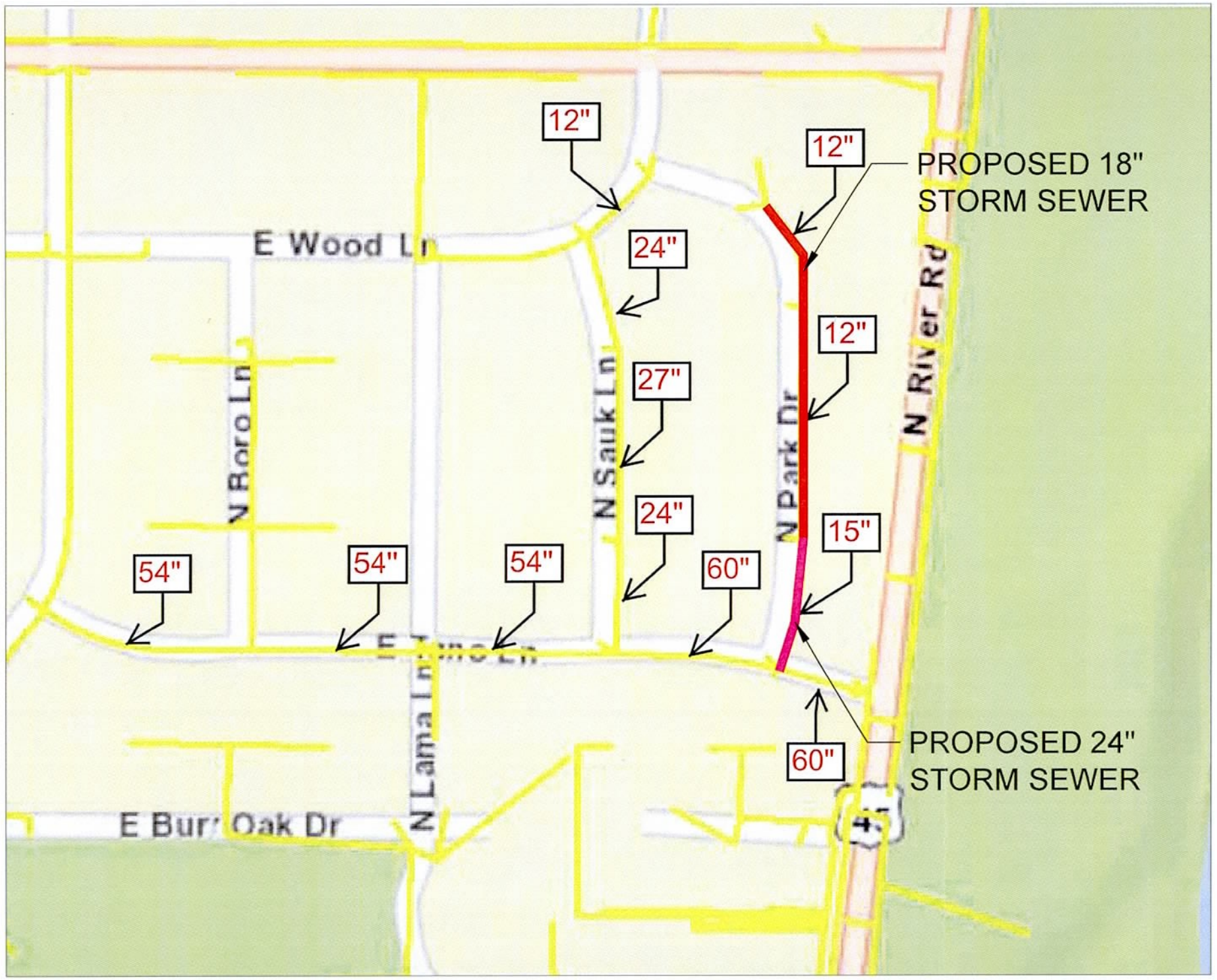
STORM SEWER REPLACEMENT

Burns & McDonnell SINCE 1898

EXHIBIT 13

ILLINOIS AMERICAN BASIN
RECOMMENDED
IMPROVEMENTS

COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.



