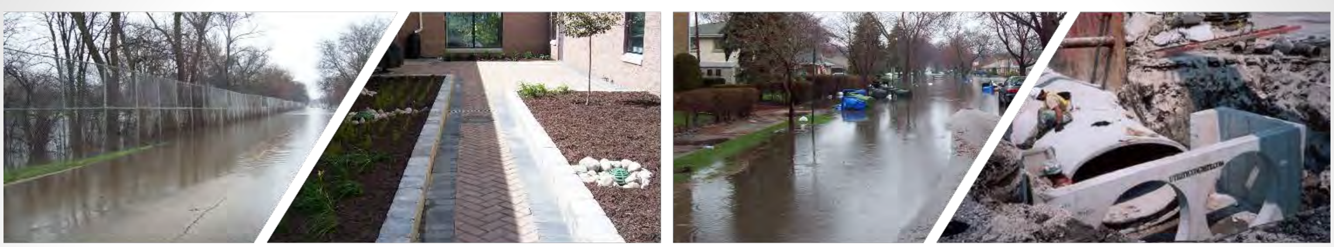
City of Park Ridge
Stormwater Master Plan
December 2017



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EXECUTIVE SUMMARY

The City of Park Ridge (City) has been engaged in stormwater planning and construction of stormwater reliprojects in response to major storm events that have occurred over the past decade. Major flooding events were experienced in September 2008, June 2011, April 2013, and June 2013. Other storm events have caused less severe, localized flooding. The efforts undertaken by the City during this time include:

- Initiated creation of a Flood Assessment Report following 2008 flooding (2009)
- Oversaw development of a Citywide Sewer Study with project recommendations (2010 -2011)
- Construction of $4.6 million in sewer system improvements (2011-2013)
- Evaluation of feasibility and costs of other larger scale flood reduction projects
- Completion of a Stormwater Utility (SWU) study to evaluate potential funding options (2016)
- Implementation of a placeholder SWU ordinance until an approved funding rate was agreed upon (2016)

The City, mostly serviced by a combined sewer system, has only a few areas with storm sewer outlets to the Des Plaines River. The majority of the sewer system relies on the Metropolitan Water Reclamation District (MWRD) of Greater Chicago interceptors. The Stormwater Utility process identified a need for a funding mechanism to make necessary upgrades to the City's stormwater systems. The SWU study focused on developing the database and calculations needed to equitably allocate the costs of a stormwater program amongst property owners based upon their contribution of stormwater into the system (i.e. their impervious coverage). The cost of the stormwater program, however, was not known during the SWU process. General assumptions were made on the types and costs of projects that could be funded by a SWU. Ultimately, it was decided by the City Council that the SWU fees should not be implemented until a program of stormwater projects was developed so that a more accurate program cost could be estimated. The vision was that the entire City would be analyzed so that a recommended level of flood protection could be determined, and then a program of potential projects would be developed to raise the current level of protection to the recommended minimum level. To achieve that vision, the City initiated the creation of this Stormwater Master Plan (SMP).

The core of the SMP is the development of the recommended projects, which have been referred to as the Stormwater Capital Improvement Plan, and the corresponding recommended SWU rates. Other report sections have reviewed and made recommendations on issues such as prioritizing the projects, the City's current stormwater regulations, water quality planning, the use of green infrastructure, and the evaluation of administrative issues such as staffing capacity and the establishment of a stormwater commission.

The SMP is intended as a planning tool. It is understood that the recommendations included within carry significant costs and impacts to the community, and would need to be implemented over many years. The needs and limitations of the City will inevitably change over that time. The SMP will help to guide future City administrations so that flood control efforts in the City will be well coordinated for years to come.

The major conclusions of the key SMP report sections are summarized below:

CURRENT LEVEL OF FLOOD PROTECTION

The current level of flood protection is fairly well known, having been previously analyzed in the Citywide Sewer Study. However, the SMP process provided the opportunity to refine that analysis using new information gathered in the wake of two major flood events that occurred after the Citywide Study was completed. Major storms in April and June of 2013 caused widespread flooding through the City. CBBEL staff observed and took photos of several of the known flooding areas immediately after those storms. During the SMP process, a project website was created with a link to a flood questionnaire that residents could complete; many residents shared photos of the flooding they experienced. The photographic record was extremely valuable and allowed "calibration" of the model. Calibration is a process where the sewer model is simulated using recorded rainfall data, and the simulation results are compared to the observed flooding. This comparison allowed the model parameters to be adjusted for maximum accuracy.

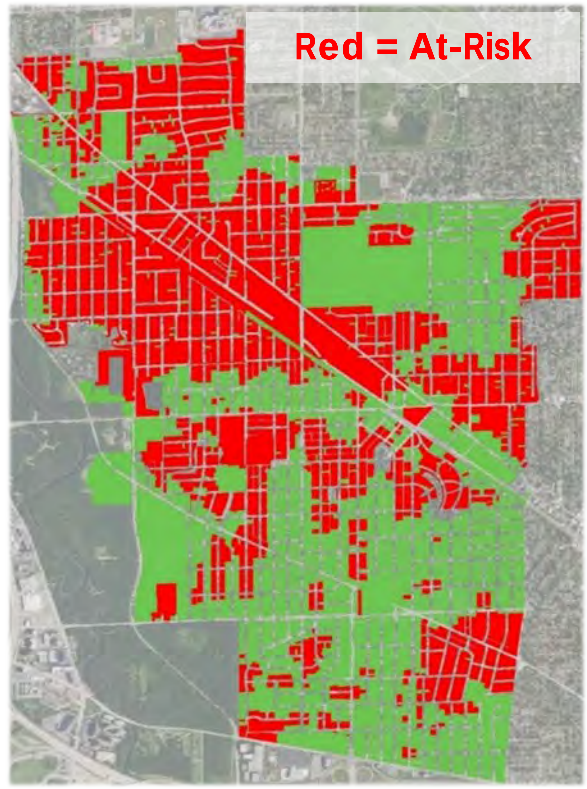

Figure 1. At-Risk Properties of Sewer Backup 1YR Event

The modeling determined that unless a property has a flood control system such as overhead sewers, much of the City is at-risk of basement flooding through sewer backup from storms as frequent as the 1-year event (1.2" rain in 1 hour duration). A series of maps (**Figure 1**) were developed to depict the at-risk properties for a given storm event.

The modeling also examined the overland flooding that occurs during major storms. Overland flooding occurs after the sewer system has filled to capacity, and stormwater starts to accumulate on streets, yards, etc., until water enters a structure and causes flood damage. To depict overland flooding, the model was simulated and the results were linked to a digital map of the City's terrain. Shaded areas indicated presence of water that was ponded at some depth for some duration. The ponding areas were filtered using depth and reported flooding from flood questionnaires to identify specific areas that should be targeted by the flood control projects.

RECOMMENDED FLOOD PROTECTION LEVEL

The question of recommended flood protection level was divided into two categories between basement backup flooding and overland flooding. An analysis of each was done to estimate the costs associated with various levels of flood protection. For basement backups, it was demonstrated that the maximum protection level that could feasibly be provided would be in the 5- to 10-year range. It was also demonstrated that the most cost effective solution to basement backups would require individual property owners to implement their own flood control solutions; if the City were to do it, it would be more costly, would cause enormous disruption in terms of construction, and would not provide the same level of protection as the individual flood control system. For these reasons, it was decided that sewer backups should not be specifically addressed in the SMP.

A similar analysis was done for overland flooding. The recommended projects comprise the core of the Stormwater Capital Improvement Plan. It was decided by the City Council to recommend the 100-year level of protection.

STORMWATER CAPITAL IMPROVEMENT PLAN (SCIP) AND PRIORITIZATION

A program of thirteen (13) projects were developed to alleviate flooding in the identified overland flooding areas. The projects primarily include the construction of new relief sewers and underground storage vaults in available open space areas. Those open space areas are generally Park District or school sites; in one location, underground storage on a private property has been proposed. Obviously, negotiation and coordination with these property owners would be required to allow construction of the projects. Two previously developed projects – Mayfield Estates and Northwest Park – were also included in the recommendations. Concept level costs were estimated for each project. The total cost of the SCIP was estimated to be $106 million.

A prioritization of the projects was also completed to serve as the basis of an implementation plan. The projects were ranked based upon their flood control benefits in comparison to the project costs. Issues such as the ability to secure easements or property rights to construct the project were not considered, although these have the potential to change the order of implementation. The prioritized list of projects is as follows:

Table 1: Prioritization and Estimated Cost of Proposed Capital Improvement Projects

Rank	Project Name	Estimated Cost
1	Mayfield	$2.5 Million
2	West Sibley Corridor	$20 Million
3	Marvin Parkway	$2.3 Million
4	Northwest Park	$15.7 Million
5	East Sibley Corridor	$39.9 Million
6	Northeast Park	$8.8 Million
7	Crescent Avenue	$12.3 Million
8	Southwest Park	$4.5 Million
TOTAL		**$106 Million**

STORMWATER UTILITY RATE SETTING

The SWU study completed in 2016 assumed a program cost of $40 million that would be implemented over a 20-year construction schedule. These assumptions led to the SWU fee to be set at a recommended level of $11 per Equivalent Residential Unit (ERU). When the City Council agreed upon the 100-year level of protection for overland flooding projects during the SMP process, it was recognized that the program costs would well exceed the original $40 million assumption. However, Council gave guidance that the ERU fee rate should assume consecutive 20-year implementation plans for a total duration of 40 years.

The financial analyst for the SWU study was consulted about setting the rate recommendation based upon the new parameters ($106 million, 40-year period). Their recommendation was that because the financial projection involves assumptions such as interest rates, cost escalation, etc, a projection over a 40-year period is not particularly reliable. In reviewing the original financial analysis, they noted that the $11/ERU fee was calculated to pay for the peak anticipated spending. In time, as bonds were retired, either the fee could have been reduced or the payoff time shortened. Alternately, if the fee was held constant, a substantial balance would have accumulated with which new projects could be constructed. In other words the original $11/ERU recommendation could fund more than $40 million in projects, depending on the payoff time.

In the opinion of the financial analyst, the previously recommended funding rate of $11/ERU remains a valid and reasonable starting point for funding the SWU program. It will allow for construction of major projects in the near term, and allow the City to assess the longer term stormwater funding needs in future years. The ERU can be adjusted in future years based upon the projects that are ultimately constructed and the desired payoff schedule. ***We continue to recommend setting the ERU rate at $11/ERU.***

STORMWATER ADMINISTRATION

As part of the SMP an evaluation of stormwater administrative components have been reviewed and recommendations made for current and future City practices. Items such as the City's stormwater regulations and policies, operations and maintenance program, water quality program, staffing capacity, and establishment of a stormwater commission were reviewed. Current stormwater regulations and policies the City implement were deemed to be reasonable, including a fee-in-lieu of detention for smaller non-residential developments or redevelopments. The operations and maintenance program of the City was reviewed and found to be very proactive. The City's water quality program was evaluated and it is recommended that the program should focus its resources on projects that will reduce the frequency of combined sewer overflow (CSO) events by implementing the Capital Improvement Plan, continuing the current sewer lining program, utilizing green infrastructure, and educating residents on steps they can take to better manage their properties to improve water quality. As part of the SMP, a review of the current and future staffing needed to manage the City's stormwater program was completed. There is currently no need for additional staff to manage stormwater issues within the City; however, depending on if the projects proposed in the SMP are to all be constructed additional staff may be warranted and should be considered. Issues and benefits related to the potential creation of a stormwater commission for the City were also evaluated. In-depth discussion of these issues is provided in this report.

CHAPTER 1 BACKGROUND

1.1 INTRODUCTION

The City of Park Ridge (City) is a fully developed community of 7.1 square miles with an extensive sewer system comprised mainly of combined sewers supplemented by relief sewers and combined sewer overflows that outfall to the Des Plaines River (Figure 2). There are scattered areas with separate storm and sanitary sewers, and several detention facilities located throughout the City. All of these drainage systems are interconnected, and when coupled with overland flow routes, depressional storage areas, varying river levels, etc., create complex conditions that affect the performance of the system and its ability to handle runoff during storm events.

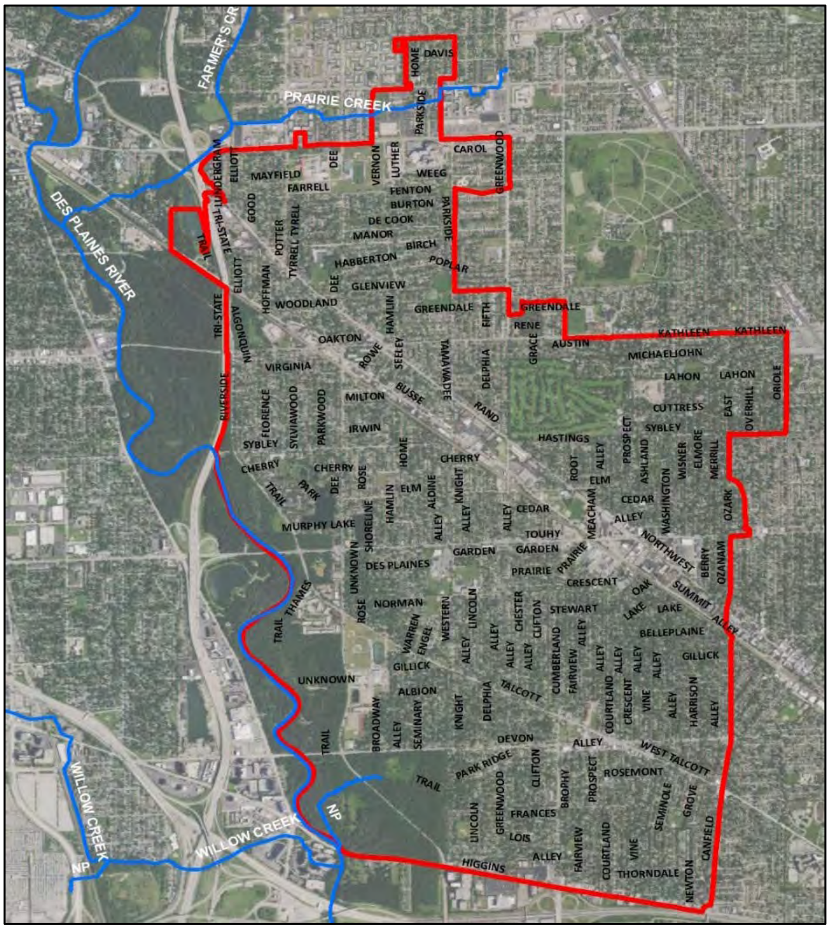

Figure 2. City of Park Ridge Boundary

In recent years, the City has experienced several major storm events that have resulted in flooding throughout the City, both from basement backups and overland flow. A few of these storms include the September 2008 and April and June 2013 events. In particular, a storm on September 13-14, 2008 caused widespread flooding. As a result of the September 2008 event, several key problem areas were identified and proposed concept-level improvements were suggested. However, the City identified the need to comprehensively evaluate the citywide system before moving forward with projects. A Citywide Sewer Study was then completed by CBBEL in July 2011, in which a computer model was developed of the City's entire sewer system consisting of approximately 150 miles of sewers and over 5000 drainage structures. The 2011 study established a baseline understanding of the capacity of the City's existing sewer systems and on a concept level a number of projects to improve sewer capacity and to reduce flooding. There were several projects from the citywide study that were designed and constructed and others that were not constructed due to their significant costs.

City staff and Council continued to discuss stormwater management and potential funding mechanisms for stormwater projects. This lead to the commissioning of a Stormwater Utility (SWU) study. The SWU study estimated the level of funding required to construct various types of stormwater improvement projects throughout the City. However, it was not within the scope of the SWU study to develop specific projects or an overall master plan. It became clear from Council discussions that if a SWU fee were to be enacted, it was preferable to establish the rate based on an approved comprehensive master plan for the entire City.

This report details the results of the completed Stormwater Master Plan (SMP), which includes the modeling analysis of the existing sewer system in addition to multiple proposed and analyzed capital improvement projects aimed at reducing flooding and improving the sewer system performance. Those project areas are described in this report as well as the accompanying exhibits. Concept-level cost estimates have also been prepared in addition to a benefit cost analysis found in **Appendices 1 & 2**, respecitvely.

1.2 PURPOSE AND SCOPE

The purpose of this SMP is to:

- Determine the current and recommended levels of flood protection throughout the City;
- Develop a prioritized Capital Improvement Plan that meets the desired protection level;
- Evaluate stormwater issues related to the City's ordinances, system maintenance, and staffing needs;
- Recommend an Equivalent Residential Unit (ERU) rate to fund the SMP;

This SMP includes detailed hydrologic and hydraulic modeling of the City to identify flood damage areas and existing bottlenecks or problems in the sewer conveyance system. The detailed modeling was used to identify optimal locations and sizes for capital drainage improvement projects and stormwater quantity/quality Best Management Practices (BMPs) to reduce flooding and damages.

CHAPTER 2 STUDY DEVELOPMENT

2.1 DATA COLLECTION

For the SMP, most of the data used for the analysis was already obtained during the 2011 Citywide Sewer Study. Additional information such as as-built drawings for constructed projects and field survey were used to supplement the computer model since the previous study.

2.1.1 City Staff and Public Involvement

Participation from City staff and the public was helpful to understanding the historic and recent flooding and drainage issues throughout the City. This input is necessary to craft solutions to effectively address flooding problems. The extent and nature of known existing stormwater conditions and concerns in the City were identified through various means including: discussions with the City staff, a public open house, and flood survey questionnaires. The previous study was used as the template for the current SMP with additional applicable data and information from recent studies and construction documents added.

A website (www.parkridgestormwatermasterplan.com) was created for residents to fill out the flood survey questionnaires to address their concerns of flooding issues, in addition to being able to share photographs of past flooding (Figure 3). Appendix 3 includes information pertaining to the flood survey questionnaire. CBBEL reviewed specific accounts and photographs of flooding from various storm events that were reported by residents. Two major rainfall events occurring since the previous study that had widespread flooding impacts throughout the City occurred in April and June of 2013. Detailed consideration was taken to quantify the full extent of the flooding problems located throughout the City.

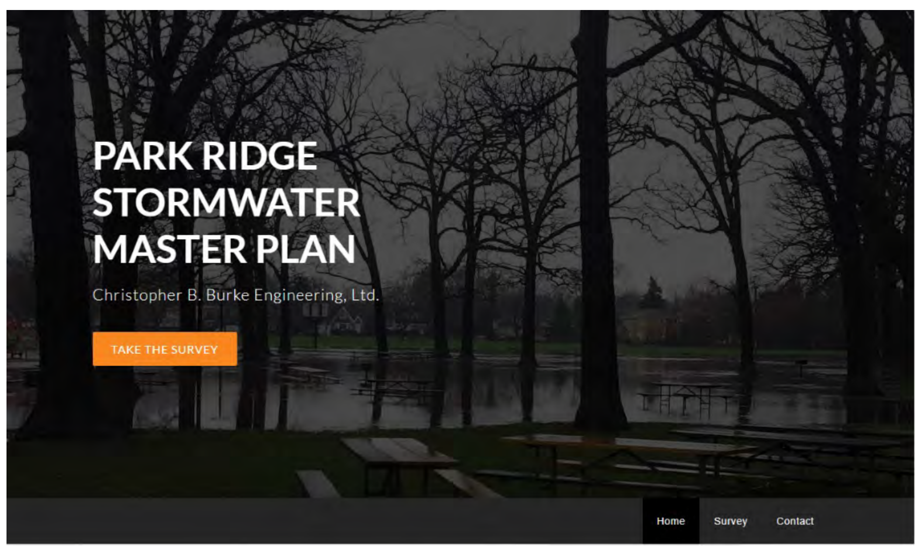

Figure 3. Flood Survey Questionnaire Website

In total, there were 465 flood survey questionnaires submitted by residents as part of the current SMP. Of the 465 surveys received, 210 reported sewer backups; 96 of which reported backups prior to installing Flood Control systems. There were 257 responses that reported having a Flood Control system in place. Additionally, there were 200 reports of overland flooding. **Figures 4 & 5** show the areas where basement backups and overland flooding were reported, respectively. **Figures 4 & 5** show the reported data from the current SMP flood survey and previously reported flooding accounts received by the City from 2008.

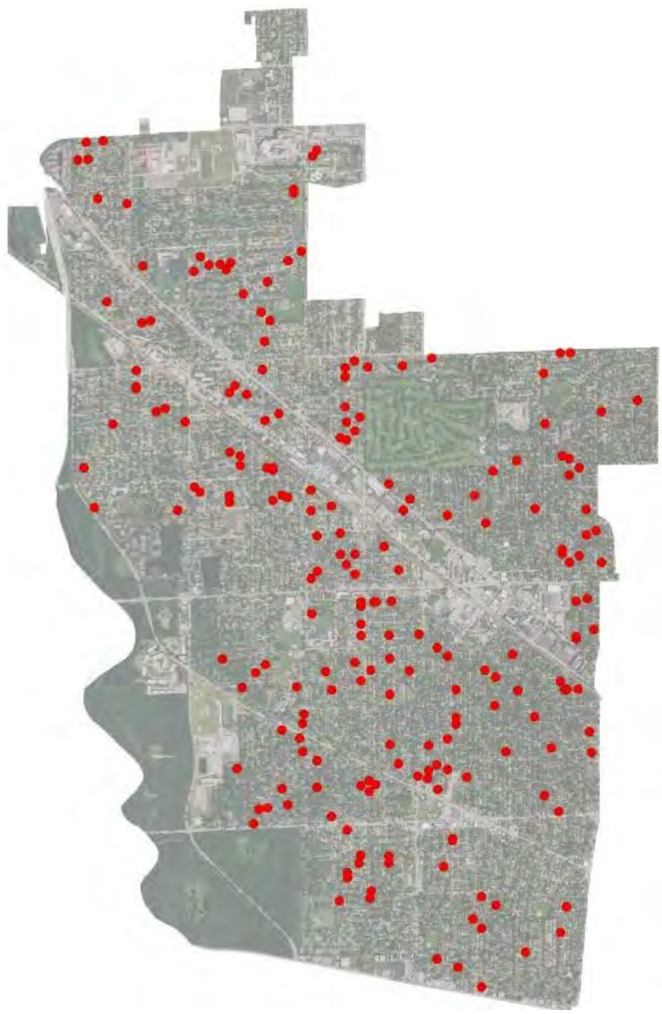

Figure 4. Reported Basement Backups

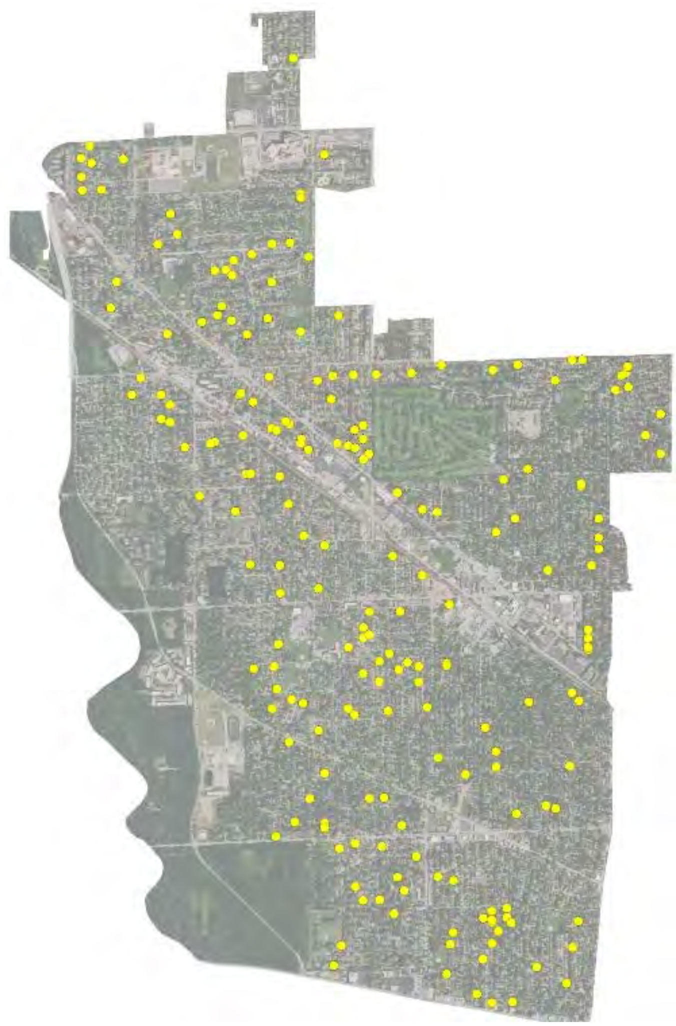

Figure 5. Reported Overland Flooding

2.1.2 Sewer Data Collection

The sewer data obtained from the 2011 Citywide Sewer Study was used as the basis of the current modeling and supplemented with as-built plans of completed sewer projects. Required input data for the sewer system included manhole locations and rim elevations, and sewer locations, inverts, and diameters. The City's GIS database provided much of this data, and was supplemented with field surveying of portions of the sewer system.

