WATER SOLUTIONS PROJECT

Planning For Resilient Communities

9.10.2014

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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executive summary

The Water Solutions Project is a series of four pilot studies in three communities and a template for future studies. Each pilot study focused on retrofit solutions for flooding in an already developed area, each with a different type of land use:

- **Boal Parkway in Winnetka:** a single-family residential neighborhood within the floodplain
- **The block in Glenview bounded by Harlem Avenue, Henley Street, Dewes Street, and Washington Street:** a multi-family residential neighborhood outside the floodplain
- **Milwaukee Avenue in Niles, between Dempster Street and Ballard Road:** a commercial corridor outside the floodplain
- **The West Elm District in Winnetka: a downtown retail district outside the floodplain**

All four pilot study areas have a history of flooding and this project evaluated each area to understand the site specific causes of that flooding. The evaluation process utilized in this project provides an example that can be repeated in other areas within these three communities and throughout the watershed.

Each pilot study included a public survey and two open houses. The survey and the first open house gave residents and property owners the opportunity to provide details of their experience with flooding. The second open house included a presentation of preliminary recommendations for neighborhood scale and individual property-scale solutions. Attendees were given the opportunity to ask questions and provide feedback on the recommended solutions.

As a result of this project, residents and property owners in the four study areas learned about a suite of flooding solutions that they can implement immediately on their own property, or with the cooperation of their neighbors. Two tools that may be especially helpful are the matrices in Appendix 1 and Appendix 6. The matrix in Appendix 1 is designed to help an individual self-diagnose the cause of flooding, while the matrix in Appendix 2 gives the individual a variety of flood protection options to consider. A secondary result is that the work products developed during this project are available for public education on a wider scale. Municipalities can use these work products to repeat the pilot studies in other flood prone areas, or simply distribute the public education pieces to an individual property owner searching for solutions.

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Chapter 1
introduction

1A | Purpose and Approach to the Water Solutions Project

The Water Solutions Project focuses on four pilot-study areas in order to better understand where flooding occurs, why it occurs, and what its effects are. The goal is to develop solutions that can be implemented by property owners or groups of property owners to prevent or reduce flooding and the damage it causes. This is not intended to be a community-wide planning project leading to large-scale municipal infrastructure projects.

This project has been funded by an "IKE" Grant administered by the Illinois Department of Commerce and Economic Opportunity. The focus of the grant is on community planning to address the needs and issues of the population groups most significantly impacted by the 2008 floods associated with Hurricane Ike.

The Water Solutions Project is a series of four pilot studies in three communities and a template for future studies. Each pilot study focused on retrofit solutions for an already developed area, each with a different type of land use. All four pilot study areas have a history of flooding and this project evaluates each area to understand the site specific causes of that flooding. The evaluation process utilized in this project provides an example that can be repeated in other areas within these three communities and throughout the watershed.

THE FOUR PILOT STUDY AREAS ARE...

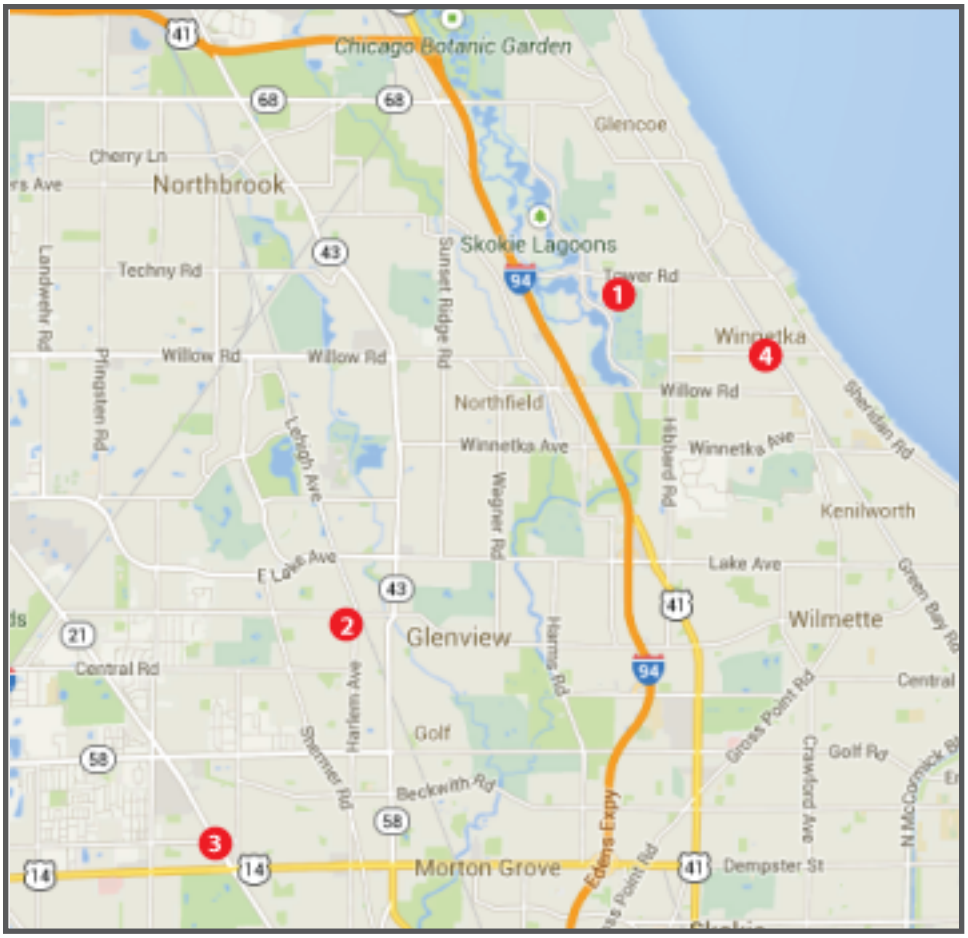
1. **Boal Parkway in Winnetka**
   A single-family residential neighborhood within the floodplain;

2. **Harlem Ave / Henley Street / Dewes Street / Washington Street / Block in Glenview**
   A multi-family residential neighborhood outside the floodplain;

3. **Milwaukee Avenue (Dempster to Ballard Road) in Niles**
   A commercial corridor outside the floodplain; and

4. **The West Elm District in Winnetka**
   A downtown retail district outside the floodplain.

STUDY AREA MAP



The findings and recommendations of the pilot studies are intended to be adopted as addenda to the Villages' existing stormwater planning documents to:

- ***Develop readily implementable solutions for reducing flooding in the pilot-study area; and***
- ***Establish templates for flood reduction efforts by property owners in other parts of the Village.***

Recommendations resulting from the pilot studies are not expected to become part of the communities' capital improvements programs – they include specific mitigation mechanisms for one or several property owners, which those owners may choose to implement. Municipal support may come through the Village's overall flood mitigation programs, public education, technical assistance, grant administration, and facilitating neighborhood efforts.

1B | Considering Flooding Issues

A flood can be defined as a damaging overflow of water into buildings or onto land that is dry most of the time. More formally, the Federal Emergency Management Agency (FEMA) defines a flood as, "A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties" (FEMA, NFIP). In addition, it is necessary to understand differences in the types of flooding that occur.

THIS PROJECT CONSIDERS TWO DIFFERENT KINDS OF FLOODING...

1. **Stream Flooding**
   Sometimes known as overbank flooding; involves streams or rivers overflowing onto a floodplain.

   Stream Flooding occurs when the water level in the stream channel rises above its banks. This may be caused by excessive rain or snow melt, or when the water's natural path is blocked. In either case, water overflows onto surrounding floodplain areas. Such high-risk areas are classified by FEMA as Special Flood Hazard Areas (SFHAs) with the goal of discouraging new construction in these areas and encouraging protection, mitigation measures, and flood insurance coverage for structures in SFHA's.

2. **Stormwater Flooding**
   Otherwise known as localized flooding, drainage flooding, or overland flow; involves flooding outside of mapped floodplains.

   Many locations outside of floodplains may experience stormwater flooding, which is characterized by standing water when the rate of runoff exceeds the rate at which water can drain away from the land. Runoff water collects in low-lying areas until it can drain out, infiltrate into the soil, evaporate, or be pumped to another location. This type of flooding can be especially problematic in urban areas where rooftops and pavement have increased the amount and rate of runoff from storms.

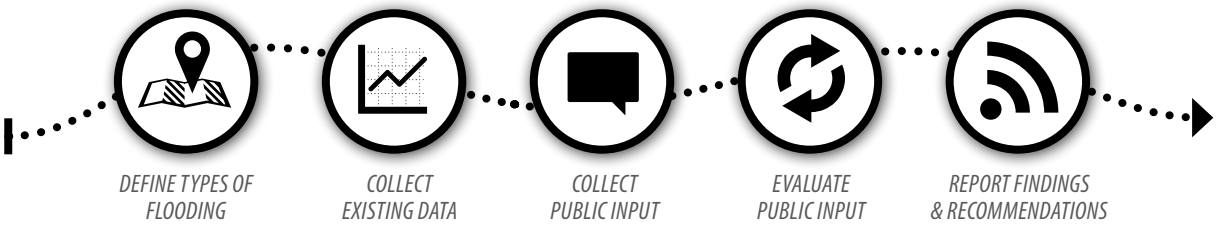
Looking beyond the kinds of flooding...

It is also necessary to consider where on a property the flooding occurs – as impacts of stormwater inside one's house clearly are different from those outside one's house.

▸ **Appendix 1** includes a matrix showing six primary ways (or places) that flooding can occur –inside and outside the building. For each of these, the matrix notes several common causes and effects of that kind of flooding.

The Water Solutions Project works in concert with overall community stormwater management programs. The approach and range of potential solutions involved in the project do not replace or supplant those efforts, but rather seek to provide an additional level of support at a more local and individual scale. By focusing on individual properties or neighborhood projects, this approach is intended to arm residents and communities with additional flood hazard mitigation tools that can be implemented swiftly. Within that context, flooding and the damage that occurs is considered from the perspective of the individual property owner: their flooded basement, yard, street, or parking lot.

Chapter 2
process



2A | Define Types of Flooding

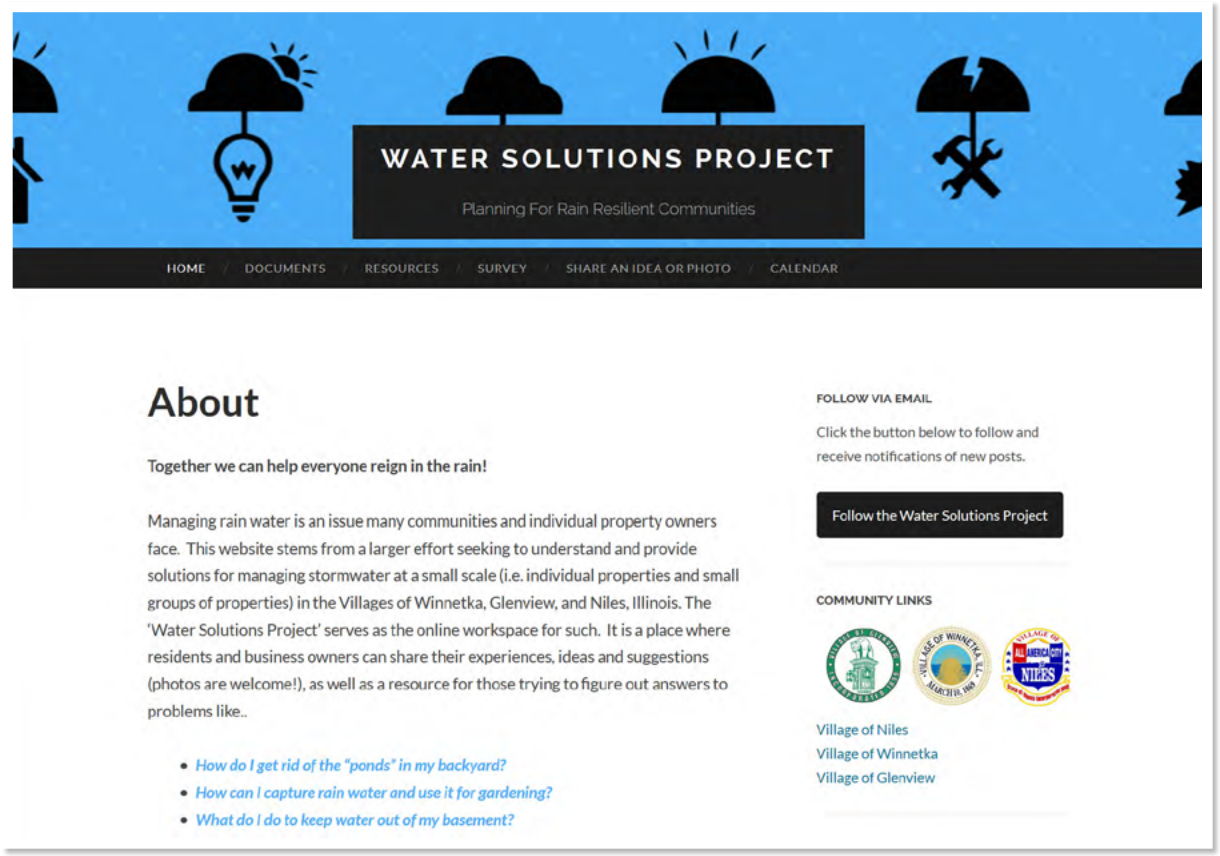
Types of flooding can be considered in ways both technical (the 100 year storm event) and colloquial ("It poured for an hour!"). The first step in The Water Solutions project was to define flooding events and the impacts they create in terms that bridge these two understandings. In this way, potential solutions could be identified and outlined in a manner that was meaningful to all involved. The definitions of Stream and Stormwater Flooding were shared with the residents in the Study Area, as well as descriptions of various locations and causes of flooding, to help residents understand the nature of the problems and solutions to be considered.

2B | Collect Existing Data

Existing condition information was collected for the pilot study areas including land use, natural resources, neighborhood character, and utilities. In addition, stormwater management plans and general plans of the community were reviewed. Lastly the flooding history of the pilot area was evaluated.

2C | Collect Public Input

A project website, www.watersolutionsproject.org, was established as an online workspace for publicizing upcoming meetings, gathering input, and identifying small-scale solutions. The site includes documents prepared in the course of the study, allows for submission of stories, ideas, comments and photos related to flooding, provides a listing of flooding causes and effects, and has downloadable copies of the in-depth property surveys.



PROJECT WEBSITE

▶ **WWW.WATERSOLUTIONSPROJECT.ORG**

To understand in detail the stormwater management issues of the Study Area, property owners and/or tenants were asked to complete the in-depth survey by providing specific details describing the parts of their building and property that flood, under what types of rains, and how long the flooding lasts (see Appendix 2). This level of detail is required in order to fully understand site-specific problems and then develop effective solutions to mitigate flood risks.

As a follow up, residents of the Study Area were invited to an open house to provide further details regarding flooding on their property and in their neighborhood. Letters inviting residents to the open houses are included in Appendix 3. Open house attendees used detailed site maps, at the scale of an individual property, to indicate exact locations of flooding, home and yard features, potential sources or causes of that flooding, and any measures that have already been taken to reduce flooding (see Appendix 4). Combined with the surveys, this information provided a detailed understanding of local flooding issues. The information gathered through the surveys and open house was reviewed by the consultant team and grouped by the type and location of flooding problem. Slideshow presentations used at the open houses are included in Appendix 5.

2D | Evaluate Public Input

A range of potential flooding solutions were developed based on the data collected, input from property owners, past work by the community, and experience of the consultant team. These solutions were reviewed with municipal Staff and then presented to property owners at a second open house, along with preliminary recommendations for property owners and groups of property owners. This was done with the understanding that residents had already applied varying degrees of remediation and that each property had unique circumstances. To that extent, the possible mitigation approaches were not presented as site specific recommendations, but as a matrix of possible solutions applicable to various types and locations of flooding. Property owners were encouraged to consider using options they had not already applied (perhaps in concert with neighbors). Neighborhood-scale solutions were also presented as graphics showing general locations and extents of improvements. At this second open house, the attending residents identified which solutions they thought were appropriate to their local flooding problems, and which were not.

2E | Report Findings & Recommendations

Using the resident feedback from the second open house, the matrix of individual lot solutions was compiled into this report (see Appendix 6). The matrices of problems and solutions developed for this project should help property owners diagnose the causes of their flooding problem and then identify appropriate solutions from the universe of possibilities.

Despite the site specific characteristics of each pilot study area (i.e. lot size, impervious lot coverage, and location in relation to the floodplain), the pilot studies should be transferable to similar types of land uses throughout the Village and the watershed. Other study areas may have some notable differences when compared to the pilot study areas, but the same types of solutions should still apply. Since the range of potential solutions is so broad, certain solutions will simply be more applicable than others in each case.

Chapter 3
pilot study #1

Single-Family Area
Winnetka, IL

3A | Vision, Goals & Objectives

VISION

Identify ways to reduce the likelihood of flooding along Boal Parkway and minimize the damage caused when flooding occurs, through property protection measures, land use policies, and green infrastructure that can also be applied to single family neighborhoods in other flood-prone areas.

GOALS

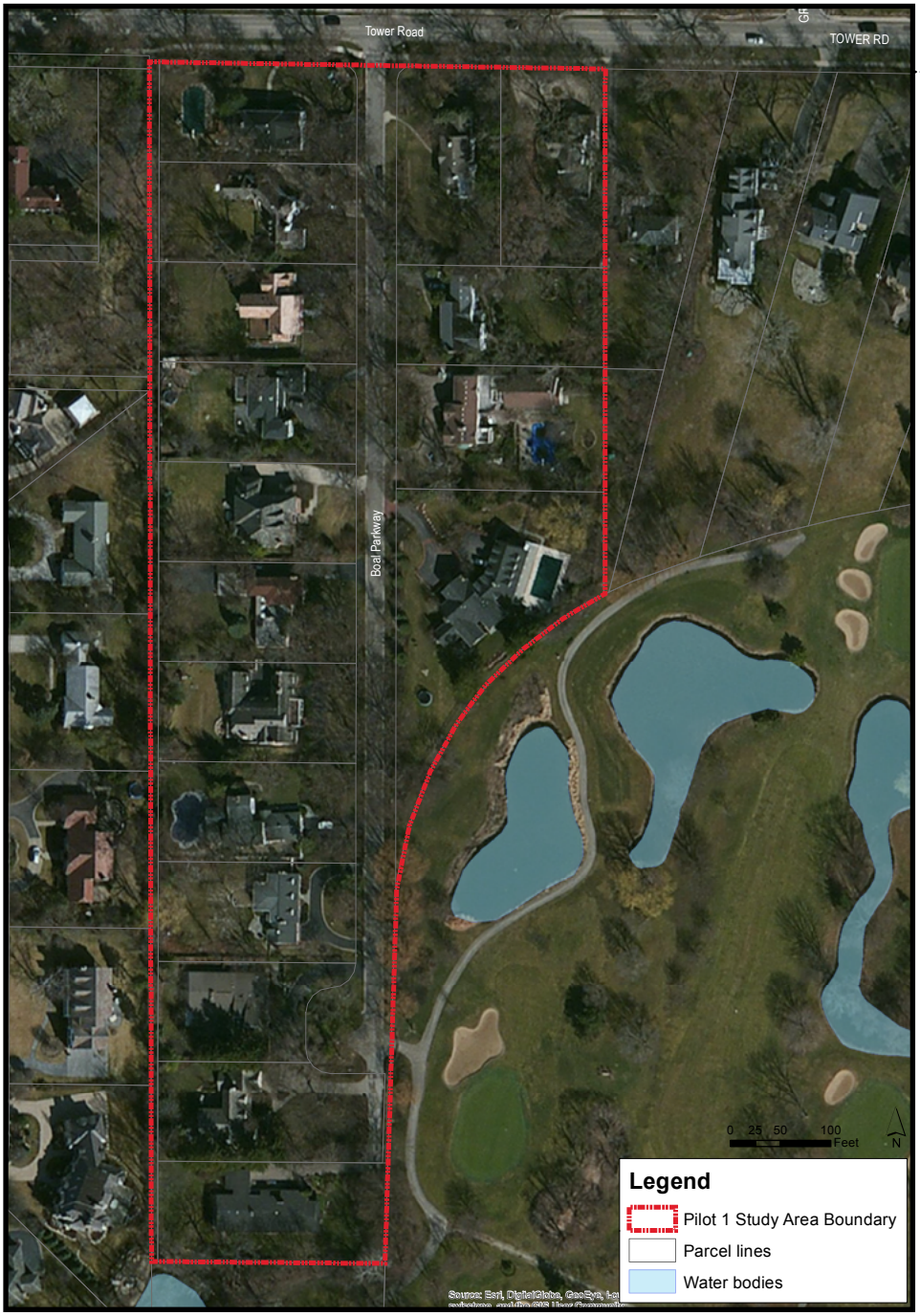
- Educate property owners on the causes of flooding
- Gather public input on localized stormwater problems
- Identify a range of readily implementable solutions
- Incorporate public feedback on the recommended solutions

OBJECTIVES

- Involve property owners in identifying causes of and solutions to flooding problems
- Provide property owners with recommendations to mitigate stormwater flooding and flood damage on their property, with solutions applicable to individual properties and scalable to whole neighborhoods
- Develop a plan to guide the Village and property owners through each step of implementation

3B | Existing Conditions & Regulations

The Study Area includes exclusively single family residential dwellings on large lots averaging approximately 21,700 square feet. Homes include attached garages and a variety of accessory structures on the lots. Homes in the Study Area average approximately 3,500 square feet in size.



STUDY AREA

SITE FEATURES

- The neighborhood includes homes built in a variety of architectural styles.
- Lots have significant tree cover and vegetation.
- The road is narrow with low rolled curbs and serves only a limited number of local properties; Boal Parkway is a dead end street.
- The road has an asphalt surface, but was a gravel road prior to resurfacing in the 1990's when it became a public street.
- A number of properties in the area have circular driveways and side loaded garages, which add to the paved areas of the sites, particularly in the front yards.
- The driveways are constructed of various materials: asphalt, concrete, or brick pavers.
- There are a number of storm sewer inlets along the road and adjacent to the road.
- The properties have varying amounts of plantings, with some being heavily landscaped.
- The area is relatively flat with some properties lower than others.
- The foundation openings and lowest adjacent grade levels of some houses are lower than the roadway based on visual observation and the Village's GIS data.

SURROUNDINGS

- Nearby recreation areas include Nick Corwin and Bell Woods parks, and the Cook County Forest Preserve (Skokie Lagoons).
- Also located nearby (to the south and accessed from Willow Road) are the Winnetka Golf Club and Skokie Play Fields. The golf course is relevant to local stormwater management in that it abuts the southern end of Boal Parkway and the rear yards of several homes.