NORTH

LEGEND

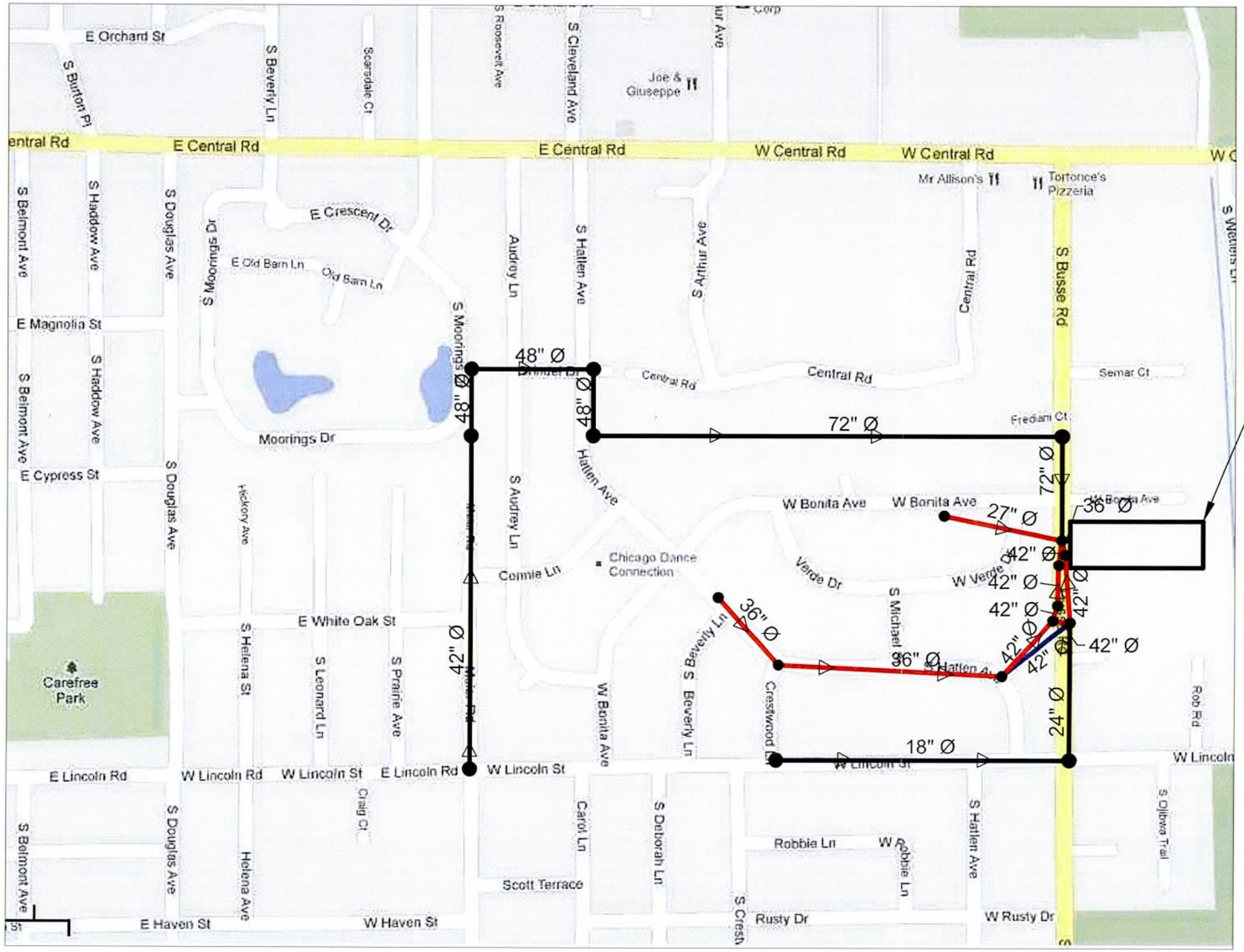
- EXISTING STORM SEWER
- STORM SEWER REPLACEMENT - 18"
- STORM SEWER REPLACEMENT - 24"

Burns & McDonnell SINCE 1898

EXHIBIT 14

ILLINOIS AMERICAN BASIN RECOMMENDED IMPROVEMENTS

COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.