2.1.3 Floodplain Maps

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel 238, for Cook County, Illinois and Incorporated Areas, effective August 19, 2008; the Des Plaines River contains Zone AE Special Flood Hazard Areas (SFHA) outside its banks, while portions of the City along the Des Plaines River are denoted as Zone X (Other Flood Areas) (**Exhibit 1**). Additionally, FIRM panel 236, for Cook County, Illinois and Incorporated Areas, effective August 19, 2008; shows Prairie Creek Zone AE SFHA outside its banks impacting structures near the northernmost portion of the City from Prairie Creek, in addition to Zone X (**Exhibit 2**). The majority of the City however has non-printed flood map boundaries, meaning that there are no SFHAs located within a majority of the City.

FEMA defines Zone AE as a SFHA subject to inundation by the 1% annual chance flood with a defined elevation. The 1% annual chance flood is the 100-year flood, or base flood, or the flood that has a 1% chance of being equaled or exceeded in any given year. The Base Flood Elevation (BFE) is the water surface elevation of the 1% annual chance flood. Zone X is an area of 0.2% chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance flood. The majority of the City is generally protected from overbank flooding because of higher ground in comparison to the Des Plaines River.

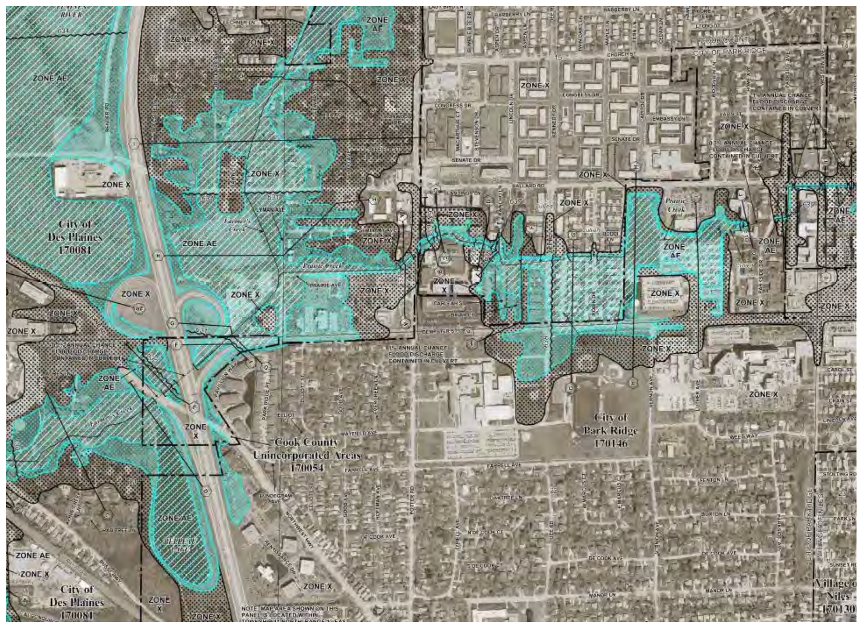

Figure 6. Cook County FEMA FIRM Panel 236

According to FIRM Panel 236 (Figure 6), there is approximately 25 acres of Zone AE 100-yr floodplain associated with Prairie Creek. This area along Dempster Street is at risk for overbank flooding from Prairie Creek during larger storm events.

CHAPTER 3 DESCRIPTION OF EXISTING DRAINAGE SYSTEM

There are three watersheds within the City, referred to as the Devon, Sibley, and North Area watersheds. The Devon watershed is 1300 acres in size and includes everything tributary to the Devon Avenue combined sewer, which conveys sanitary flow to MWRD facilities for treatment, as well as two relief sewer networks that provide relief to the combined sewer system. One relief sewer discharges to the Des Plaines River at Devon Avenue, and the second discharges to the Des Plaines River downstream of Higgins Road. **Exhibit 3** and **Figure 7** shows the limits of the watershed and the major trunk and relief sewers.

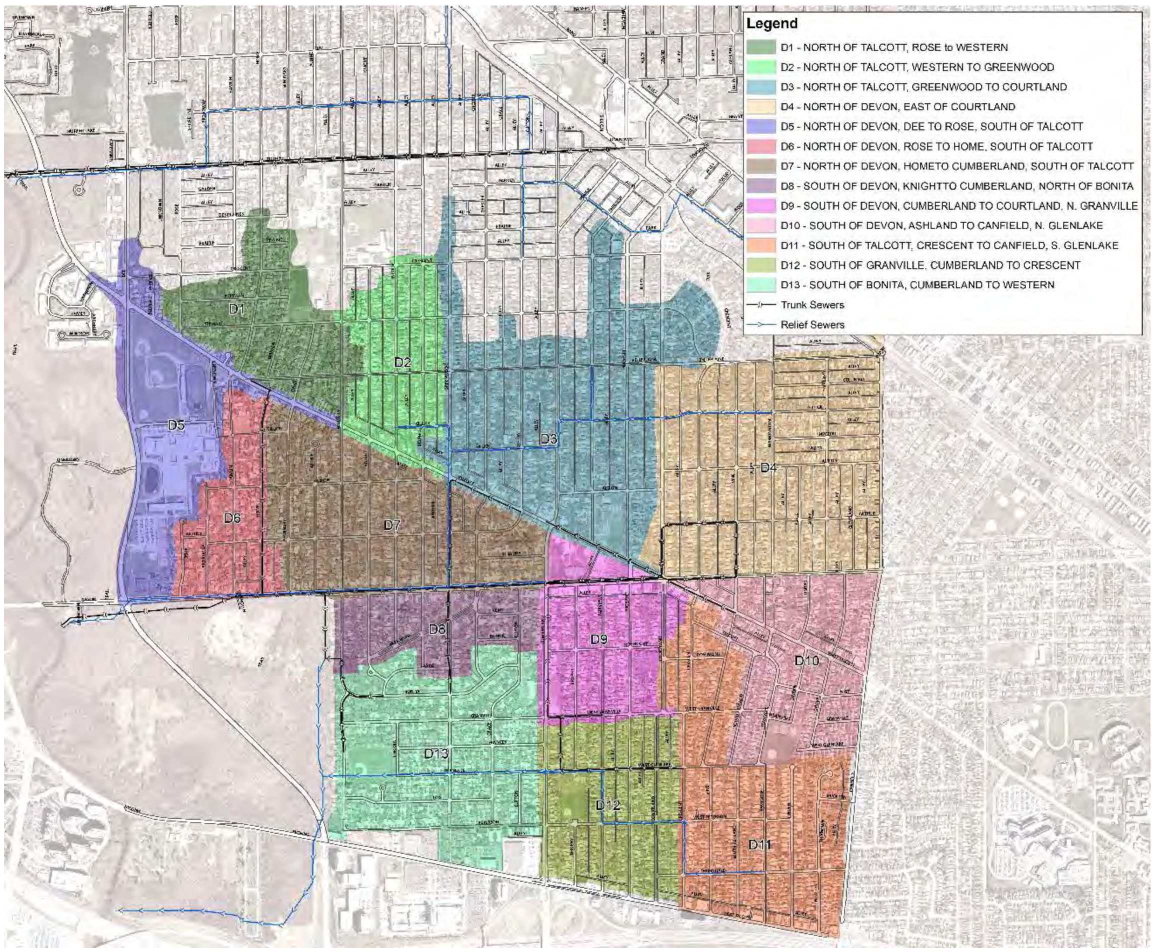

Figure 7. Devon Drainage System

The Sibley watershed is 2400 acres in size and includes everything tributary to the Sibley Avenue combined sewer, which conveys sanitary flow to MWRD facilities for treatment, as well as two relief sewer networks that provide relief to the combined sewer system. One relief sewer network discharges to the Des Plaines River at Algonquin Road, and the second discharges to the Des Plaines River at Touhy Avenue. **Exhibit 4** and **Figure 8** shows the limits of the watershed and the major trunk and relief sewers. The Sibley watershed includes a large pump station at Sibley Avenue near the Des Plaines River. The pump station allows dry weather flows and limited wet weather flows to drain to the MWRD facilities, and higher flows to be pumped directly to the Des Plaines River. The Sibley Pump Station has a maximum design capacity of 400 cubic feet per second (cfs).

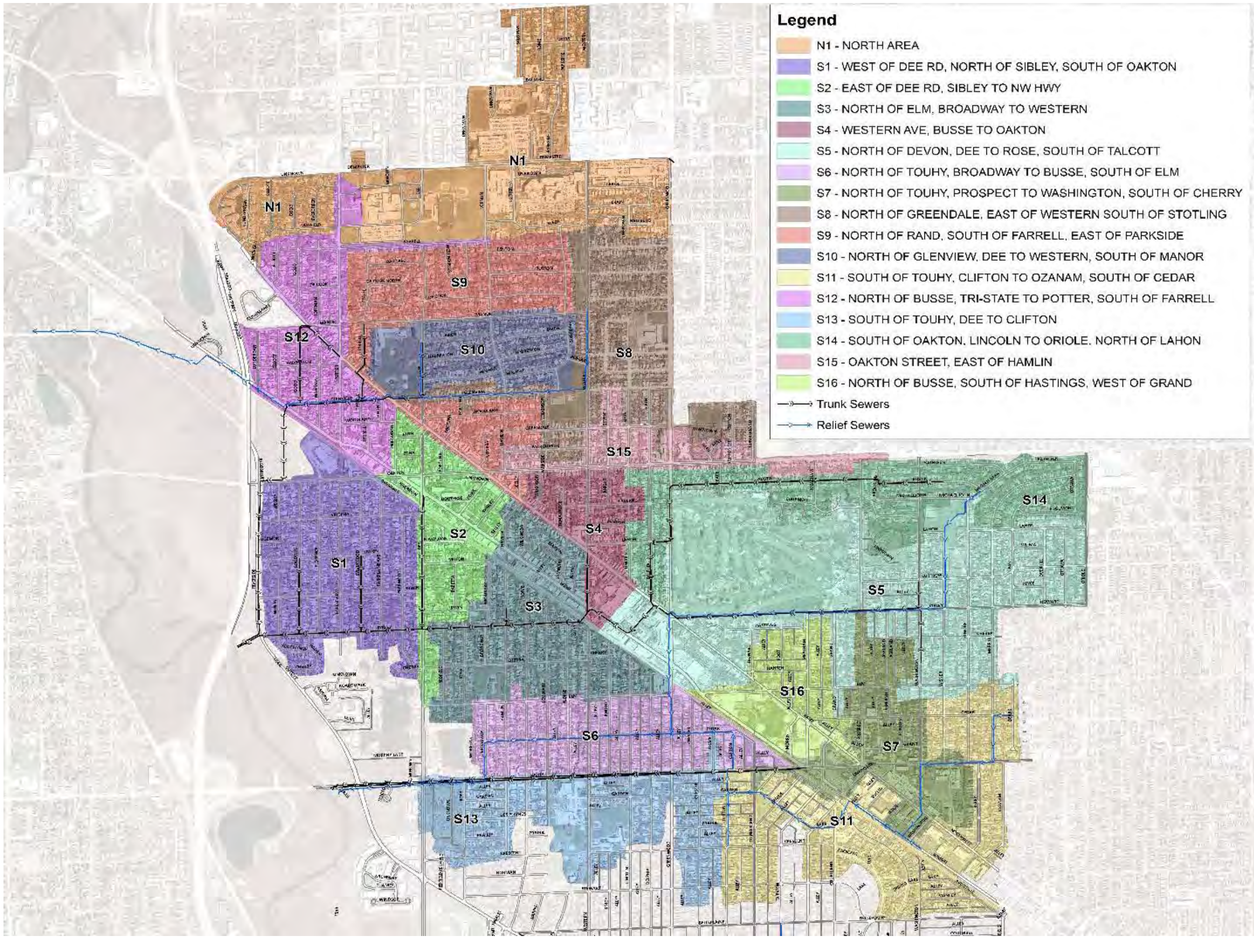

Figure 8. Sibley and North Area Drainage System

The third watershed is referred to as the North Area, which is north of the Sibley watershed, and is approximately 340 acres. This area is not tributary to the rest of the City's combined sewer system and contains several individual drainage systems. Much of the area is drained by storm sewer systems on Dempster Avenue, which are under IDOT's jurisdiction and were not modeled. Only a model for Mayfield Estates was developed within the North Area. Exhibit 4 and Figure 8 shows the limits of the watershed and the major trunk and relief sewers.

3.1 EXISTING SEWER NETWORK AND LIMITATIONS

The City of Park Ridge was primarily developed prior to modern stormwater management practices. As such, there is limited stormwater storage, poor overland flow routes and most notably a combined sewer system, none of which were designed based on current rainfall standards. These conditions result in the significant sewer backups or overland flooding experienced within the City during a wide variety of storm events.

With the City being majority combined sewer system in addition to having older residential structures with no flood control, sewer backups are an issue. A sewer backup will occur and impact residential structures once the water level in the combined sewer exceeds the basement elevation of an adjacent home with a gravity flow sewer connection (Figure 9).

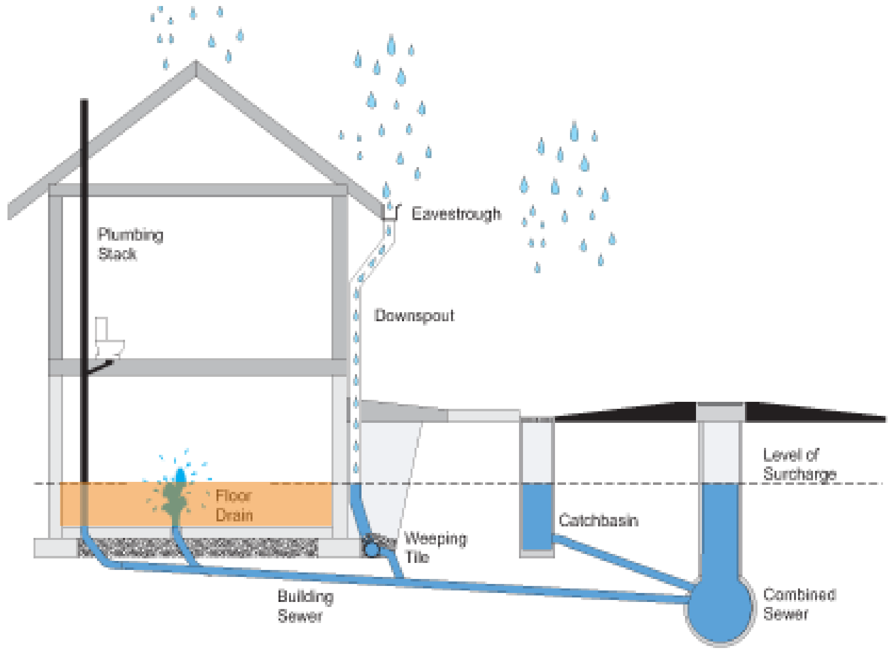

Figure 9. Sewer Backup Schematic

Given the lack of sewer capacity and poor overland drainage of the City, overland flooding is a common issue for a variety of storm events. Overland flooding occurs when the sewer capacity is exceeded and surcharges the structure. After surcharging, surface runoff flows by gravity towards the lowest ground elevations and inundates depressional areas, usually beginning with the streets. When the available surface storage capacity is exceeded, overland flow continues towards other lower lying areas, typically along or through residential properties. During overland flooding, there is a potential for the surface runoff to enter residential structures through openings such as basement window sills, stair wells, first floor openings, footing drains or excessive seepage from severely saturated ground adjacent to the home. The City typically drains from east to west towards the Des Plaines River as seen in **Exhibit 5,** with several areas located throughout the City where widespread overland flooding occurs. Well-known locations of historical overland flooding include areas west of the Park Ridge Country Club and the area east of Northwest Park, among others.

Figure 10. Overland Flooding

CHAPTER 4 HYDROLOGIC AND HYDRAULIC MODEL DEVELOPMENT

For the SMP, most of the data used for the analysis was already obtained during the 2011 Citywide Sewer Study, and updated as needed. CBBEL previously used InfoSWMM software for the 2011 Citywide Sewer Study, which is a proprietary program based on the US EPA's Storm Water Management Model (SWMM). InfoSWMM is GIS-based, which allows transfer of input data from the City's GIS database into the model, as well as export of data from the model back into the GIS database for convenient mapping uses.

For a more detailed hydrologic and hydraulic analysis, the previous InfoSWMM model was converted to an XP-Software Stormwater and Wastewater Management Model (XP-SWMM) for the City's sewer network. Due to the size of the City sewer network, two XP-SWMM models were created for both the Sibley and Devon watersheds. The XP-SWMM software is a dynamic modeling program that determines the hydrologic response (runoff mode) from a storm event and routes the runoff through a sewer network (hydraulic mode). The XP-SWMM software was chosen for the analysis for its ability to simulate overland flows and surface storage combined with a sewer network to identify localized flooding problems. Additionally, XP-SWMM has 2-D modeling capabilities, allowing for a more detailed overland flooding analysis utilizing a digital terrain model (DTM). The 2-D modeling allows for mapping of the inundation during design storms and allows for a better insight into how the sewer system operates when surcharged.

4.1 SUBBASIN DELINEATION

The subbasin delineation completed from the 2011 Sewer Study was also used for the SMP. The computer modeling required input data for the sewer system as well as the tributary watershed. For the watershed, the City provided 1' contour interval aerial topographic mapping, which was used to delineate the drainage area tributary to each section of sewer and necessary subbasins. The approximately 7.1 square mile watershed area for the City was subdivided into over 800 subbasins with an average size of less than 5 acres, which provided a high level of detail for the models. **Exhibits 6 & 7** show the delineated subbasins for both the Devon and Sibley models. Additional detail was used in areas where drainage boundaries were required to capture known drainage problems identified by City staff and residents.

4.2 LAND USE

From the previous Stormwater Utility Study, the impervious area database was used to determine the impervious percentage of each subbasin. Using aerial imagery, the land usage was broken down into pervious versus impervious area. The impervious percentage of each subbasin was then calculated based on the total impervious land use per subbasin area, as determined through a GIS exercise. Other watershed parameters, such as each subbasin's characteristic width and slope, were generated through GIS tools that analyze the contour mapping.

4.3 DATA ENTRY

The hydraulic elements of the 2011 InfoSWMM model were also brought over, including sewer diameters, inverts, lengths, etc., which were imported from the information obtained from the sewer data collection described previously. The XP-SWMM model was then enhanced with the additional data to the sewer system obtained since the previous 2011 study. Another major element to the sewer system's function, overland flow routes, were also input to the model. By reviewing the topography, the routing of overland flow was determined and input to the model. If a sewer does not have sufficient capacity to convey the tributary runoff, it will become surcharged and eventually back up out of the manhole rim. When this occurs, water will flow by gravity along overland flow routes that follow the topography. Where overland flow routes converge at depressional areas, ponding areas were entered to the model so that the depth and volume of ponding could be modeled. Finally, other hydraulic elements such as pumps and restrictors were added to the model where they were known to exist.

4.4 EXISTING CONDITION MODELING CALIBRATION

The purpose of the XP-SWMM analysis is to simulate the hydrologic response of various rainfall depths on the City. Specifically, it accounts for the modeling of the existing sewer system, overland flow system, storage areas and the interactions between these components to identify system bottlenecks and evaluate proposed drainage system improvements. Prior to completing these analyses, it is important that the model be calibrated to known storm events. For this study, historical events from April and June 2013 were used. Rainfall data for the April and June 2013 events was obtained from the Illinois State Water Survey Midwestern Regional Climate Center based on gauge data from the Cook County Precipitation Network. The April 2013 storm event produced 5.4 inches over a 24-hour period (approximately a 25-year design storm) and the June 2013 storm event produced 3.3 inches over a 3-hour period (approximately a 25-year design storm).

The precipitation data for the two storm events were entered into the XP-SWMM analysis and simulated for the existing storm sewer network. The simulation results from the XP-SWMM analysis were compared to photos and reported accounts of flooding recorded from the flood survey questionnaires of the April and June 2013 events, noting the extents of flooding. The most extensive photos available were for the April 2013 event. In comparison, the June 2013 event only had several photos and therefore mostly relied on eye-witness accounts based on the flood survey questionnaire responses. The modeled results from these storm events were reviewed with City staff and compared to the residential flooding reports and photos provided from the flood questionnaire surveys from those events. There was an accurate correlation between the model results and actual flooding locations. City staff identified some locations that were not shown by the model, and others where the model predicted flooding that has not been witnessed. Minor calibration of the model was made for these areas by adjusting one or more of several factors that are input to the model by the user. A few examples of locations where the calibration were verified for the April 2013 event are shown in **Figures 11 & 12**. **Figures 11 & 12** show a comparison of the XP-SWMM modeled results, on a 3-D rendering from information obtained via aerial drone footage, to photos showing the extent of flooding during the actual events.