ZONING

Zoning requirements relate to stormwater management in how they control the location of structures and define open space on a property, but are most commonly applied to properties to address impact on community character and aesthetics.

- Under the Village of Winnetka Zoning Ordinance properties in the R-2 Single Family Zoning District (including the Study Area) must be a minimum of 24,000 square feet in size.
- The size of homes is regulated by the Gross Floor Area (GFA) standard (based on the lot size) and the Roofed Lot Coverage standard (no more than 25% of the lot can be covered by structures under a roof).
- Another zoning standard related to stormwater management is the front yard coverage standard; however, there is no maximum coverage of the front yard set for the R2 District.
- The key factor in which zoning relates to stormwater management is the impermeable surface standard. The code permits that to up 50% of the lot in an all residential single-family districts can be "impermeable", as defined below. Eighty percent of areas covered with brick, stone, or concrete pavers count toward the total impermeable lot area. This incentivizes home owners to use such surfaces for driveways, walks, etc. as they can have larger areas for those functions.

The key factor in which zoning relates to stormwater management is the impermeable surface standard.

IMPERMEABLE SURFACES

"Impermeable surfaces" means surfaces which do not allow water to drain, seep, filter or pass through into the ground below. Such surfaces shall include, but are not limited to, buildings, other structures, driveways, sidewalks, walkways, patios, tennis courts, swimming pools and other similar surfaces; except that such surfaces shall not include any such continuous surface having an area of less than sixteen (16) square feet, and except that only eighty (80) percent of an area covered with brick, stone or concrete pavers shall be considered to be an impermeable surface."

– Village of Winnetka Zoning Code

YARD SETBACKS

The Yard Setback standards in the zoning ordinance establish areas that cannot include major structures. However, some structures are permitted as "obstructions" and can impact stormwater management by adding impervious surface to a property and potentially altering the flow of stormwater on a site.

Landscape areas are not regulated as obstructions (as they are not "structures"), but can impact the flow of water on and across properties if planting beds are raised or create low points.

Permitted obstructions include: garages, driveways, patios, terraces, fences, tennis courts, swimming pools, etc. In all cases the total lot impermeable surface must fall within the 50% limitation.

Some detailed characteristics of the Study Area are listed below. The average lot size along Boal Parkway is close to the half- acre minimum lot size required by the R2 Zoning district.

The data further show that homes are smaller and the lots covered with less impervious surface than is allowed by the Zoning Ordinance standards.

STUDY AREA CHARACTERISTICS

LOT SIZE
*Range: 16,110 to 41,409 sqft **
Average = 21,700 sqft
Median = 19,800 sqft

IMPERVIOUS AREA
Range: 4,389 ft2 to 10,495 sqft
Average = 6,715 sqft
Median = 6402 sqft

HOUSE SIZE
*Range: 2,619 ft2 to 5,846 sqft ***
Average = 3,808 sqft
Median = 3,671 sqft

LOT COVERAGE
*Range: 21% to 51% ***
Average =31%
Median =31%

AGE OF BUILDINGS
*Range: 13 years to 77 years ***
Average = 61 years
Median = 69 years

Data Calculations based on:

* Village GIS Data
** Cook County Assessor Data
\+ Winnetka Website Utility Fee Estimator Tool
++ Winnetka Data

The Village of Winnetka Landmark Preservation code regulates properties designated as historic landmarks. Owners of such properties may alter or demolish such properties only in keeping with the regulations of that ordinance. None of the properties in the Study Area are designated as historic landmarks.

Almost all of the residences along Boal Parkway lie within the mapped 100-year floodplain; however, the residences were constructed before the floodplains of Cook County were first published on any map.

DRAINAGE FACTORS

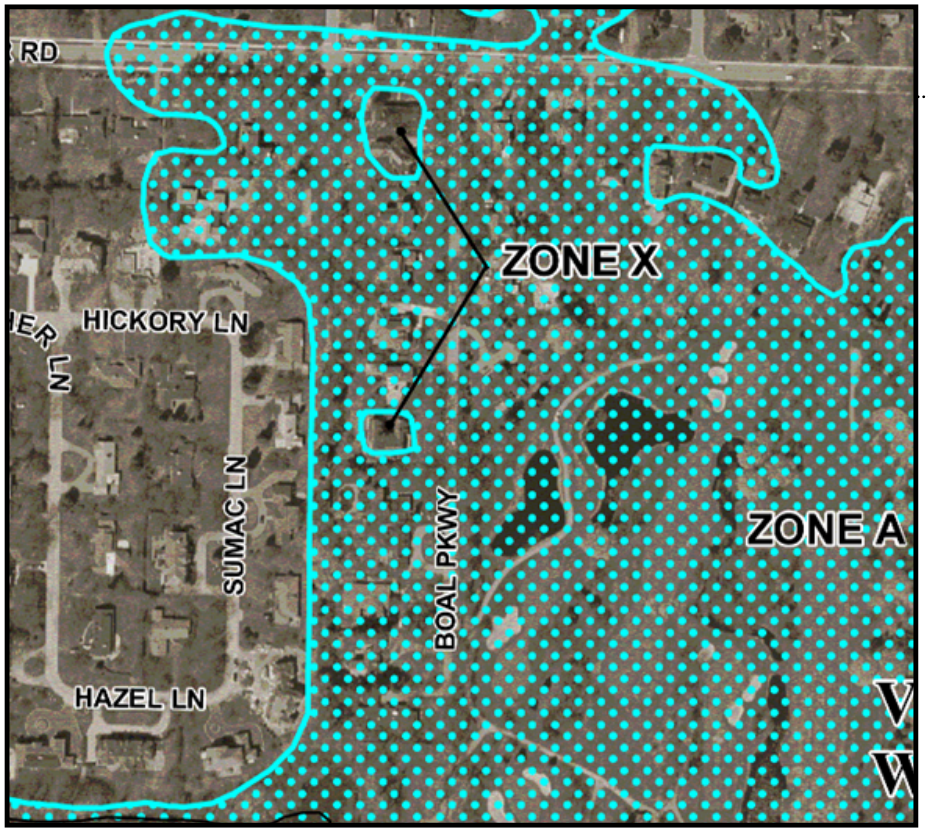
The Village of Winnetka has a dedicated separate storm sewer system. The Study Area is drained by two storm sewer outlets that both drain to the East Diversion Ditch: a 24-inch pipe running through the rear yards of properties along Boal Parkway and Sumac Lane; and a 12-inch pipe carrying the drainage from Boal Parkway. The 24-inch outlet may have drained Nick Corwin Park at some point in the past, but that pipeline has since been severed at Tower Road.

The sewer currently only serves to drain the rear yards directly above it, as several residents have connected area drains to the sewer. When the water surface in the East Diversion Ditch rises, the flow of stormwater is blocked at both storm sewer outlets in the Study Area, which results in yard and street flooding. The Village requires that downspouts drain to the ground before stormwater enters the public storm sewer system, unless the downspouts drain first to a stormwater detention system.

However, sump pumps are allowed to connect directly to the storm sewer. Single family redevelopment is required to provide detention based on the difference between the existing condition impervious area and the maximum lot coverage allowed by code.

The Cook County Watershed Management Ordinance exempts all single-family homes from its requirements. Residential subdivisions or resubdivisions of 1 acre or larger require runoff calculations and volume control; at 5 acres, detention is required.

When a new home is constructed in the floodplain, or an existing home in the floodplain is substantial improved, the home must be elevated so the lowest floor is above the 100-year flood elevation. Compensatory storage is required for any fill placed in the floodplain.



FEMA FLOODPLAIN MAP

Most yards in the Study Area do not have a suitable overland flow path for stormwater whenever the storm sewer system is at capacity, since the front yards are typically lower than the road. The soils in the Study Area have characteristically high groundwater, which limits the rate that standing water can percolate into the soil.

At the south end of Boal Parkway, the East Diversion Ditch forms a pond that is classified as a wetland by the National Wetlands Inventory. There are other nearby wetlands in the golf course east of Boal Parkway.

3C | Past & Ongoing Plans

COMPREHENSIVE PLAN

The Village's Comprehensive Plan, WINNETKA 2020, was formally adopted by the Village Council on November 16, 1999. The Comprehensive Plan addresses many topics relevant to this Pilot Study, including: development in R2 zoned districts, impermeable surfaces, buildings located in floodplains, and storm and sanitary sewers .

The plan states that..

- Temporary ponding is considered acceptable, but flooded basements / impassable streets are not acceptable.
- It suggests resident surveying to identify areas of the Village served by undersized or inadequate sewers.
- It also addresses the need to monitor the effects of development and continue to refine regulations concerning development in low-lying areas.

FLOOD INSURANCE STUDY

The Cook County Flood Insurance Study was last updated on August 19, 2008.

It determined that...

- The 100-year flood elevation in the Boal Parkway Study Area to be 625.3 from Hill Road to the north Village limits (based on the North American Vertical Datum of 1988).

WATERSHED PLAN

The Metropolitan Water Reclamation District of Greater Chicago completed a Detailed Watershed Plan for the North Branch of the Chicago River and Lake Michigan Watershed in January 2011.

The Plan determined that...

- The 100-year flood elevation in the Study Area to be 625.5 feet (based on the North American Vertical Datum of 1988). The Village's topographic maps indicate the ground elevations within the Study Area generally range between 620 and 627.

FLOOD RISK REDUCTION ASSESSMENTS

Major flooding occurred in Winnetka in September 2008, following extended storm activity related to Hurricane Ike. This major flooding event prompted the Village of Winnetka to investigate the capacity of its stormwater infrastructure. The Village then commissioned Flood Risk Reduction Assessments to identify areas in need of capital improvements for stormwater management.

The Village completed a Flood Risk Reduction Assessment of the "Additional Study Areas" in December 2012. These study areas were not included in the original Flood Risk Reduction Assessment of 2011. The Boal Parkway neighborhood was part of Area E in the Additional Study Areas.

Recommended improvements for the Boal Parkway neighborhood included...

- Replacing existing 12" diameter storm sewers with storm sewers ranging in size from 18" to 24"
- Increasing the inlet capacity of the storm sewer system;

However, the Assessment acknowledges the sensitivity of the storm sewer system to the elevation of the water surface at the outlet, which limits the benefits of the recommended improvements when the East Diversion Ditch crests after a significant rainfall.

The estimated cost of the recommended improvements serving Boal Parkway was approximately $372,000.

FLOOD SURVEYS

The most extreme storm event in recent Village history took place on July 22-23, 2011. Following that event, the Village sent a survey to all residents inquiring about flooding they may have experienced during the July 2011 storm event.

- Of the approximately 4,425 properties in the Village, 1,061 survey responses were received.
- Four properties on Boal Parkway responded to the survey and, of those, two reported flooding.
- One property reported window well/doorway flooding and the other reported flooding due to a sump pump failure.

Another resident survey was conducted in 2013.

- Of 17 properties within the Study Area, 10 residents responded.
- 40% of respondents reported overland flooding.
- 50% reported basement flooding, mostly from sump pump failures.

STORMWATER MASTER PLAN

The Village adopted its Stormwater Master Plan in April 2014. The Plan presents a comprehensive, multi-faceted strategy to manage stormwater runoff quantity and quality, to manage sanitary sewer discharges, and to guide Village investment and policy decisions.

The Plan outlines capital improvement projects, establishes floodplain management priorities, recommends stormwater best management practices, and addresses development regulations, all from a Village-wide perspective.

ALL HAZARDS MITIGATION PLAN

The Cook County All Hazards Mitigation Plan is currently being developed and may be completed in 2014. This plan is a collaborative effort between the County and municipalities and townships within the County. It will identify activities that can be undertaken by both the public and private sectors to reduce safety hazards, health hazards, and property damage caused by all types of hazards, including flooding.

The development and subsequent adoption of this plan will allow communities to become eligible for Federal Emergency Management Agency (FEMA) hazard mitigation funds.

3D | Community Outreach

SURVEY RESULTS

Residents in the Boal Parkway Study Area were asked to complete a survey as part of this project. The survey prompted respondents to provide details of their experience with flooding in their homes and on their properties (see Appendix 2). Completed surveys were returned by owners of 11 of the 17 properties in the Study Area.* The specificity of the survey questions was intended to provide a detailed understanding of site specific and neighborhood flooding issues.

In considering various locations in their homes and around their property respondents were asked to indicate the storm severity that led to flooding, water depths during that flooding, and how long it took for flooding to subside. Severity was described in general terms, such as: light rain/drizzle, medium rain, heavy rain, sudden deluge, and melting snow. Respondents also were asked to indicate the type of improvements they have undertaken to mitigate stormwater in and around their homes.

Key Survey Findings

1. Average length of time living in homes on Boal Parkway was 23 years (two respondents have lived in their homes 40 years, and the shortest was eight).

2. Home flooding came from a range of locations: through a floor drain or bathroom fixture, basement wall seepage, floor seepage, window well, or sump pump failure. Note: Responses were not required to be exclusive; several respondents had multiple answers.

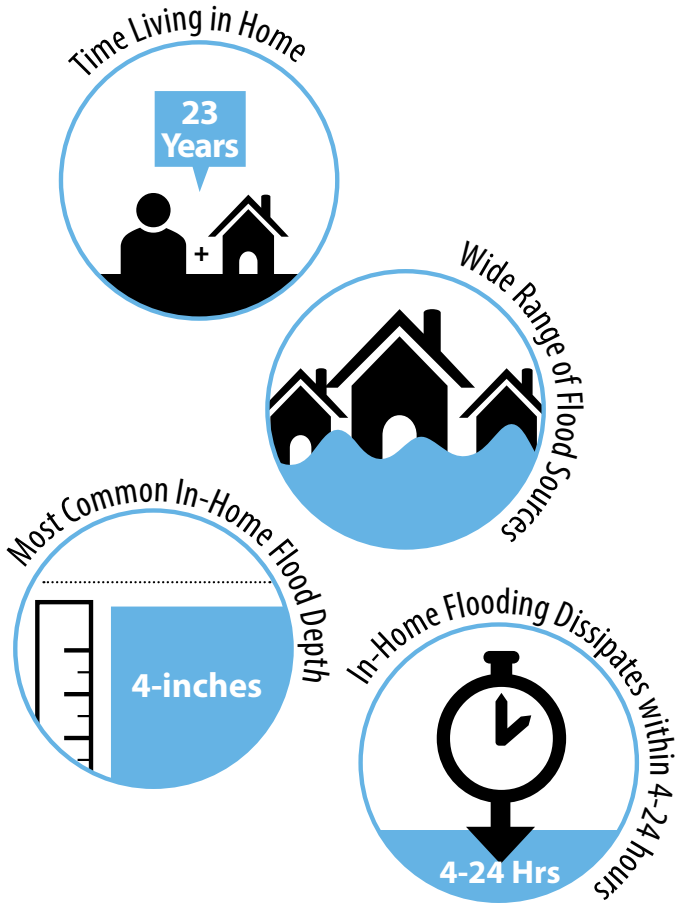
3. When flooding did occur in homes, it most commonly did not exceed four inches and the water was typically gone within 4 to 24 hours.

4. Eight of the 11 survey respondents indicated they had made improvements to their homes to prevent or limit flooding or seepage. The most common improvement was the addition of a sump pump or sump pump backup system.

5. Most respondents indicated a "heavy rain" was required to cause yard flooding (as opposed to a "light rain" or "medium rain", or "snowmelt").

6. All 11 respondents noted rear yard flooding, and four in the front yard. Eight of the 11 noted having made improvement to limit property flooding.

7. Yard flooding was most commonly reported to be more than four inches deep and remaining for greater than 24 hours.



* The small sample and number of responses do not provide (nor was it intended to provide) a statistically significant response to provide definitive answers to the flooding issue. The intent was to understand the location and intensity of flooding, as well as how property owners have already begun to address the flooding issue.

1ST OPEN HOUSE

As follow up to the survey, Study Area residents were invited to attend an open house to provide further information on the location, intensity, and impact of flooding on their property.

Residents from seven of the properties attended the open house. Working with detailed map of each property, participants indicated the general location of flooding (on site and in their home), the direction of water flow on their property, and the location of various structures on the site that may inhibit drainage.

Road paving on Boal Parkway elevated the road surface.

Berms located along the edge of the Winnetka Golf Course.

The maps were completed working with members of the consultant team. An example completed site study is included as Appendix 4.

The mapped information and one-on-one discussions between resident and consultant were useful in understanding current flooding issues and the history of flooding in the neighborhood. As highlighted below, the discussions and mapping identified several key aspects regarding residents' history with and understanding of stormwater management in the neighborhood:

Highlights from Open House Discussions

- A 24" stormwater line runs from north to south in an easement (known as the Grove Street easement) at the back of the homes on the west side of Boal Parkway. The line is capped and serves only the area south of Tower Road. Residents noted that water in the sewer backs up out of it during significant rains.
- The storm sewer line in the Grove Street easement outlets at the south end of Boal Parkway into the East Diversion Ditch. When the water level in the Ditch rises, the storm sewer cannot drain the rear yards along the west side of Boal Parkway.
- Boal Parkway had been a private gravel road until the 1990's, at which time the Village paved and took jurisdiction of the road. The Village also added a storm sewer system. As a result of the paving, the surface of the road was elevated.
- The Winnetka Golf Course located east of the neighborhood has a series of berms separating it from the neighborhood. Residents reported that drainage from the golf course does not flow into the neighborhood.

3E | Preliminary Recommendations and 2nd Open House

After the conclusion of the first open house, residents were invited to attend a second open house, at which preliminary recommendations were presented regarding individual lot and neighborhood-scale solutions. Three residents attended the second open house. The three residents were from three separate households, all on the west side of Boal Parkway. The presentation was informal, allowing residents the opportunity to ask questions and provide feedback as each potential solution was presented. Concept plans were used to illustrate the neighborhood-scale solutions and photographs were used to illustrate the individual lot solutions. The slideshow presentation from the second open house is included in Appendix 5.

NEIGHBORHOOD SCALE SOLUTIONS

These solutions would require, at a minimum, the coordination of several property owners for construction and long-term maintenance. They would have a greater cost and require more time to implement than the individual lot solutions, but these solutions could potentially have a greater impact on flooding. Plus, the cost could be spread between the properties benefiting from the improvements. These types of improvements were evaluated at a concept level. Additional work, from ground-based topographic surveying to detailed plans and cost estimates and permits, would be needed to implement them.

Neighborhood Scale Solution #1
Augment Golf Course Berms

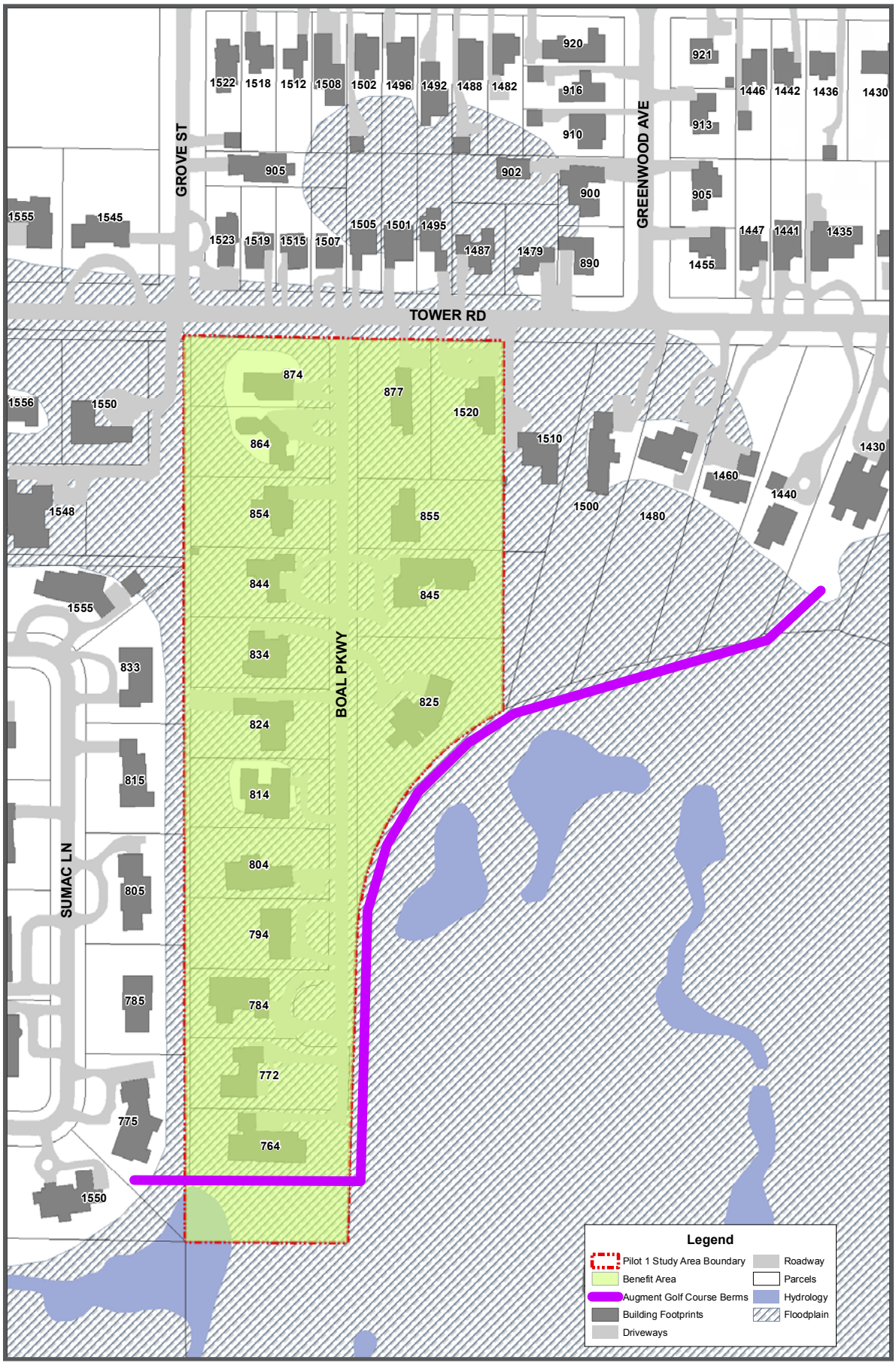
The first potential improvement presented was a berm across the floodplain and the adjacent Park District golf course. This project would involve filling the gaps between the existing berms along the edge of the golf course. It would require the cooperation of the Park District and several individual property owners, including property owners outside of the Study Area. Depending on the desired protection level, the berm height could be increased to provide different protection levels (i.e., 10-year vs. 100-year). The cost of the berm and its impact on affected properties would increase with the height of the berm.