NORTH

CRUMLEY BASIN

LEGEND

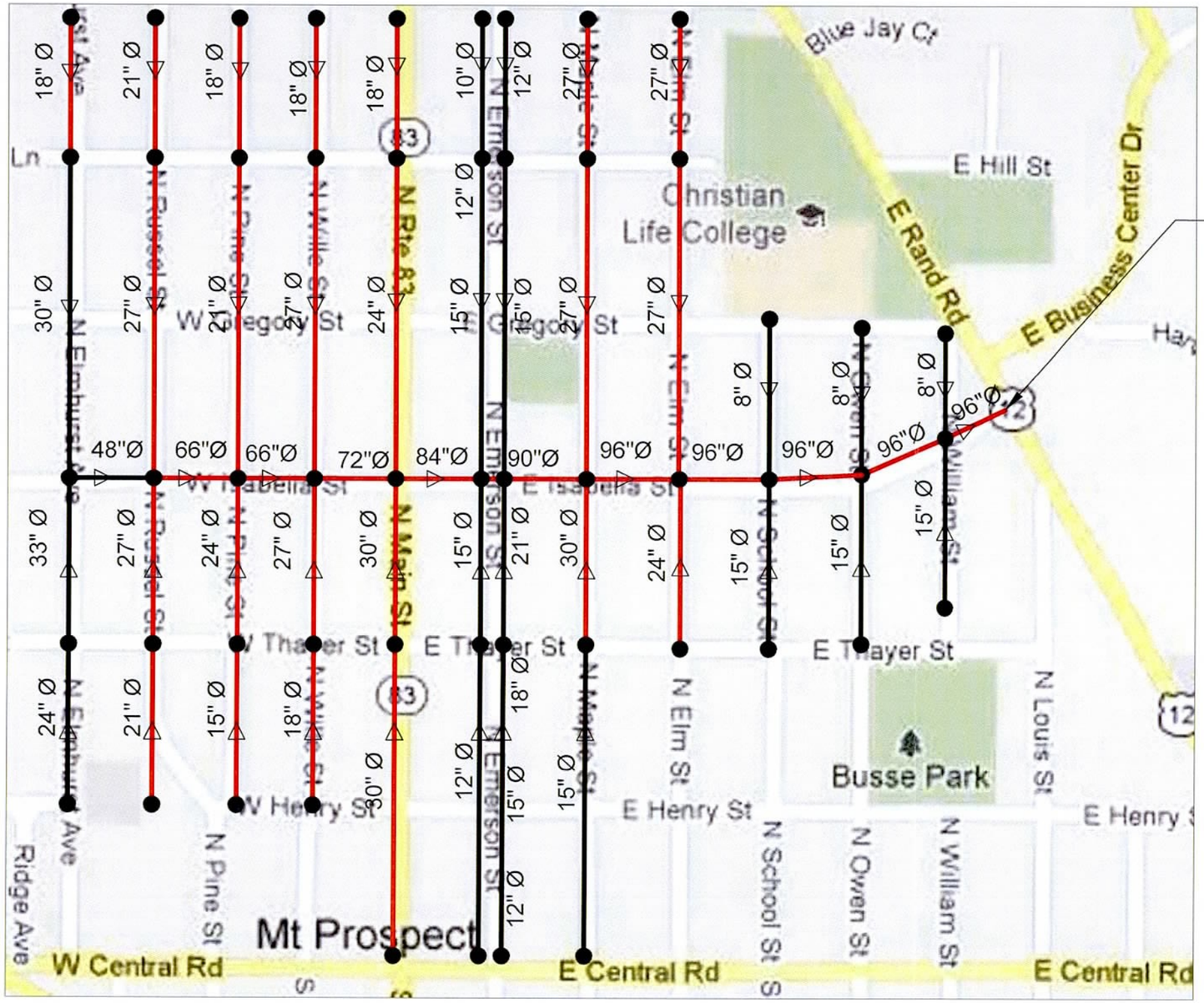
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- STORM SEWER REPLACEMENT

COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.