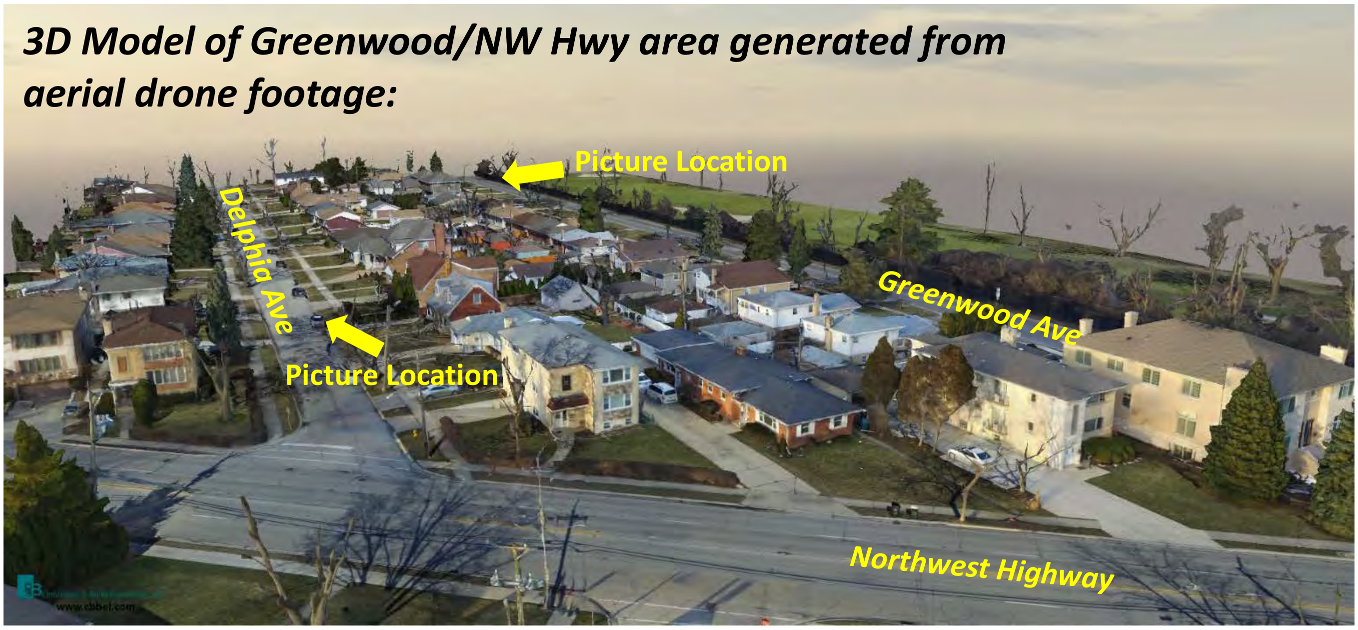

Photo and Model Simulation of 4/18/13 Flood Event at Delphia Avenue

Photo and Model Simulation of 4/18/13 Flood Event at Greenwood Avenue

Figure 11. Greenwood/Northwest Highway Area April 2013 Calibration Comparison

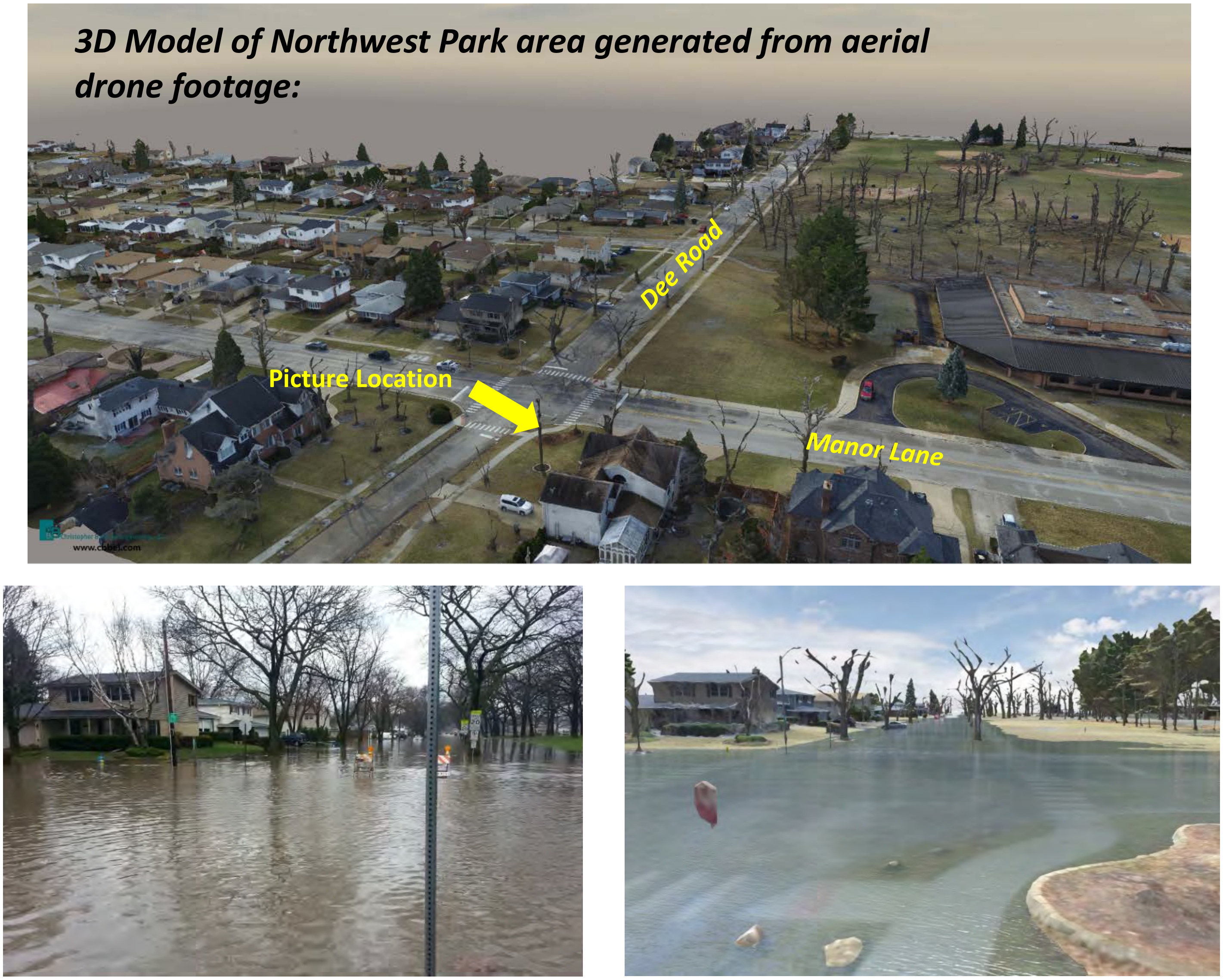

Photo and Model Simulation of 4/18/13 Flood Event at Dee Road & Manor Lane

Figure 12. Northwest Park April 2013 Calibration Comparison

CHAPTER 5 EXISTING LEVEL OF PROTECTION

5.1 CRITICAL DURATION AND DESIGN STORMS

Following the calibration process, a critical duration analysis was completed using the XP-SWMM model. A series of design storms were simulated on the existing City sewer system utilizing rainfall depths published in the Rainfall Frequency Atlas of the Midwest, by the Midwestern Climate Center and the Illinois State Water Survey (Bulletin 71) and Huff rainfall distributions. The critical duration refers to the duration of a storm that produces maximum water surface elevations, flood depths or flow rates. For example, the 100-year critical duration analysis included executing the XP-SWMM model for the 1-hour through 48-hour duration storm events. The storm event producing the highest flood elevation is the critical duration storm event, and all proposed improvements are then designed for the critical duration storm. The 1-hour duration design storm is the critical duration for the City sewer network. Upon completion of the critical duration analysis, the XP-SWMM model was run for the 1-year through 100-year return interval, 1-hour duration storm events. **Table 2** shows the rainfall depths of the various 1-hour duration storm events considered in the analysis.

Table 2. ISWS Bulletin 70 Rainfall Depths

Storm Event	Storm Duration	Rainfall Depth (in)
1-year	1-hour	1.18
2-year	1-hour	1.43
5-year	1-hour	1.79
10-year	1-hour	2.10
25-year	1-hour	2.59
50-year	1-hour	3.04
100-year	1-hour	3.56

The term "10-year storm" is used to define a rainfall event recurrence interval that statistically has the same 10% chance of occurring in any given year. **Table 3** shows the recurrence and statistical probability of a storm happening in a given year.

Table 3. Design Storm Statistics

Common Name	Probability of Occurrence in any Given Year	Percent Chance of Occurrence in any Given Year
100-Year Storm	1 in 100	1
50-Year Storm	1 in 50	2
25-Year Storm	1 in 25	4
10-Year Storm	1 in 10	10
5-Year Storm	1 in 5	20
2-Year Storm	1 in 2	50

5.2 FLOOD DEPTHS

Model simulations were run to establish which types of storms cause flooding, and therefore what the current level of protection (LOP) is. The LOP will be different whether discussing basement backups or overland flooding. Both were evaluated.

To determine if a sewer backup occurred, it was assumed that properties had a basement floor elevation at 6 feet below the lowest ground elevation of each property, which was determined from a DTM created from the 1-foot aerial topography provided by the City. The assumed basement floor elevation was then compared to the closest manhole invert to determine if it was higher in elevation; if the assumed basement floor elevation was not higher, an elevation of 2 feet above the invert elevation was assumed. The water levels within the structures for multiple design storms were then compared to the assumed basement floor elevation to determine if a property was "at-risk" of a sewer backup. Properties were considered "at-risk" when the simulated WSEL exceeded the assumed basement elevation. A property would have a greater level of protection and not be "at-risk" if they had a flood control system. For the purposes of analysis, properties were assumed to not have flood control systems, to determine the "worst case" scenario for properties being "at-risk" of a sewer backup based on the existing sewer system capacity.

To determine if a structure was at risk of overland flooding, CBBEL utilized the 1-foot aerial topography provided by the City. CBBEL used the topography to determine the lowest street and yard elevations within the study areas. The elevations based on the topography were used in delineating the inundation maps to determine the extent of overland flooding. The flood depths for overland flooding were calculated by taking the WSEL at each modeled structure and subtracting it from the rim elevation and compared to the 1-foot aerial topography. This was done in an XP-SWMM analyses for each critical design storm. This flood depth represents the maximum flood depth or "worst case" scenario within the City.

5.3 MODEL RESULTS

5.3.1 Sewer Backups

To determine the existing level of protection for sewer backups, an analysis was done running the 6-month, 1-, 2-, 5-, and 10-year design storms. A total of 12,942 parcels, consisting of 5,055 and 7,887 parcels for both the Devon and Sibley watersheds respectively, were analyzed based on the assumed basement elevation and closest modeled node water level. **Table 4** shows the number of properties at-risk for a sewer backup in both the Devon and Sibley watersheds.

Table 4. Sewer Backup – Existing Level of Protection

Design Storm	Devon Watershed		Sibley Watershed	
	Properties At-Risk	Percentage At-Risk	Properties At-Risk	Percentage At-Risk
6-month	708	14%	4360	55%
1-year	1365	27%	5427	69%
2-year	2149	43%	6286	80%
5-year	4504	89%	6934	88%
10-year	4808	95%	7267	92%

The model results indicate that under existing conditions a majority of the City sewer system has less than a 1-year level of protection for sewer backups (**Figure 13**). Therefore, the City sewer system can convey runoff from less than 1.2 inches of rain over a 1-hour period before the combined sewer reaches a water level that causes a sewer backup. As a reminder, this conclusion is based upon assumed basement floor elevations and ignores any overhead sewer systems that may exist. A majority of the Devon watershed has approximately a 2-year level of protection compared to the Sibley watershed, which has less than a 6-month level of protection.

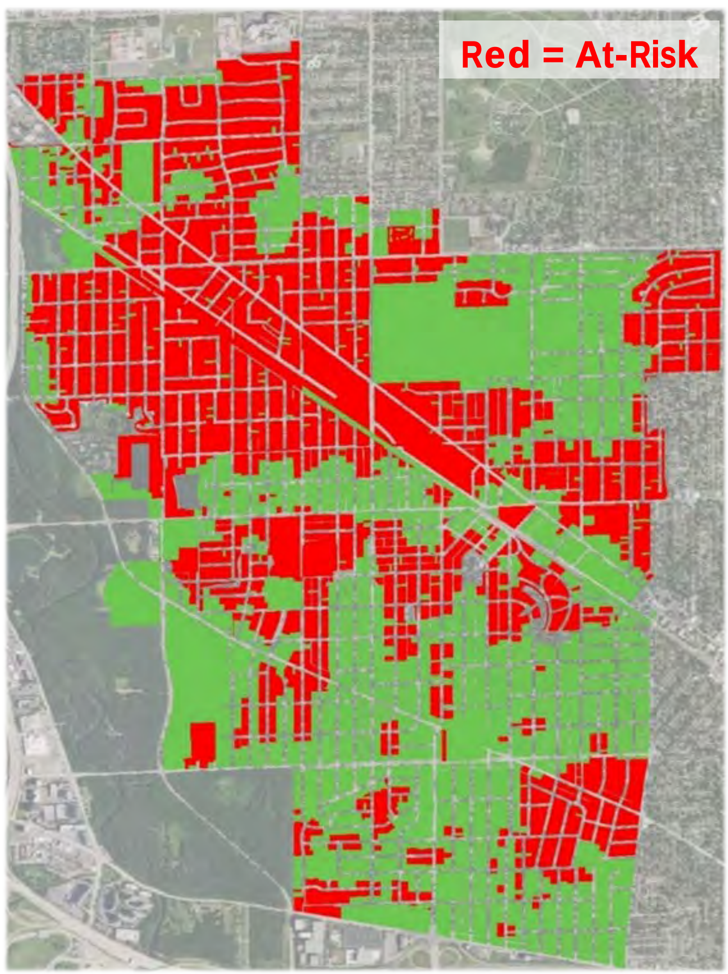

Figure 13. At-Risk Properties of Sewer Backup: Existing Conditions 1-Year Storm Event

The results shown in **Table 4** and **Figure 13** do not account for properties that have installed flood control systems. There are approximately 11,600 single family homes located within the City. It is estimated that the City may have approximately 3,500 single family homes with flood control systems (approximately 30% of homes). This estimate was based upon recorded permits and estimated number of homes built since overhead sewers were required in the building code. **Table 4a** summarizes the at-risk properties when incorporating the 30% assumption for flood control for residential properties. Note that Tables 4 and 4a are based upon the total number of properties, and the 30% assumption applies to residential properties, so the two table are not simply different by 30%. The locations of the homes with flood control is not known or mapped, but they are assumed to distributed proportionally between the two watersheds. Tables 4 and 4a both have inherent assumptions, and both have been included to provide the best information available.

Table 4a. Sewer Backup – Existing Level of Protection
(Assuming 30% of Residential Properties Have Flood Control Systems)

Design Storm	Devon Watershed		Sibley Watershed	
	Properties At-Risk	Percentage At-Risk	Properties At-Risk	Percentage At-Risk
6-month	--	--	2326	30%
1-year	--	--	3393	43%
2-year	717	14%	4252	54%
5-year	3072	61%	4900	62%
10-year	3376	67%	5233	66%

5.3.2 Overland Flooding

To determine the extent of existing overland flooding issues throughout the City, the 100-year critical design storm event was simulated in XP-SWMM. As mentioned previously, XP-SWMM has 2-D modeling capabilities, allowing for a more detailed overland flooding analysis utilizing a DTM. A DTM based on the 1-foot aerial topography was incorporated into the model to allow for mapping of the inundation areas during the 100-year critical design storm. A raster was created from the XP-SWMM modeling output, which showed the areas of inundation throughout the City and allowed for a better insight into how the sewer system operates when it surcharges and causes overland flooding. **Figure 14** shows the extents of overland flooding throughout the City for the 100-year critical storm event.

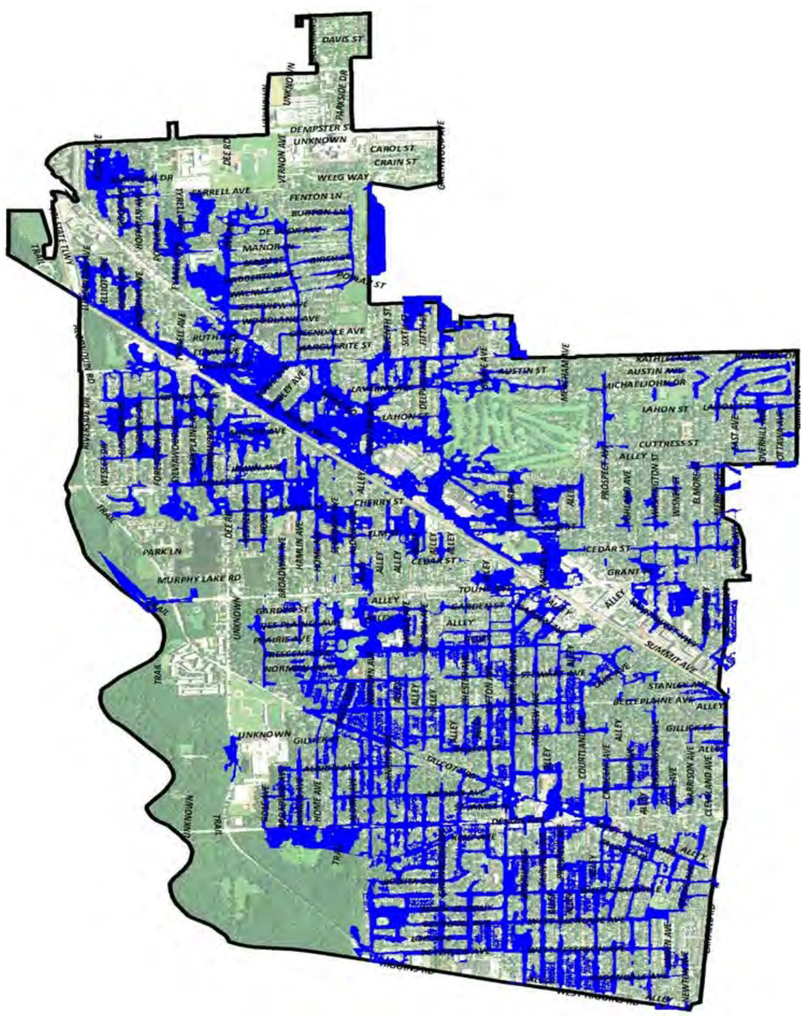

Figure 14. 100-Year 1-Hour Existing Conditions Inundation Map

To further understand the areas affected with overland flooding throughout the City, the ponding area threshold was refined to only show areas of inundation greater than 6 inches and then 1 foot as seen in **Figures 15 & 16**. The locations of reported overland flooding from the current flood survey questionnaires and past accounts recorded by the City from 2008 were then plotted with the inundation greater than 1 foot map as seen in **Figure 17**. There were several areas throughout the City with notable overland flooding. These areas corresponded to historically known locations such as Northwest Park, west of the Park Ridge Country Club, Marvin Parkway, among several others. Overall, the inundation maps show that the existing sewer system is not adequately able to fully convey flows as there is surcharging throughout the City. Note that these figures account for the depth above the existing ground elevations. They show locations where the simulated water elevation is more than 6" or 12" deep, respectively. The varying depth of water over the ground surface is better shown on Exhibit 8.

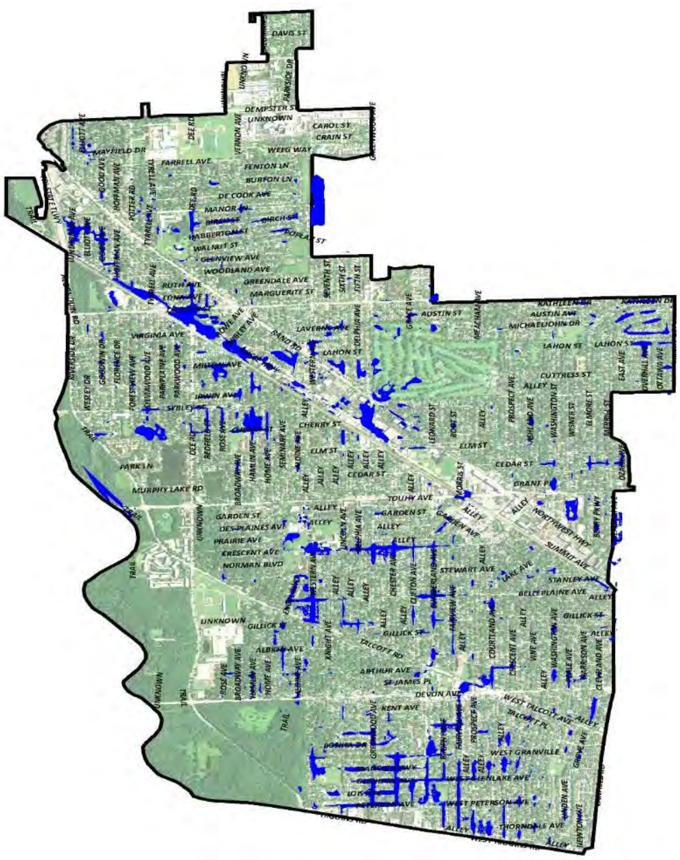

Figure 15. 100-Year Ponding Depth > 6"

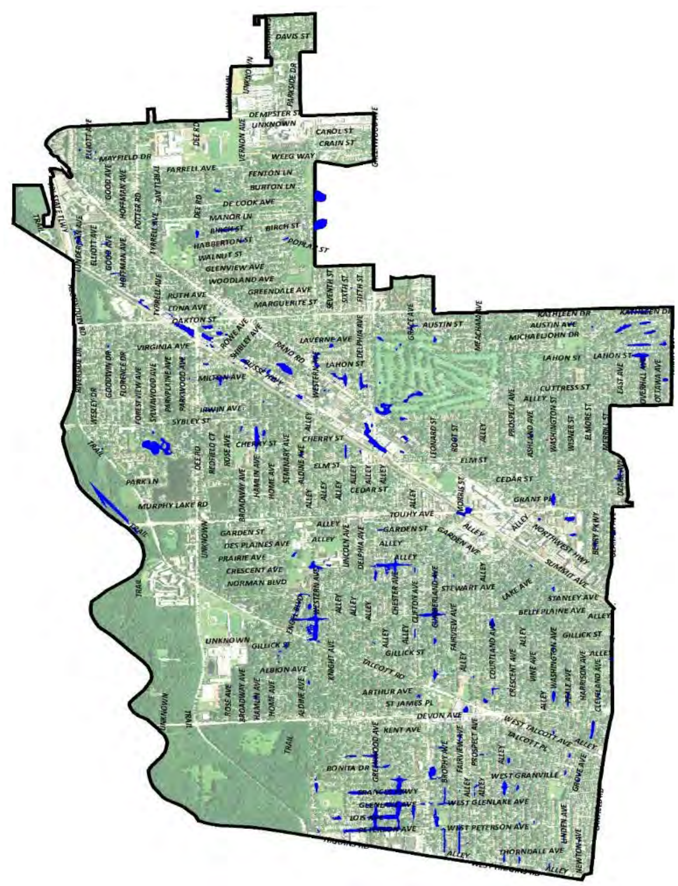

Figure 16. 100-Year Ponding Depth > 12"

The inundation map shown in **Figure 16** was overlaid with flood survey questionnaires that reported overland flooding. This was done to further refine validity of the modeling results, as well as a means to identify areas prone to flood damage since ponding depth does not directly correspond to flood damages. **Figure 17** shows the reported overland flooding locations.