Protection from the 100-year flood would require the berm to be certified as a levee, entailing structural design and permitting through the U.S. Army Corps of Engineers and FEMA.
Since the berm would trap runoff from the Study Area, the project would also have to include a pumping station discharging stormwater over the berm and into the East Diversion Ditch.

The feedback from the residents in attendance was unanimously negative toward this project. Despite the neighborhood's location within the floodplain, the residents stated they were not aware of floodwaters ever overflowing the banks of the East Diversion Ditch, then flowing across the golf course and into the neighborhood. This included one resident who has lived in the neighborhood for 40 years. Therefore, the residents in attendance questioned the benefit of this project. They agreed that the road, which was elevated when it was paved in the 1990's, effectively created a berm that protects the properties along the west side of Boal Parkway, if the golf course is ever flooded.

** See diagram on following page*

Neighborhood Scale Solution #1 - Augment Golf Course Berms



Neighborhood Scale Solution #2
Lower Boal Parkway Pavement

The Village's topographic mapping indicates that, in order for runoff from the west to drain across Boal Parkway to the east, a section of Boal Parkway would have to be lowered by approximately two feet. The residents reported that this was about the extent to which it was raised when it was improved to Village standards. It is possible that this project could be incorporated into a Village road maintenance project, but the additional cost would be significant, and the existing storm sewer system would have to be examined carefully to make sure it would still drain the lowered roadway. Furthermore, at least one rear yard would have to be filled to ensure positive drainage across Boal Parkway.

The attending residents were not supportive of this project, indicating that it would provide little benefit but entail a significant expense. The raised profile of Boal Parkway was also perceived as an existing benefit for some within the Study Area. Lowering the road would increase their risk of flooding.

** See diagram on following page*

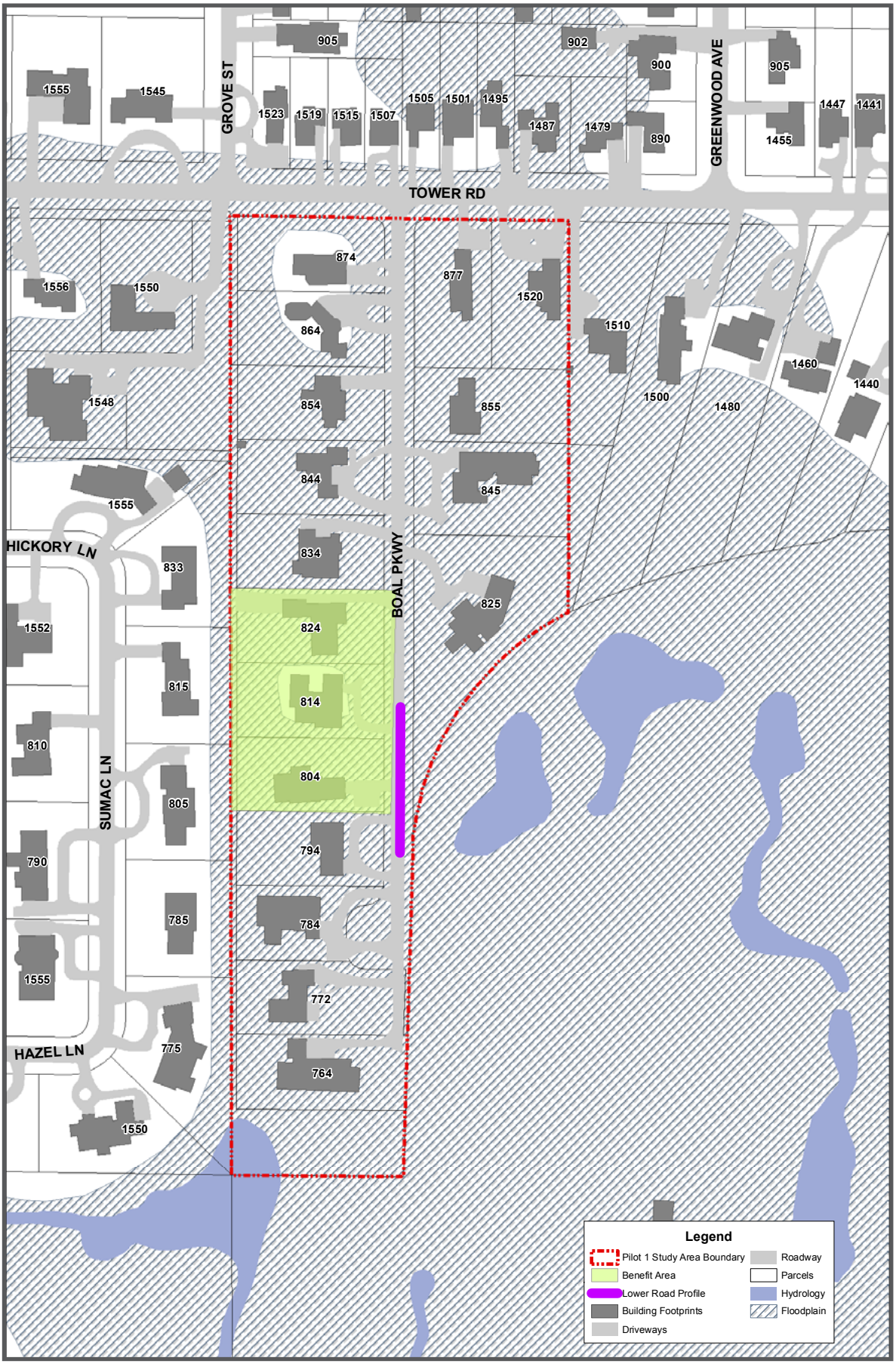
Neighborhood Scale Solution #3
Neighborhood Pump Station

The third solution presented was a stormwater pumping station at the south end of the Study Area, which would involve connecting the two parallel storm sewers (Boal Parkway and the Grove Street easement), building a pumping station at the connection point, and running a discharge pipe along the same route as the existing gravity outlet from Boal Parkway. This improvement would allow these storm sewers to continue functioning even when the water level in East Diversion Ditch is elevated. The location and long-term maintenance responsibilities of the pumping station would have to be worked out among the residents and the Village.

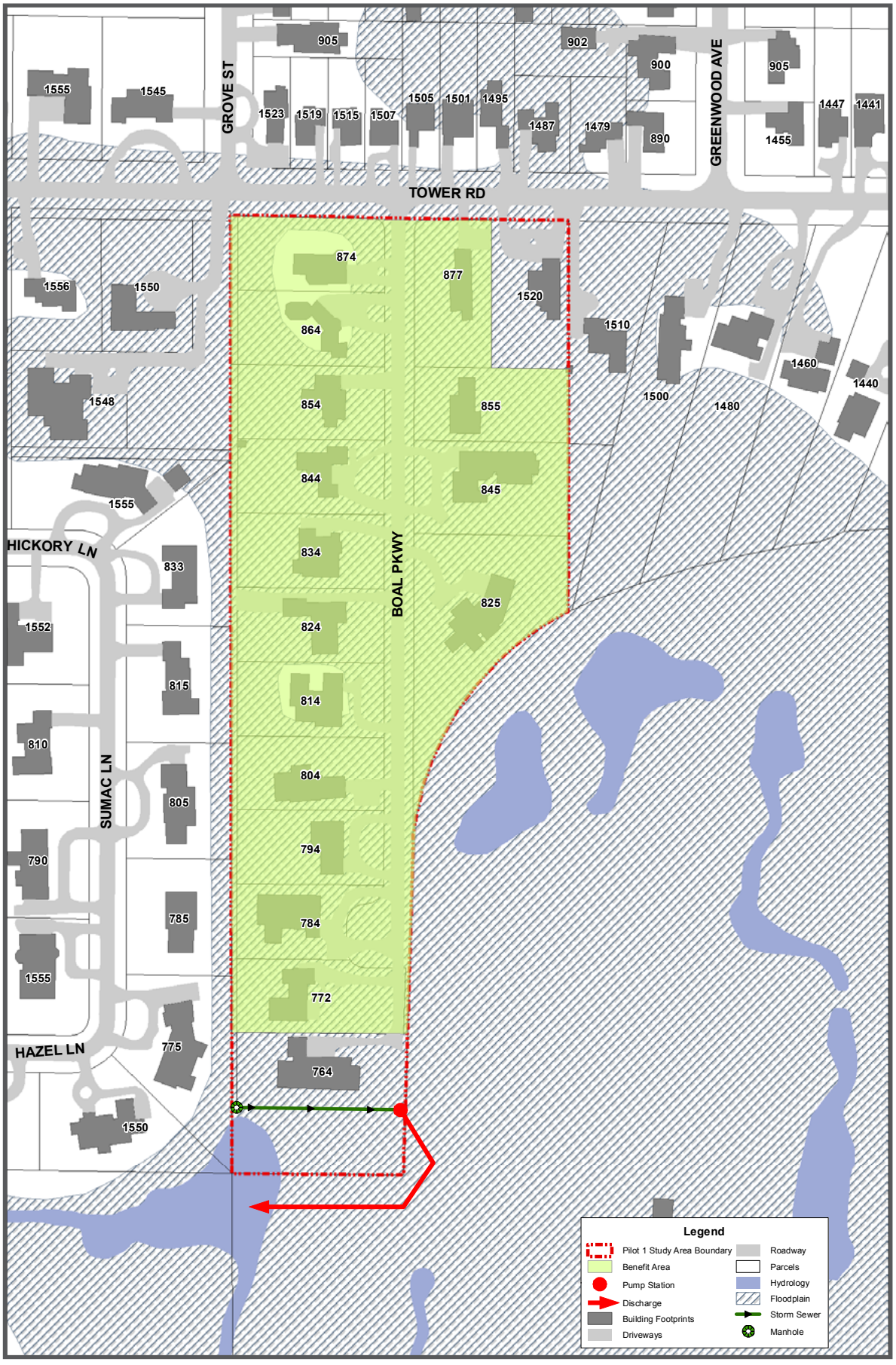
The attending residents were all in favor of this option, indicating that their flooding problems occur only when the storm sewers in the Study Area are unable to drain, due to the water level in the East Diversion Ditch. They indicated that the storm sewer inlets are generally able to accept the runoff from the neighborhood, but flooding occurs when stormwater surcharges from the storm sewer system. The consensus among attending residents was that the above-ground features of the pumping station could be effectively screened by the existing trees in the area or with additional plantings.

** See diagram on page 24*

Neighborhood Scale Solution #2 - Lower Boal Parkway Pavement



Neighborhood Scale Solution #3 - Neighborhood Pump Station



Neighborhood Scale Solution #4
Improved Overland Flow Path

Creating a positive slope from the north end of the Grove Street easement to the south end would require excavation as much as six feet deep at the downstream end. Plus, at the excavated depth, rising water in the East Diversion Ditch would flood the easement more regularly than it currently does. Therefore, the conceptual plan focused on re-grading the rear yards and adding a few inlets at select locations, to minimize the depth of flooding at the elevation where surface water could begin to flow overland to the East Diversion Ditch. Even minimal re-grading in the easement would entail the loss of trees, some of which are scrub trees that provide screening and others which are mature hardwood trees. The re-grading would also impact landscaping and fences.

The residents did not favor such a project, citing the minimal benefit it would provide and their strong preference for a pumping station.

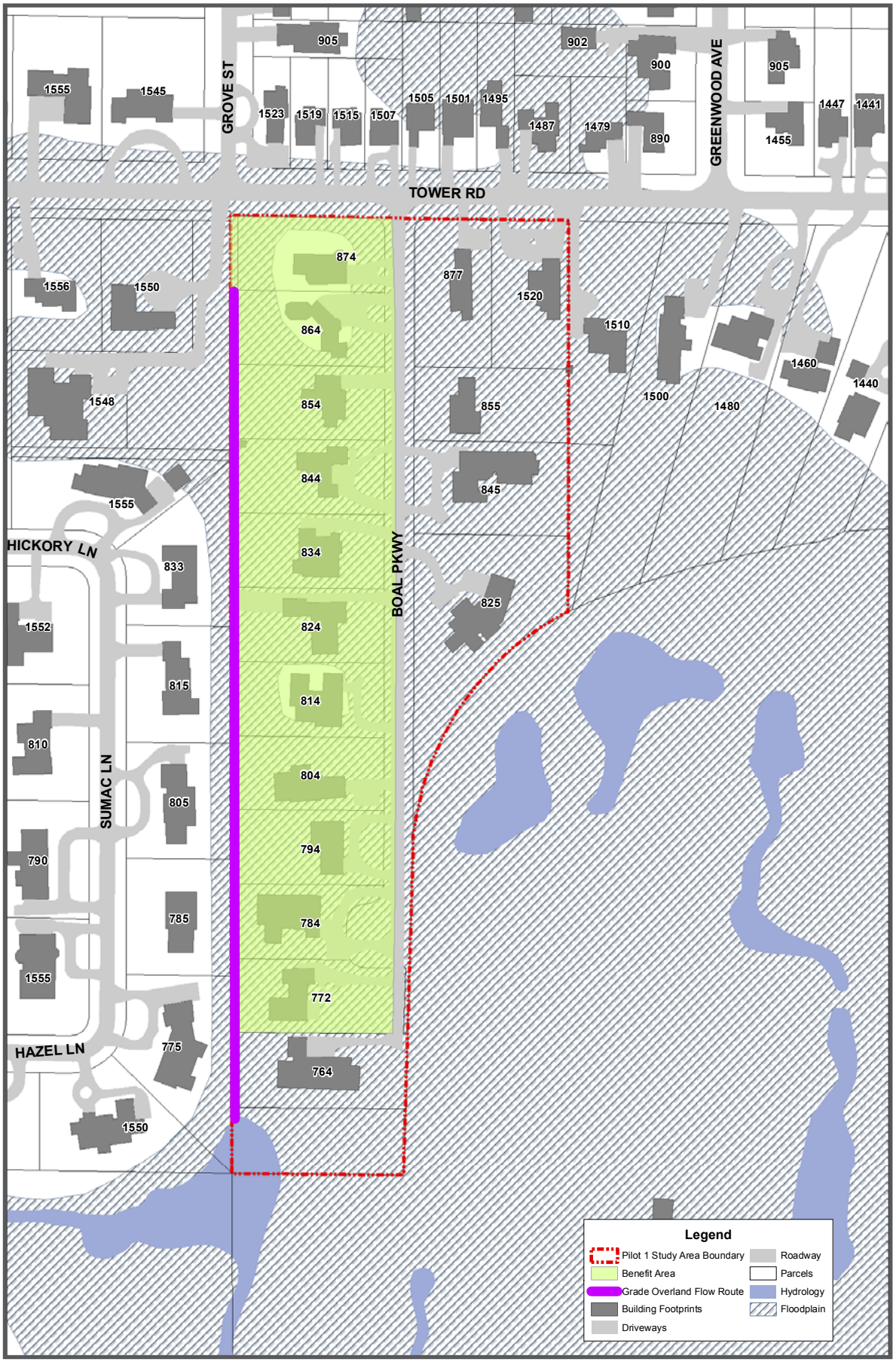
** See diagram on following page*

Neighborhood Scale Solution #5
Local Detention

The final neighborhood-scale solution presented at the open house was a detention pond; however, no specific location was suggested. Such a pond would ideally be located in an area that is already prone to flooding. The available storage volume would be expanded by excavation and the surrounding areas would be allowed to drain into it; however, the benefit of the excavated storage could be lost during wet seasons when the groundwater level approaches the ground surface and fills all or a portion of the excavated storage volume. Tree and landscaping removal would be significant for this project, but would be concentrated at the pond location; therefore, the impact of this project would be borne by a limited number of property owners. The cost of a detention pond would increase the further the pond is located from an existing flood prone area, because more storm sewer pipe would be required.

The residents' response to this solution was negative.

Neighborhood Scale Solution #4 - Improved Overland Flow Path



INDIVIDUAL PROPERTY-SCALE SOLUTIONS

Individual property solutions were also presented and discussed at the second open house. Since the neighborhood-scale solutions are not fully developed and since the funding for those projects has not yet been secured, residents may elect to implement one or more individual property solutions, rather than wait for a neighborhood-scale solution to be developed. These measures can be implemented swiftly, without the need to coordinate with other property owners.

Appendix 6 consists of a matrix of individual lot solutions organized by the source of the flooding problem. For each flooding cause, a variety of solutions were presented. The matrix explains when specific solutions would be the most appropriate and situations where the solution may not work well. The matrix can be very helpful for a neighborhood like Boal Parkway, where many residents have already implemented some measure of flood protection, but the flooding problem has not been completely solved yet. In such cases, the matrix provides a range of potential solutions that might complement or replace previous installations.

The residents seemed to find these ideas helpful; several ideas were new to them and not something they had previously thought to try. The most applicable solutions seemed to be outdoor sump pumps, overland flow paths, and indoor sump pump modifications. As much as the attending residents appreciated the individual recommendations, they still preferred the neighborhood-scale solution of a pumping station at the south end of Boal Parkway.

4

	Type of Problem	Solution	Purpose	Ideal Applications	Limitations and Other Considerations
Outside the Building	Landscaped Areas	Construct a rain garden	Reduces the period of inundation by increasing the rates of infiltration and evapotranspiration	Where no municipal sewer system is nearby	Clayey soils and high groundwater limit the rate of infiltration
		Install a yard drainage system	Convey stormwater from the yard to the municipal sewer system	Where the municipal sewer system is nearby and lower than the flood prone area	May require removal of trees or relocation of utility service lines
		Excavate high ground or fill in a low-lying area	Create a suitable overland flow path from the flood prone area	Where a small amount of excavation allows overland flow from a low lying area of the yard to the street	Must not create a flooding problem on another property and floodplain fill requires compensatory excavation
		Install a rain barrel	Reduce the amount of runoff to flood prone area	Where the area contributing runoff is small	Storage capacity can be overwhelmed by intense rain
		Install a sump pit, sump pump, and discharge line	Pump water out of the stairwell	Where the ground is sloped to drain away from the stairwell	Requires a discharge point that does not create a flooding problem on another property
		Remove debris from inlets	Prevent clogged storm drains	Any storm drain inlet	Inlets should be cleaned regularly
		Install a check valve on the sewer service line	Allow the free flow of water through the sewer service and prevent backflow	Where the sewer system reaches or exceeds its capacity from time to time	Debris within the sewer service line can prevent proper operation
	Paved Areas	Reconstruct pavement with permeable pavers	Store water in the aggregate below the pavers and allow it to infiltrate into the soil	Anywhere	Clayey soils and high groundwater limit the rate of infiltration
		Reconstruct pavement to drain	Prevent water from accumulating on paved areas	Where a ground slope of 1% or more can be attained	Fill in a flooplain requires compensatory excavation
		Install a trench drain and a drainage system	Convey stormwater from the paved area to the municipal sewer system	Where the municipal sewer system is nearby and lower than the paved area	May require relocation of utility service lines
		Construct a driveway berm	Prevent overland flow from the street from flooding a garage	Where the garage floor is lower that the street	The height of the driveway berm depends on the level of protection desired, which could be set a certain distance above the existing driveway or it could be set to match the elevation of the lowest ground elevation that cannot be raised

Snapshot Section of Matrix

3F | Action Steps

POTENTIAL NEXT STEPS FOR PROPERTY OWNERS ON BOAL PARKWAY

The first step for every property owner is to develop an inventory of the existing flooding issues they face and the flood control measures already installed on their property.

The matrix in Appendix 1 can be used to identify the source of any unresolved problems. Based on the type of flooding the property experiences, the property owner can then sort through possible solutions using the matrix in Appendix 6 and taking into account cost, effectiveness, and feasibility. Many of the solutions are best used in conjunction with others; combining several different flood control measures will give the system strength and redundancy.

Specific recommendations for property owners on Boal Parkway include creating a side yard overland flow path to alleviate rear yard flooding, where possible.

When the ground elevations are not conducive to constructing an overland flow path, an outdoor sump pump can be installed in a low-lying area of the rear yard with a discharge line connected to a pop-up structure in the front yard.

An alternative approach would be to construct a rain garden in the low-lying area. The rain garden would be planted with deep rooted native plants that increase the rates of infiltration and transpiration of runoff that drains to the rain garden.

Indoor flooding can be alleviated by making sure every property has a back-up sump pump with an alternate power source and a surface overflow at some point on the sump pump discharge line. The overflow will prevent the sump pump motor from burning out when the storm sewer system is at capacity. The overflow could be as simple as an air gap just outside the foundation wall, but a better option would involve fitting the discharge line with a tee at the air gap allowing the overflow point to be extended away from the foundation wall.

Basement window flooding can be resolved by adding concrete window wells with a higher top-of-wall elevation, or replacing low-lying glass pane windows with glass block windows.

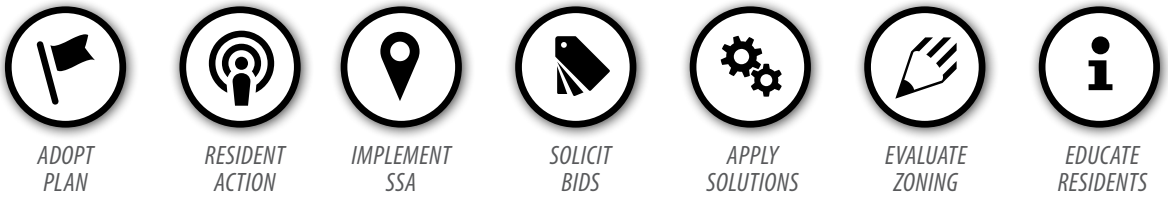
Overland Flow Path

Rain Garden

Backup Sump Pump

Glass Block Windows

POTENTIAL NEXT STEPS FOR THE VILLAGE OF WINNETKA



Adopt Plan

The Village's first step is to adopt this plan as an addendum to the Stormwater Master Plan. It gives residents the tools to understand and proactively address flooding on their property and in their neighborhood.

Support Resident Action

Residents are encouraged to take the lead in addressing localized flooding, but the Village can offer support and guidance helping to identify sources of funding by preparing and submitting grant applications, and then taking responsibility for administering any grant funding that can be secured.

Solicit Bids

Resident-led efforts to address localized flooding that could be supported by the Village include: soliciting bids from contractors to construct improvements, such as sump pumps, landscaping, or permeable pavement at multiple properties at a lower unit price than individual residents could obtain on their own; or bidding a privately funded neighborhood-scale solution with a Village-funded project to get lower unit prices than the neighborhood could get on their own.