Burns & McDonnell SINCE 1898

EXHIBIT 15

BASINS SS08 & SS11
RECOMMENDED
IMPROVEMENTS



CONNECT TO MWRD INTERCEPTOR

NORTH

LEGEND

EXISTING COMBINED SEWER

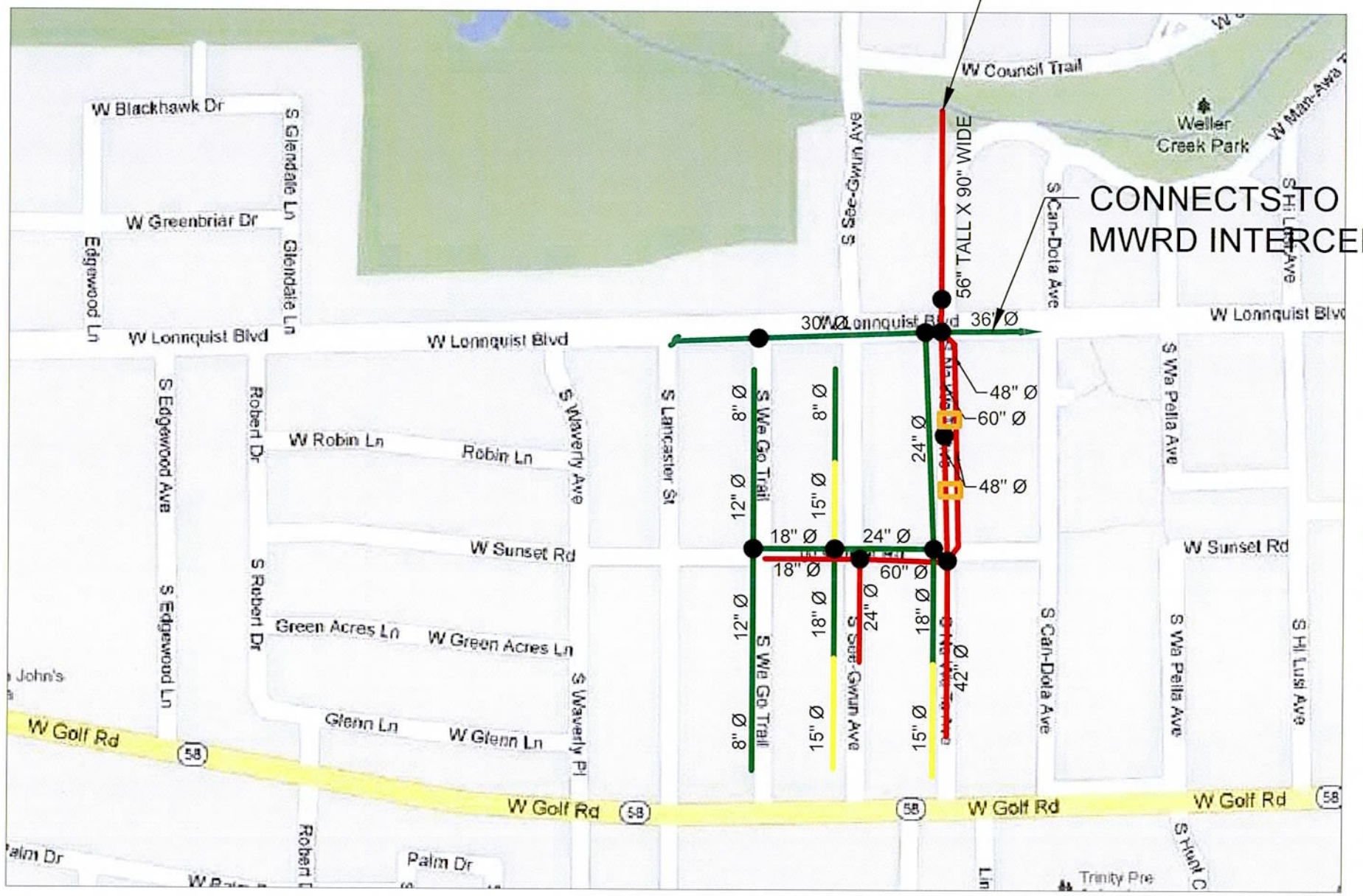
RELIEF SEWER

COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.