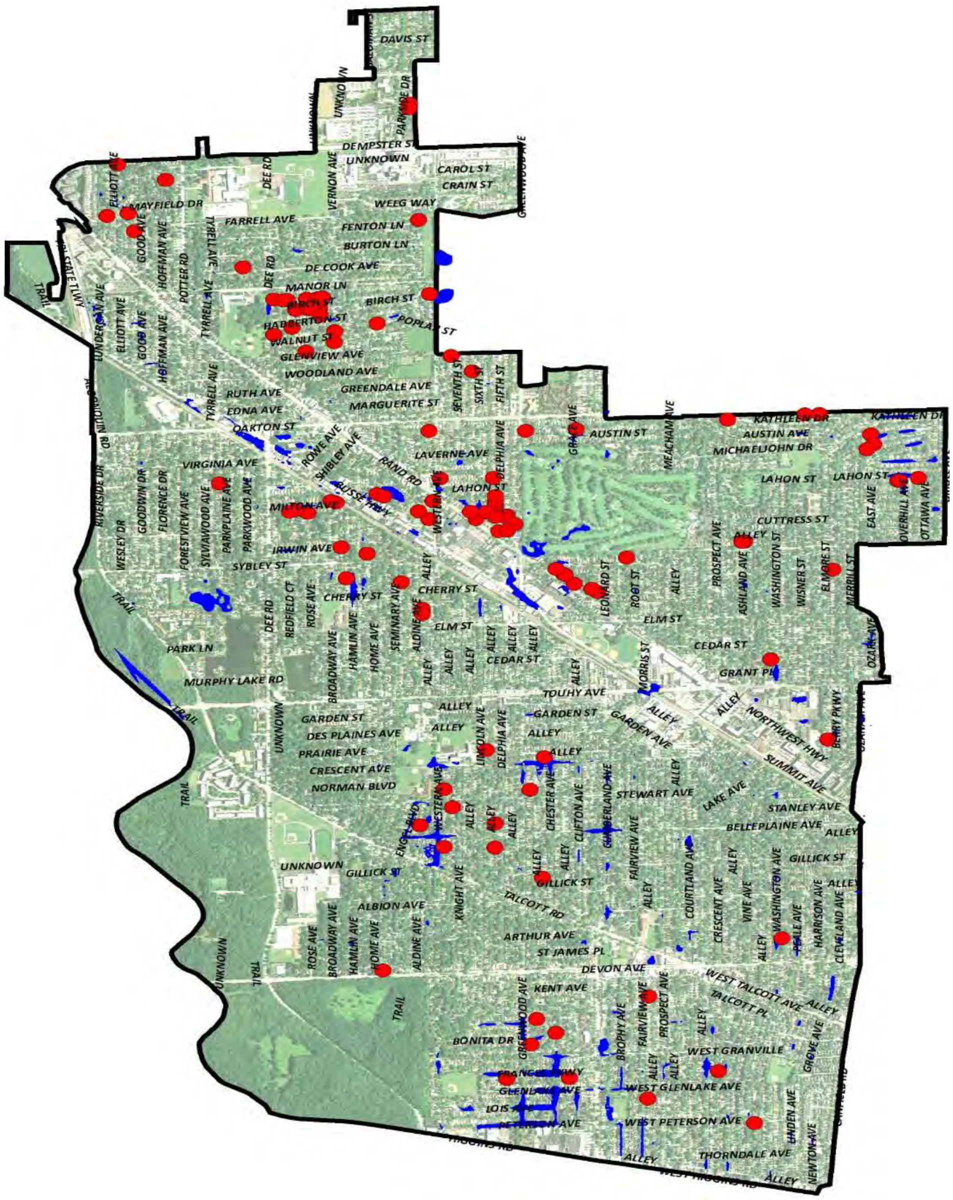

Figure 17. 100-Year Ponding Depth > 12" With Flood Survey Questionnaires

CHAPTER 6 PROPOSED LEVEL OF PROTECTION

To assess the improvements needed to raise the LOP, it was necessary to separate the discussion into the two types of flooding: basement backups and overland flooding. Due to the nature of the combined sewer system, basement flooding will occur before overland flooding, and therefore it is not reasonable to expect the same LOP for both types of flooding. Therefore, an analysis of both types of flooding was completed.

6.1 BASEMENT BACKUP LOP ANALYSIS

To determine the improvements needed to raise the basement flooding LOP to a higher standardized and citywide LOP, a modeling analysis was completed. Concept project areas were created to estimate the level of protection costs for several areas of the City, and establish an average cost that could be extrapolated it for the entire City. The concept project areas are **not** proposed projects. Concept project areas used traditional relief sewers and storage vaults to use as a template to estimate citywide costs for improving flooding from sewer backups. There were 7 areas comprising roughly 20% of the combined sewer area (3,400 acres) located between both the Devon and Sibley watersheds (Figure 18).

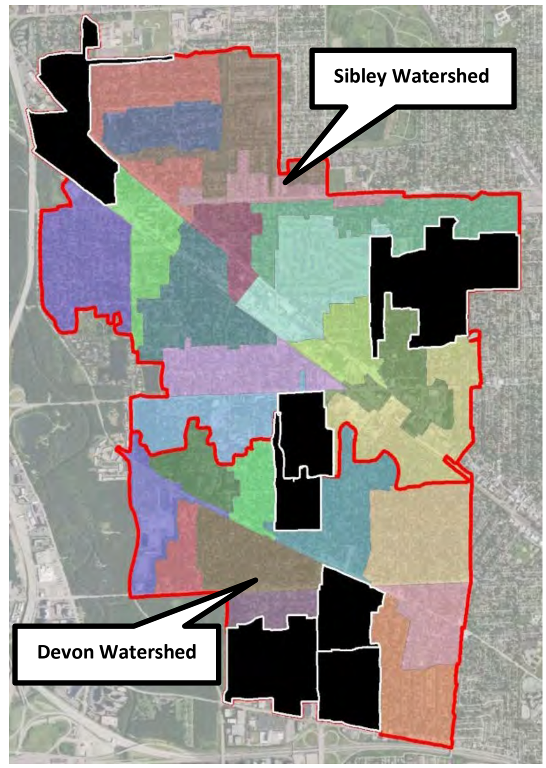

Figure 18. Sewer Backup Concept Project

The costs for the 7 concept areas were averaged based on the cost to achieve a higher level of protection. The 2-, 5-, and 10-year events were analyzed. Due to physical limitations on sewer sizing, backup protection higher than a 10-year level is unlikely to be achieved through the public sewer system. Higher levels of protection would require flood control systems for individual properties. Based on the 7 concept areas, costs were averaged for achieving a 2-, 5-, and 10-year level of protection as follows:

- 2-Year Level of Protection = $32,800/acre
- 5-Year Level of Protection = $51,000/acre
- 10-Year Level of Protection = $62,500/acre

These costs were then applied to the entire City area to estimate the overall cost to achieve a desired level of protection as seen in Table 5 below.

Table 5. Estimated Cost to Provide Citywide Sewer Backup Protection

Level of Protection	Estimated Cost (2017 Dollars)	Cost per Single Family Parcel*
2-yr (1.4" in 1-hour)	$71 Million	$6,100
5-year (1.8" in 1-hour)	$150 Million	$13,000
10-year (2.1" in 1-hour)	$194 Million	$16,700

**Approximately 11,600 single family properties in the City*

As shown in Table 4, the costs to provide a standardized LOP for basement backups are extreme. To provide these higher LOP's, essentially a new sewer system is needed. Aside from the costs, the disruption to City for construction of the improvements would go on for years.

Basement backups can be addressed not only through public improvements, but by private flood control improvements as well. The types of systems, and corresponding costs, can vary widely but generally range between $6,000 and $12,000. Table 5 shows that private improvements are a more cost effective approach to preventing basement backups, and they have the benefit of of providing a much higher LOP than the public improvements can reasonably provide. It was also noted that there is a natural rate to conversion of the housing stock to modern overhead sewer plumbing systems. It was estimated based on the number of homes constructed since overhead sewers were required and recent rates of home teardowns that most single family properties in the City would have overhead sewer within 40 years.

Based upon all these factors, it was decided by the City Council that the Stormwater Master Plan should not focus on basement backup issues and should instead focus on overland flooding problems.

6.2 OVERLAND FLOODING ANALYSIS

Proposed project areas were chosen based on the convergence of the areas that had shown at least 1 foot of ponding in addition to reported accounts of overland flooding from the flood questionnaires as previously mentioned in the last chapter (**Figure 17**). There are thirteen (13) proposed projects for inclusion in the SMP, which are discussed in further detail in the following chapter. Projects were developed and analyzed to provide the 25-, 50-, and 100-year level of protection for overland flooding. Conveyance and storage projects were the two primary types of projects used to achieve these levels of protection. All conveyance projects would require an outfall. The exisiting combined system does not have adequate capacity for higher levels of protection as it is undersized. In terms of new river outfalls, there is limited opportunity given the proximity to the river and available space within the right-of-way (ROW) or easements. A new outfall to the river would also require a sewer separation project, however there would be physical constraints on the outfall size that could limit the level of protection provided. Storage projects would require open space to utilize. An issue that can arise from storage projects is the available areas with open space are not all owned by the City. Therefore cooperation with the private landowners would be required to obtain easements and permission to construct storage located within non-City owned property.

In general most of the capital improvement projects discussed in the following chapter are storage based. As shown in **Table 6**, the cost to achieve the 25 to 100-year level of protection ranges from $83 Million to $106 Million, respectively. Based on discussions with the City, it was decided that a 100-year level of protection should be sought after.

Table 6. Estimated Cost to Provide Overland Flood Protection

Level of Protection	Estimated Cost (2017 Dollars)
25-yr (2.6" in 1-hour)	$83 Million
50-year (3.0" in 1-hour)	$94 Million
100-year (3.6" in 1-hour)	$106 Million

**Level of protection would be for the project area locations.*

CHAPTER 7 STORMWATER CAPITAL IMPROVEMENT PLAN

Part of the scope of this SMP was to identify areas of flooding based on discussions with the City, flood survey questionnaire responses, and existing XP-SWMM model results. Potential improvements that could be made to the system to increase performance and reduce the frequency or severity of flooding were designed to address known flooding areas. Improvements to increase the level of protection for both sewer backup and overland flooding issues were analyzed, but ultimately after discussions with the City an emphasis on only overland flooding projects was pursued. The proposed drainage improvements needed to achieve a higher level of protection require a long-term Capital Improvement Plan. Each of the proposed projects in the plan are described in this section.

Please note that all costs in this report are relative to September 2017. If projects are completed a year, 5 years or 10 years from now, the costs will likely be significantly more than the estimated cost in September 2017. However, the stormwater utility funding analysis did account for an escalation of costs over time. Conceptual cost estimates are located within Appendix 1.

7.1 PROPOSED OVERLAND FLOODING PROJECTS

The proposed long-term capital improvements include significant improvements to the drainage system consisting of larger relief sewers, sewer separation, and designated flood storage areas for various projects located throughout the City. Conveyance projects require an outfall, as the existing combined sewer system does not have adequate capacity for higher level of protections. Storage projects require open space, which are not necessarily City-controlled and therefore require landowner cooperation. To achieve the 100-year level of protection for several areas that experience extensive overland flooding, approximately 117 acre-feet of flood storage is required throughout the City. The proposed areas would need to be combined with upsized sewers to have the required conveyance to provide a 100-year level of protection.

As previously mentioned in Chapter 5.3.2 the existing conditions 100-year 1-hour design storm inundation map, showing ponding greater than 12-inches, was overlaid with flood survey questionnaires that reported overland flooding (**Figure 17**). Project areas were selected that corresponded with locations that showed dense areas of survey responses and inundated areas throughout the City as seen in **Figure 19**. The proposed overland flooding project areas, are shown on **Exhibit 9**. All the potential locations for overland flood projects were analyzed for flood reduction benefits.

The following factors apply to all overland flooding projects:

- Upsized lateral sewers are proposed to effectively convey stormwater into the new storage options.
- An effort to maintain existing sewers in place was made.
- Access points to new storage options utilize City owned property, roadways, and existing drainage easements with an effort to avoid working between residential properties.
- Large areas of open space were analyzed.
- Most alternatives are underground storage vaults, due to them being connected to a combined sewer system.

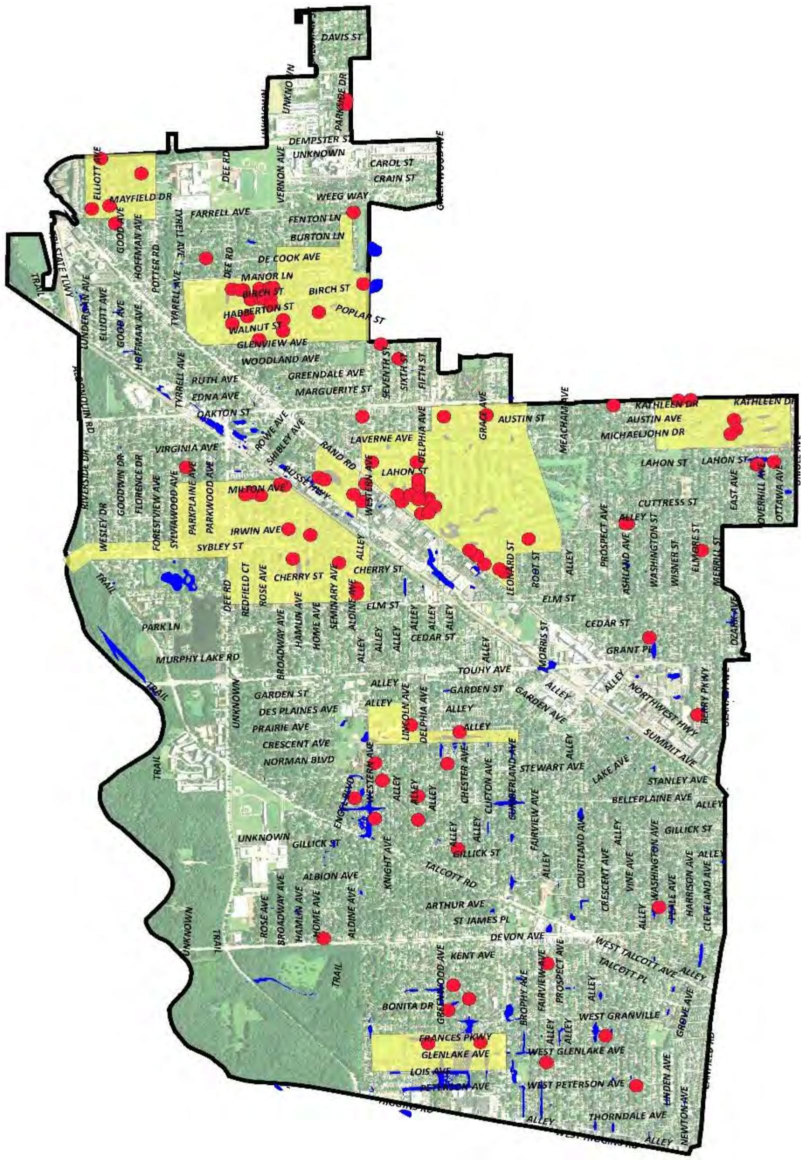

Figure 19. Proposed Overland Flooding Project Locations

7.1.1 Northeast Park

The Northeast Park location is comprised of the area bordered between Kathleen Drive to the north, Lahon Street to the south, Ottawa Avenue to the east and Washington Street to the west. This area had several flood questionnaires submitted with reported accounts of flooding, which are consistent with the existing conditions and April and June 2013 calibrated XP-SWMM model results. In general, the Northeast Park area has multiple properties with reversed slope driveways in addition to prominent roadway sags. Based on the existing conditions XP-SWMM model, the existing sewer system does not have enough conveyance capacity and surcharges, causing the roadway sags to become inundated and flow overland towards the residential structures, impacting structures with reverse sloped driveways.

To alleviate flooding in the Northeast Park area, detention storage and upsizing portions of the sewer on Michael John Drive and Merrill Street is required (**Figure 20**). Underground detention storage is being proposed in the northeastern corner of Northeast Park. To provide a 100-year level of protection, 10 acre-feet of storage is required. The existing sewer on Michael John Drive starting at the intersection with Kathleen Drive will need to be upsized, ranging from 36-inch to 60-inch, and conveyed towards the proposed underground detention vault. Prior to the vault, the existing 48-inch sewer to the south will be restricted with a 12-inch restrictor to force water over a weir and into the storage vault. A portion of the existing sewer on Merrill Street will also need to be upsized to a 24-inch sewer that will tie into the existing 33-inch sewer going northwest towards the proposed upsized pipe on Michael John Drive.

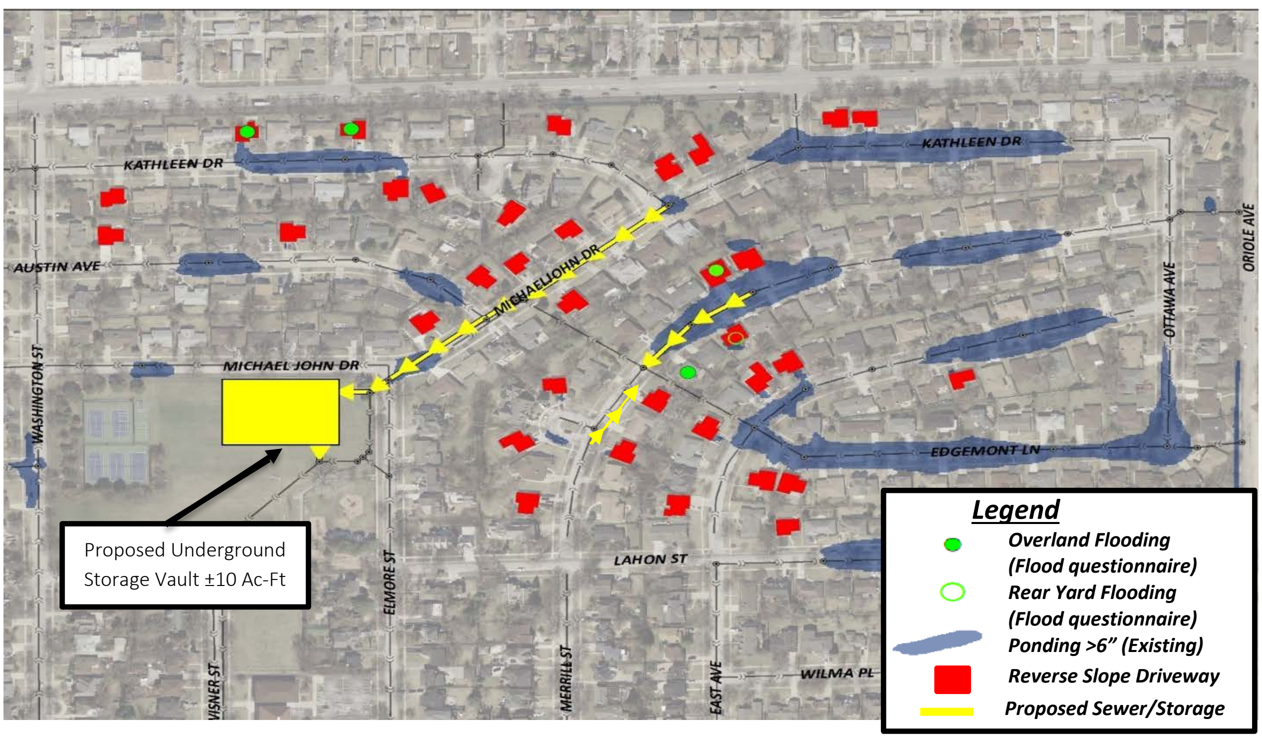

Figure 20. Northeast Park Project Area

The conceptual engineer's estimate of probable cost for the Northeast Park project, including engineering, permitting, and construction costs approximately **$8.8 Million** for a 100-year level of protection. **Exhibit 10** shows the proposed Northeast Park project.

7.1.2 Northwest Park

The Northwest Park overland flooding problem areas exist at De Cook Avenue, Manor Lane, Birch Street and Habberton Avenue between Dee Road and Parkside Drive. These problems areas are all located east of Northwest Park. This area was previously analyzed during the 2011 Citywide Sewer Study. The XP-SWMM results for the existing conditions and April and June 2013 calibration storms confirmed the extent of flooding that has historically occurred in the region. There are no existing sewers in the vicinity with excess capacity that can provide relief to the area.

To achieve a 100-year level of protection, 34 acre-feet of excavated detention storage is being proposed in the southeastern portion of Northwest Park. A relief sewer network is required to be able to allow for the required conveyance of runoff into the proposed detention basin for the Northwest Park area. The basin will outlet to the existing sewer at Northwest Highway. The relief sewer network ranges in size from 18- to 84-inches in diameter and collects conveyance from Parkside Drive, Walnut Street, Habberton Avenue, Birch Street, Hamlin Avenue, Manor Lane, De Cook Avenue, and Dee Road (**Figure 21**).

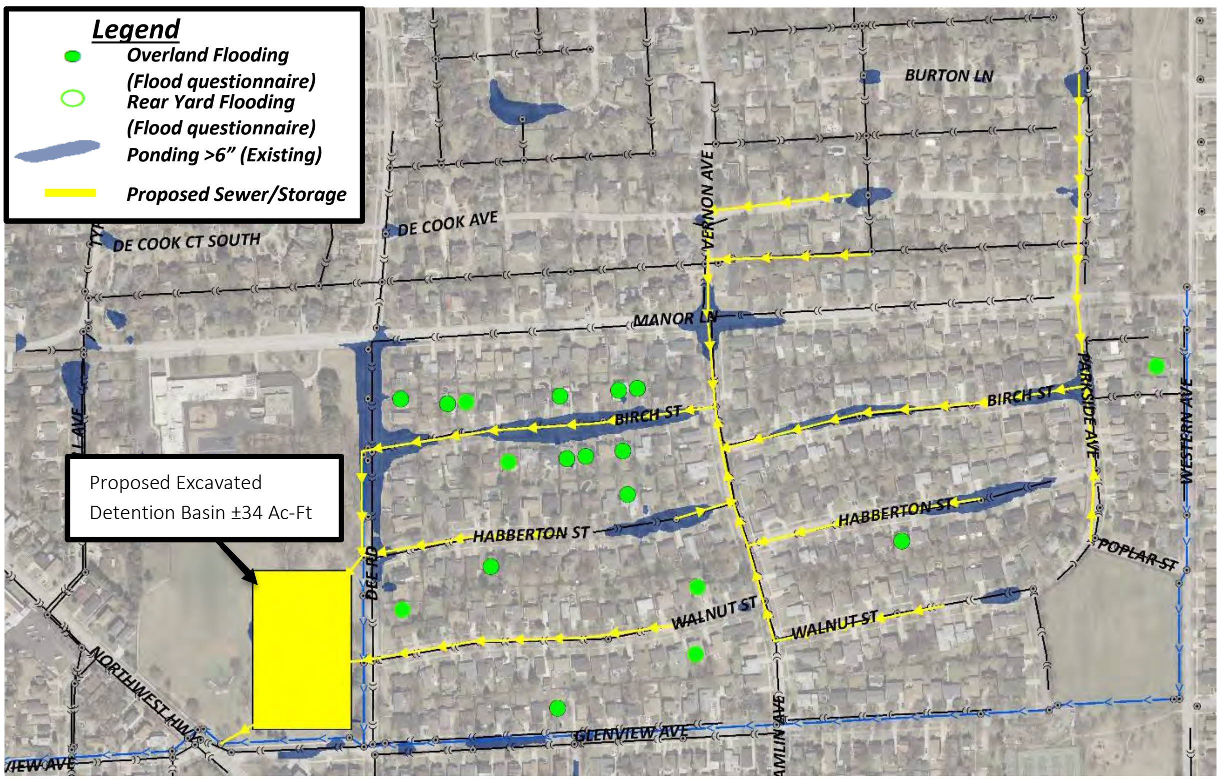

Figure 21. Northwest Park Project Area

The conceptual engineer's estimate of probable cost for the Northwest Park project, including engineering, permitting, and construction costs is approximately **$15.7 Million** for a 100-year level of protection. **Exhibit 11** shows the proposed Northwest Park project, including the proposed relief sewer configuration and sizes.