Apply Solutions

The Village could apply the templates developed as part of the Water Solutions Project to identify readily implementable solutions in other flood prone areas of the Village. Areas of the Village that would be prime candidates for this type of study include Areas A, C, G, and N from the Flood Risk Reduction Assessment completed in December 2012 for the Additional Study Areas.

Educate Residents

Educate residents about stormwater and floodplain management. The implementation of Winnetka's new stormwater utility has already done a lot to educate the public about the factors that influence the rate and volume of stormwater runoff from their property. The Village could make the educational materials generated for the Water Solutions Project available on its website. These materials help the public discover actions they can take, either individually or collectively, to combat localized flooding.

Evaluate Zoning

The Village could also amend its zoning regulations that relate to stormwater management, as recommended in the Village's Comprehensive Plan and Stormwater Master Plan (see chart on following page). These standards function to maintain the Village's community character, so they must be evaluated in the context of both applications; however, a change that adds emphasis to mitigating stormwater impacts may be appropriate for certain applications or areas.

ZONING REGULATIONS TO BE EVALUATED

1 **Maximum Front Yard Lot Coverage**

The Village Zoning Ordinance regulates how much of the front yard can be covered by structures. For lots smaller than R2, the maximum is 30 percent coverage; however, there is no maximum in R2 and R1 zoning districts. The concept is that R2 and R1 lots are larger lots and can include more structures without impacting the area character. From a practical standpoint, this encourages construction of circular driveways and parking pads in front yards, which add to impermeable surfaces.

2 **Maximum Total Area of Impermeable Surfaces**

The maximum lot coverage of 50% (applicable in all zoning districts) is somewhat higher than current exists in the Study Area. The average there is about 30% and only two of the seventeen properties in the Study Area are higher than thirty-five percent. Setting a lower impermeable surface maximum would maintain more natural surfaces, and in the Study Area create limited nonconforming properties.

3 **Garage Regulations**

The two standards of 1) bonus square footage toward Gross Floor Area that comes with placing detached garages in the rear portion of lots and 2) encouraging side loaded garages (by limiting the width of front facing garages) support design objectives of reducing building bulk and the appearance of garages at the front of a building; however, both of these regulations support (effectively require) more driveway length on a given lot.

4 **Semi-Permeable Surfaces**

Eighty percent of an area installed as brick, stone, or concrete pavers counts toward the maximum permitted impermeable surface of a lot. This allows a greater area of these materials to be installed than other pavement. It creates a higher level of aesthetic by many standards and does allow for some amount of water to pass through to the ground. From a stormwater management standpoint these materials do not facilitate as much rain water absorption as natural areas, but do require maintenance to retain their degree of permeability.

CATALOG OF POSSIBLE FUNDING METHODS

Increased Cost of Compliance

After a flood, holders of National Flood Insurance Program insurance policies may eligible for payments of up to $30,000 above the cost to repair structural damage to the affected property. This additional coverage is called Increased Cost of Compliance (ICC), and it applies if policy holders are required to meet certain repair or rebuilding requirements. These requirements and the ICC coverage are triggered in cases where a home or business is more than 50% damaged during a flood ("substantially damaged") or where a home or business has been flooded at least twice in the past 10 years ("repetitive damage"). ICC payments may be used for elevation of the structure, relocation, demolition, or floodproofing.

Cook County All Hazards Mitigation Assistance

Several other sources of hazard mitigation assistance will become available once the Cook County All Hazards Mitigation Plan is complete and has been adopted by both the County and the Village. The Plan is currently being developed by Cook County and may be completed in 2014.

FEMA Hazard Mitigation Assistance Programs

FEMA hazard mitigation assistance programs include the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) program, and Flood Mitigation Assistance (FMA). Each program has its own eligibility and funding criteria, but each can be used to fund property protection measures as shown in the table on the following page, provided that the benefits of the project exceed project costs (B/C>1). In general, these programs are funded when FEMA approves an application prepared jointly by a local government, such as the Village, and the Illinois Emergency Management Agency (IEMA). In most cases, FEMA pays 75% of eligible expenses, but the federal share can reach 90% for Repetitive Loss Properties and 100% for Severe Repetitive Loss (SRL) properties.

MWRDGC Stormwater Management Program

In 2014, the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) began its Phase II Stormwater Management Program, which funds local projects designed to improve drainage and reduce flood damage. From time to time the MWRDGC will announce a formal call for funding requests, but funding requests are accepted at any time. The Village could request funding for the entire cost of a neighborhood-scale solution, but the MWRDGC generally prefers to fund projects that are partially funded by another source. This other source of funding could potentially come from a FEMA hazard mitigation assistance program.

Stormwater Utility

The Village of Winnetka recently created a Stormwater Utility to fund stormwater expenses. The Village uses a bi-monthly stormwater fee based on the property's impact to the stormwater system. The stormwater fees fund all aspects of the Village stormwater system, including current operating and maintenance expenditures and the anticipated debt service associated with capital improvement projects. The Village's capital improvement program does not include a stormwater capital improvement project for Boal Parkway, but additional projects may be programmed once the currently programmed projects have been designed and constructed.

Special Service Area

Another funding option would be for the Boal Parkway residents to build support for a Special Service Area to fund one or more neighborhood improvement projects. Special Service Areas are local tax districts that fund expanded services and programs through a localized property tax levy within contiguous areas. The enhanced services and programs would be in addition to those currently provided through the Village.

Cost Sharing Program

The Village could establish a neighborhood-led initiative, such as Glenview's SWAMP Program, that allows residents to petition to install local drainage projects with the help of the Village. The property owners would present a petition to the Village that requests consideration of a local drainage project. If the majority of property owners support the drainage improvement, the Village would provide a report including costs for the improvement. If the plan is approved by a majority of the property owners, the drainage improvement can be built, and would be partially funded by the Village.

FEMA HAZARD MITIGATION ASSISTANCE PROGRAMS

Eligibility & Funding Criteria

Eligible Activities	HMGP	PDM	FMA
Property Acquisition and Structure Demolition	√	√	√
Property Acquisition and Structure Relocation	√	√	√
Structure Elevation	√	√	√
Mitigation Reconstruction			√
Dry Floodproofing of Non-residential Structures	√	√	√
Minor Localized Flood Reduction Projects	√	√	√
Structural Retrofitting of Existing Buildings	√	√	
Non-structural Retrofitting of Existing Buildings and Facilities	√	√	√
Infrastructure Retrofit	√	√	√
Post-Disaster Code Enforcement	√		
Generators	√	√	

Chapter 4
pilot study #2

Multi-Family Block
Glenview, IL

4A | Vision, Goals & Objectives

VISION

Identify ways to reduce the likelihood of flooding along this multi-family block of housing in Glenview and minimize the damage caused when flooding occurs, through property protection measures, land use policies, and green infrastructure that can also be applied to multi-family neighborhoods in other flood-prone areas.

GOALS

- Educate property owners on the causes of flooding
- Gather public input on localized stormwater problems
- Identify a range of readily implementable solutions
- Incorporate public feedback on the recommended solutions

OBJECTIVES

- Involve property owners in identifying causes of and solutions to flooding problems
- Provide property owners with recommendations to mitigate stormwater flooding and flood damage on their property, with solutions applicable to individual properties and scalable to whole neighborhoods
- Develop a plan to guide the Village and property owners through each step of implementation

4B | Existing Conditions & Regulations

The Study Area is approximately one sqaure block consisting of mostly multi-family housing. The block is bounded by Dewes street to the north, Harlem Avenue to the east, Henley Street to the south, and Washington Street to the west. Lots in the Study Area average approximately 12,700 square feet. Buildings in the Study Area average approximately 4,500 square feet, with individual units averaging around 1,600 square feet.

STUDY AREA

SITE FEATURES

- The neighborhood includes two townhome buildings, three stand-alone townhomes, four two-story apartment buildings, and two single-family homes. The building facades are predominantly brick and vinyl siding.
- Most of the lots have significant tree cover and vegetation, especially the back yards.
- Except for Harlem Avenue, which is an asphalt surface, the other roads around the Study Area have concrete surfaces with low rolled curbs.
- The driveways are linear, with the exception of one circular driveway, and either lead to a garage or are used for off-street parking.
- The driveways are constructed of various materials: asphalt, concrete, or brick pavers.
- Several of the driveways slope up from the street and then down towards the backyard. As a result, the foundation openings and lowest adjacent grade levels of some buildings are lower than the roadway.
- There are concrete sidewalks along each of the streets. Driveways and sidewalks together comprise significant paved and impervious areas, particularly in the front yards.
- Each side of the block currently has only one storm sewer inlet.
- The properties have varying amounts of landscaping, with some densely planted.
- Three properties have on-site stormwater detention areas.
- There is a grade change of approximately two to three feet between the parcels in the Study Area and the parcel on the southeast corner of the block.

SURROUNDINGS

- The Study Area is south of a large commercial strip center near downtown Glenview and is part of an area designated in the Village Comprehensive Plan as the "Downtown Frame Neighborhood". This commercial area includes a significant amount of impervious area.
- There is a multi-family townhome development to the east of the Study Area.
- The west and south sides of the Study Area are surrounded by single-family homes.
- The Metra Milwaukee District North Line is one block east of the Study Area. The Village's central business district along Glenwood Road and Waukegan Road is less than half a mile away.

Multi-Family Home in Study Area

Single-Family Home in Study Area

ZONING

Zoning requirements relate to stormwater management by guiding the locations of structures and open space on properties. Stormwater is just one consideration in zoning, and most zoning requirements address property impacts on community character and aesthetics.

- All properties in the Study Area are within an R-18 Residential District per the Village of Glenview Zoning Ordinance. This District permits single and multi-family dwellings as land uses. Certain community and institutional uses also are permitted (parks, private clubs, and nursing homes). Certain other uses are allowed as Conditional Uses through approval by the Village (training schools, houses of worship, and certain communal residences).
- Lots in this District must be a minimum of 6,250 square feet for residential uses. In addition, there must be at least 2,400 square feet of lot per dwelling unit (permitting approximately 18 units per acre). For example, a multi-family building with 10 dwelling units would require a lot of at least 24,000 square feet. Further, the District has a maximum lot size of two acres (87,120 square feet). In effect, this maximum lot size limits multi-family structures in the District to 36 units.

The key factor in which zoning relates to stormwater management is the impermeable surface standard.

IMPERMEABLE SURFACES

- The area of a lot that can be covered by impervious surface is a key element of stormwater management. Developed residential properties in the R-18 Residential District can have a maximum impervious lot coverage of 50 percent; however, if that property also is in the Downtown Frame Neighborhood, it can have a maximum of 62 percent lot coverage (the subject site is in the Downtown Frame Neighborhood). The higher permitted coverage allowed in that neighborhood recognizes that denser development is appropriate in and around a downtown area. (Impervious lot coverage is defined elsewhere in the Village code as including all impervious surfaces except the water surface of an in-ground swimming pool and/or a wood deck with semi-permeable membrane.)

BUILDING SETBACKS AND RELATED DISTRICT REQUIREMENTS

- **Lot Width:** 80 feet minimum
- **Front Yard Setback:** 30 feet minimum
- **Side Yard Setback:** 12 feet minimum (proportionally less on narrower lots) or 30 feet minimum if adjacent to a street
- **Rear Yard Setback:** 25 feet minimum
- **Maximum Building Size** (as determined by calculating the Floor Area Ratio – FAR)**:** 0.65 (this is because the property is in the Downtown Frame Neighborhood – in other areas the maximum R-18 FAR is 0.5).

STUDY AREA CHARACTERISTICS

LOT SIZE
*Range: 8,533– 22,303 sqft **
Average = 12,773 sqft
Median = 11,122 sqft

AGE OF BUILDINGS
*Range: 10 – 86 years ***
Average = 47 years
Median = 53 years

BUILDING SIZE
*Range: 1,375–11,250 sqft ***
Average = 4,557 sqft
Median = 3,813 sqft

IMPERVIOUS AREA
*Range: 3,331–8,713 sqft**
Average = 5,685 sqft
Median = 5,296 sqft

UNIT SIZE
*Range: 916–2,500 sqft**
Average = 1,668 sqft
Median = 1,482 sqft

LOT COVERAGE
*Range: 31–65% **
Average =45%
Median =45%

NOTES:

- The multi-family building that has a circular drive exceeds the permitted lot coverage by 3%.
- The density of two multi-family parcels is higher than the 18 units/acre maximum.

Data Calculations based on:

* Village GIS Data
** Cook County Assessor Data

DRAINAGE FACTORS

The Village of Glenview has a dedicated separate storm sewer system. There are two storm sewer systems (varying in diameter from 8 inches to 21 inches) that run south along Washington Street and Harlem Avenue and connect to a large 48 inch storm sewer that runs east along Henley Street. The mainline sewer along Harlem Avenue then crosses under the Metra Milwaukee District North Line and empties into the West Fork of the North Branch of the Chicago River.

Recent sewer improvements on Henley Avenue (August 2014) installed a 48 inch storm sewer along Henley Avenue in addition to the already existing drainage system. This improvement is expected to provide relief for the street flooding in the area. Based on the modeling done for this project, street flooding from a 100-year storm event should be reduced from 15 inches to 4 inches on Washington Street and from 9 inches to 0 inches on Harlem Avenue.

The Village requires downspouts to splash at grade, but requires sump pumps to be connected to the storm sewer system or to a rain garden. Stormwater detention is required for any redevelopment. For construction of multi-family land uses or single-family subdivisions with more than two lots, developments must provide on-site stormwater detention per Village Code.

The Cook County Watershed Management Ordinance requires detention for multi-family developments disturbing 0.5 acre or more when the parcel being developed (or redeveloped) is 3 acres or larger. It also requires volume control (retention of the first inch of runoff from impervious areas of the development or redevelopment) for multi-family developments disturbing 0.5 acres or more.

The Study Area is not located in a FEMA designated Special Flood Hazard Area, but is classified as a Tier 1 and Tier 2 flood area by the Glenview Flood Mitigation Tiering Framework. Tier 1 is defined as sanitary Capital Improvements Program (CIP) priority areas and Tier 2 as areas of over-foundation flooding. Almost the entire Study Area is also within the boundary of a local surface flooding inundation area, according to the Village's city-wide stormwater model.

Many yards in this Study Area are lower than the road, which makes yard ponding and over-foundation flooding a problem. Some of the multi-family lots have detention ponds, but they were designed under less stringent detention requirements of 20 years ago. There are also many mature trees in the area and leaves often clog roof gutters and stormwater inlets.

Rainwater runoff in the Study Area flows east from Washington Street, through the middle of the block, to Harlem Avenue.

Note: Sloping grade change from building foundation to side yard, contributing to ponding and over-foundation flooding.

4C | Past & Ongoing Plans

COMPREHENSIVE PLAN

The last major update to the Village of Glenview Comprehensive Plan was adopted in 2004. It does not have specific recommendations related to stormwater management or the Study Area; however, the Village extensively considered and planned for stormwater management in recent studies, particularly the 2010 Flood Risk Reduction Program. The 2004 Comprehensive Plan Household Survey included one question about stormwater drainage:

"***How do you rate the overall quality of stormwater drainage in Glenview?"***

- 46% of respondents said that it was "good" or "somewhat good"
- 18.5% of respondents were neutral
- 33% considered stormwater drainage to be "somewhat poor" to "poor"
- 2.5% had no opinion

As addressed in the Glenview Comprehensive Plan, the Study Area is adjacent to "The Main Street" in the Downtown District (essentially Glenview Road from Waukegan Road to Washington Street. The Study Area is considered in the Plan due to its proximately to downtown. In fact, there are separate recommendations for an area around the downtown referred to as "downtown supporting residential districts" in which the Study Area is included. These recommendations effectively call for continuation of the residential character.

GLENVIEW MASTER PLAN

The Glenview Master Plan was written in 1996 and focuses largely on the Glenview Naval Air Station redevelopment. This area, located just north of the Study Area, was planned and developed with a large naturalized detention basin to improve stormwater management in the area.

STORMWATER TASK FORCE

The Storm Water Task Force (SWTF) was formed after a severe flooding event in September 2008 and is still active. The SWTF is charged with identifying local storm water projects and providing cost estimates and revenue sources for these projects. The group consists of 16 citizens that represent a cross-section of Glenview residents. They work with Village staff and consultants to discuss and analyze flooding concerns in Glenview. The Flood Risk Reduction Program (on the opposite page) documents the goals and fundamental principles defined by the SWTF.

STORM WATER UTILITY FEE STUDY

The Stormwater Utility Fee Study was a recommended action of the SWTF in the Flood Risk Reduction Program. The Study includes details on how a stormwater utility fee could be implemented in Glenview, including the impacts on customers, fee structures, and implementation schedule. The stormwater utility would provide a stable, dedicated source of funding for stormwater projects. However, the Village has decided to continue to fund stormwater projects through other sources of revenue.

FLOOD RISK REDUCTION PROGRAM

The Flood Risk Reduction Program was adopted by the Village in 2010. It presents a comprehensive plan of action for flood-risk reduction throughout Glenview. The Program has three goals: to eliminate sanitary sewer backups, to reduce the risk and impacts of over-foundation flooding, and to improve local drainage infrastructure to meet the Village's current design standards. Current design standards specify no street flooding for the 10% annual chance rainfall event and no more than 10 inches of street flooding for the 1% annual chance rainfall event.

The Program has five principles:

1. Efforts to address flooding should include actions that lead to quick visible results;
2. Take action to reduce the rate and volume of discharges to receiving sewers and streams;
3. Solutions should strive to have no significant negative impact on flooding downstream areas;
4. Solutions should include public, private, local and regional efforts; and
5. Costs to address all identified problems are very large; prioritizing efforts is required.

The Program outlines capital improvement projects for in-pipe detention, storm sewer conveyance improvements, and storm inlet capacity improvements. Capital improvement projects also include "quick win" projects. "Quick win" projects are defined as projects that are intended to achieve visible reductions in flooding in certain areas in a short period of time. These included both sanitary sewer and stormwater projects.

The Program also implemented cost-sharing initiatives for residents for beneficial storm water projects, including: rain gardens, over-head sanitary sewer service conversions, and holistic drainage inspections. These inspections are performed by licensed professional engineers working for the Village, with the cost split between the Village and the homeowner. Existing drainage issues and features are identified on and in the building, the yard, and surrounding areas. The solutions are identified, assessed for potential benefits, and their expected costs are estimated in a final report to the homeowner. The owner also receives a discount on Village permit fees for work needed to implement the identified solutions. The Program also organized funding mechanisms for future projects.

HAZARD MITIGATION PLANS

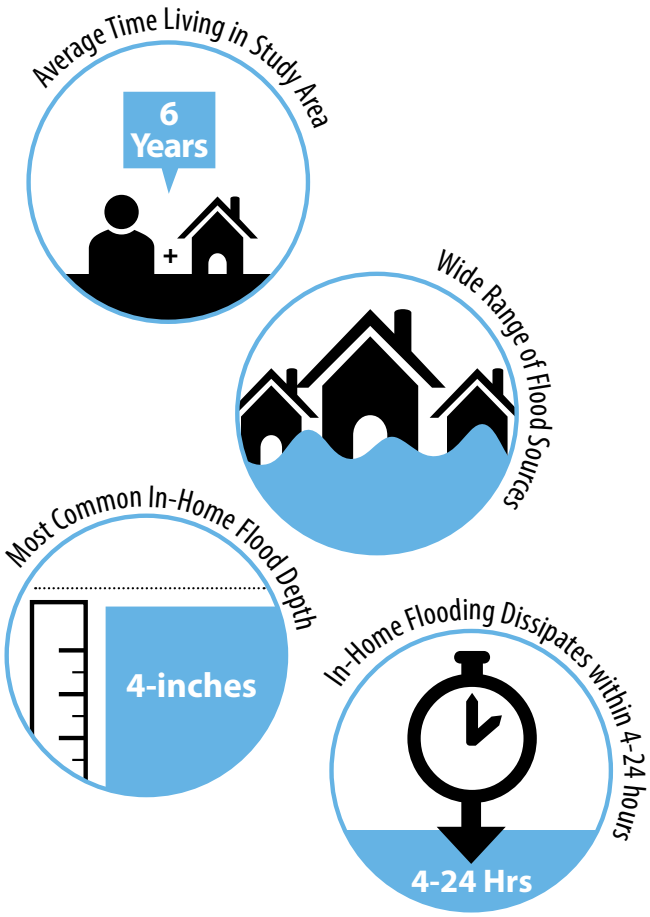
The Village adopted a Multi-Hazard Mitigation Plan in 2009. This Plan identifies activities that can be undertaken by both the private and public sectors to reduce safety hazards, health hazards, and property damage caused by multiple types of hazards, including flooding. This Plan makes the Village eligible for Federal Emergency Management (FEMA) hazard mitigation funds.
The Cook County All Hazards Mitigation Plan is currently being developed by Cook County and may be completed in 2014. This Plan is a collaborative effort between the County and municipalities and townships within the County. It will identify activities that can be undertaken by both the public and private sectors to reduce the risk of property damage and loss of life caused by all types of hazards, including flooding.

4D | Community Outreach

SURVEY RESULTS

Residents of the Study Area were asked to complete a survey as part of this project. The survey prompted respondents to provide details of their experience with flooding in their homes and on their properties (see Appendix 2). Completed surveys were returned by eight residents in the Study Area (five property owners and three tenants).* The specificity of the survey questions were intended to provide a detailed understanding of site specific and neighborhood flooding issues.

Respondents were asked to indicate the storm severity that led to flooding, water depths during that flooding, and how long it took for flooding to subside. Severity was described in general terms, such as: light rain/drizzle, medium rain, heavy rain, sudden deluge, and melting snow. Respondents also were asked to indicate the type of improvements they have undertaken to mitigate stormwater in and around their homes.



Key Survey Findings

1. The average length of time respondents have lived in their homes in the Study Area was six years; the longest term was 14 years. Three respondents indicated living in the area for one year.

2. Home flooding came from a range of sources. The most common were doorways, seepage, drains (bathroom fixtures), and window wells. Respondents were allowed to provide multiple answers.

3. When flooding did occur in homes, it most commonly did not exceed four inches, and the water typically was gone within 4 to 24 hours.

4. Respondents noted they had made improvements to their homes to prevent or limit flooding or seepage. Three indicated having installed overhead sewers and three indicated they had installed a check valve.

5. Residents who did have flooding were asked what type of rain caused the flooding to occur; all respondents indicated that "heavy rain" or "sudden deluge" was the cause.

6. Four of eight respondents indicated they had made improvements to their property to address flooding. Improvements focused on maintenance of storm drains and other stormwater management elements.