Burns & McDonnell SINCE 1898

EXHIBIT 16

BASIN CS21
RECOMMENDED
IMPROVEMENTS



COPYRIGHT © 2012 BURNS & McDONNELL ENGINEERING COMPANY, INC.

Burns & McDonnell
SINCE 1898

EXHIBIT 17

BASIN CS31
RECOMMENDED
IMPROVEMENTS

Table I
Basins SS08 and SS11: Hatlen Heights Subdivision
Village of Mount Prospect
XPSWMM Modeling Results

	Street										
Storm Event	Lincoln/ Meier	North Meier	Hatlen/ Bonita	Bonita/ Busse	Hatlen/ Beverly	East Hatlen	Verde	Busse/ Detention	Busse/Susan	Busse/ Lincoln	Crestwood/ Lincoln
1-Yr 3 hr Storm	No	No	No	No	Yes	Yes	No	No	No	No	No
2-Yr 3 hr Storm	No	No	No	No	Yes	Yes	No	No	No	No	No
5-Yr 3 hr Storm	No	No	No	No	Yes	Yes	Yes	No	No	No	No
10-Yr 3 hr Storm	No	Yes	No	No	Yes	Yes	Yes	No	No	No	No
25-Yr 3 hr Storm	No	Yes	No	No	Yes	Yes	Yes	No	No	No	No
100-Yr 3 hr Storm	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No	Yes
July 23, 2011 Storm	Yes	Yes	No	No	Yes	Yes	No	No	No	No	No

Table II
Basin CS18: Highland Street Sewer System
Village of Mount Prospect
XPSWMM Modeling Results

Kensington	Street									
Storm Event	Forest	Fairview	Prospect Manor	Eastwood	Elmhurst	Russel	Pine	Wille	Main	Maple Ct
1-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	No
2-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	Yes
5-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	Yes
10-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	Yes
25-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	Yes
100-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	Yes
July 23, 2011 Storm	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes

Highland - Original	Street									
Storm Event	Forest	Fairview	Prospect Manor	Eastwood	Elmhurst	Russel	Pine	Wille	Main	Maple Ct
1-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	N/A
2-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	N/A
5-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	N/A
10-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	N/A
25-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	N/A
100-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	N/A
July 23, 2011 Storm	Yes	No	No	No	No	No	No	No	No	N/A

Highland - New	Street									
Storm Event	Forest	Fairview	Prospect Manor	Eastwood	Elmhurst	Russel	Pine	Wille	Main	Maple Ct
1-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	N/A
2-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	N/A
5-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	N/A
10-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	N/A
25-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	N/A
100-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	N/A
July 23, 2011 Storm	Yes	No	No	No	No	No	No	No	No	N/A

Mid Flowing West	Street									
Storm Event	Forest	Fairview	Prospect Manor	Eastwood	Elmhurst	Russel	Pine	Wille	Main	Maple Ct
1-Yr 3 hr Storm	N/A	No	No	No	No	No	N/A	N/A	No	Yes
2-Yr 3 hr Storm	N/A	No	No	No	No	No	N/A	N/A	No	Yes
5-Yr 3 hr Storm	N/A	No	No	No	No	No	N/A	N/A	No	Yes
10-Yr 3 hr Storm	N/A	No	No	No	No	No	N/A	N/A	No	Yes
25-Yr 3 hr Storm	N/A	No	No	No	No	No	N/A	N/A	No	Yes
100-Yr 3 hr Storm	N/A	No	No	No	No	No	N/A	N/A	No	Yes
July 23, 2011 Storm	N/A	Yes	No	No	No	No	N/A	N/A		