7.1.3 Crescent Avenue

The Crescent Avenue project location entails the area of known overland flooding along Crescent Avenue between Cumberland Avenue to the east and Lincoln Avenue to the west. The Crescent Avenue area had several flood questionnaire survey responses along with concurring XP-SWMM modeling results. Crescent Avenue is lower in elevation compared to the surrounding streets and therefore receives overland flows from the north, south, and east. The existing sewer network in the vicinity lacks the capacity for both the on and offsite tributary flows. The lack of capacity causes the depressional pockets along Crescent Avenue to become inundated impacting structures as it continues to flow overland west towards Western Avenue.

To alleviate flooding along Crescent Avenue, detention storage is required in addition to upsizing the sewer (**Figure 22**). Underground detention storage is being proposed along the open northern portion of the Lincoln Middle School property. Cooperation with the school will be required for this project to be completed. To provide a 100-year level of protection, approximately 12 acre-feet of underground detention storage is required. A proposed 84-inch upsized relief sewer would begin at the intersection of Crescent Avenue and Cumberland Avenue heading west towards Lincoln Avenue where it would then be routed north to the proposed underground detention vault. The proposed outlet of the underground detention is to the existing sewer on Western Avenue.

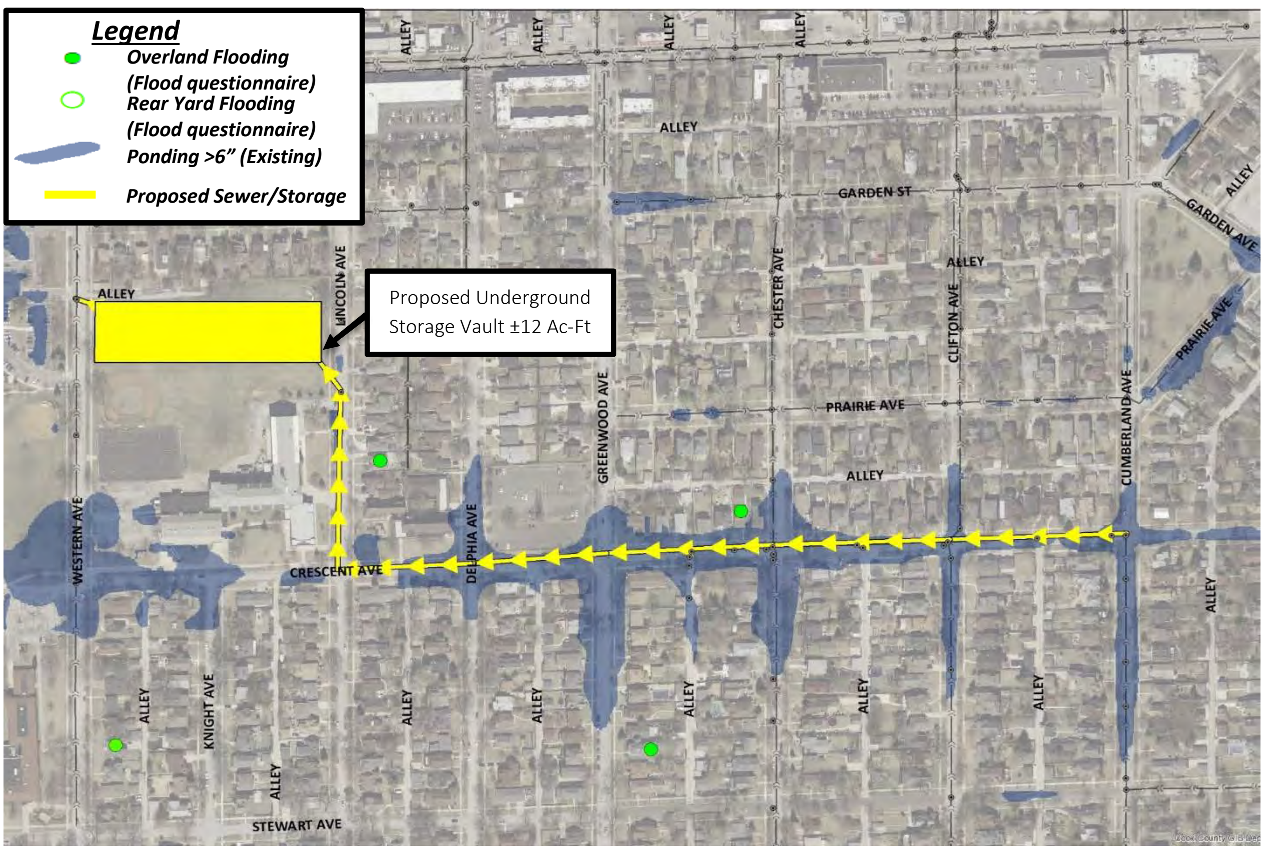

Figure 22. Crescent Avenue Project Area

The conceptual engineer's estimate of probable cost for the Crescent Avenue project, including engineering, permitting, and construction costs approximately **$12.3 Million** for the 100-year level of protection. **Exhibit 12** shows the proposed Crescent Avenue project.

7.1.4 Sibley Corridor

The Sibley Corridor consists of areas surrounding Sibley Avenue and the Park Ridge County Club (PRCC) (**Figure 23**). The area was analyzed in past studies and revisited as part of the SMP. The Sibley Corridor area consists of projects that can be completed to achieve a 100-year level of protection for multiple identified and historically known areas of overland flooding within the City. The projects are divided into two areas, West Sibley and East Sibley, and require certain projects be constructed prior to others to allow for flood reduction benefits to be achieved. The West Sibley projects are contingent upon the enabling Sibley Avenue Storm Sewer project, proposing a sewer separation on Sibley Avenue with a large trunk sewer for other project areas to be conveyed through and outlet to the Des Plaines River. The East Sibley projects are contingent upon cooperation with the PRCC as a large underground detention vault would need to be placed on their property within the golf course to achieve any significant benefit in level of protection. The proposed Sibley Corridor project locations are shown on **Exhibit 13**.

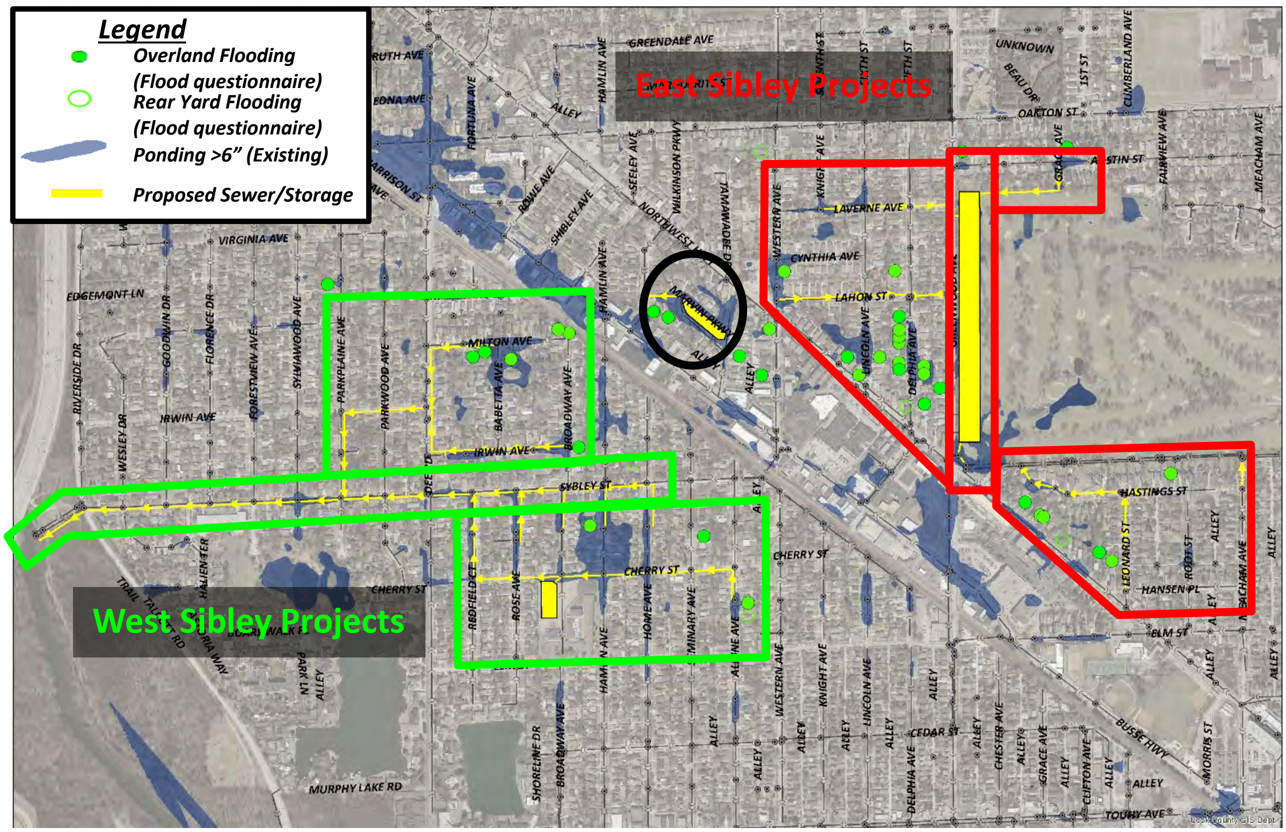

Figure 23. Sibley Corridor Project Areas

7.1.4.1 Sibley Avenue Storm Sewer Separation (West Sibley)

The Sibley Avenue Storm Sewer project is the enabling project required for the West Sibley projects. The project entails adding a separate storm sewer on Sibley Avenue starting at the intersection of Home Avenue that would then discharge into the Des Plaines River (**Figure 24**). The proposed storm sewer ranges from 48- to 84-inches in diameter. The proposed project provides the necessary conveyance and relief to the existing combined sewer to allow for increased level of service in the surrounding project areas.

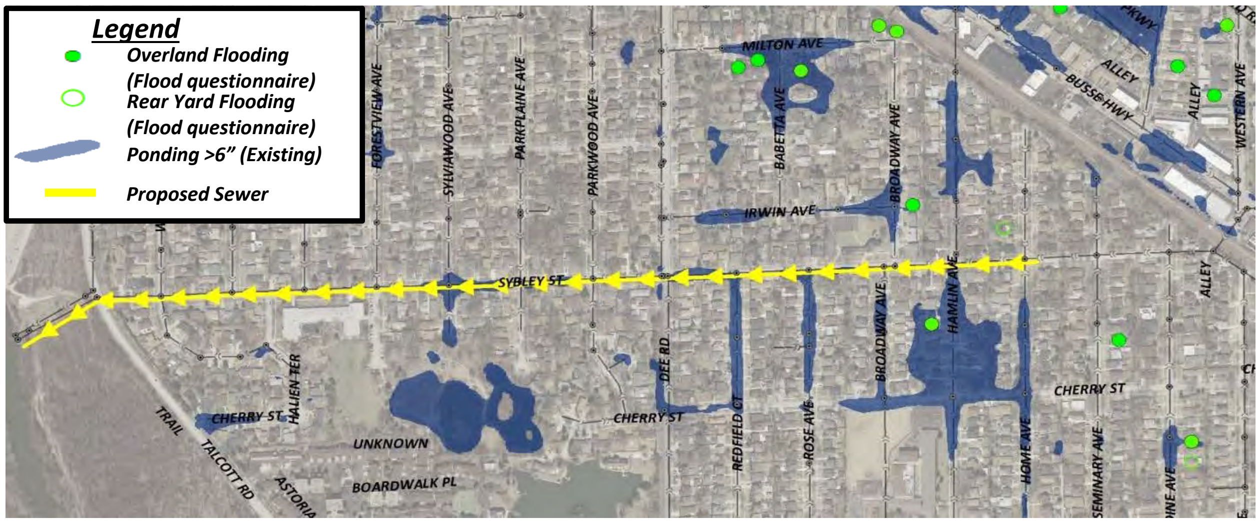

Figure 24. Sibley Avenue Storm Sewer Separation Project Area

The conceptual engineer's estimate of probable cost for the Sibley Avenue Storm Sewer Separation, including engineering, permitting, and construction costs is approximately **$12.0 Million**. **Exhibit 14** shows the Sibley Avenue Storm Sewer conveyance project.

7.1.4.2 Cherry Street (West Sibley)

The Cherry Street project entails the residential area between Sibley Avenue to the north, Cherry Street to the south, Aldine Avenue to the east and Redfield Court to the west. The Cherry Street project area, within the West Sibley projects, had several flood survey questionnaires reporting overland flooding issues, which were confirmed by the existing XP-SWMM model. Several of the side streets including, Aldine Avenue, Home Avenue, Hamlin Avenue, Broadway Avenue, Rose Avenue and Redfield Court showed inundation as the existing sewer network lacks the necessary conveyance capacity.

To alleviate flooding and achieve a 100-year level of protection, a separate storm sewer project is being proposed, in addition to providing underground detention storage. Approximately 4.6 acre-feet of underground detention storage is required for a 100-year level of protection. There is an existing storage vault on the site that could be incorporated into the total required storage. Underground detention storage is being proposed in the open area at George B Carpenter Elementary School. Cooperation with the school district will be required for this project. A proposed storm sewer ranging in size from 24- to 48-inches in diameter is being proposed to alleviate flooding on Aldine Avenue where it will then be routed west on Cherry Street. The proposed storm sewer continues west on Cherry Street towards Redfield Court where it will head north and tie into the proposed Sibley Avenue Storm Sewer project. The underground detention vault is accessed via a weir and outlets back into the proposed storm sewer during non-low flow events. Additional 24-inch separate storm sewers are also being proposed on Rose Avenue, Broadway Avenue, Hamlin Avenue and Home Avenue that will tie into the proposed Sibley Avenue Storm Sewer to alleviate flooding in those areas (**Figure 25**).

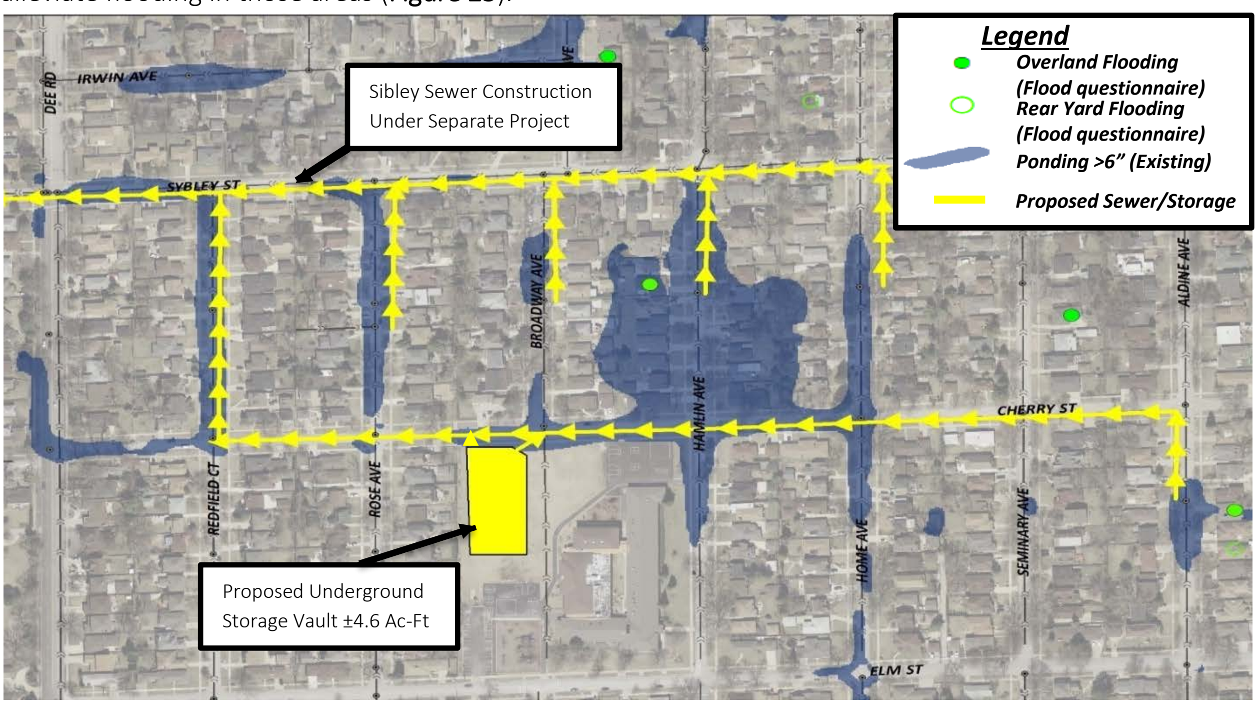

Figure 25. Cherry Street Project Area

The conceptual engineer's estimate of probable cost for the Cherry Street project, including engineering, permitting, and construction costs approximately **$5.7 Million** for a 100-year level of protection. **Exhibit 15** shows the proposed Cherry Street storage and conveyance project.

7.1.4.3 Milton/Babetta/Irwin (West Sibley)

The Milton/Babetta/Irwin West Sibley project is a two-block area enclosed between Dee Road to the west, Broadway Avenue to the east, Milton Avenue to the north, and Irwin Avenue to the south. This area is a previously known problem area for overland flooding, which was confirmed by the several flood survey questionnaire responses and existing XP-SWMM model results. There are three depressional areas, with the most sizeable at the intersection of Milton Avenue and Babetta Avenue. There is a lack of conveyance out of the subdivision causing the depressional pockets to become inundated.

To alleviate flooding within the project area, a proposed separate storm sewer system ranging in size from 36- to 48-inches in diameter will collect runoff from Milton Avenue and Irwin Avenue. The two storm sewers will converge on Dee Road before continuing west on Irwin Avenue to Parkplaine Avenue where it will then head south and connect into the proposed Sibley Avenue Storm Sewer project (**Figure 26**).

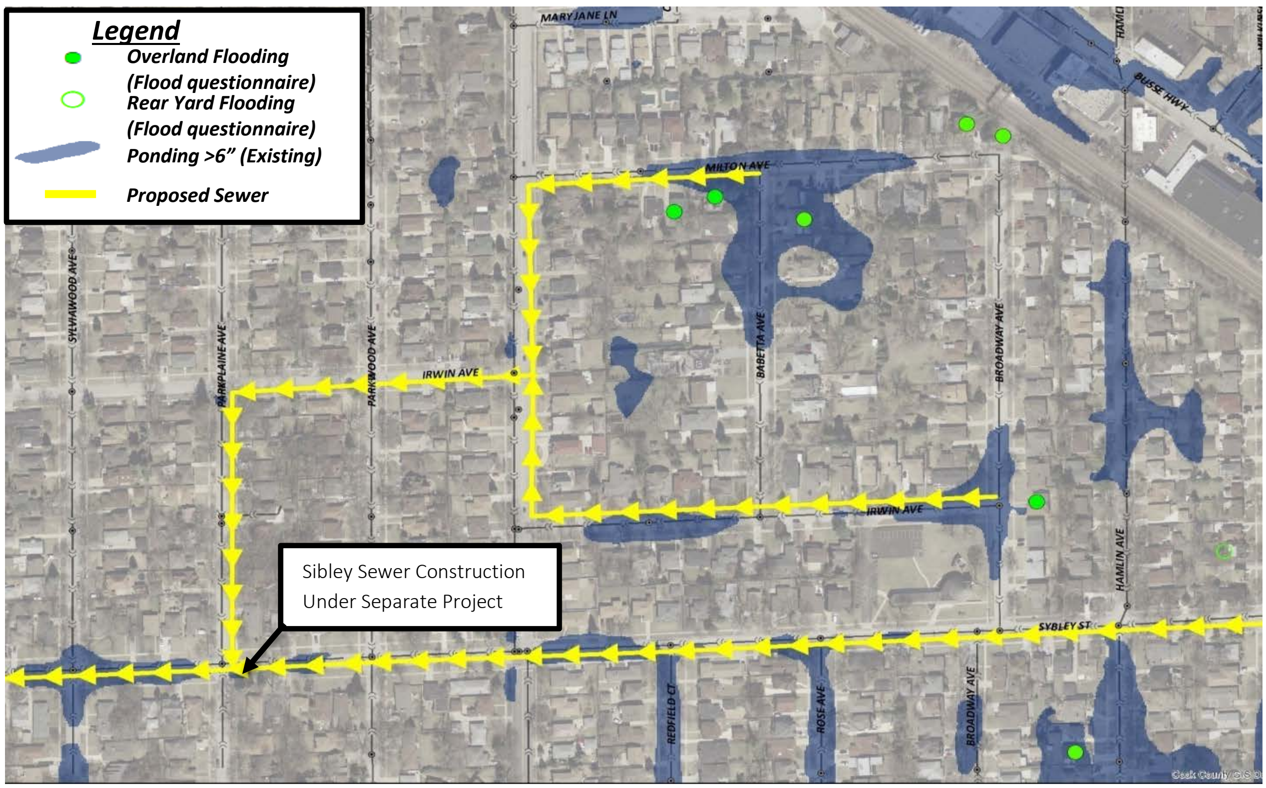

Figure 26. Milton/Babetta/Irwin Project Area

The conceptual engineer's estimate of probable cost for the Milton/Babetta/Irwin project costs approximately **$2.3 Million** for a 100-year level of protection with a maximum allowable 6-inches of ponding, respectively. **Exhibit 16** shows the proposed Milton/Babetta/Irwin conveyance project.

7.1.4.4 Park Ridge County Club Storage (East Sibley)

The Park Ridge Country Club (PRCC) Storage is the enabling project required for the East Sibley projects. The residential area to the west of the PRCC has historically had severe overland flooding and is a known problem area to the City, which was verified by the large amount of flood questionnaires received and existing conditions XP-SWMM model.

The project entails placing a large underground storage vault on the western boundary of the PRCC property on the golf course and ultimately upsizing conveyance towards the facility from the surrounding residential areas with other projects (**Figure 27**). The PRCC Storage project would require cooperation with the PRCC, as a large area of the golf course would be required for the proposed storage. The proposed underground detention required is approximately 48.3 acre-feet for the 100-year level of protection. The underground storage will receive runoff from both the 48- and 60-inch sewers running south on the PRCC property as well as from Greenwood Avenue and outlet onto Lahon Street. The underground storage vault would be accessed via a weir from the conveyance of the southern 48- and 60-inch sewers or continue to the west through the existing system during low flow events. The proposed project provides the necessary storage to allow for an increased level of protection in conjunction with other projects.