* The small sample and number of responses do not provide (nor was it intended to provide) a statistically significant sample. The intent was to understand the local occurance and intensity of flooding, as well as how local property owners have already begun to address the flooding issue.

1ST OPEN HOUSE

As follow up to the survey, Study Area residents were invited to attend an open house to provide further information on the location, intensity, and impact of flooding on their property.

Residents from 33% of the parcels in the Study Area attended the open house. Working with detailed maps of the properties, participants indicated the general location of flooding (on site and in their home), the direction of water flow on their property, and the location of various structures on the site that may inhibit drainage.

The maps were completed working with members of the consultant team. An example of a completed site study is included as Appendix 4.

The mapped information and one-on-one discussions between resident and consultant were useful in understanding current flooding issues and the history of flooding in the neighborhood. As highlighted below, the discussions and mapping identified several key aspects of residents' history with and understanding of stormwater management in the Study Area.

Highlights from Open House Discussions

- Private properties in the area include detention ponds and stormwater inlets to help manage stormwater. In instances discussed at the open house, the detention basin overflowed and flooded adjacent properties to the east.
- Street flooding occurs as a result of very heavy rains, particularly on the north end of the Study Area along Dewes Street. Discussions with residents indicated a sense that limited system capacity causes flooding in the street and contributes to flooding on private properties.
- The Village is enhancing local stormwater capacity by installing a new storm sewer under Henley Street and nearby stormwater detention. The improvement is anticipated to relieve street flooding in the Study Area.
- Residents' experiences with flooding made them informed about the location and impacts of property flooding, and they had engaged in previous discussions with Village staff on the topic. The homeowners association of one development in the area has conducted an engineering study of impacts specific to their property.

4E | Preliminary Recommendations and 2nd Open House

Residents were invited to attend a second open house, at which preliminary recommendations were presented regarding individual lots and neighborhood-scale solutions. Four residents from three separate households attended the second open house. The presentation was informal, allowing residents the opportunity to ask questions and provide feedback as each potential solution was presented. Concept plans were used to illustrate the neighborhood-scale solutions and photographs were used to illustrate the individual lot solutions. The slideshow presentation from the second open house is included in Appendix 5.

NEIGHBORHOOD SCALE SOLUTIONS

These solutions would require, at a minimum, the coordination of several property owners, and possibly tenant/landlord cooperation, for construction and long-term maintenance. They would have a greater cost and require more time to implement than the individual lot solutions, but these solutions could potentially have a greater impact on flooding. Plus, the cost could be spread between the properties benefiting from the improvements. These types of improvements were evaluated at a concept level. Additional work would be needed to implement them, including ground-based topographic survey, detailed engineering plans, cost estimates, and permits.

Neighborhood Scale Solution #1
Local Detention

A detention pond that serves multiple properties could be added to the block in some of the open space that is available in the area. Such a pond would ideally be located in an area that is already prone to flooding. The available storage volume would be expanded by excavation, and the surrounding areas would be allowed to drain into it.

One of the downsides to this solution is that the addition of a detention pond would probably require the removal of some mature trees in the area.

Neighborhood Scale Solution #2
Raise Sidewalks Along Washington Street

Raising the sidewalk along Washington Street would create a berm between the street flooding that occurs on Washington Street and properties in the Study Area. Depending on the height of the sidewalk, the street flooding would not be directed into the two detention basins and thus would protect the lower floors of the surrounding homes.

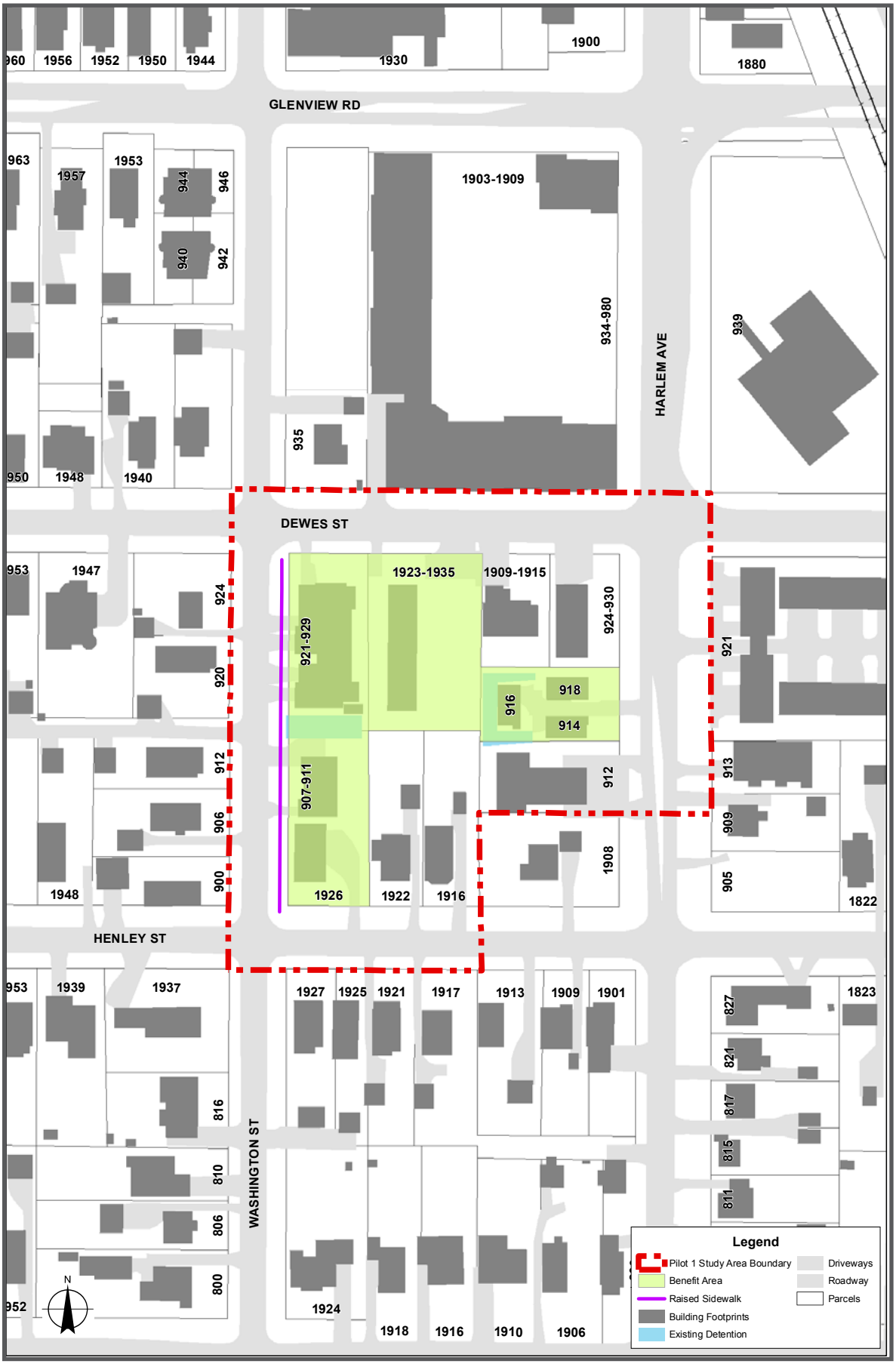
ℹ This possibility would have to be further analyzed to see if it is possible to raise the sidewalk while still maintaining passable slopes on the existing driveways, and to see if raising the sidewalk would negatively affect any other properties.

Neighborhood Scale Solution #3
Redirect Detention Pond Overflow

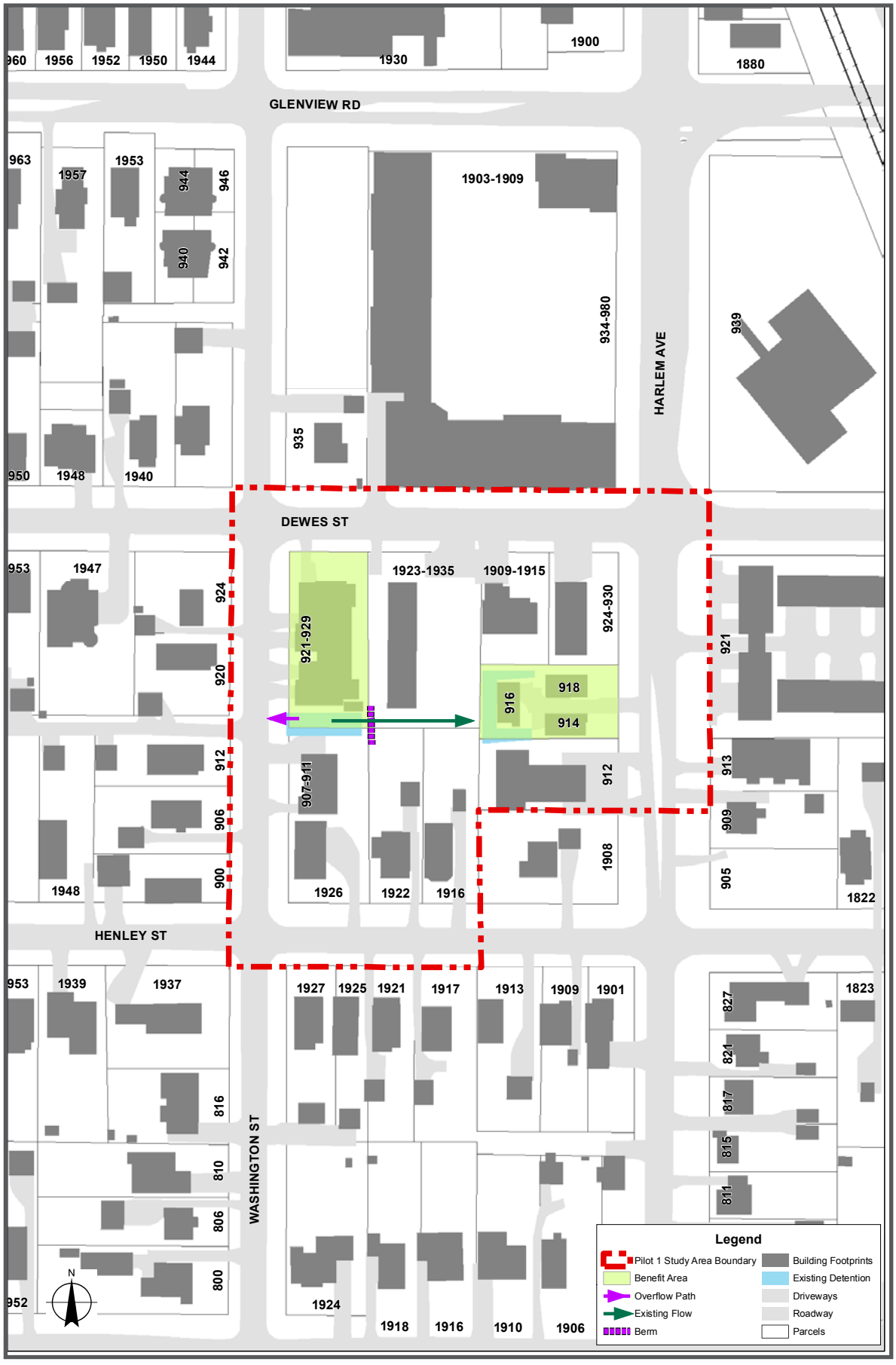
From the residents' open house comments, it was determined that overflow from the detention basin along Washington Street overflows to the east and floods lower floors of surrounding homes. To fix this problem, a berm could be constructed along the east side of the existing detention pond and an alternate overflow from the detention pond to the street established.

ℹ This solution would only be possible if the detention pond overflow elevation could be designed above the street flooding elevation on Washington and if it would not adversely affect any other properties.

Neighborhood Scale Solution #2 - Raise Sidewalks Along Washington Street



Neighborhood Scale Solution #3 - Redirect Detention Pond Overflow

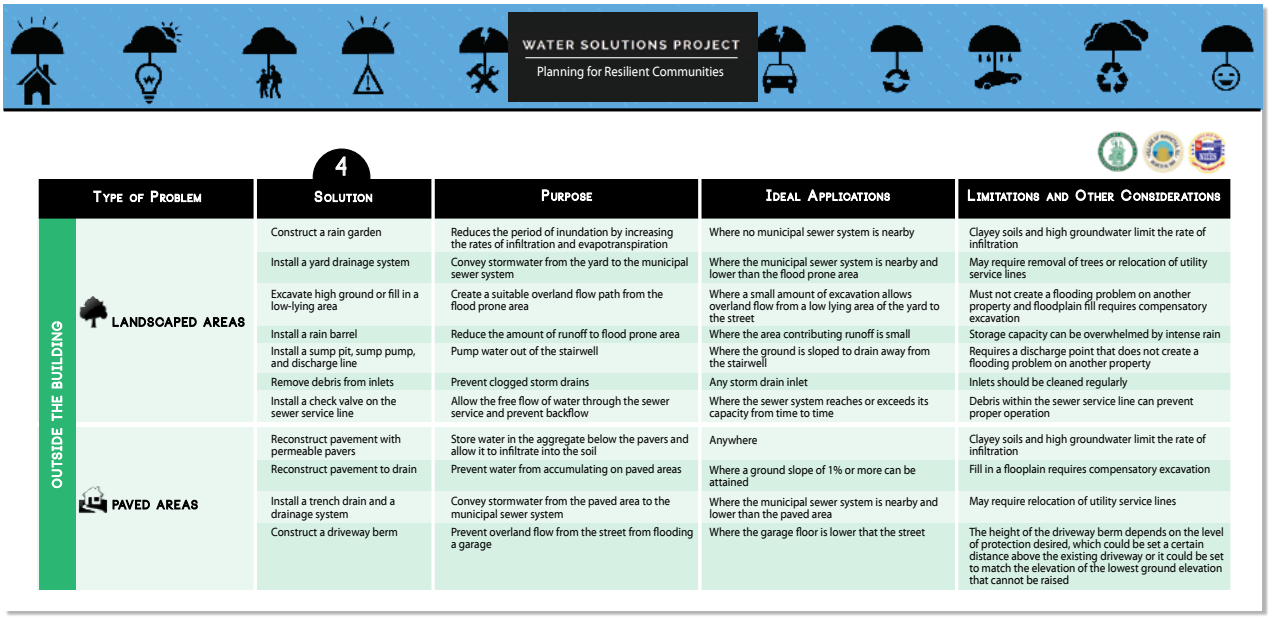


INDIVIDUAL PROPERTY-SCALE SOLUTIONS

Individual property solutions were also presented and discussed at the second open house. Since the neighborhood-scale solutions are not fully developed and since the funding for those projects has not yet been secured, residents and/or landlords may elect to implement one or more individual property solutions, rather than wait for a neighborhood-scale solution to be developed. These measures can be implemented swiftly, without the need to coordinate with other property owners.

Appendix 6 consists of a matrix of individual lot solutions organized by the source of the flooding problem. For each flooding cause, a variety of solutions were presented. The matrix explains when specific solutions would be the most appropriate and situations where the solution may not work well. The matrix provides a range of potential solutions that might complement or replace previous installations. The matrix offers solutions that are relevant for multi-family neighborhoods. These upgrades will require the cooperation of both the tenant and the landlord.

One of the challenges in a multi-family neighborhood is that the owner of the building is not typically involved in the day-to-day operations and may not see stormwater flooding firsthand. The tenant may consider such repairs an owner responsibility and/or not have the resources to make stormwater flooding prevention improvements on their own. Improvements in these areas are more likely to be driven by redevelopment regulations.



WATER SOLUTIONS PROJECT

Planning for Resilient Communities

4

	Type of Problem	Solution	Purpose	Ideal Applications	Limitations and Other Considerations
OUTSIDE THE BUILDING	LANDSCAPED AREAS	Construct a rain garden	Reduces the period of inundation by increasing the rates of infiltration and evapotranspiration	Where no municipal sewer system is nearby	Clayey soils and high groundwater limit the rate of infiltration
		Install a yard drainage system	Convey stormwater from the yard to the municipal sewer system	Where the municipal sewer system is nearby and lower than the flood prone area	May require removal of trees or relocation of utility service lines
		Excavate high ground or fill in a low-lying area	Create a suitable overland flow path from the flood prone area	Where a small amount of excavation allows overland flow from a low lying area of the yard to the street	Must not create a flooding problem on another property and floodplain fill requires compensatory excavation
		Install a rain barrel	Reduce the amount of runoff to flood prone area	Where the area contributing runoff is small	Storage capacity can be overwhelmed by intense rain
		Install a sump pit, sump pump, and discharge line	Pump water out of the stairwell	Where the ground is sloped to drain away from the stairwell	Requires a discharge point that does not create a flooding problem on another property
		Remove debris from inlets	Prevent clogged storm drains	Any storm drain inlet	Inlets should be cleaned regularly
		Install a check valve on the sewer service line	Allow the free flow of water through the sewer service and prevent backflow	Where the sewer system reaches or exceeds its capacity from time to time	Debris within the sewer service line can prevent proper operation
	PAVED AREAS	Reconstruct pavement with permeable pavers	Store water in the aggregate below the pavers and allow it to infiltrate into the soil	Anywhere	Clayey soils and high groundwater limit the rate of infiltration
		Reconstruct pavement to drain	Prevent water from accumulating on paved areas	Where a ground slope of 1% or more can be attained	Fill in a flooplain requires compensatory excavation
		Install a trench drain and a drainage system	Convey stormwater from the paved area to the municipal sewer system	Where the municipal sewer system is nearby and lower than the paved area	May require relocation of utility service lines
		Construct a driveway berm	Prevent overland flow from the street from flooding a garage	Where the garage floor is lower that the street	The height of the driveway berm depends on the level of protection desired, which could be set a certain distance above the existing driveway or it could be set to match the elevation of the lowest ground elevation that cannot be raised

Snapshot Section of Matrix

4F | Action Steps

POTENTIAL NEXT STEPS FOR THE MULTI-FAMILY STUDY AREA RESIDENTS

The first step for every resident is to develop an inventory of the flooding issues they face and the flood control measures already installed on their property.

The matrix in Appendix 1 can be used to identify the sources of any unresolved problems. Based on the type of flooding the property experiences, the property owner can then identify solutions using the matrix in Appendix 6 and taking into account cost, effectiveness, and feasibility. Many of the solutions are best used in conjunction with others; combining several flood-control measures will give the system strength and redundancy.

Specific recommendations for property owners in Glenview include creating a side yard overland flow path to alleviate rear yard flooding, where possible.

When the ground elevations are not conducive to constructing an overland flow path, an outdoor sump pump can be installed in a low-lying area of the rear yard with a discharge line connected to a pop-up structure in the front yard.

An alternative approach would be to construct a rain garden in the low-lying area. The rain garden would be planted with deep rooted native plants that increase the rates of infiltration and transpiration of runoff that drains to the rain garden.

Indoor flooding can be alleviated by making sure every property has a back-up sump pump with an alternate power source and a surface overflow on the sump pump discharge line. The overflow will prevent the sump pump motor from burning out when the storm sewer system is at capacity. The overflow could be as simple as an air gap just outside the foundation wall, but a better option would involve fitting the discharge line with a tee at the air gap allowing the overflow point to be extended away from the foundation wall.

Basement window flooding can be resolved by adding concrete window wells with a higher top-of-wall elevation, or by replacing low-lying glass pane windows with glass block windows.

Multi-family units may also need to get approval from the other properties on their parcel, through their homeowners association or property manager, prior to implementing these solutions, especially any outdoor grading or new discharge outlets, as they may negatively affect other owners on the property. Projects may also require building permits from the Village, which should be consulted prior to conducting improvements.

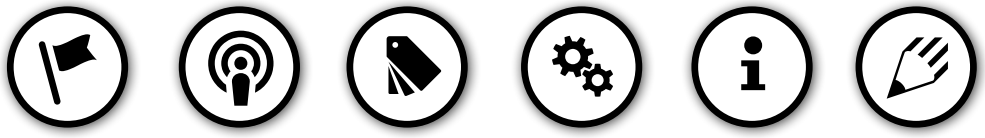
Overland Flow Path

Rain Garden

Backup Sump Pump

Glass Block Windows

POTENTIAL NEXT STEPS FOR THE VILLAGE OF GLENVIEW



Adopt Plan

The Village's first step is to adopt this Plan as an addendum to the Flood Risk Reduction Program. It gives residents the tools to understand and proactively address flooding on their property and in their neighborhood.

Support Resident Action

Residents are encouraged to take the lead in addressing localized flooding, but the Village can offer support and guidance by helping to identify sources of funding, preparing and submitting grant applications, and then taking responsibility for administering any grant funding that can be secured.

Solicit Bids

Resident-led efforts to address localized flooding that could be supported by the Village include: soliciting bids from contractors to construct improvements, such as sump pumps, landscaping, or permeable pavement at multiple properties at a lower unit price than individual residents could obtain on their own; or bidding a privately funded neighborhood scale solution with a Village funded project to get lower unit prices than the neighborhood could get on their own.

Apply Solutions

The Village could apply the templates developed as part of the Water Solutions Project to identify readily implementable solutions in other flood prone areas of the Village. Areas of the Village that would be prime candidates for this type of study are those within the Tier 1 and Tier 2 flood areas.

Educate Residents

Glenview already works hard to inform residents about the Village's ongoing stormwater programs, but the Village could also make the educational materials generated for the Water Solutions Project available on its website. These materials help make the public aware of actions they can take, either individually or collectively, to combat localized flooding.

Evaluate Zoning

The Village could amend its zoning regulations that relate to stormwater management. These standards function to maintain the Village's community character, so any changes must be evaluated in this context; however, a change that emphasizes mitigating stormwater impacts may be appropriate for certain applications or areas. By their nature, multi-family developments can be expected to cover a relatively significant portion of a site to accommodate building and parking footprints. Certain zoning standards may cause impacts in the Study Area and could be evaluated by the Village.

ZONING REGULATIONS TO BE CONSIDERED

1 **Maximum Lot Coverage**

All lots in the Study Area except one meet the maximum allowable lot coverage, currently set at 62 percent. Setting a lower lot coverage maximum would allow greater infiltration for future development or redevelopment. Along with such a change, encouraging permeable surfaces for driveways, patios, etc. could help more stormwater be absorbed; however, it should be noted that such surfaces must be thoughtfully designed to enhance stormwater management and also require ongoing maintenance.