Mid Flowing South	Street									
Storm Event	Forest	Fairview	Prospect Manor	Eastwood	Elmhurst	Russel	Pine	Wille	Main	Maple Ct
1-Yr 3 hr Storm	N/A	No	No	No	No	No	N/A	N/A	No	N/A
2-Yr 3 hr Storm	N/A	No	No	No	No	No	N/A	N/A	No	N/A
5-Yr 3 hr Storm	N/A	No	No	No	No	No	N/A	N/A	No	N/A
10-Yr 3 hr Storm	N/A	No	No	No	No	No	N/A	N/A	No	N/A
25-Yr 3 hr Storm	N/A	No	No	No	No	No	N/A	N/A	No	N/A
100-Yr 3 hr Storm	N/A	No	No	No	No	No	N/A	N/A	No	N/A
July 23, 2011 Storm	N/A	No	No	No	No	No	N/A	N/A	Yes	N/A

Table III
Basin CS21: Isabella Street Sewer System
Village of Mount Prospect
XPSWMM Modeling Results

North Side of Isabella

Highland	Street										
Storm Event	Elmhurst	Russel	Pine	Wille	Main	Emerson	Maple	Elm	School	Owen	Williams
1-Yr 3 hr Storm	No	No	No	No	No	No	No	No	N/A	N/A	N/A
2-Yr 3 hr Storm	No	No	Yes	No	No	No	No	No	N/A	N/A	N/A
5-Yr 3 hr Storm	No	Yes	Yes	Yes	No	Yes	No	Yes	N/A	N/A	N/A
10-Yr 3 hr Storm	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A
25-Yr 3 hr Storm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A
100-Yr 3 hr Storm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A
July 23, 2011 Storm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A

Memory	Street										
Storm Event	Elmhurst	Russel	Pine	Wille	Main	Emerson	Maple	Elm	School	Owen	Williams
1-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	No	No
2-Yr 3 hr Storm	No	No	Yes	Yes	No	No	No	No	No	No	No
5-Yr 3 hr Storm	No	No	Yes	Yes	No	No	No	No	No	No	No
10-Yr 3 hr Storm	No	Yes	Yes	Yes	No	No	No	Yes	No	No	No
25-Yr 3 hr Storm	No	Yes	Yes	Yes	No	Yes	No	Yes	No	No	No
100-Yr 3 hr Storm	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
July 23, 2011 Storm	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No

Isabella	Street										
Storm Event	Elmhurst	Russel	Pine	Wille	Main	Emerson	Maple	Elm	School	Owen	Williams
1-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	No	No
2-Yr 3 hr Storm	No	Yes	No	No	No	No	No	No	No	No	No
5-Yr 3 hr Storm	No	Yes	No	No	No	No	No	No	No	No	No
10-Yr 3 hr Storm	No	Yes	No	No	Yes	No	No	No	No	No	No
25-Yr 3 hr Storm	No	Yes	No	No	Yes	No	No	No	No	No	No
100-Yr 3 hr Storm	No	Yes	No	No	Yes	No	Yes	No	No	No	No
July 23, 2011 Storm	No	Yes	No	No	Yes	No	Yes	No	No	No	No

South Side of Isabella

Thayer	Street										
Storm Event	Elmhurst	Russel	Pine	Wille	Main	Emerson	Maple	Elm	School	Owen	Williams
1-Yr 3 hr Storm	No	No	No	No	No	No	No	No	No	No	No
2-Yr 3 hr Storm	No	Yes	No	Yes	No	Yes	Yes	No	No	No	No
5-Yr 3 hr Storm	No	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No
10-Yr 3 hr Storm	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
25-Yr 3 hr Storm	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
100-Yr 3 hr Storm	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
July 23, 2011 Storm	No	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A

Henry/Central	Street										
Storm Event	Elmhurst	Russel	Pine	Wille	Main	Emerson	Maple	Elm	School	Owen	Williams
1-Yr 3 hr Storm	No	No	No	No	No	No	No	No	N/A	N/A	N/A
2-Yr 3 hr Storm	No	Yes	No	No	Yes	Yes	Yes	No	N/A	N/A	N/A
5-Yr 3 hr Storm	No	Yes	No	Yes	Yes	Yes	Yes	No	N/A	N/A	N/A
10-Yr 3 hr Storm	No	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	N/A	N/A
25-Yr 3 hr Storm	No	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	N/A	N/A
100-Yr 3 hr Storm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	N/A	N/A
July 23, 2011 Storm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	N/A	N/A