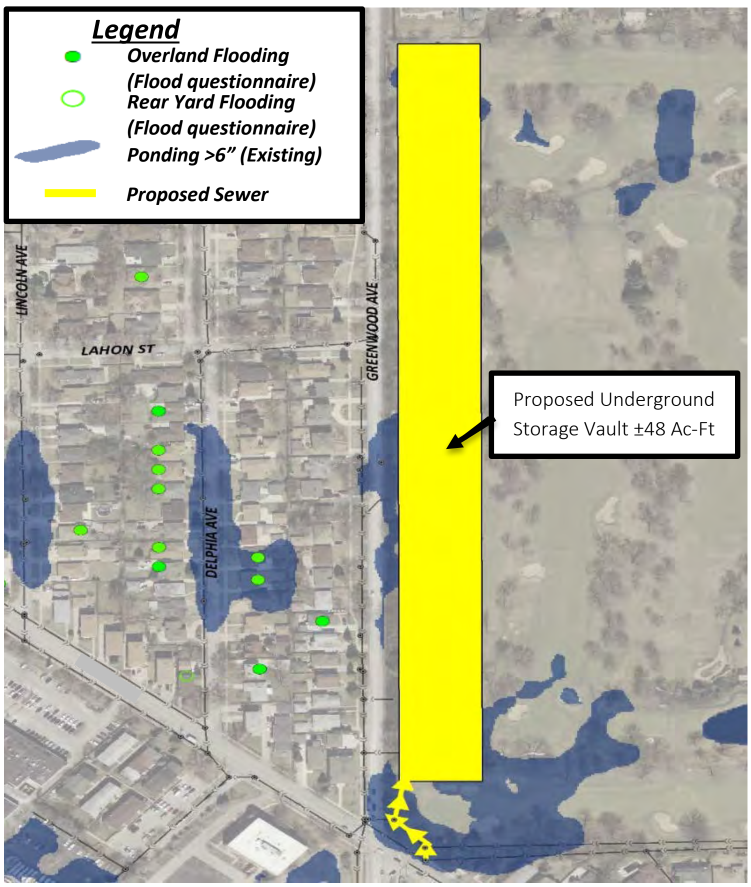

Figure 27. PRCC Storage Project Area

The conceptual engineer's estimate of probable cost for the PRCC Storage, including engineering, permitting, and construction costs approximately **$35.9 Million** for a 100-year level of protection. **Exhibit 17** shows the PRCC Storage project.

7.1.4.5 Delphia/Laverne/Lahon (East Sibley)

The Delphia/Laverne/Lahon project consists of the area to the west of the PRCC bounded by Northwest Highway to the south, Greenwood Avenue to the east, Laverne Avenue to the north, and Western Avenue to the west. Several streets that experience frequent overland flooding are Western Avenue, Laverne Avenue, Lincoln Avenue, Delphia Avenue, and Greenwood Avenue. The XP-SWMM model confirmed the flooding extents reported by the City in addition to the flood survey questionnaires. The current sewer system lacks conveyance capacity and therefore inundates the areas along the streets mentioned above.

To alleviate the existing flooding in these areas west of the PRCC, upsized conveyance of the current sewer system towards the proposed PRCC underground storage vault is being proposed. Two main sewer lines will convey runoff to the proposed PRCC underground storage vault and range in in size from 24- to 60-inches in diameter. The first upsized sewer will take water east, from the intersection of Laverne Avenue and Knight Avenue towards Greenwood Avenue and ultimately the proposed storage. The other proposed upsized sewer will be along Lahon Street heading east from Western Avenue towards Delphia Avenue. The proposed sewer will be extended to collect drainage from the proposed PRCC storage vault to Delphia Avenue as well. The upsized relief sewer along Lahon Street will be restricted before heading south into the existing Delphia Avenue sewer. The restriction will allow for flows to backup into the proposed storage at the country club (**Figure 28**).

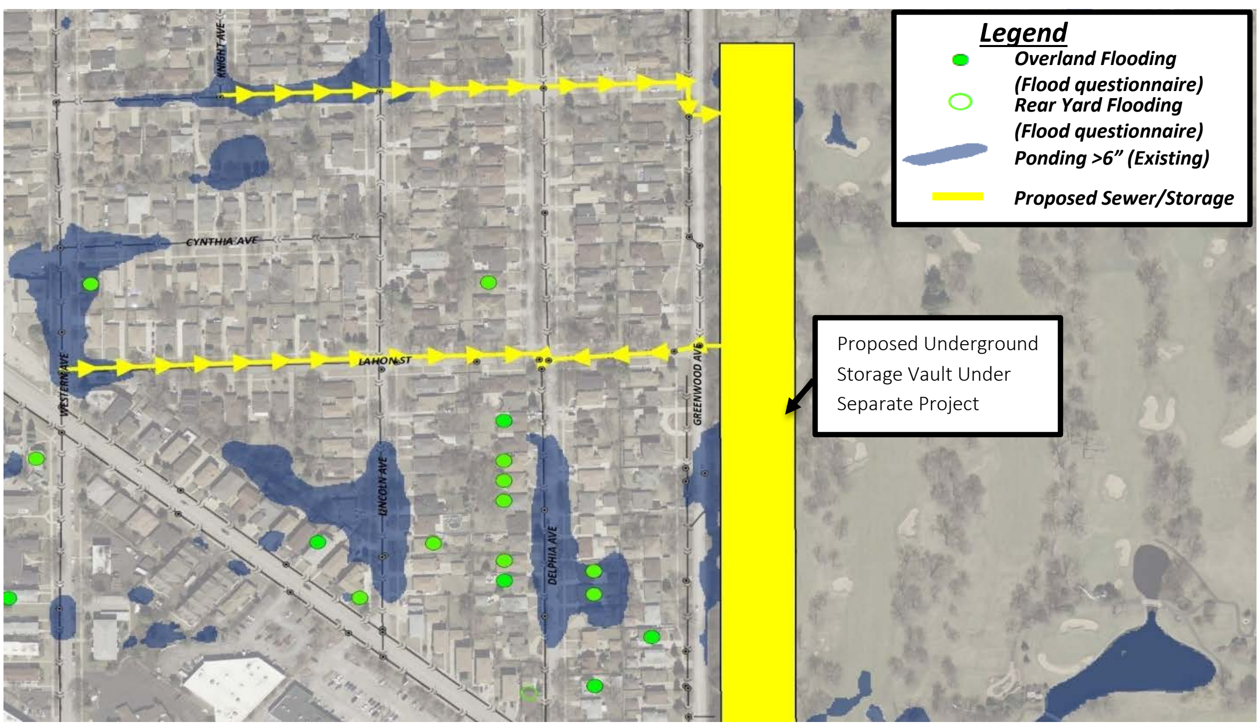

Figure 28. Delphia/Laverne/Lahon Project Area

The conceptual engineer's estimate of probable cost for the Delphia/Laverne/Lahon Project, including engineering, permitting, and construction costs is approximately **$1.9 Million** for a 100-year level of protection. **Exhibit 18** shows the Delphia/Laverne/Lahon conveyance project.

7.1.4.6 Austin Street (East Sibley)

The Austin Street, East Sibley project would pertain to the area north of the PRCC along Austin Street between Grace Avenue and Greenwood Avenue. Flood survey questionnaires were received for the area and the existing XP-SWMM model results correspond to the reported overland flooding. The intersection of Grace Avenue and Austin Street is a depressional area that receives overland flows. The existing sewer system lacks the conveyance capacity to drain the area and causes inundation.

To alleviate the existing flooding along Austin Street, a 72-inch relief sewer is being proposed. The proposed relief sewer will convey runoff from the intersection of Grace Avenue and Austin Street through the northern portion of the country club property towards and into the proposed PRCC storage vault (**Figure 29**).

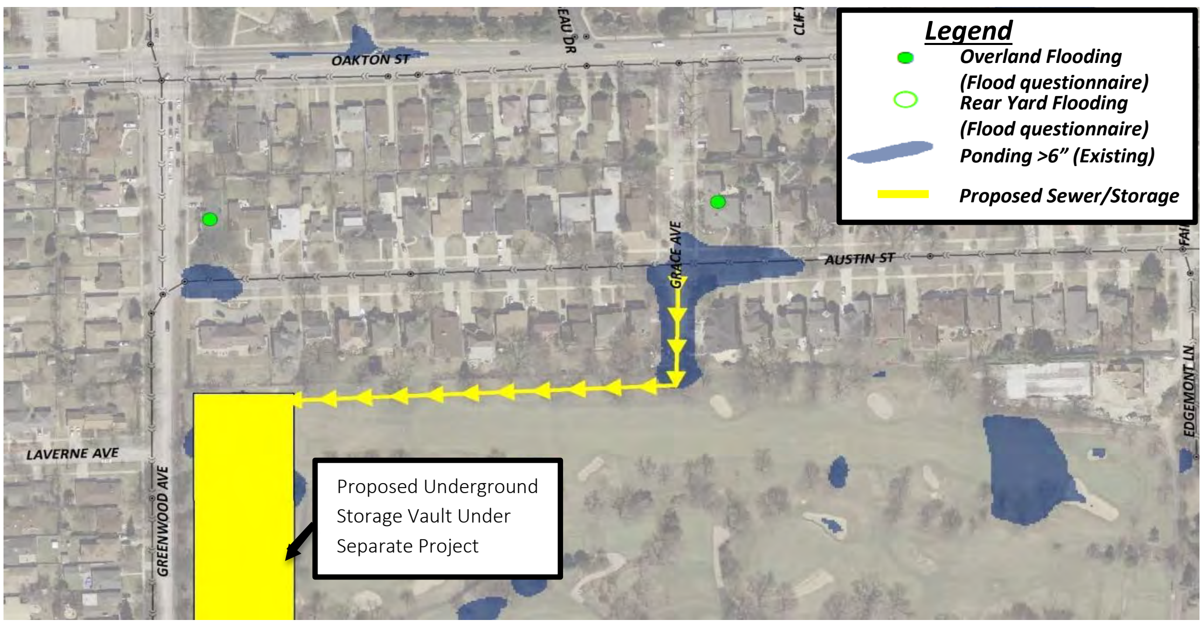

Figure 29. Austin Street Project Area

The conceptual engineer's estimate of probable cost for the Austin Street project, including engineering, permitting, and construction costs is approximately **$0.6 Million** for a 100-year level of protection. **Exhibit 19** shows the Austin Street conveyance project.

7.1.4.7 Hastings Street (East Sibley)

The Hastings Street East Sibley project consists of the triangular residential area to the south of the PRCC, bordered Northwest Highway to the south, Leonard Street to the east and Hastings Street to the north. The existing area had several flood survey questionnaires with reported overland flooding. The existing XP-SWMM model results show that overland flow from Leonard Street and Hastings Street from the east flows west and fills in the depressional areas within the roadways and rear yards causing flooding issues.

To alleviate the overland flooding in the project area, upsized relief sewers ranging from 24- to 36-inches in diameter would be provided. The relief sewer will begin at the intersection of Leonard Street and Hansen Place and routed north towards Hastings Street where it will continue west and ultimately connect to the existing 48-inch combined sewer running south along the PRCC property (**Figure 30**). The 48-inch sewer will convey runoff to proposed PRCC storage vault as part of the PRCC Storage project.

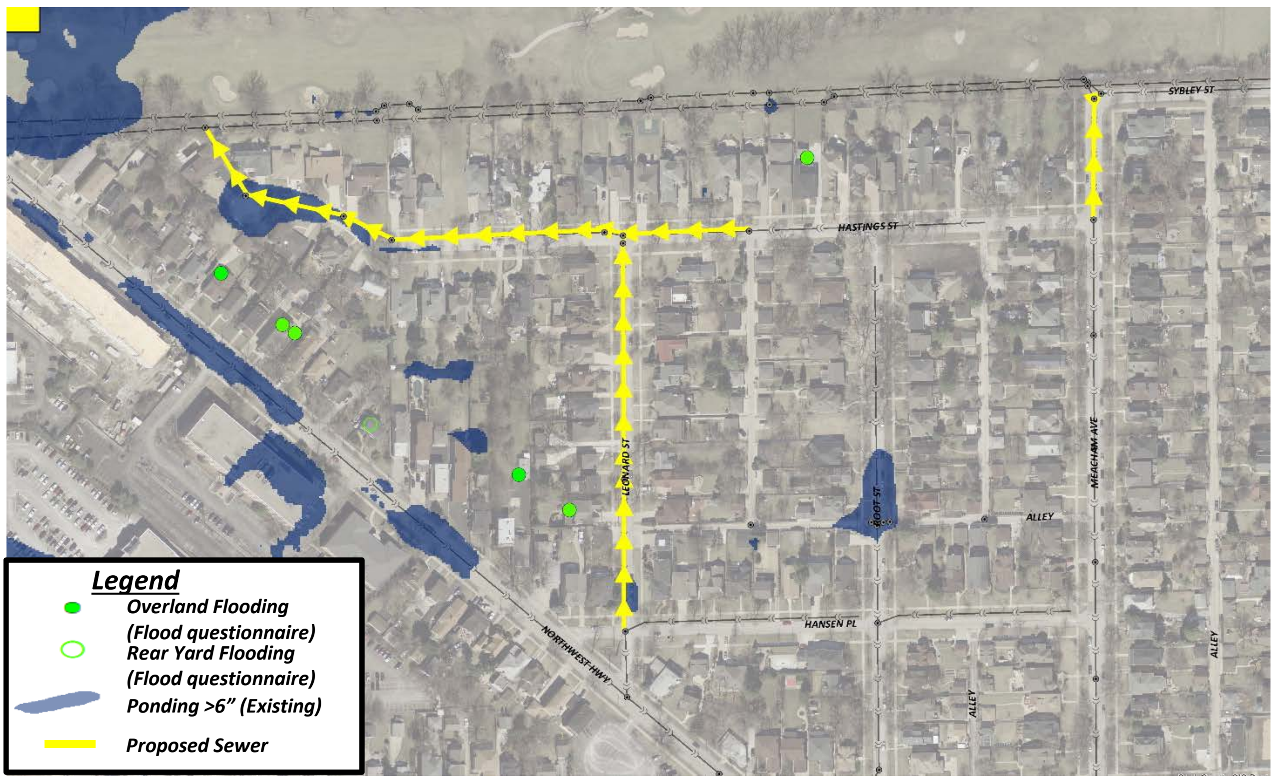

Figure 30. Hastings Street Project Area

The conceptual engineer's estimate of probable cost for the Hastings Street project, including engineering, permitting, and construction costs approximately **$1.5 Million** for a 100-year level of protection. **Exhibit 20** shows the Hastings Street conveyance project.

7.1.5 Marvin Parkway

Marvin Parkway located south of Northwest Highway and between Wilkinson Parkway to the west and Seminary Avenue to the east has historically been a known area of overland flooding. Marvin Parkway is topographically lower in elevation than the surrounding areas and receives overland flows from both Busse Highway and Northwest Highway. The XP-SWMM model results are consistent to the flooding reported by the City and flood survey questionnaires received. The existing sewer system for Marvin Parkway is inadequately sized and causes the depressional area within Marvin Parkway to become inundated.

To alleviate the flooding along Marvin Parkway, underground storage within the existing parkway is being proposed. Given the site limitations with the available area for detention, cover issues, and inverts of the existing sewer system, the maximum amount of storage that can be provided is approximately 3 acre-feet, and therefore only a maximum 50-year level of protection provided. The underground detention vault would be restricted to a 12-inch sewer tying into the existing sewer system on Wilkinson Parkway (**Figure 31**).

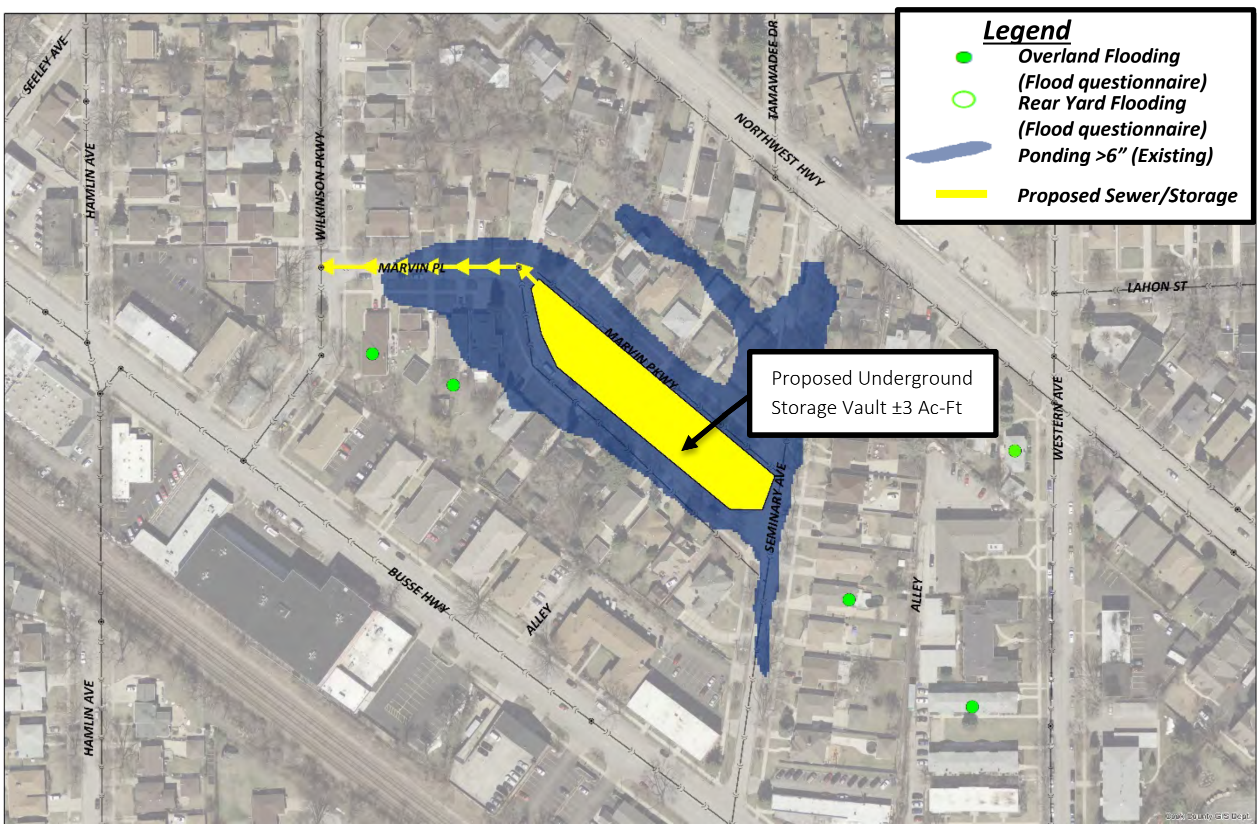

Figure 31. Marvin Parkway Project Area

The conceptual engineer's estimate of probable cost for the Marvin Parkway project, including engineering, permitting, and construction costs **$2.3 Million** for a 50-year level of protection. **Exhibit 21** shows the Marvin Parkway storage project.

7.1.6 Southwest Park

The Southwest Park entails the residential area of Cumberland Avenue to the east, Western Avenue to the west, Peterson Avenue to the south, and Granville Avenue to the north. A project was chosen for this area as the existing XP-SWMM model results were showing overland flooding occurring within the region. According to the XP-SWMM model the existing sewer system is inadequately sized causing the depressional areas within the streets and yards to become inundated.

To alleviate the flooding in the area shown from the existing XP-SWMM model, an underground detention vault is being proposed within Southwest Park. The proposed detention storage required to achieve a 100-year level of protection is 5 acre-feet. The 72-inch relief sewer running south through the park will be routed through the proposed underground vault to help relieve the existing system upstream. Additional relief sewers will be routed to the underground vault from Lincoln Avenue and Lois Court (**Figure 32**).

Figure 32. Southwest Park Project Area

The conceptual engineer's estimate of probable cost for the Southwest Park project, including engineering, permitting, and construction costs approximately **$4.5 Million** for a 100-year level of protection. **Exhibit 22** shows the Southwest Park project.

7.1.7 Mayfield

The Mayfield project area is located in the northwestern portion of the City. It is a residential neighborhood along Mayfield Drive and Elliot Avenue, south of Dempster Street and west of Potter Road. There is approximately ±30 acres tributary to this area, which is one of the few separate sewer drainage areas in the City. Mayfield is located in a depressional "bowl" area. When the subdivision was originally developed, runoff was conveyed through roadside swales and culverts to a pump station located in an easement area behind the homes on the west side of Elliott Drive. The pump station drained the area through ditches to Farmer's-Prairie Creek, just before its confluence with the Des Plaines River. The existing pump station capacity is significantly undersized and does not provide adequate conveyance for the whole 30 acre area. Due to limited pump capacity, the stormwater ponds in the low areas in the rear yards, then on Elliott Drive, and eventually inundates many of the homes along Elliott Drive.

To achieve a 100-year level of protection and alleviate flooding in the Mayfield neighborhood, a 36-inch storm sewer is being proposed, with a new 30-cfs pump station that will discharge to a future MWRD sewer on Dempster Street (**Figure 33**). Land will need to be acquired to construct a pump station in a location that is yet to be determined.

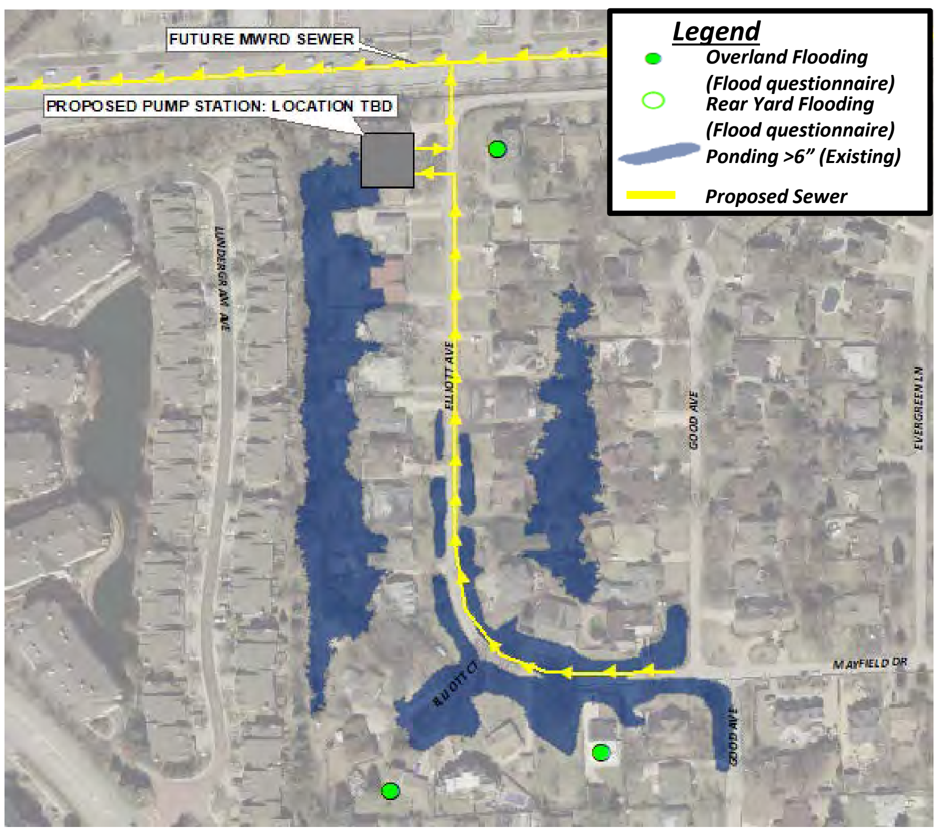

Figure 33. Mayfield Project Area

The conceptual engineer's cost estimate of probable cost for the Mayfield project, including engineering, permitting, and construction costs is approximately **$2.5 Million**, not including land acquisition for the pump station, to achieve a 100-year level of protection. **Exhibit 23** shows the Mayfield project.