2 **Lot Size Limit**

The lot size limit of two acres may limit the amount of a multi-family site that can be set aside for stormwater management. The eighteen dwellings per acre (or thirty-six units total) encourages concentrated townhomes or small apartment / condominium buildings, a form of development in keeping with the Comprehensive Plan designations for the area. However, smaller lots create challenges to providing adequate stormwater management facilities (detention ponds). This condition may suggest a review of zoning criteria with the intent of requiring more open space in which to facilitate detention facilities. Alternatively, engineering techniques such as structured, underground detention may be considered.

CATALOG OF POSSIBLE FUNDING METHODS

FEMA Hazard Mitigation Assistance

FEMA hazard mitigation assistance programs include the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) program, and Flood Mitigation Assistance (FMA). Each program has its own eligibility and funding criteria, but each can be used to fund property protection measures as shown in the table on the following page, provided that the benefits of the project exceed project costs. In general, these programs are funded when FEMA approves an application prepared jointly by a local government, such as the Village, and the Illinois Emergency Management Agency (IEMA). In most cases, FEMA pays 75% of eligible expenses, but the federal share can reach 90% for Repetitive Loss Properties and 100% for Severe Repetitive Loss (SRL) properties.

MWRDGC Stormwater Management Program

In 2014, the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) began its Phase II Stormwater Management Program, which funds local projects designed to improve drainage and reduce flood damage. From time to time, the MWRDGC will announce a formal call for funding requests, but funding requests are accepted at any time. The Village could request funding for the entire cost of a neighborhood-scale solution, but the MWRDGC generally prefers to fund projects that are partially funded by other sources.

Special Service Area

The property owners or tenants within the Study Area could build support for a Special Service Area to fund one or more neighborhood improvement projects. Special Service Areas are local tax districts that fund expanded services and programs through a localized property tax levy within contiguous areas. The enhanced services and programs would be in addition to those currently provided through the Village.

SWAMP Program

The Village of Glenview's Stormwater Area Management Program (SWAMP) is a neighborhood-led initiative that allows residents to petition to install local drainage projects with the help of the Village. The property owners must present a petition to the Village manager that requests Village consideration of a local drainage project. If the majority of residents support the drainage improvement, the Village will provide a report including costs for the improvement. If the plan is approved by at least 2/3 of the residents, the drainage improvement can be built, and will be partially funded by the Village.

FEMA HAZARD MITIGATION ASSISTANCE PROGRAMS

Eligibility & Funding Criteria

Eligible Activities	HMGP	PDM	FMA
Property Acquisition and Structure Demolition	√	√	√
Property Acquisition and Structure Relocation	√	√	√
Structure Elevation	√	√	√
Mitigation Reconstruction			√
Dry Floodproofing of Non-residential Structures	√	√	√
Minor Localized Flood Reduction Projects	√	√	√
Structural Retrofitting of Existing Buildings	√	√	
Non-structural Retrofitting of Existing Buildings and Facilities	√	√	√
Infrastructure Retrofit	√	√	√
Post-Disaster Code Enforcement	√		
Generators	√	√	

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Chapter 5
pilot study #3

Commercial Corridor
Niles, IL

5A | Vision, Goals & Objectives

VISION

Identify ways to reduce the likelihood of flooding along this commercial corridor in Niles and minimize the damage caused when flooding occurs, through property protection measures, land use policies, and green infrastructure that can also be applied to commercial corridors in other flood prone areas.

GOALS

- Educate property owners on the causes of flooding
- Gather public input on localized stormwater problems
- Identify a range of readily implementable solutions
- Incorporate public feedback on the recommended solutions

OBJECTIVES

- Involve property owners and tenants in identifying causes of and solutions to flooding problems
- Provide property owners with recommendations to mitigate stormwater flooding and flood damage on their commercial property, with solutions also applicable to whole commercial districts
- Develop a plan to guide the Village and property owners through each step of implementation

5B | Existing Conditions & Regulations

The study area is a commercial corridor that runs along Milwaukee Avenue and is bounded by Dempster Road to the south and Ballard Road to the north. Most of the area is zoned B1 – Retail Business. The lots in the Study Area average approximately 27,800 square feet. Buildings in the Study Area average approximately 13,700 square feet, and include commercial buildings, as well as one condominium building and the Niles Historical Museum.

STUDY AREA

SITE FEATURES

- The Study Area includes mostly commercial properties of varying sizes: a gas station, a bank with a drive-through, a condominium building, and a museum building. Some of the parcels are dedicated parking lots. The building facades include brick, concrete block, plaster and vinyl siding, with glass storefronts.
- The lots consist of nearly 100 percent impervious surfaces due to driveways and parking areas, except for one vacant parcel that does not have any built surfaces. The Assi Plaza site has limited naturalized stormwater detention areas that reduces its impermeable surface area to 89 percent.
- Milwaukee Avenue is a four lane asphalt road with curbs and gutters. It currently has no landscaped central medians. The cross streets, while also in asphalt, have curbs but no gutters. Storm drains are provided at various locations along the streets and within parking lot areas. There is an alley behind the parcels between Oak Avenue and Elizabeth Avenue that has a concrete finish. Concrete sidewalks exist along the streets.
- The commercial lots all have driveways and surface parking along the front and sides of the buildings and are predominantly at the same level as the building entrances; however, all of the parking areas have storm drains with the parking lots sloped towards them. In addition, most of the lots are also at a higher elevation than the roads.

SURROUNDINGS

- The Study Area is flanked by single-family residential neighborhoods to the east and west. The zoning ordinance calls for a 20 foot buffer in the rear setback of the parcels, but this does not exist for the parcels in the Study Area; however, some parcels do have parking areas or an alley along the adjacent residential parcel.
- Commercial properties continue along Milwaukee Avenue to the north of the Study Area, while the Mayhill Cemetery is to the south.
- Dempster Street to the south of the Study Area has an underpass in addition to travel lanes at street level.

The study area is predominately impervious due to driveways and parking areas

Building entrances are primarily level with the parking lots

ZONING

Zoning requirements relate to stormwater management by guiding the locations of structures and open space on properties. Stormwater is just one consideration in zoning, and most zoning requirements address property impacts on community character and aesthetics.

- Most properties (all but four) in the Study Area are zoned B1 Business District per the Village of Niles Zoning Ordinance. The B1 District allows a range of commercial and special uses, including business, retail, medical offices, services, and related uses.
- The Study Area includes small areas of B2 Service District, R4 General Residence District, R2 Single-Family Residence District, and P1 Public Land Use (one site each of B2, R4 and P1, and two sites of R2). The B2 District allows the same uses as the B1 District plus additional permitted and special uses. The R4 District allows all the uses permitted in other residential zoning districts, plus multi-family dwellings. The P1 District is reserved for publicly owned properties.
- Development on lots in the B1 District must not exceed a Floor Area Ratio (FAR) of 1.8 or have a height greater than 36 feet (although greater height may be permitted as a Special Use). A side yard setback of five feet is required, or 20 feet adjacent to a residential zoning district. A rear yard setback of 20 feet is required.
- B2 yard setback and height requirements are the same as in B1, but a 2.0 FAR is permitted. R4 property sizes are based on the dwellings (number of bedrooms) and correspond to a development density of roughly 16 dwelling units per acre.

The key factor in which zoning relates to stormwater management is the impermeable surface standard.

- Additional requirements are: FAR of 0.6, building height for multi-family structures of the lesser of three stories or 40 feet, front yards of 25 feet, and rear yards of 30 feet (side yard requirements vary based on circumstances). P1 properties do not have requirements for lot size, width, or side yard. Other yard size requirements in the P1 zoning district depend on circumstances, but are generally set to minimize impact on adjacent residential areas.

IMPERMEABLE SURFACES

- The area of a lot that can be covered by impervious surface is a key element of stormwater management. The zoning requires that 5 percent of interior parking lot area be devoted to landscaping, and perimeter landscaping is also required. However, in practice, this amounts to hardly any “unpaved area” for percolation of stormwater in the B1 District.

STUDY AREA CHARACTERISTICS

LOT SIZE
*Range: 3,124–426,885 sqft **
Average = 27,833 sqft
Median = 10,019 sqft

FLOOR AREA RATIO (FAR)
*Range: 0.2 – 0.7 **
Average = 0.5
Median = 0.5

COMMERCIAL BUILDING SIZE
*Range: 2,719 – 18,470 sqft **
Average = 13,703 sqft
Median = 5,796 sqft

IMPERVIOUS AREA
*Range: 3,124 –380,885 sqft****
Average = 25,339 sqft
Median = 9,958 sqft

AGE OF BUILDINGS
*Range: 5– 60 years ***
Average = 40 years
Median = 45 years

LOT COVERAGE
*Range: 85–100% *****
Average =96%
Median =100%

NOTES:

- The impervious surface ratios of properties in the Study Area are extremely high.
- No pervious materials are used for parking surfaces or alleys.
- Rooftop runoff in the Study Area typically is directed to the parking lots.

Data Calculations based on:

* Village GIS Data

** Cook County Assessor Data

*** This does not include the vacant parcel in the Study Area

DRAINAGE FACTORS

The Village has 150 miles of combined sewers, 75 miles of sanitary sewers, and 35 miles of storm sewers. The drainage system in the Study Area consists of mostly dedicated storm sewers, but there is a small section of combined sewer on the northeast corner of Dempster Street and Milwaukee Avenue. Half of the storm sewer in the area runs down Milwaukee Avenue and turns on to Dempster Street and the other half runs up Milwaukee Avenue and turns on to Ballard Rd. Both systems drain to the west, toward the Des Plaines River. A large Metropolitan Water Reclamation District (MWRD) interceptor runs southeast through the middle of the Study Area, along Milwaukee Avenue.

The Assi Plaza shopping center on the east side of the Study Area was built within the past five years and added detention as part of its site improvements, but the majority of the Study Area lacks stormwater detention.

No part of the Study Area is within a FEMA designated Special Flood Hazard Area.

The Village of Niles requires that all downspouts splash at grade. All new buildings with basements below ground level are required to have overhead plumbing. Sump pumps are required to daylight onto rear lawns and are encouraged to be directed toward storm sewer inlets or drainage ditches, wherever possible.

The Village of Niles Stormwater Management Ordinance (adopted March 22, 2011) requires that all developments proposing over 7,500 square feet of new or redeveloped impervious surface provide a stormwater management plan. Because so many of the properties in the Study Area are nearly completely paved, development of that additional square footage of impervious surface is unlikely to occur.

The code also requires that development disturbing over 15,000 square feet in total will require a stormwater management plan. In short, development or redevelopment of properties less than 15,000 square feet in the Study Area will not require a stormwater management plan.

The Cook County Watershed Management Ordinance requires volume control (retention of the first inch of runoff from impervious areas of development or redevelopment) for non-residential developments disturbing 0.5 acres or more. This Ordinance also requires detention for non-residential developments disturbing 0.5 acres or more when the parcel being developed (or redeveloped) is 3 acres or larger.

Lack of landscaping and pervious surfaces within the study area contribute to flood issues.

5C | Past & Ongoing Plans

2030 COMPREHENSIVE PLAN

The last major update to the Village of Niles Comprehensive Plan was adopted in 2011. The Study Area is incorporated in the Plan as part of redevelopment alternatives considered for the Milwaukee Avenue corridor. In-depth consideration of, and planning for, stormwater management was conducted through the Stormwater Commission Report (2009) and Stormwater Relief Program (2012)

The Village of Niles Comprehensive Plan included a resident questionnaire to gauge the opinion of residents on Village issues. When asked about the disadvantages of Niles, the majority of residents responded that flooding was the thing they least liked about the Village. When asked about public facilities, most responded they were "good" or "fair" with the exception of stormwater drainage; respondents rated stormwater drainage as "poor." Flooding was identified as one of Niles' key issues.

The Plan's goal for infrastructure and development is to maintain a high-quality, "green" and efficient infrastructure system. It notes the need for regular investment and maintenance to meet the needs of the Village both today and in the future. Some objectives for stormwater are to continue to budget for stormwater improvements and maintenance, coordinate infrastructure and utility projects with other agencies to reduce costs through economies of scale, amend the zoning ordinance to restrict development in flood-prone area, ensure that new development does not negatively impact neighbors or put undue stress on the existing sewer system, and promote sustainable design practices in new developments.

STORMWATER COMMISSION

In September 2008, the Village of Niles experienced a 100-year storm and flood. In response, the Mayor of Niles appointed a Stormwater Commission to prepare a comprehensive report on stormwater related issues. The Commission released a report in 2009; its primary purpose was to provide a comprehensive look at persistent stormwater conditions that occur during intense two- and five-year storm events. It identified that homeowners lack an understanding of stormwater basics and urged that homeowner education should be a priority for the Village. The Commission compiled survey results, workshop data, one-on-one site visits, and storm investigations to map areas of concern within the Village. The Commission also worked to amend outdated stormwater ordinances, policies, and procedures; they also engaged an engineering firm to develop a Stormwater Relief Program.

STORMWATER RELIEF PROGRAM

The Stormwater Relief Program Report was released in June 2012. The report listed actions the Stormwater Commission has taken since the 2009 report. Since 2009, 12 stormwater management ordinance amendments were approved and a homeowner education program was developed. The Commission also coordinated with owners to construct local drainage improvements on eight large properties, mostly parks and cemeteries. GIS atlases were also developed for all major municipal utilities including systems for tracking and planning sewer maintenance activities.

A detailed two-phase study of stormwater flow and drainage in Niles was conducted. A model was prepared to identify flood risks and stormwater problems. The Study Area here is located in the north section of the Niles stormwater model. The study identified many capital improvement projects that could be implemented to help the Village with its stormwater problems. The improvements are divided into two tiers. Tier 1 projects are currently funded, targeting areas with the most frequent and concentrated flooding. Tier 2 includes currently unfunded projects that are recommended for future resources. The study area is currently not a part of any Tier 1 or Tier 2 projects.

ALL HAZARDS MITIGATION PROGRAM

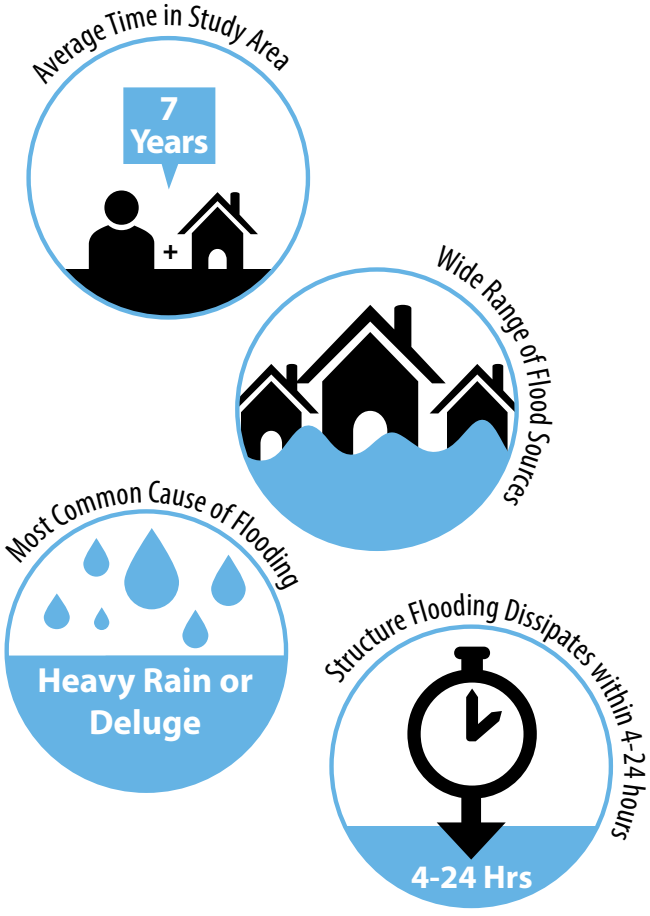
The Cook County All Hazards Mitigation Plan is currently being developed by Cook County and may be completed in 2014. This Plan is a collaborative effort between the County and municipalities and townships within the County. It will identify activities that can be undertaken by both the public and private sectors to reduce the risk of property damage and loss of life caused by all types of hazards, including flooding. The development and subsequent adoption of this Plan will allow communities to become eligible for Federal Emergency Management Agency (FEMA) hazard mitigation funds.

5D | Community Outreach

SURVEY RESULTS

Business and property owners in the Study Area were asked to complete a survey as part of this project. The survey prompted respondents to provide details of their experience with flooding in their buildings and on their properties (see Appendix 2). Completed surveys were returned by three persons in the Study Area.* The specificity of the survey questions were intended to provide a detailed understanding of site specific and area-wide flooding issues.

Respondents were asked to indicate the storm severity that led to flooding, water depths during that flooding, and how long it took for flooding to subside. Severity was described in general terms, such as: light rain/drizzle, medium rain, heavy rain, sudden deluge, and melting snow. Respondents also were asked to indicate the type of improvements they have undertaken to mitigate stormwater in and around their buildings.



Key Survey Findings

1. The average length of time respondents have owned property or business in the Study Area was seven years; two had been there for seven years and one for six years.

2. Two of three respondents indicated they had flooding in their buildings from several sources including: roofs, floor drains, doorways, and sanitary backups. Respondents were allowed to provide multiple answers.

3. When flooding did occur in buildings, it did not exceed four inches and the water was gone within 4 to 24 hours.

4. Respondents who did have flooding were asked what type of rain caused the flooding; all respondents indicated that a "heavy rain" or "sudden deluge" was the cause.

5. Respondents indicated they had not or were unsure if improvements to their property to address flooding had been made.

* The small sample and number of responses do not provide nor was it intended to provide a statistically significant sample. The intent was to understand the location and intensity of flooding, as well as how respondents have already begun to address the flooding issue.

1ST OPEN HOUSE

As follow up to the survey, Study Area business and property owners were invited to attend an open house to provide further information on the location, intensity, and impact of flooding on their property.

One tenant of a business from the Study Area attended the open house. Working with detailed maps of nearby properties, the participant indicated the general location of flooding, the direction of water flow on their property, and the location of various structures on the site that may inhibit drainage.

The map was completed working with members of the consultant team. An example of a completed site study is included as Appendix 4.

The mapped information and discussion between business owner, staff and consultants were useful in understanding current flooding issues and the history of flooding in the district. As highlighted below, the discussions and mapping identified several key aspects regarding the participants' history with and understanding of stormwater management in the area.

Highlights from Open House Discussions

- Participants raised the issues of deferred maintenance and limited expenditures on private property related to stormwater management as contributing causes to building flooding.
- Flooding in the area is usually along the streets, but in some cases the street flooding backs up onto the properties.
- Street flooding that occurs in heavy rains was noted as the predominant cause of flooding in this area.

The most common type of flooding in the study area is along streets.

5E | Preliminary Recommendations and 2nd Open House

After the conclusion of the first open house, property owners and tenants were invited to attend a second open house, at which preliminary recommendations were presented regarding individual lots and district scale solutions. The presentation was informal, allowing attendees the opportunity to ask questions and provide feedback as each potential solution was presented. Concept plans were used to illustrate the district-scale solutions, and photographs were used to illustrate the individual lot solutions.

DISTRICT SCALE SOLUTIONS

District scale solutions in commercial areas would require the coordination of property owners in the area. A challenge in these commercial developments is that the owner of the building is not typically involved in the day-to-day operations and may not see stormwater flooding firsthand. The tenant may consider such repairs an owner responsibility, or not have the resources to make stormwater flooding prevention improvements on their own. District scale solutions may have to be driven by redevelopment regulations to be successful. These types of improvements were evaluated at a concept level. Additional work would be needed to implement them, including ground-based topographic survey, detailed engineering plans, cost estimates, and permits.

District Scale Solution #1

Pocket Parks

Many of the storefronts in this Study Area are currently vacant. The area would benefit if some of these unused spaces were converted back into green space or pocket parks between developments. Pocket parks would allow for more natural stormwater infiltration and possibly open up areas for stormwater detention. Pocket parks may also be seen as a beautifying element.

District Scale Solution #2

Above Ground Detention

There are open areas in the Study Area that would be natural places to add stormwater detention. A pond would ideally be located in an area that is already prone to flooding. The available storage volume would be expanded by excavation and the surrounding areas would be allowed to drain into it. One of the drawbacks of this solution is that the property at such a pond site would be more profitable if it were developed into commercial space, rather than stormwater detention.

District Scale Solution #3

Underground Detention

Because so much of the Study Area is already developed, underground detention would be a good way to provide detention while preserving usable space above ground. Depending on the depth of the receiving sewer, underground detention may allow for a large storage volume in a small footprint area, and is usually installed under parking lots. This improvement would have to be installed in phases, as the parking lots in the Study Area are currently in use and cannot be shut down completely.

Example: Underground detention

District Scale Solution #4

Streetscape and Parking Lot Improvements

Many parking lots in the area lack landscaped islands and buffers. Existing parking lots could be retrofitted with permeable pavement or bioswale parking lot islands to allow for stormwater infiltration. Native plant based streetscapes could be constructed along Milwaukee Avenue to beautify the commercial properties, to reduce runoff rates and volumes, and to improve water quality.

Example: Parking lot landscaping

Example: Parking lot rain garden

INDIVIDUAL PROPERTY SCALE SOLUTIONS

Individual property solutions were also presented and discussed at the second open house. Since the district scale solutions are not fully developed and since the funding for those projects has not yet been secured, property owners may elect to implement one or more individual property solutions, rather than wait for a district scale solution to be developed. These measures can be implemented swiftly, without the need to coordinate with other property owners.

Appendix 6 consists of a matrix of individual lot solutions organized by the source of the flooding problem. For each flooding cause, a variety of solutions were presented. The matrix explains when specific solutions would be the most appropriate and situations where the solution may not work well. The matrix provides a range of potential solutions that might complement or replace previous installations. The matrix offers solutions that are relevant for commercial properties. These upgrades will require the cooperation of both the tenant and the landlord.

> A challenge in these commercial developments is that the owner of the building is not typically involved in the day-to-day operations and may not see stormwater flooding firsthand. The tenant may consider such repairs an owner responsibility and/or not have the resources to make stormwater flooding prevention improvements on their own. Improvements in these areas are more likely to be driven by redevelopment regulations.