7.1.8 Proposed Overland Flooding Projects Summary Table

A summary of the overland flooding projects proposed is provided in **Table 7**. These projects achieve a 100-year level of protection for their respective locations. The conceptual cost estimates for each project is located in **Appendix 1**.

Table 7. Proposed Overland Flooding Projects To Achieve 100-Year Level of Protection

Project	Cost
Northeast Park	$8.8M
Northwest Park	$15.7M
Crescent Avenue	$12.3M
Sibley Avenue Storm Sewer Separation	$12.0M
Cherry Street	$5.7M
Milton/Babetta/Irwin	$2.3M
PRCC Storage	$35.9M
Delphia/Laverne/Lahon	$1.9M
Austin Street	$0.6M
Hastings Street	$1.5M
Marvin Parkway	$2.3M
Southwest Park	$4.5M
Mayfield	$2.5M
TOTAL:	**$106 Million**

7.1.9 Proposed Overland Flooding Projects – Benefits, Costs and Considerations

With the proposed project improvements, a 100-year level of protection is obtained for the project areas above. The conceptual engineer's cost estimate, including engineering, permitting, and construction costs is approximately **$106 Million**. This cost does not include any land acquisition that is required, or maintenance cost for the proposed system.

Other cost and considerations include:

- Long-term project duration
- Significant traffic disruption
- Utility conflicts
- School grounds disruption (Coordination and approval from the school district)
- Park Ridge Country Club disruption (Coordination and approval from the PRCC)
- Agreements with property owners/easements
- Permitting
- Costs associated with increased construction costs in future years

CHAPTER 8 PROJECT PRIORITIZATION

The projects proposed for this Stormwater Master Plan are varied, with significantly different costs, impacts to properties, and flood reduction benefits. A prioritization of the projects is needed to guide the City in financial planning and coordination with affected property owners. There are many factors that can be used to prioritize the projects; we have used a numerical approach based upon estimated reductions in flood damage. However, we recognize that there are legitimate, non-technical factors such as availability of funding or the ability to secure easements that may change the recommended project priority.

8.1 BENEFIT-COST ANALYSIS

Projects were prioritized by ranking them based upon on cost effectiveness. Projects which demonstrated the greatest flood reduction benefits compared to the project costs were ranked highest. Two types of flood reduction benefits were quantified. Since the projects were developed to alleviate overland flooding, an estimate of the anticipated reduction in overland flooding damage was completed. Although projects were not developed to specifically address basement backup issues, the proposed overland flooding projects do have benefits in reducing basement backups. These benefits were also quantified and factored into the project ranking.

8.1.1 Overland Flooding

A traditional Benefit-Cost (BC) analysis that would be used, for example, to apply for some grant funding requires significant data and effort. For each structure that is affected by flooding, information is required for the type of home (one story, two story, basement, etc.), it's assessed property value, the lowest elevation at which water can enter the structure, and the elevation of the first floor. There are hundreds of affected properties in the SMP projects, and this type of analysis is outside the scope of this study. A BC analysis determines whether a project's benefit in terms of reduction in flood damages outweighs the project cost; it is a financial threshold that agencies such as the Federal Emergency Management Agency (FEMA) must ensure a project exceeds if they are to provide grant funding. The City is not tied to such a threshold, and can fund a project without such an analysis.

We have completed a BCA that is similar to the FEMA type, but used solely for the purpose of ranking these projects relative to each other. An in-depth description of the BC methodology used is provided in **Appendix 2**. In short, we used a median City household value and identical structure type for all properties, and applied assumed structure elevations to each property based upon the lowest ground surface elevation. These assumptions simplified data collection and allowed a widespread BC analysis to be completed.

The BC analysis, using the project modeling results, calculates the depth of flooding for each property for various storm events. The theoretical financial damage associated with these flood depths is determined based upon information developed and maintained by the U.S. Army Corps of Engineers. This is done for existing and with-project conditions. Various financial ratios are applied within the BC calculator to express the flood damages in terms of a present-day value. If the project cost is lower than the present-day value of the damage, then the project will have a BC ratio greater than one and is said to be cost effective.

Using this methodology, a BC "ratio" was calculated for each project. As noted previously, this is not a true evaluation of cost effectiveness because of the generalizations used for property values and the assumptions of structure elevations. However, it is a useful and appropriate tool for ranking the projects relative to each other. **Table 8** summarizes the rankings of the projects in terms of overland flooding benefits:

Table 8. Project Ranking (Overland Flooding Benefits Only)

Project	Computed BC Ratio	Rank
Mayfield	5.2	1
West Sibley Corridor	1.7	2
Marvin Parkway	1.0	3
Northwest Park	0.89	4
East Sibley Corridor	0.80	5
Crescent Avenue	0.72	6
Northeast Park	0.68	7
Southwest Park	0.5	8

8.1.2 Basement Backup

The proposed overland flooding projects will also create benefits by reducing the amount of properties at-risk of basement backups. While not the primary intention of the projects, these are significant benefits that should be included in the prioritization analysis. The methodology used was to simply quantify those properties that were shown to be "at-risk" of basement backups for the 10-year event for the existing and with-project conditions. As stated in other sections of this report, properties were considered to be "at-risk" when the modeled water elevation in the sewer system exceeds the assumed basement elevation; basement elevations were assumed to be 6' below the lowest ground elevation on the property. The reduction in at-risk properties due to each project was quantified, and the project cost was divided by this quantity to determine a "cost per parcel". The projects were ranked from the lowest to highest cost per parcel. **Table 9** summarizes the rankings of the projects in terms of basement backup benefits:

Table 9. Project Ranking (Basement Backup Benefits Only)

Project	Computed Cost Per Property Protected from Basement Backup (10-yr Event)	Rank
Northwest Park	$32,914	1
Northeast Park	$34,363	2
Southwest Park	$38,136	3
Marvin Parkway	$92,000	4
West Sibley Corridor	$153,846	5
Crescent Avenue	$267,391	6
East Sibley Corridor	$293,382	7
Mayfield	n/a	8

8.2 PROJECT RANKING

A weighted-average of the overland flooding project rank and basement backup project rank was calculated and served as the overall project score. The rankings were weighted 75% to the overland flooding, since this was the focus of the SMP, and 25% for the basement backup rank. For example, the Mayfield project ranked #1 for overland flooding and #8 for sewer backup . The calculated score is (0.75 x 1) + (0.25 x 8) = 2.8. Other factors such as property acquisition and financing methods could be added to the ranking matrix and may change the prioritization. The project with the lowest combined score ranks as the highest priority. Additional detail on the project ranking calculations is included in **Appendix 2**. **Table 10** below summarizes the recommended project priority list:

Table 10. Recommended Project Prioritization

Project	Overland Rank	Basement Backup Rank	Score	Rank
Mayfield	1	8	2.8	1
West Sibley Corridor	2	5	2.8	2
Marvin Parkway	3	4	3.3	3
Northwest Park	4	1	3.3	4
Northeast Park	6	2	5.0	5
East Sibley Corridor	5	7	5.5	6
Crescent Avenue	7	6	6.8	7
Southwest Park	8	3	6.8	8

For the West Sibley Corridor projects, the phasing of individual projects should be constructed in the following order; Sibley Avenue Storm Sewer first, Milton/Babetta/Irwin second, and Cherry Street last. For the East Sibley Corridor projects, the phasing of individual projects should be constructed in the following order; Park Ridge County Club Storage first, Delphia/Laverne/Lahon second, Austin Street third, and Hastings Street last.

CHAPTER 9 GREEN INFRASTRUCTURE

Over the last 20 years many communities throughout the region have increased implementation of green infrastructure by adding green infrastructure to their toolkit of approaches for the management of stormwater. Green infrastructure techniques include using vegetation and infiltration techniques to reduce stormwater impacts, restoring wetlands to retain runoff, installing permeable pavement to mimic natural hydrology, and using or capturing and re-using stormwater more efficiently on site. By attempting to mimic natural hydrologic functions, such as infiltration and evaporation, these approaches prevent stormwater from flowing into surface waters or sewer systems already under great stress. Green infrastructure is typically used to compliment or assist traditional stormwater management practices and is not meant to replace engineered “grey” or conventional stormwater management practices.

Green infrastructure best management practices (BMPs) are effective for the treatment of runoff from smaller storm events and for the initial volumes of runoff from large storm events. The initial stormwater runoff at the beginning of a rain event will be more polluted than the stormwater runoff later in the event. This is because the initial runoff washes off pavements and “cleanses” the catchment. The stormwater containing this high initial pollutant load is called the “first flush”. To be effective and efficient, consideration to the proper placement of a BMP should be considered such that the design involves the capture of the first flush from frequent, small storm events. Treating the first flush is most effective on small catchments or individual properties, particularly if a high proportion of the catchment is impervious. On an individual property or in a neighborhood, the first flush collection system can form an integral part of the stormwater pollution control system.

The MWRD Watershed Management Ordinance (WMO), which became effective in January 2014, has stormwater detention and volume control (green infrastructure) requirements that apply to developments and redevelopments throughout Cook County. Any developments in the City must meet the WMO requirements. The volume control requirements are intended to capture runoff from first flush storm events or runoff from the directly connected impervious areas of a development from the first inch of rainfall. Volume control practices as stated in the Ordinance shall provide treatment of the volume control storage through practices including infiltration trenches, infiltration basins and other retention practices. The required practices reduce the volume of stormwater being discharged, and also reduce pollutant loadings. The volume control itself greatly reduces loadings, and volumes not retained generally have lower pollutant concentrations because of the green infrastructure measures.

There are no known municipal green stormwater infrastructure elements in the City. A majority of the City is serviced by a combined sewer system, therefore stormwater not infiltrated into the ground or retained on site is ultimately collected in the sewers and sent to an MWRD waste water treatment plant where it is then treated. The implementation of green infrastructure would incrementally reduce the amount of runoff that is sent to the combined sewer systems and help minimize combined sewer overflow (CSO) events. It is required that all new developments or redevelopments adhere to the MWRD WMO requirements via the usage of green infrastructure to provide benefits to the existing sewer system, by retaining the initial rainfall on site.

Green infrastructure practices cannot single-handedly mitigate citywide flooding during extreme storm events. This can be readily demonstrated by comparing the volume of water that ponds in streets and yards during a flood event with the comparatively small volume that can be held in rain barrels, infiltration areas, permeable paving, etc. It is important to understand the magnitude of the flooding problem in the City, the capacity of the existing sewer network and the relation of limitations of green infrastructure. In typical urban flood problem areas, the storage volumes required to reduce the flood depths to an acceptable level are significant. Additionally, construction of green infrastructure techniques like green streets and rain gardens also have a heavy reliance on soil type for infiltration. Soil amendments to achieve proper infiltration rates to meet performance standards can increase construction costs. Roadway jurisdictions and requirements can also limit the use and increase construction cost of green streets. Vegetation used in rain gardens and bio retention areas also requires establishment and maintenance.

However, despite these challenges, green infrastructure BMPs do provide a reduction in stormwater runoff volumes and improve water quality for more frequent storm events. Infiltration BMPs can be extremely useful for eliminating nuisance ponding in residential areas.

Given the magnitude of flooding problems throughout the City, it is our opinion that the bulk of any funding resources should be directed to traditional flood mitigation practices. However, we do recommend that green infrastructure should be an important part of the overall SMP.

To be effective in reducing overall flooding, BMPs must have widespread implementation. For instance, a BMP placed in a street parkway may be able to handle runoff from the street, but not from the dozens of parcels that drain to that street. If those dozens of parcels each had a BMP, then a noticeable reduction in flooding may be achieved. The City's SMP should include strategies for promoting the implementation of green infrastructure on private properties. We recommend two key strategies:

1. *Provide an incentive program within the Stormwater Utility*. The incentive program would reduce the SWU fee paid by a property owner if they install an approved BMP on their property. While the fee reduction would not eliminate a property's SWU fee, it would give homeowners some control over the fee they pay and also introduce and educate more residents to the benefits of having green features on their property. Ultimately, widespread implementation will not occur unless residents see the BMPs as beneficial; the incentive program would help to accelerate the rate of exposure for residents to BMPs.

2. *Incorporate Green Infrastructure to Municipal Projects.* There are routine municipal projects such as street resurfacing/reconstruction, sidewalk projects, alleys, streetscapes, etc. which could be designed to incorporate green infrastructure. We are not recommending pursuing stand-alone flood control projects using green infrastructure. Rather, incorporating green elements to otherwise necessary projects can be a cost effective strategy to reduce runoff volume, manage stormwater, and create high visibility features that will continue the education of the public on the benefits of green infrastructure.

It is recommended that green infrastructure aspects be incorporated into future projects when feasible. Examples of green infrastructure include the installation of rain gardens or bioswales to take runoff from streets or parking lots, or to convert alleyways or parking areas to permeable pavements. Swales would consist of landscaping features adapted to promote increased infiltration and provide on-site removal of pollutants from stormwater runoff using native plants or conventional turf grasses. Permeable pavement consists of a permeable material (porous asphalt, permeable concrete, permeable block pavers), which allows distributed infiltration of rainfall runoff into the underlying soil. CBBEL has identified numerous areas where green infrastructure could be implemented throughout the City. Recommendations of types and potential locations are as follows:

- Green Roads:
  - Future City projects as warranted (**Figures 34 and 35**)
- Green Alleyways (**Figure 36**)
  - Near Hastings Street
  - Near Crescent Avenue
  - Future City projects as warranted
- Island rain gardens (based on available space)
  - Courtland Avenue
  - Lois Court
  - Park Ridge Boulevard
  - S Knight Avenue
  - S Aldine Avenue
  - Elliott Court
  - Good Avenue
  - Tomawadee Drive
  - Wilkinson Parkway
  - Delphia Avenue
  - Other locations as appropriate
- Rain barrels and downspout disconnection
  - Program for downspout disconnection and rain barrel assistance (**Figures 37 and 38**)
  - Limited to private property
- Permeable pavement
  - Pilot program in selected areas around businesses

Figure 39 shows a map with several of the proposed green infrastructure project locations.

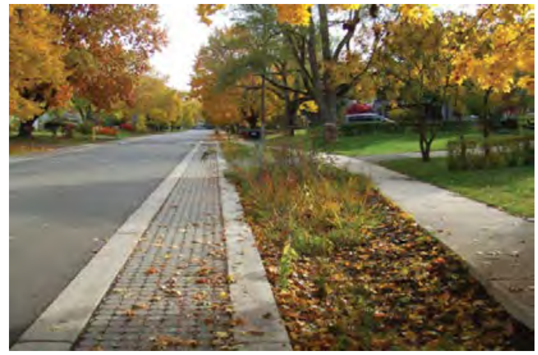

Figure 34. Green Road

Figure 35. Green Road

Figure 36. Green Alleyway

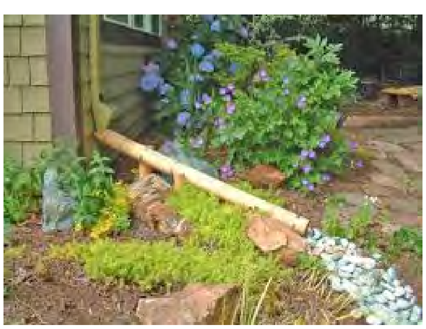

Figure 37. Downspout

Figure 38. Rain Barrel

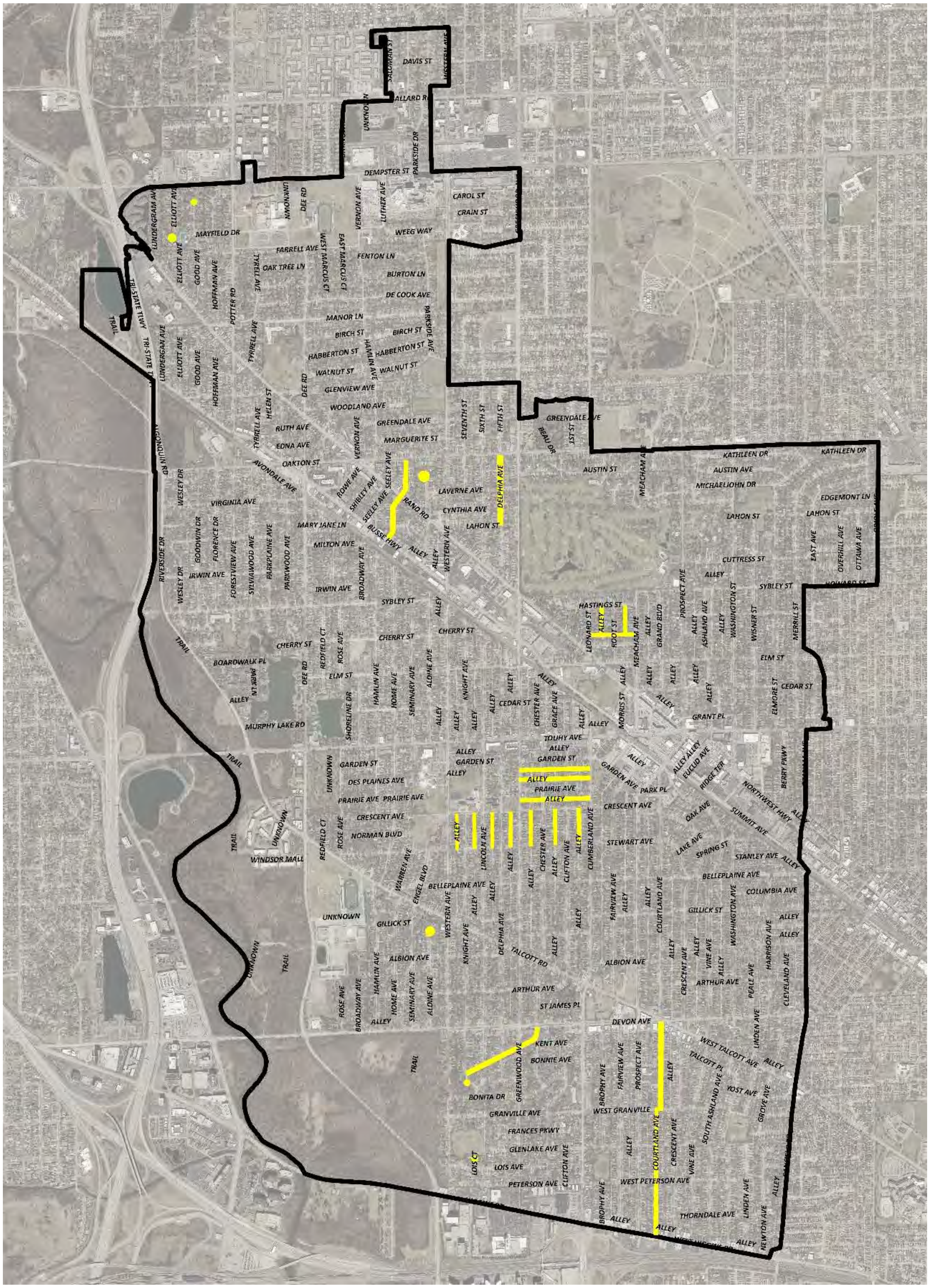

Figure 39. Potential Green Infrastructure Locations

CHAPTER 10 STORMWATER UTILITY FEE

The previous SWU study focused on developing a database and calculations needed to equitably allocate the costs of a stormwater program amongst property owners based upon their contribution of stormwater into the system (i.e. their impervious coverage). The amount of stormwater runoff a parcel generates corresponds to the amount of impervious area on the parcel. Impervious areas are surfaces that prevent stormwater from infiltrating into soil such as sidewalks, roofs, and parking lots; an example of a pervious versus impervious surface for a residential property is shown in **Figure 40**.

Figure 40. Example of Impervious Area Versus Pervious Area

To quantify the SWU fee, the impervious area of an average residential property in each zoning class (R-1, R-2, etc) was determined. R-3 zoning was found to have the smallest average impervious area and was defined as an Equivalent Residential Unit (ERU). For Park Ridge, 1 ERU is approximately 2,800 square feet. The ERUs for each Zoning Classification are listed below:

- R-1 residential = 1.4 ERU *(1.4x the average impervious area)*
- R-2 residential = 1.1 ERU *(1.1x the average impervious area)*
- R-3 residential = 1 ERU *(1x the average impervious area)*
- R-4 residential = 3 ERU *(3x the average impervious area)*
- R-5 residential = 8 ERU *(8x the average impervious area)*
- Non-residential = 4 ERU *(4x the average impervious area)*

The SWU fee is based on the actual impervious area for every individual parcel tabulated in the City and not the average impervious area. Every parcel in the City would be given an ERU value, with the City having a total of 18,141 ERUs. The fee for each parcel would be based on its individual impervious area and corresponding ERU value. The rate for 1 ERU was determined to be $11 per month, based on a financial analysis of the estimated project costs and schedule, and the total ERU.

Based on the SWU rate of $11 per month, the average fees by zoning type are as follows:

- R-1 = 1.4 ERU = $15 per month
- R-2 = 1.1 ERU = $12 per month
- R-3 = 1 ERU = $11 per month
- R-4 = 3 ERU = $33 per month
- R-5 = 8 ERU = $88 per month
- Non-residential vary significantly

An example of how an ERU for a residential property will be determined is shown in **Figure 41** below.

- Total Parcel Area = 6,620 ft^2
- Pervious Area = 3,250 ft^2
- Impervious Area = 3,370 ft^2

1 ERU = 2,800 ft^2

Example ERU = 3,370 / 2,800 = 1.2 ERU

Preliminary SWU Fee = 1.2 x $11 = $13.20/month

Figure 41. Example ERU Calculation

Another aspect of an SWU program that can be incorporated include provisions for incentives and credits to help offset fees, while providing benefits to the immediate surrounding areas. An incentive would be a one-time rebate and is typically used to encourage residents and businesses to construct small projects while minimizing City staff resources. Some examples of projects and common incentive amounts per property are rain barrels ($25, with a maximum incentive of $50), rain gardens (minimum area of 100ft^2 = $200, minimum area of 200ft^2 = $350 incentives), and permeable paving (minimum area of 100ft^2 = $200, minimum area of 200ft^2 = $350 incentives). A credit is a permanent or semi-permanent reduction of the SWU fee and is used to encourage large property owners to construct stormwater projects such as stormwater detention basins/vaults and infiltration basins. Two types of stormwater projects could be eligible; volume reduction projects (infiltration BMPs) and runoff rate reduction (stormwater detention). These projects would need to be located in dedicated, deed-restricted easements. Credit (if approved) would be valid for 5 years, after which time property owners must reapply and demonstrate that the stormwater feature is maintained and functioning. The following are recommendations for the volume reduction and runoff rate reduction projects:

Volume Reduction Projects (Infiltration BMPs)

- Must provide a minimum storage volume of 1,000 ft^3
- Design volume = ½" runoff x property area
- Credit given for providing full design volume = 20% of the calculated SWU fee
- A pro-rated credit amount would be given for storage volumes less than the full design volume

Runoff Rate Reduction Projects (Detention Storage)

- Must provide a minimum storage volume of 5,000 ft^3
- Design volume = detention required for site under current City ordinance
- Credit fomula:
  - % SWU Credit = 0.5 x [1 – (Design Volume – Storage Provided)]
  - Providing the ordinance-required detention volume would generate a 50% SWU credit
- Maximum credit allowed is 100% of SWU fee

City staff would handle the SWU billing. The SWU monthly fee would be a new line item on the sewer and water bill (**Figure 42**). An ERU database will be provided to the City for upkeep and periodic updating.

PLEASE SEE REVERSE SIDE FOR ADDITIONAL UTILITY BILLING INFORMATION

NAME: [redacted]
SERVICE ADDRESS: [redacted]
ACCOUNT NUMBER: [redacted]

BILL DATE: 11/30/2015

METER INFORMATION:

PRESENT READING	READING DATE	READING TYPE	PREVIOUS READING	READING DATE	READING TYPE	USAGE (1000 Gallons)
125	10/06/2015	E	118	08/18/2015	C	7

Stormwater Utility Information		
Your Property's ERU Value	ERU Unit Cost	Assessed Fee
1.0	$11	$11

WATER	$24.22
UTILITY TAX	$3.03
SEWER SVC CHARGE	$9.94
FIXED SEWER CHARGE	$3.35
CHICAGO WATER	$27.02
5/8 INCH METER	$9.41
Stormwater Utility Fee	**$11.00**

TOTAL CHARGES DUE BY 12/20/2015 **$87.97**

Figure 42. Sample SWU Bill

As part of the SMP study, a number of projects were developed to alleviate flooding throughout the City. It was decided at a June 12, 2017 presentation to City Council that the SMP should focus on overland flooding projects and should not include projects designed to reduce basement backups, which were shown to be addressed most cost effectively through private flood control systems. The recommended overland flooding projects were presented at a September 11, 2017 City Council presentation. At that meeting, it was decided that the design criteria should be the 100-year event; the estimated cost of the 100-year overland flooding projects was $106 million. Direction was given by the City Council that the final SMP document should consider the rate setting implications of funding these projects over two consecutive 20-year programs.

Setting the rate for the ERU is based upon a financial projection of the anticipated funding needs and estimated timing of the construction projects. During the SWU study, as described previously, it was assumed that $40 million in projects would be constructed over a 20-year period. It was assumed that the larger projects would be constructed early in the program, and smaller projects would continue throughout the 20-year program. Based upon this schedule, a financial projection was completed. At the recommended funding level of $11 per ERU, the SWU fee would generate approximately $2.4 million annually in stormwater funding (18,000 ERU x $11/month). The funds received from the SWU would not pay for the projects directly unless the City waited several years between projects. Instead, it was assumed that City would issue bonds and pay the debt service on the bonds with the funds generated by the SWU. A bonding schedule was developed which would allow funding of the assumed construction schedule. The bonding schedule assumed a series of 6 bonds to be issued over 15 years, with each bond being repaid over 25 years. Based on this projection, the total program would construct $40 million in projects over 20 years and pay for them over 40 years. However, because the debt service obligations change over time and are reduced as the initial bonds are retired, the financial projection showed that at the end of the 40 years there would be a significant balance in the fund. The balance begins to grow after 25 years or so; at that point, the bonds could be paid off more quickly, or additional projects could be constructed.

Based upon the recommendation of $106 million in projects and the direction to assume that they would be constructed over a 40-year period, the funding rate for the ERU was reconsidered. Per the advice of the financial consultant, making an accurate projection over a 40-year period is challenging. Inherent to the financial projections are assumptions on interest rates, escalation of project costs, etc. Since many of the proposed SMP projects require property or easement acquisition, some of which may not be obtainable, the total project costs and certainly the project schedule are unknowable at this time. In short, there are too many variables and unknowns at this time to reasonably project the costs over a 40-year period and calculate a new ERU rate based upon the recommended SMP projects. However, we do know that the previously recommended $11/ERU rate could fund construction of $40 million in projects over 20 years, and start to generate a significant fund balance after 25 years. This would put the City well on the way to accomplishing the SMP goals. With the assumption of a 40-year construction period, the $11/ERU rate could reasonably provide funding of the entire SMP program. Periodic financial projections would of course be required to evaluate the tradeoff between the ERU rate charged to residents and the desired construction schedule and payoff duration to ensure that the City's financial needs are met.

In our opinion, the previously recommended funding rate of $11/ERU remains a valid and reasonable starting point for funding the SWU program. It will allow for construction of major projects in the near term, and allow the City to assess the longer term stormwater funding needs in future years. The ERU can be adjusted in future years based upon the projects that are ultimately constructed and the desired payoff schedule. **We continue to recommend setting the ERU rate at $11/ERU.**

CHAPTER 11 STORMWATER ADMINISTRATION

11.1 STORMWATER REGULATIONS AND POLICIES

Stormwater ordinances regulate the management of stormwater for development sites. Development within the City falls under the jurisdiction of two ordinances, including the City's stormwater ordinance (Article 11, Chapter 3 of the City's Code of Ordinances) and the MWRD's Watershed Management Ordinance (WMO). Permit applicants must demonstrate that the requirements of both ordinances are met.

The WMO requires certain types of developments to provide detention storage to control the rate at which stormwater is released from a property. It also requires volume control storage, which are best management practices or green infrastructure elements designed to infiltrate runoff and reduce the runoff volume leaving a site. Both of these requirements are important protections designed to minimize the potential for negative impacts on adjacent and downstream properties. The applicability of the WMO requirements is based upon several factors but it generally depends on the size of the development property. Detention storage is required for single family residential developments when they are greater than 5 acres in size. For multi-family or non-residential developments, the threshold is 3 acres. Volume control storage is required for single family residential developments greater than 1 acre, and multi-family or non-residential developments greater than 0.5 acres.

While the WMO provides important stormwater requirements for the County, it can be seen from the thresholds that many developments within the City would not be required to provide detention per the WMO. For example, non-residential developments less than 3 acres in size are exempt from providing detention under the WMO, The City's ordinance, however, is more strict. All non-residential developments require detention regardless of the property size. For residential developments, the threshold is 1 acre. Therefore, the only development types that do not require stormwater detention are residential developments smaller than one acre.

Given that much of the development in the City is actually redevelopment, there are few cases where a residential development less than 1 acre in size will result in more impervious coverage than whatever the existing land use. One exception is the case of a residential teardown and reconstruction with a larger impervious footprint. This issue is a challenge for many communities and would require its own examination independent of the SMP. However, it should be noted that providing stormwater detention on an individual lot basis is impractical, and if the stormwater utility fee is implemented, it will encourage minimization of impervious coverage.

11.1.1 Fee In Lieu of Detention

The City's stormwater ordinance includes a provision for paying a fee in lieu of constructing detention storage on a development site. While this policy is sometimes controversial, it can only be applied in certain circumstances. The ordinance language reads as follows (ordinance section 11-3-9):

When a proposed development will not cause any increase in the existing rate of runoff from the property, or

1. *the 0.15 cfs release rate is exceeded even though the minimum three inch restrictor specified in Subsection 11-3-6.8 is utilized; or*
2. *the development is a reconstruction of an existing building having a lot coverage of 75 percent or greater; or*
3. *the stormwater detention required by this Chapter cannot reasonably be provided, as determined by the City Engineer.*

The developer or owner shall pay to the City a fee in the amount as prescribed in Section 20-7-1. Sites larger than one acre must provide partial or complete onsite detention. Such fees shall be utilized by the City for the purpose of constructing stormwater management improvements for the City.

These three ordinance provisions are important protections to ensure that the fee-in-lieu provision is used responsibly. The first provision is important and ensures that fee-in-lieu can only be used on very small sites. The ordinance requires that when detention is required, it is sized to limit the release rate to 0.15 cfs per acre; for a small site, say 0.5 acre, the allowable release rate is only 0.075 cfs. There is a practical limit to how much the release can be restricted. The release rate is controlled by the size of the restrictor pipe, and the City's ordinance says that a 3" pipe is the smallest size allowed. Smaller sizes are prone to clogging, which could lead to an overflow and uncontrolled release from the basin. So for very small sites, the smallest allowable restrictor may still pass more flow than the maximum rate allowed by the ordinance. In practice, because there is a direct correlation between the storage volume and the release rate, this means that the detention storage will not fill completely fill during a 100-year storm. Ordinances that do not allow fee-in-lieu are ignoring this fact and requiring developers to construct detention storage that may not be utilized during a storm. With the fee-in-lieu provision in the ordinance, there is a mechanism for the City to collect funds that the developer would have otherwise spent on providing detention. Those funds can be used for other stormwater projects throughout the City. In our opinion, the fee-in-lieu of detention policy is reasonable and we do not recommend any changes to it.

11.2 OPERATIONS AND MAINTENANCE

Operation and maintenance of the sewer system is a very straightforward process, as the system largely works by gravity without need for human intervention. There are a few pump stations within the system, notably the Sibley Pump Station, that require operation plans that are already in place. Public Works staff has been operating these stations for years and are well acquainted with the operational procedures. Operation of the pumps themselves are programmed and are activated by rising or falling water levels. As far as maintenance, each pump has a recommended service life that should be followed. Funding for capital expenses such as pump station components has typically been provided through the Sewer Fund.

Beyond the mechanical equipment, the City's stormwater system is comprised of thousands of inlets, catch basins, and manholes, plus miles of sewer mains. Physically inspecting all of the system at any regular interval is challenging, and it is questionable whether it would be cost effective. To some extent, it is inevitable that items in need of repair will be identified after a problem has arisen or is soon to arise. Maintenance of the system should be focused on components that are directly related to the performance of the system, i.e the ability to collect stormwater and to convey it away from streets, etc. To accomplish this goal, the City has several maintenance policies in place. First, there are two Public Works staff members that are on constant availability for root cutting and flushing of sewer mains. Part of this effort is more directly attributable to the sanitary sewer system rather than the stormwater system, however there are some parkway or yard drains that can be compromised by root intrusion. Based on interviews with the Public Works Director, there historically has been four staff dedicated to this task, and the reduction in staffing can at times lead to a constant backlog for repairs. In our opinion, this is not primarily a stormwater issue and additional staffing to handle root cutting cannot likely be funded through the stormwater utility.

There are approximately 8000 inlets in the City. Inlet grates tend to accumulate debris which can cause blockages and lead to localized ponding. Public Works has a program that utilizes seasonal (summer) labor to inspect each inlet, remove and clean the grate, and manually clean inside the structure itself. The City's policy is to inspect and clean all 8000 inlets every year.

Catch basins also allow stormwater into the sewer system, and they have a "sump" built into the catch basin structure. The sump is just the portion of the structure that is below the outflow pipe, and it is intended to collect roadway debris. Once the sump is filled, debris can be drained out into the system and cause siltation of the sewers, which decreases capacity. Catch basin cleaning is the most important maintenance task for the sewer system. Cleaning is done with a vactor truck. No new equipment needs were identified in the staff interview. The City's current policy is to clean 25% of the City's catch basins each year so that each catch basin is cleaned every four years. As with any maintenance task, more is always better. However, the current policy is very proactive and appears to be sufficient. No problems related to siltation of the sewer system have been identified. We do not recommend using maintenance funds to increase the cleaning frequency.

11.3 WATER QUALITY ASSESSMENT

As a combined sewer community, water quality issues are different for the City than for a similar community with a separate sewer system. In a separate sewer system, all stormwater runoff ends up in local ditches and waterways. The pollutants that can be carried by stormwater runoff are deposited into those water bodies, where they can impact aquatic resources and habitats, and in some cases recreational use of lakes, rivers, etc. for the public.

With the exception of a few small isolated areas, all runoff in the City is combined with household waste and conveyed to through the combined sewer system to MWRD water treatment facilities. The treatment plants remove these wastes and pollutants before discharging the processed water back to a local waterway. Therefore, water quality management in the City is largely handled by this process.

Although runoff is treated by MWRD facilities under most circumstances, there are several combined sewer overflow (CSO) locations throughout the City that allow the sewer system to overflow directly to the Des Plaines River during large storm events when the MWRD receiving sewers are full. These events happen infrequently, but when they do happen, they allow household wastes mixed with stormwater runoff to be discharged to the river. A CSO event typically happens well after the beginning of a storm event, after most pollutants are "first flushed" from the surfaces of roads, lawns, etc. The first flush ends up being treated, and therefore the typical pollutants present in stormwater runoff are not the major concern in a CSO event.

Based upon this rationale, the City's water quality program should focus its resources on projects that will reduce the frequency of CSO events, while educating residents on steps they can take to better manage their properties to improve water quality. The following recommendations, as part of the overall SMP, address water quality issues and if implemented will significantly reduce the quantity of CSO events in the future:

1. *Implement the Capital Improvement Plan.* While obviously a major undertaking, the CIP projects identified in this SMP report will provide significant new capacity to temporarily hold stormwater, allowing the combined sewer system to convey it when capacity in the MWRD system becomes available. The CIP improvements will reduce the frequency of CSO events, as well as localized flooding that will keep water within the combined sewer system and not on streets, lawns, etc.

2. *Inflow and Infiltration Reduction:* The MWRD has put in place requirements to reduce the amount of Inflow and Infiltration (I&I) that enters the system. I&I is caused by issues such as cracks in pipes and poor sealing of pipes where they enter manholes. These situations allow water to enter the sewer system that should otherwise stay in the ground. I&I increases the treatment requirements for MWRD, which is an indirect cost shared by all taxpayers, and also adds water to the sewer system, which reduces the system capacity during a storm event. The reduced capacity contributes to localized flooding and to CSO events.

   The City has been meeting the MWRD I&I program requirements by maintaining a sewer lining program. Sewer lining seals cracks in pipes and manholes to prevent leakage of groundwater into the system. The City program currently includes approximately $600,000 per year in sewer lining. It is recommended that the City continue with this program.

3. *Green Infrastructure.* Green Infrastructure (GI) and water quality go hand in hand. GI techniques are highly effective at removing pollutants from runoff, and they also promote infiltration which lessens the water entering the system. Less water in the sewer system contributes to a reduction in CSO events. A suggested GI plan for the City is described in other sections of this document.

4. *Public Education and Outreach.* There are small steps, such as installing rain barrels and managing pet wastes, that homeowners can take to manage stormwater on their property in ways that improve water quality. Again, many of these steps are GI techniques and described in other sections of this report. There are also many resources available to educate residents on the steps they can take on their own property, such as pamphlets created by The Conservation Foundation or other groups. One simple way to improve public education on water quality issues would be to make such pamphlets available at City Hall and to create a page on the City's website with links to water quality resources.

11.4 STAFFING LEVEL ANALYSIS

As part of the SMP, a review of the current and future staffing needed to manage the City's stormwater program was completed. Implementing a Stormwater Utility Fee provides a funding mechanism to add staff to manage the stormwater program, if the City desired. We have reviewed the current staff efforts relative to stormwater management and examined two approaches as to how the proposed SMP projects and stormwater management in general could be handled on a staffing level.

Currently, stormwater management related issues are handled by the City Engineer and one staff engineer. These issues are typically related to review of permit submittals for compliance with the City's stormwater ordinance, review of grading plans and resolution of in-field grading issues during construction, and investigation of drainage complaints from residents. All of these efforts are completed within the context of staff's other responsibilities. Based on these routine responsibilities, there is sufficient staff to handle these stormwater related issues. There are currently no stormwater infrastructure projects under construction or under consideration that require staff effort; therefore, there is no current need for additional staff to manage stormwater issues in the City.

Between 2011 and 2013, the City completed eight sewer projects for a combined design and construction cost of approximately $4.6 million. These projects were completed under the Sewer Improvement Program, which was managed by staff (City Engineer). Although the project design and construction management of the sewer projects was handled by outside consultants, the sewer projects did require additional staff resources for items such as bid advertising and opening, contract administration, project oversight, and resolution of construction related issues. Staff managed to complete these tasks within the context of their other stormwater and non-stormwater responsibilities.

The projects proposed in the SMP, if all are constructed, may be considerably more consuming than the Sewer Improvement Program. The variable is the schedule at which the projects are implemented. If the schedule is on par with the Sewer Improvement Program – roughly $2 million to $3 million per year – then it appears that the current staff capacity is sufficient to manage the program. If the pace is greater, or if more than one major project is ongoing concurrently, additional staffing would be warranted and should be considered. Another possible threshold to consider for adding staff is whether the East Sibley projects are to be constructed. Aside from the high cost of these projects, they will require extensive coordination between property owners and would benefit from a sustained staff presence, since the projects would take several seasons to construct. If the East Sibley projects move forward, we recommend providing additional staffing to help manage the stormwater projects.

11.5 STORMWATER COMMISSION

A stormwater commission is a municipal-related entity that can serve several roles related to stormwater management and can be comprised in several ways. A commission can be advisory board that discusses stormwater issues and provides recommendations to City Council. They can also be an appointed board with authority to spend stormwater funds or execute stormwater projects. Commission members are often resident volunteers that are appointed by the City Council. Depending on the makeup and role of the commission, there may be a staff or elected official that serves as a liason to the commission; sometimes there are both. In short, there are numerous ways a stormwater commission can be formulated, and numerous reasons for forming one. As part of the SMP, we have evaluated issues related to the potential creation of a stormwater commission for the City.

11.5.1 Review of Nearby Communities

A useful place to start contemplating the creation of a stormwater commission is to examine what other similar communities nearby have instituted. A review was completed based on online search results and our own knowledge of stormwater policies and procedures in the 25 communities for which CBBEL serves as municipal engineer. To the extent that data was available, our review focused on the specific composition of the commission, the initial reasons for its creation, and its typical ongoing responsibilities.

To start the review, we looked for combined sewer communities in Cook County which are served by the MWRD. From a stormwater perspective, these communities (depending on size) would be the most similar to Park Ridge. There are 51 combined sewer communities in Cook County. Of these, only one is known to have a stormwater commission. The Village of Niles has a standing stormwater commission that was initiated after the major 2008 flooding event. The commission was initially comprised of Village staff and elected officials; currently, there are also two residents on the nine-person panel. The initial stated goal of the stormwater commission was to "identify, evaluate, and report back on persistent stormwater related issues" within the Village. The stormwater commission initiated the creation of a Stormwater Master Plan, and has continued with the role of overseeing the implementation of the projects in their Stormwater Relief Program.

Other non-combined sewer communities in northeastern Illinois that were found to have a stormwater commission included Northbrook, Downers Grove, Wood Dale, Deerfield, and Beach Park. Extending the search to northwestern Indiana, communities such as Dyer, Merrillville, Highland, Cedar Lake, Crown Point and Lowell have stormwater boards or commissions. Of these, two are described in further detail in a following section as case studies or models for a potential City stormwater commission.

As part of our review, we also noted several communities that have advanced significant flood control projects or a program of projects without setting up a stormwater commission. These examples each followed the "traditional" process where the municipality has a SMP or similar flood study developed, the SMP recommended a series of projects, and the municipality authorized funding of each project on an individual basis. These communities include Des Plaines, Franklin Park, Elmwood Park, Elmhurst, and Arlington Heights.

In summary, there are few examples of stormwater commissions for communities similar to Park Ridge. There are several examples of communities similar to Park Ridge enacting major stormwater projects without having a stormwater commission. Neither statement is intended as a recommendation for or against the creation of a stormwater commission for the City.

11.5.2 Stormwater Commission Case Studies

Based upon or review and knowledge of other stormwater commissions, we have selected two "case studies" to serve as examples of how such a committee could be composed for the City.

11.5.2.1 *Case Study #1 – Village of Northbrook*

The Village of Northbrook started a Stormwater Management Commission after several major floods in the late 1980's. The Commission was formerly started in June 1992 with 9 AD HOC members of Village residents representing various areas of the municipality. The members serve three year terms that are staggered and decided by the Village Board. The commission oversaw the hiring of a consulting firm that prepared a SMP that was completed in 1993. The SMP was revised in 1996. The Commission was formed for the sole purpose of reviewing and recommending corrective action for existing and potential flood water problems that directly affect a significant group of Northbrook residents and commercial properties. The first projects submitted to and accepted by the Board were easy to reach, had a lower cost per structure benefited than other projects. During the SMP revision in 1996, the Board was presented with more costly and challenging projects. The Commission requested authorization to spend $300,000 on additional studies and value engineering for specific projects. The Board approved the expenditures. Over the years the SMP has been updated and vetted through the Stormwater Management Commission. Each time projects were added, costs updated and projects prioritized. The Village instituted a stormwater Utility Fee in 2012 that was dedicated to funding approximately $20 million in stormwater management projects. While the Commission met on a monthly basis to vet projects and discuss the results of the updated SMP, now that the projects are established with time frames for prioritizing design and construction, the Commission meets quarterly or less frequently as the projects are being completed.

11.5.2.2 *Case Study #2 – Town of Dyer*

Similar to the Village of Northbrook, the Town of Dyer started a Stormwater Management Board in 1991 to address continued flooding concerns throughout the Town as a result of major flooding in the late 1980's. Dyer's Stormwater Board is a more formal part of Town government, with the ability to collect funds and administer spending. Other northeast Indiana communities such as the towns of Highland, Merrillville, and Cedar Lake follow a similar format.

The duties and powers of the Stormwater Management Board include:

- Hold hearings following public notice
- Make findings and determinations
- Install, maintain, and operate a storm water collection and disposal system
- Make all necessary or desirable improvements of the grounds and premises under its control
- Issue and sell bonds of the district in the name of the municipality for the acquisition, construction, alternation, addition, or extension of the storm water collection and disposal system or for the refunding of any bonds issued by the board
- The board has exclusive jurisdiction over the collection and disposal of storm water within the district

The board is made up of three members of Dyer residents selected by the Town Council and Council liaison is appointed for Board. The Board members serve one year terms.

The Board meets monthly and has control over the Stormwater Utility funds the Town receives. They have had several increases in the fee to pay for additional projects including the issuing of new bonds in December 2017 to pay off older bonds and gain capital for another large stormwater project. The Town has one staff member solely for stormwater that works under the Town Manager and reports to the

Stormwater Management Board.

11.5.3 Role of a Stormwater Commission

Based upon our review, most stormwater commissions have been initiated for the purpose of creating a stormwater master plan. Once the plan has been created, the commission's main role has been to coordinate implementation of the plan and to occasionally update the plan. The composition of the commission is varied and dependent on the needs of the community, but is typically largely composed of staff member with some resident participation.

11.5.4 Recommendations

This review has shown that a program of stormwater improvement projects can be developed and implemented successfully whether through the "traditional" process using City staff and Council, or through using a stormwater commission. It is a matter of preference for City government to decide which route makes the most sense for Park Ridge. Given our history of working with the City on stormwater issues and experience in other communities, we offer the following points for consideration on the issue:

- *The Stormwater Master Plan has been created*. This is typically the main driver for creating a stormwater commission and major goal to be accomplished. Throughout the several studies that have been completed over the years, we are confident that the critical flooding locations throughout the City have been identified, and feasible solutions for each area have been identified. There have been ample resident input and opportunities for public comment on stormwater issues through the years.

- *Avoid creating a new obstacle to implementing solutions.* If the City elects to move forward with implementing the projects laid out in the SMP, it should be reminded that each project is a concept-level design. Each project, as it moves forward with design, will require additional analysis, vetting, development of alternatives, and coordination on issues such as property acquisition, cost estimating, scheduling, etc. These are issues where a stormwater commission could be helpful to reduce the burden on City Council. However, it should be considered whether a stormwater commission would become another approval that a project must obtain before having to obtain a second approval at Council, and whether this will make implementation of projects more difficult.