4

	Type of Problem	Solution	Purpose	Ideal Applications	Limitations and Other Considerations
Outside the Building	Landscaped Areas	Construct a rain garden	Reduces the period of inundation by increasing the rates of infiltration and evapotranspiration	Where no municipal sewer system is nearby	Clayey soils and high groundwater limit the rate of infiltration
		Install a yard drainage system	Convey stormwater from the yard to the municipal sewer system	Where the municipal sewer system is nearby and lower than the flood prone area	May require removal of trees or relocation of utility service lines
		Excavate high ground or fill in a low-lying area	Create a suitable overland flow path from the flood prone area	Where a small amount of excavation allows overland flow from a low lying area of the yard to the street	Must not create a flooding problem on another property and floodplain fill requires compensatory excavation
		Install a rain barrel	Reduce the amount of runoff to flood prone area	Where the area contributing runoff is small	Storage capacity can be overwhelmed by intense rain
		Install a sump pit, sump pump, and discharge line	Pump water out of the stairwell	Where the ground is sloped to drain away from the stairwell	Requires a discharge point that does not create a flooding problem on another property
		Remove debris from inlets	Prevent clogged storm drains	Any storm drain inlet	Inlets should be cleaned regularly
		Install a check valve on the sewer service line	Allow the free flow of water through the sewer service and prevent backflow	Where the sewer system reaches or exceeds its capacity from time to time	Debris within the sewer service line can prevent proper operation
	Paved Areas	Reconstruct pavement with permeable pavers	Store water in the aggregate below the pavers and allow it to infiltrate into the soil	Anywhere	Clayey soils and high groundwater limit the rate of infiltration
		Reconstruct pavement to drain	Prevent water from accumulating on paved areas	Where a ground slope of 1% or more can be attained	Fill in a flooplain requires compensatory excavation
		Install a trench drain and a drainage system	Convey stormwater from the paved area to the municipal sewer system	Where the municipal sewer system is nearby and lower than the paved area	May require relocation of utility service lines
		Construct a driveway berm	Prevent overland flow from the street from flooding a garage	Where the garage floor is lower that the street	The height of the driveway berm depends on the level of protection desired, which could be set a certain distance above the existing driveway or it could be set to match the elevation of the lowest ground elevation that cannot be raised

Snapshot Section of Matrix

5F | Action Steps

POTENTIAL NEXT STEPS FOR THE CORRIDOR STUDY OWNERS

The first step for every resident is to develop an inventory of the flooding issues they face and the flood control measures already installed on their property.

The matrix in Appendix 1 can be used to identify the sources of any unresolved problems. Based on the type of flooding the property experiences, the property owner or tenant can identify solutions using the matrix in Appendix 6 and taking into account cost, effectiveness, and feasibility. Many of the solutions are best used in conjunction with others; combining several different flood control measures will give the system strength and redundancy.

Specific recommendations for property owners in Niles include building flood-proofing measures. Cracks and gaps between walls, foundations, and doors can leave space for water to seep into buildings. Patching these gaps with continuous impermeable flood proofing can help keep water out.

Measures should also be taken to protect building openings, such as doors and windows.

Downspouts and sump pump discharges should also be extended to discharge on ground that slopes away from the building foundation.

Basement window flooding can be resolved by adding concrete window wells with a higher top-of-wall elevation, or by replacing low-lying glass pane windows with glass block windows.

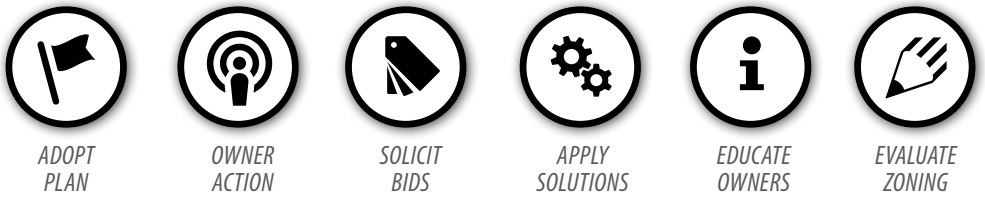
Repair Cracks/Gaps

Extend Downspouts

Window Well Covers

Glass Block Windows

POTENTIAL NEXT STEPS FOR THE VILLAGE OF NILES



Adopt Plan

The Village's first step is to adopt this Plan as an addendum to the Stormwater Master Plan. It gives property owners the tools to understand and proactively address flooding on their development and in their district.

Support Owner Action

Property owners are encouraged to take the lead in addressing localized flooding, but the Village can offer support and guidance by helping to identify sources of funding, preparing and submitting grant applications, and then taking responsibility for administering any grant funding that can be secured.

Solicit Bids

Owner-led efforts to address localized flooding that could be supported by the Village include: soliciting bids from contractors to construct improvements, such as sump pumps, landscaping, or permeable pavement at multiple properties at a lower unit price than individual property owners could obtain on their own; or bidding a privately funded district-scale solution with a Village-funded project to get lower unit prices than the district could get on their own.

Apply Solutions

The Village could apply the templates developed as part of the Water Solutions Project to identify readily implementable solutions in other flood-prone areas of the Village. Areas of the Village that would be prime candidates for this type of study are those within the Tier 1 flood areas.

Educate Property Owners

Niles already works hard to inform businesses and tenants about the Village's ongoing stormwater programs, but the Village could also make the educational materials generated for the Water Solutions Project available on its website. These materials help make the public aware of actions they can take, either individually or collectively, to combat localized flooding.

Evaluate Zoning

The Village could amend its zoning regulations that relate to stormwater management. These standards function to maintain the Village's community character, so any changes must be evaluated in this context; however, a change that emphasizes mitigating stormwater impacts may be appropriate for certain applications or areas. By their nature, commercial developments can be expected to cover a relatively significant portion of a site to accommodate building and parking footprints. Certain zoning standards may cause impacts in the Study Area and could be evaluated by the Village.

ZONING REGULATIONS TO BE CONSIDERED

1 **On-Site Landscaping**

On-site landscaping is a zoning standard that can be used to increase the capacity to absorb stormwater on a given site. The current landscape requirements in the Village's zoning ordinance are relatively modest. Best zoning practice is to require a higher level of landscaping and specify the format to a greater degree, including promoting stormwater infiltration. In addition to possible zoning standards, such improvements could be encouraged through demonstration projects.

2 **Redevelopment in Commercial Districts**

Redevelopment in established commercial districts is an opportunity to improve stormwater management. From a zoning standpoint (as well as other municipal codes), the key consideration is to identify the thresholds that will trigger the need for new stormwater management requirements. In Niles, the triggers include either (1) adding 7,500 square feet of new or (2) redeveloped impervious surface or disturbing at least 15,000 square feet of site area. Under these guidelines, development or redevelopment of sites around 1/3 of an acre would require stormwater detention. This threshold acknowledges that the cost of mitigating stormwater impacts on small sites or for small projects may discourage owners from making property improvements. The Village may consider requiring small-scale stormwater management practices, such as landscaping or a fee-in-lieu of stormwater detention, for permitted projects that fall below the current threshold.

CATALOG OF POSSIBLE FUNDING METHODS

Cook County All Hazards Mitigation Assistance

FEMA hazard mitigation assistance will become available once the Cook County All Hazards Mitigation Plan is complete and has been adopted by both the County and the Village. The Plan is currently being developed by Cook County and may be completed in 2014.

FEMA hazard mitigation assistance programs include the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) program, and Flood Mitigation Assistance (FMA). Each program has its own eligibility and funding criteria, but each can be used to fund property protection measures as shown in the table on the following page, provided that the benefits of the project exceed project costs. In general, these programs are funded when FEMA approves an application prepared jointly by a local government, such as the Village, and the Illinois Emergency Management Agency (IEMA). In most cases, FEMA pays 75% of eligible expenses, but the federal share can reach 90% for Repetitive Loss Properties and 100% for Severe Repetitive Loss (SRL) properties.

MWRDGC Stormwater Management Program

In 2014, the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) began its Phase II Stormwater Management Program, which funds local projects designed to improve drainage and reduce flood damage. From time to time, the MWRDGC will announce a formal call for funding requests, but funding requests are accepted at any time. The Village could request funding for the entire cost of a district-scale solution, but the MWRDGC generally prefers to fund projects that are partially funded by other sources.

Special Service Area

The property owners or tenants within the Study Area could build support for a Special Service Area to fund one or more district improvement projects. Special Service Areas are local tax districts that fund expanded services and programs through a localized property tax levy within contiguous areas. The enhanced services and programs would be in addition to those currently provided through the Village.

Fee in Lieu

As sites are improved, particularly small scale improvements, the Village could require a fee in lieu of stormwater detention to fund future stormwater infrastructure. Fees collected by the Village could be used to fund one or more of the district scale improvement projects.

Stormwater Utility Fee

The Village could implement a stormwater utility fee. A stormwater utility fee is a stable, dedicated source of funding for stormwater projects, typically based on the amount of runoff created by a property. Stormwater utility fees have been implemented throughout the nation and are becoming more common in Illinois.

Cost-Sharing Program

The Village could establish a neighborhood-led initiative, such as Glenview's SWAMP Program, that allows residents to petition to install local drainage projects with the help of the Village. The property owners would present a petition to the Village that requests consideration of a local drainage project. If the majority of property owners support the drainage improvement, the Village would provide a report including costs for the improvement. If the plan is approved by a majority of the property owners, the drainage improvement can be built, and would be partially funded by the Village.

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Chapter 6
pilot study #4

Central Business District
Winnetka, IL

6A | Vision, Goals & Objectives

VISION

Identify ways to reduce the likelihood of flooding along this central business district area in Winnetka and minimize the damage caused when flooding occurs, through property protection measures, land use policies, and green infrastructure that can also be applied to central business dictricts in other flood-prone areas.

GOALS

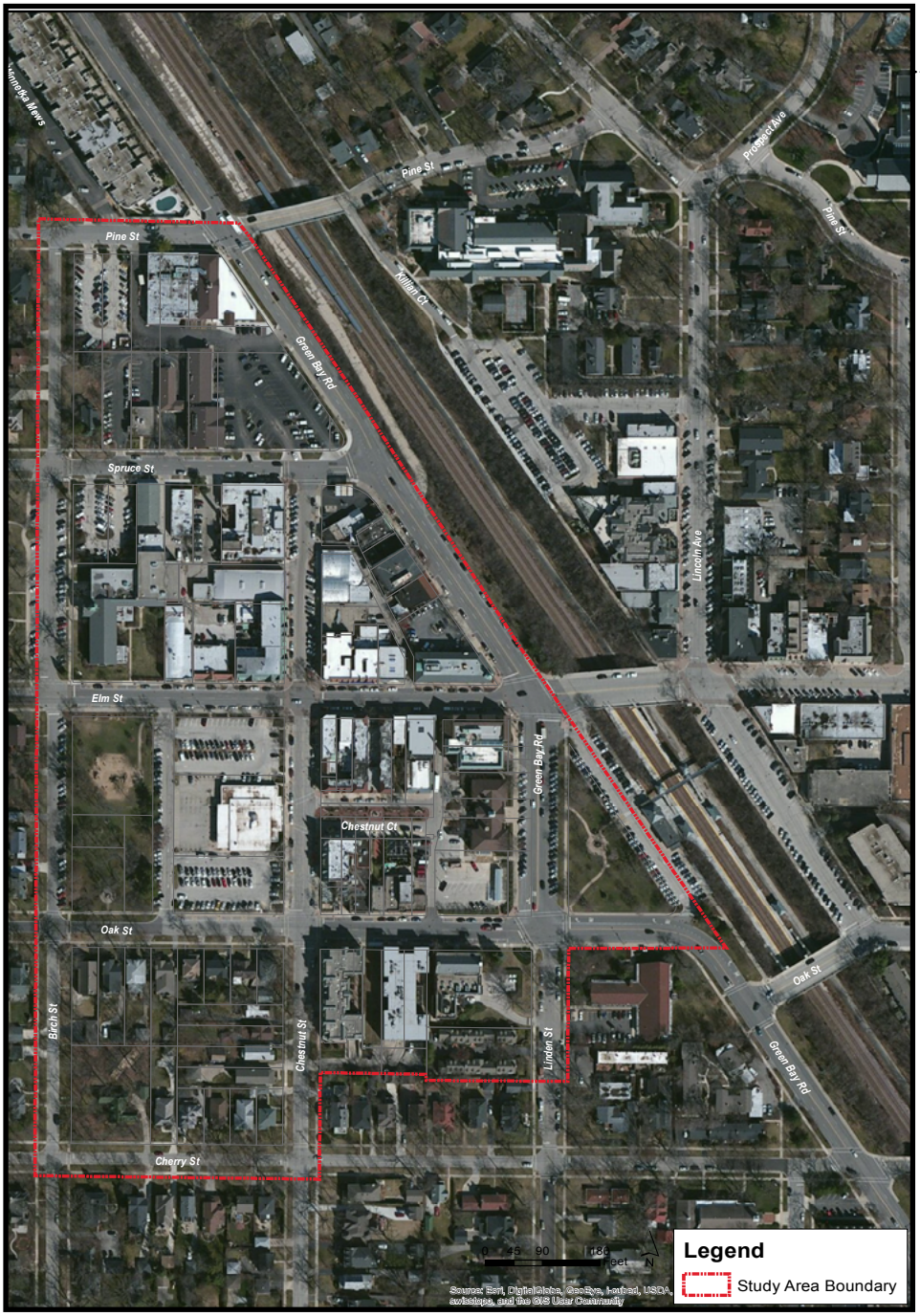
- Educate property owners on the causes of flooding
- Gather public input on localized stormwater problems
- Identify a range of readily implementable solutions
- Incorporate public feedback on the recommended solutions

OBJECTIVES

- Involve property owners in identifying causes of and solutions to flooding problems
- Provide property owners with recommendations to mitigate stormwater flooding and flood damage on their property, with solutions applicable to individual properties and scalable to whole business districts
- Develop a plan to guide the Village and property owners through each step of implementation

6B | Existing Conditions & Regulations

The Study Area is the western part of the Elm Street District in downtown Winnetka. Land use is primarily retail, with many publicly-owned parcels of land, including Winnetka City Hall and the Winnetka Public Library. The District has strong design guidelines that mandate unified composition of the existing streetscape, landscape, land-use transitions and architecture. Visually and symbolically, this district, bisected by Green Bay Road and the Metra Union Pacific North Line, is the heart of Winnetka's business and civic community.



STUDY AREA

The Study Area includes a variety of properties, including retail, other businesses, single-family, multi-family, and civic uses, as well as park space.

The lots in the Study Area average 9,900 square feet for commercial uses, 10,700 square feet for civic/ institutional uses, 5,300 square feet for mixed uses, 7,800 square feet for single-family residential uses and 12,500 square feet for multi-family residential uses.

SITE FEATURES

- The parcels in the Study Area that have mixed uses and multi-family residential uses have the highest impervious areas due to the large building areas, driveways, and surface parking areas. The only non-impervious surfaces are landscaped areas along the sidewalks and some planter areas within the parking lots.
- On-street parking is provided in the Study Area.
- Like the commercial parcels, the multi-family parcels have a high impervious area due to the building footprint, driveways, surface parking areas and sidewalks. Some of the buildings also have underground parking.
- The single-family parcels have more site landscaping; however, they do have detached garages at the rear ends of the property, with dedicated driveways. This adds to the impervious area of the site.
- The church property has a large amount of landscaped area (Village parking lots in the surrounding area are used to meet its parking needs).
- All streets in the Study Area are made of asphalt and have curbs. The sidewalks are a combination of concrete slabs with brick pavers and tree boxes along the curb edge.
- Storm sewer inlets are provided at all the street intersections and mid-block on some streets.

SURROUNDINGS

- The Study Area has single-family residential neighborhoods to the west and south, with multi-family properties to the north.
- The east side is bounded by Green Bay Road along the Metra Union Pacific North Line. The rail line is below grade at this location.
- The downtown area known as the East Elm District is to the east side of the train tracks.

Detached garages increase the impervious area present within the study area.

Landscaping is present along sidewalks in the study area.

ZONING

Zoning requirements relate to stormwater management by guiding the locations of structures and open space on properties. Stormwater is just one consideration in zoning, and most zoning requirements address property impacts on community character and aesthetics.

- Most of the study falls into the C2 General Retail Commercial Zoning District. This District allows uses that provide a range of goods and services. A portion of the District carries the additional use regulations of the C2 Overlay District, which focuses allowed uses on retail businesses. Residential uses above the first floor are permitted.
- The Study Area includes areas of B1 Multi-Family, and R5 Single-Family Residential. The B1 District allows two-family and multi-family dwellings. The R5 District permits single-family uses. Both of these districts allow certain community / institutional uses as Special Uses, which require specific approval by the Village.
- Development on lots in the C2, B1, and R5 Districts must meet the standards below.
- The B1 District has provisions specific to stormwater management: *"Drainage of Surface Waters. To diminish or remove any adverse impact of surface water drainage and run-off on adjacent properties, no building or other structure shall be constructed which will result in the water run-off following construction of such improvements, in an amount greater than the water run-off immediately prior to construction and no building permit shall be issued unless and until adequate provision is made by connecting to available storm sewers or by other means (in the form of drainage swales, detention areas or such other form of water control mechanism as shall be approved by the Village Engineer of the Village) to so limit such water run-off and provide for the proper control and drainage of surface water."*
- The area of a lot that can be covered by impervious surface is a key element that relates to stormwater management. The Winnetka Zoning Ordinance presents standards for all the zoning districts in the Study Area. In keeping with the character of the districts (as seen in the table) the maximum impermeable surface area increases from single-family to multi-family to central business district.

District	C2	B1	R5
Maximum Building Height	35 feet	35 feet	2.5 stories
Density	max: 38 du/acre	18 – 24 du/acre	lot size min 8,400 s/f
Max. Impermeable Surface	90%	60% (40 % building coverage)	50% (front yard coverage 30%)
Front Yard	max of 3 feet	25 feet	30 feet
Side Yard	min of 3 feet	12 feet	6-12 feet
Rear Yard	min of 10 feet	20 feet	15% of lot depth
Transitions	Min 5 feet landscaped buffer adjacent to residential uses		
Min Lot width		60 feet	60 feet
FAR		.8	

STUDY AREA CHARACTERISTICS

USES	INDIVIDUAL LOT AREAS**	IMPERVIOUS AREA*	LOT COVERAGE	AVERAGE BUILDING AGE**	RESIDENTIAL UNITS**
Commercial Use	*Range: 714 –32,744 sf* Average: 9,927 sf Median: 9,521 sf	237,456 sf	80%	61	
Civic / Institutional Uses	*Range: 117– 2,834 sf* Average: 10,777 sf Median: 5,777 sf	157,628 sf	54%		
Mixed Use	*Range: 771– 3,269 sf* Average: 5,381 sf Median: 4,161 sf	95,240 sf	88%	85	113 units
Single-Family	*Range: 4,930 –26,419 sf* Average: 7,827 sf Median: 7,534 sf	64,146 sf	46%	75	18 units
Multi-Family	*Range: 2,525–19,549 sf* Average: 12,564 sf Median: 14,090 sf	195,757 sf	88%	59	10 units

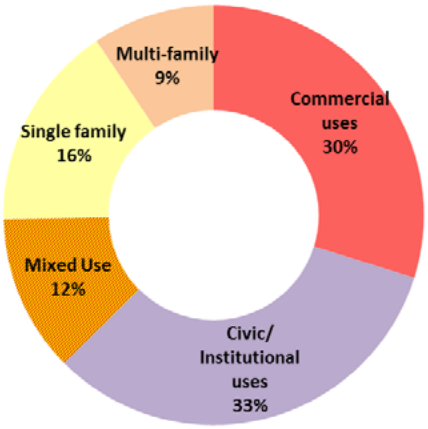
Data Calculations based on:

* Village GIS Data

** Cook County Assessor Data

Distribution of Land Use

The chart shown below highlights the distribution of land uses in the Study Area.



DRAINAGE FACTORS

The Village has approximately 150 miles of sewers and a separate storm sewer system. In this Study Area, most of the storm sewers converge and outlet to the south. Outside the Study Area, the entire system turns east and outlets to an MWRD interceptor. The very southwest corner of the Study Area drains to the west and connects to a different part of the storm sewer system, which outlets to the Skokie River. There is no existing stormwater detention infrastructure in this area.

The Cook County Watershed Management Ordinance requires volume control (retention of the first inch of runoff from impervious areas of development or redevelopment) for non-residential developments disturbing 0.5 acres or more. This Ordinance also requires detention for non-residential developments disturbing 0.5 acres or more when the parcel being developed (or redeveloped) is 3 acres or larger.

No part of the Study Area is within a FEMA designated Special Flood Hazard Area.

6C | Past & Ongoing Plans

COMPREHENSIVE PLAN

The Winnetka 2020 Comprehensive Plan was adopted in 1999. The document considers environmental factors and stormwater in various parts of the Plan. It acknowledges that water– related elements support the attractive character of the Village (from Lake Michigan on the east to the Skokie Lagoons on the west) and also that stormwater management is a concern. The Plan specifically raises concerns of increased impermeable surfaces and notes that this should be monitored as the Village continues to develop. The Study Area is addressed in the Plan as part of the west half of the Village's downtown. Plan recommendations for the West Elm area address a number of land use, transportation, urban design, and redevelopment opportunities. While not mentioned in detail in this section of the Plan, the overall issues of environment and stormwater management are relevant.

The Plan also notes that many one- and two-story buildings in the area have the potential to be redeveloped in the next 20 years, particularly along Oak Street near the Village Hall. The Plan states that:

- Temporary ponding is considered acceptable, but flooded basements and impassable streets are not acceptable.
- Resident surveying should be used to identify areas of the Village served by undersized or inadequate sewers.
- Effects of development should be monitored and such monitoring used to refine regulations concerning development in low-lying areas.

FLOOD RISK REDUCTION ASSESSMENTS

Major flooding occurred in Winnetka in September 2008, following extended storm activity related to Hurricane Ike. This major flooding event prompted the Village of Winnetka to investigate the capacity of its stormwater infrastructure. The Village then commissioned Flood Risk Reduction Assessments to identify areas in need of capital improvements for stormwater management.

The Village completed a Flood Risk Reduction Assessment of the "Additional Study Areas" in December 2012. These Additional Study Areas were not included in the original Flood Risk Reduction Assessment of 2011. The West Elm District was part of Area O in the "Additional Study Areas." The recommended improvements for the this area consist of replacing existing 22- and 24-inch storm sewers with 42- and 48-inch sewers, along with inlet capacity improvements. Two alternatives were presented: (1) disconnection of the Village storm sewer from the MWRD interceptor sewers; and (2) maintaining the connections without increasing the rate of discharge to the interceptor sewers. The Engineer's Opinion of Probable Cost for Alternates 1 and 2 are $2.3 million and $1.8 million, respectively.

FLOOD SURVEYS

The most extreme storm event in recent Village history took place on July 22-23, 2011. Following that event, the Village sent a survey to all property owners inquiring about flooding they may have experienced during the July 2011 storm. Of the approximately 4,425 properties in the Village, 1,061 survey responses were received. Eight properties in the Study Area responded to that survey and, of those, five reported flooding. Types of flooding included wall or floor seepage, floor drain, laundry tub, shower or toilet back-ups, and flooding due to a sump pump failure.

STORM WATER MASTER PLAN

The Village adopted its Stormwater Master Plan in April 2014. The Plan presents a comprehensive, multi-faceted strategy to manage stormwater runoff quantity and quality, to manage sanitary sewer discharges, and to guide Village investment and policy decisions. The Plan outlines capital improvement projects, establishes floodplain management priorities, recommends stormwater best management practices, and addresses development regulations, all from a Village-wide perspective.

ALL HAZARDS MITIGATION PLAN

The Cook County All Hazards Mitigation Plan is currently being developed by Cook County and may be completed in 2014. This Plan is a collaborative effort between the County and municipalities and townships within the County. It will identify activities that can be undertaken by both the public and private sectors to reduce the risk of property damage and loss of life caused by all types of hazards, including flooding. The development and subsequent adoption of this Plan will allow communities to become eligible for Federal Emergency Management Agency (FEMA) hazard mitigation funds.

6D | Community Outreach

SURVEY RESULTS

Business and property owners in the Study Area were asked to complete a survey as part of this project. The survey prompted respondents to provide details of their experience with flooding in their buildings and on their properties (see Appendix 2). The specificity of the survey questions were intended to provide a detailed understanding of site specific and area-wide flooding issues.

Respondents were asked to indicate the storm severity that led to flooding, water depths during that flooding, and how long it took for flooding to subside. Severity was described in general terms, such as: light rain/drizzle, medium rain, heavy rain, sudden deluge, and melting snow. Respondents also were asked to indicate the type of improvements they have undertaken to mitigate stormwater in and around their buildings. One survey was filled out and received for the Study Area. To preserve anonymity, survey results are not reported, but the input was considered as part of the study findings and recommendations.

1ST OPEN HOUSE

As follow up to the survey, Study Area residents were invited to attend an open house to provide further information on the location, intensity, and impact of flooding on their property.

No private property owners or business owners from the Study Area attended the open house. Village staff and the consultant team took the opportunity to conduct a workshop about stormwater management in the area. Staff brought local experience to the discussion, not just regarding the general area, but regarding a key publicly owned property.

The Winnetka Village Hall is located in the Study Area and staff noted that basement flooding has occurred during heavy rains.

Detailed maps of Study Area properties were used to consider the general location of flooding, the direction of water flow on their property, and the location of various structures on the site that may inhibit drainage. An example of a completed site study is included as Appendix 4.

Highlights from Open House Discussions

- The central business district character of the Study Area includes a substantial amount of paved area.
- There are several Village owned parcels and parking lots in the downtown area. This creates potential for stormwater management demonstration projects in parking lots.
- Commercial buildings in the Study Area experience flooding, primarily in below-grade parking lots.
- Single-family residential sites in the southwest corner of the Study Area experience flooding. To some extent, this is a result of the location of those areas downstream of the downtown, which is characterized by a high percentage of impervious area.

Abundance of paved area in the Central Business District.

Private parking lot in the Downtown area.

6E | Preliminary Recommendations and 2nd Open House

After the first open house, possible preliminary recommendations for individual lot and district scale solutions were considered. Those concepts were brought for discussion to a second open house (to which business and property owners also were invited). While no business or property owners attended the 2nd open house, photographs were used to illustrate the district scale solutions and discussed by the Village staff and consultant team. The slideshow presentation from the second open house is included in Appendix 5.

DISTRICT SCALE SOLUTIONS

District scale solutions in commercial areas would require the coordination of property owners in the area. A challenge in these commercial developments is that the owner of the building is not typically involved in the day-to-day operations and may not see stormwater flooding firsthand. The tenant may consider such repairs an owner responsibility and/or may not have the resources to make stormwater flooding prevention improvements on their own. District scale solutions may have to be driven by redevelopment regulations to be successful. These types of improvements were evaluated at a concept level. Additional work would be needed to implement them, including ground-based topographic survey, detailed engineering plans, cost estimates, and permits.

District Scale Solution #1

Update Winnetka's Streetscape Master Plan to Include BMPs

The Village of Winnetka has a Streetscape Master Plan that includes recommendations for the West Elm District. Future improvements might include green stormwater infrastructure, such as permeable pavement, bioswales in parking lot islands, planter boxes along sidewalks, and parkway rain gardens in curb bump outs at the intersections. Native plant based streetscapes could be constructed to beautify the commercial properties, and to reduce runoff rates and volumes, and improve water quality.

Example: Green stormwater infrastructure such as landscaping adjacent to sidewalks can help mitigate flooding.

District Scale Solution #2

Green Infrastructure Demonstration Project

Since several parcels in this area are Village-owned, this Study Area would be an ideal place for a green infrastructure demonstration project. Many green infrastructure techniques could be chosen, including permeable pavers, parking lot bioswales, or cistern stormwater collection systems. A demonstration project would not only help reduce stormwater runoff, it could also be used for the purpose of stormwater education and to stimulate additional green infrastructure retrofit projects.

Example: Driveway berms help mitigate flooding by absorbing water and also directing it to sewers

INDIVIDUAL PROPERTY SCALE SOLUTIONS

Individual property solutions were also presented and discussed at the second open house. Since the district scale solutions are not fully developed and since the funding for those projects has not yet been secured, property owners may elect to implement one or more individual property solutions, rather than wait for a district scale solution. These measures can be implemented swiftly, without the need to coordinate with other property owners.

Appendix 6 consists of a matrix of individual lot solutions organized by the source of the flooding problem. For each flooding cause, a variety of solutions were presented. The matrix explains when specific solutions would be the most appropriate and situations where the solution may not work well. The matrix provides a range of potential solutions that might complement or replace previous installations. The matrix offers solutions that are relevant for commercial properties. These upgrades will require the cooperation between the tenant and the landlord.

> One of the challenges with commercial properties is the owner of the building is not typically involved in the day-to-day operations and may not see stormwater flooding firsthand. The tenant may consider such repairs an owner responsibility and/or may not have the resources to make stormwater flooding prevention improvements on their own. Improvements in these areas are more likely to be driven by redevelopment regulations.

4

	Type of Problem	Solution	Purpose	Ideal Applications	Limitations and Other Considerations
Outside the Building	Landscaped Areas	Construct a rain garden	Reduces the period of inundation by increasing the rates of infiltration and evapotranspiration	Where no municipal sewer system is nearby	Clayey soils and high groundwater limit the rate of infiltration
		Install a yard drainage system	Convey stormwater from the yard to the municipal sewer system	Where the municipal sewer system is nearby and lower than the flood prone area	May require removal of trees or relocation of utility service lines
		Excavate high ground or fill in a low-lying area	Create a suitable overland flow path from the flood prone area	Where a small amount of excavation allows overland flow from a low lying area of the yard to the street	Must not create a flooding problem on another property and floodplain fill requires compensatory excavation
		Install a rain barrel	Reduce the amount of runoff to flood prone area	Where the area contributing runoff is small	Storage capacity can be overwhelmed by intense rain
		Install a sump pit, sump pump, and discharge line	Pump water out of the stairwell	Where the ground is sloped to drain away from the stairwell	Requires a discharge point that does not create a flooding problem on another property
		Remove debris from inlets	Prevent clogged storm drains	Any storm drain inlet	Inlets should be cleaned regularly
		Install a check valve on the sewer service line	Allow the free flow of water through the sewer service and prevent backflow	Where the sewer system reaches or exceeds its capacity from time to time	Debris within the sewer service line can prevent proper operation
	Paved Areas	Reconstruct pavement with permeable pavers	Store water in the aggregate below the pavers and allow it to infiltrate into the soil	Anywhere	Clayey soils and high groundwater limit the rate of infiltration
		Reconstruct pavement to drain	Prevent water from accumulating on paved areas	Where a ground slope of 1% or more can be attained	Fill in a flooplain requires compensatory excavation
		Install a trench drain and a drainage system	Convey stormwater from the paved area to the municipal sewer system	Where the municipal sewer system is nearby and lower than the paved area	May require relocation of utility service lines
		Construct a driveway berm	Prevent overland flow from the street from flooding a garage	Where the garage floor is lower that the street	The height of the driveway berm depends on the level of protection desired, which could be set a certain distance above the existing driveway or it could be set to match the elevation of the lowest ground elevation that cannot be raised

Snapshot Section of Matrix

6F | Action Steps

POTENTIAL NEXT STEPS FOR WINNETKA'S WEST ELM DISTRICT

The first step for every building owner or tenant is to develop an inventory of the flooding issues they face and the flood control measures already installed on their property.

The matrix in Appendix 1 can be used to identify the sources of any unresolved problems. Based on the type of flooding the property experiences, the property owner or tenant can identify solutions using the matrix in Appendix 6 and taking into account cost, effectiveness, and feasibility. Many of the solutions are best used in conjunction with others; combining several flood-control measures will give the system strength and redundancy.

Specific recommendations for property owners in Winnetka include building flood proofing measures.

Cracks and gaps between walls, foundations, and doors can leave space for water to seep into the building. Patching these gaps with continuous impermeable flood proofing can help keep water out of the building.

Measures should also be taken to protect building openings, such as doors and windows.

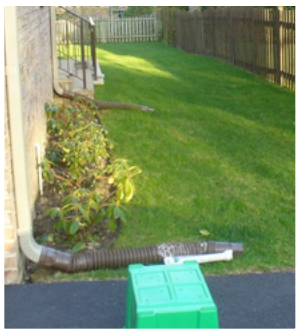
Driveway berms are recommended to keep street flooding out of subsurface parking areas/garages.

Improved parking lots that include green infrastructure (bioswales, permeable pavers, landscape buffers, etc.) are also recommended.

Repair Cracks/Gaps

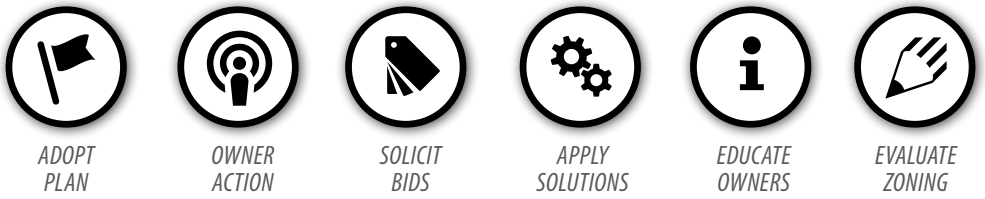
Raised Window Well

Landscaped Parking



Downspout Extension

POTENTIAL NEXT STEPS FOR THE VILLAGE OF WINNETKA



Adopt Plan

The Village's first step is to adopt this Plan as an addendum to the Stormwater Master Plan. It gives property owners the tools to understand and proactively address flooding on their properties and in their district.

Support Owner Action

Property owners are encouraged to take the lead in addressing localized flooding, but the Village can offer support and guidance by helping to identify sources of funding, preparing and submitting grant applications, and then taking responsibility for administering any grant funding that can be secured.

Solicit Bids

Owner-led efforts to address localized flooding that could be supported by the Village include: soliciting bids from contractors to construct improvements, such as sump pumps, landscaping, or permeable pavement at multiple properties at a lower unit price than individual property owners could obtain on their own; or bidding a privately funded district scale solution with a Village-funded project to get lower unit prices than the district could get on their own.

Apply Solutions

The Village could apply the templates developed as part of the Water Solutions Project to identify readily implementable solutions in other flood-prone areas of the Village. Another area of the Village that would be a prime candidates for this type of study is Area C from the Flood Risk Reduction Assessment completed in December 2012 for the Additional Study Areas

Educate Property Owners

The implementation of Winnetka's new stormwater utility has already done a lot to educate the public about the factors that influence the rate and volume of stormwater runoff from their property, but the Village could make the educational materials generated for the Water Solutions Project available on its website. These materials help make the public aware of actions they can take, either individually or collectively, to combat localized flooding.

Evaluate Zoning

The Village could amend its zoning regulations that relate to stormwater management. These standards function to maintain the Village's community character, so any changes must be evaluated in this context; however, a change that emphasizes mitigating stormwater impacts may be appropriate for certain applications or areas. By their nature, commercial developments can be expected to cover a relatively significant portion of a site to accommodate building and parking footprints. Certain zoning standards may cause impacts in the Study Area and could be evaluated by the Village.

In a central business district, zoning also supports community economic development policy. Although not specifically meant to manage stormwater, zoning regulations do impact how stormwater is handled on a given site. By their nature, central business districts typically cover a significant portion of a site to consider building and parking footprints. The Winnetka Zoning Ordinance acknowledges this reality by setting a maximum of 90% impermeable lot coverage.

Given the character of the Village downtown, substantive new or different zoning regulations related to stormwater management are unlikely to provide significant impact; however, the Comprehensive Plan recommends regularly monitor and review of the impacts of stormwater throughout the Village.

Redevelopment in established commercial districts is an opportunity to improve stormwater management. From a zoning standpoint (as well as other municipal codes), the key consideration is to identify the thresholds that will trigger the need for new stormwater management.

The cost of mitigating stormwater impacts on small sites or for small projects may discourage owners from making property improvements. Therefore, the Village may consider requiring small-scale stormwater management practices, such as landscaping or a fee-in-lieu of stormwater detention, for permitted projects that fall below the current threshold.

CATALOG OF POSSIBLE FUNDING METHODS

FEMA Hazard Mitigation Assistance

FEMA hazard mitigation assistance will become available once the Cook County All Hazards Mitigation Plan is complete and has been adopted by both the County and the Village. The Plan is currently being developed by Cook County and may be completed in 2014.

FEMA hazard mitigation assistance programs include the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM) program, and Flood Mitigation Assistance (FMA). Each program has its own eligibility and funding criteria, but each can be used to fund property protection measures as shown in the table on the following page, provided that the benefits of the project exceed project costs. In general, these programs are funded when FEMA approves an application prepared jointly by a local government, such as the Village, and the Illinois Emergency Management Agency (IEMA). In most cases, FEMA pays 75% of eligible expenses, but the federal share can reach 90% for Repetitive Loss Properties and 100% for Severe Repetitive Loss (SRL) properties.

Stormwater Utility

The Village of Winnetka recently created a Stormwater Utility to fund stormwater expenses. The Village assesses a bi-monthly stormwater fee based on each property's impact on the stormwater system. The stormwater fees fund all aspects of the Village stormwater system, including current operating and maintenance expenditures and the anticipated debt service associated with capital improvement projects. The Village's Capital Improvement Program does not include a stormwater capital improvement project for the West Elm District, but additional projects may be authorized once current projects have been constructed.

MWRDGC Stormwater Management Program

In 2014, the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) began its Phase II Stormwater Management Program, which funds local projects designed to improve drainage and reduce flood damage. From time to time, the MWRDGC will announce a formal call for funding requests, but funding requests are accepted at any time. The Village could request funding for the entire cost of a district scale solution, but the MWRDGC generally prefers to fund projects that are partially funded by other sources.

Special Service Area

The property owners or tenants within the Study Area could build support for a Special Service Area to fund one or more district improvement projects. Special Service Areas are local tax districts that fund expanded services and programs through a localized property tax levy within contiguous areas. The enhanced services and programs would be in addition to those currently provided through the Village.

Fee in Lieu

As sites are improved, particularly small scale improvements, the Village could require a fee in lieu of stormwater detention to fund future stormwater infrastructure. Fees collected by the Village could be used to fund one or more of the district scale improvement projects.

Cost Sharing Program

The Village could establish a neighborhood-led initiative, such as Glenview's SWAMP Program, that allows residents to petition to install local drainage projects with the help of the Village. The property owners would present a petition to the Village that requests consideration of a local drainage project. If the majority of property owners support the drainage improvement, the Village would provide a report including costs for the improvement. If the Plan is approved by a majority of the property owners, the drainage improvement can be built, and could be partially funded by the Village.

FEMA HAZARD MITIGATION ASSISTANCE PROGRAMS

Eligibility & Funding Criteria

Eligible Activities	HMGP	PDM	FMA
Property Acquisition and Structure Demolition	√	√	√
Property Acquisition and Structure Relocation	√	√	√
Structure Elevation	√	√	√
Mitigation Reconstruction			√
Dry Floodproofing of Non-residential Structures	√	√	√
Minor Localized Flood Reduction Projects	√	√	√
Structural Retrofitting of Existing Buildings	√	√	
Non-structural Retrofitting of Existing Buildings and Facilities	√	√	√
Infrastructure Retrofit	√	√	√
Post-Disaster Code Enforcement	√		
Generators	√	√	

Chapter 7
implementation

7A | Background

The goal of this study is to create a template that can be applied for mitigating stormwater flooding in other areas in the watershed. The four pilot Study Areas in this project demonstrate how the materials can be used for different land uses and neighborhoods. Digital copies of all the materials and exhibits developed for the pilot Study Areas have been included in this report so they can be edited for future use.

Each pilot Study Area represents a different type of development. Examples for single-family, multi-family, commercial, and downtown business developments have all been included. They should serve as models for future studies.

7B | Lessons Learned

Open House Invitations

When sending out open house invitation letters, the dates of both open houses should be included in a single letter. Including both dates allows the attendees to plan their schedule in advance. Also, including both dates in the first letter allows the two open houses to be scheduled in closer proximity to one another. Waiting for a second letter to be delivered can delay the second open house.

Respect to Privacy

Reports generated from these studies should be sensitive to resident concerns about keeping information private. The report should not call out specific addresses, especially when identifying flooding on the property. Keep recommendations general to the study area, not property-specific.

Study Area Boundaries

Study area boundaries should be defined by a common flooding problem. Flooding can occur in many ways, and it is helpful when formulating solutions to focus on similar types of flooding throughout the study area. Focusing on a common flooding problem is practical when recommending neighborhood scale solutions and personalizing the matrix of individual lot solutions for a given Study Area.

Quality Data Integration

Reliable and highly detailed GIS data are critical for analysis of an area. Both engineering and zoning recommendations depend on having accurate topographic data and information on impervious surface coverage and land use. Using these data adds precision and credibility to the recommended solutions.

Public Education

One of the primary benefits of this project was the public education component. Property owners learned about the variety of options available to address flooding problems, as well as the reasons for flooding. Educating owners on different types of flooding helped them identify the problems specific to their property and helped them come up with appropriate solutions. This educational material can help owners to be more confident when talking with contractors and installers of flood prevention technologies and know whether a solution is appropriate to their property.

Working in Groups

During the first open house, having neighbors work in groups was helpful, especially for properties that abutted each other. Working in groups allowed the property owners to combine their knowledge of the area and create a more complete picture of flooding problem areas. It was helpful for members of Village staff or other meeting leaders to sit with each group as they are filling out their property map and ask specific questions about flood depth, duration, and frequency of flooding to draw out information that the property owner might not have included or thought about on their own.

7B | Lessons Learned (cont.)

Future Studies

Future Study Areas would potentially include any area that experiences heavy local stormwater flooding, yet lacks plans for major capital improvement projects in the near future. The strength of this method is in the fast turn-around. It is a great way to gather information and identify a range of potential solutions without having to go through a long stormwater modeling process. It is also a robust education tool for residents and property owners in these areas.

Commercial Properties

Commercial properties seem to be less proactive about stormwater improvements than the home owners in residential Study Areas. Attendance at the open houses for both commercial Study Areas were low and only a very small percent of surveys were returned. It may not be realistic to expect owner-driven stormwater improvements, especially for the district scale solutions. Instead, the municipality should consider using redevelopment requirements to encourage stormwater drainage improvements in those areas.

7C | Steps to Apply the 'Water Solutions Project' in your Community

Appendix 1

Flooding Types & Locations

BACKGROUND ON FLOODING

DEFINITION

Simply put, a flood is a damaging overflow of water into human structures or onto land that is dry most of the time. More formally, the Federal Emergency Management Agency (FEMA) defines a flood as, "A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties" (FEMA, NFIP).

FACT: Floods are the #1 Natural Disaster in the United States.

Source: FEMA.gov

FLOOD CATEGORIES

For the purpose of this study, flooding is divided into two categories. One is "stream flooding" (also known as "overbank flooding"), involving streams or rivers overflowing onto a floodplain. The second is "stormwater flooding" (also known as "localized" flooding, drainage flooding, or overland flow), involving flooding outside of mapped floodplains.

STUDY FOCUS

The focus of this study is to understand where flooding occurs, why it occurs, and what its common effects are. The goal is to explore solutions to prevent or reduce flooding and the damage it causes.

STREAM FLOODING

Stream or "overbank flooding" results when the water level in the stream channel rises above its banks.

This may be caused by excessive rain or snow melt, or when the water's natural path is blocked. In either case, water overflows onto surrounding floodplain areas. Such high-risk areas are classified by FEMA as Special Flood Hazard Areas (SFHAs) with the goal of discouraging new construction in these areas and encouraging protection, mitigation measures, and flood insurance coverage for existing structures.

STORMWATER FLOODING

Many locations may experience stormwater flooding, standing water and damage if the accumulation of water, typically after heavy rains, exceeds the rate at which water drains away from the land.

Runoff water collects in low-lying areas until it drains out, infiltrates into the soil, evaporates, or is pumped to another location. This type of flooding can be especially problematic in urban areas where rooftops and pavement increase the amount of runoff after storms.

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FLOODING CAUSE & EFFECT

	1 WHERE DOES IT HAPPEN?	2 WHAT CAUSES IT TO HAPPEN?	3 WHAT ARE THE EFFECTS?
OUTSIDE THE BUILDING	STREET FLOODING	⚠ Extreme rain events ⚠ Melting snow ⚠ Saturated/frozen ground ⚠ Stormwater or river/stream flooding ⚠ Blocked culverts ⚠ Sewer backup ✓ Clogged inlet ⚠ Discharge from adjacent properties	• Water damage to vehicles • Limited access for people and vehicles • Flooded yards and garages • Wake against homes due to vehicles passing through flood waters
OUTSIDE THE BUILDING	PROPERTY FLOODING	⚠ Extreme rain events ⚠ Melting snow ⚠ Saturated/frozen ground ⚠ Stormwater or river/stream flooding ⚠ Blocked culverts ⚠ Sewer backup ✓ Clogged inlet ✓ Sump pump discharge ✓ Down spout discharge ✓ Clogged gutters ✓ Alleys/roads above the grade of yards ✓ Landscape features that obstruct the flow of stormwater ✓ Built features that obstruct the flow of stormwater ✓ Impervious surfaces ✓ Unmaintained pervious pavement ✓ Improper grading ✓ Stormwater discharge from adjacent properties	• Temporary ponding of water • Window well backup • Yard flooding • Garage or shed flooding • Seepage of water into the building • Damage to lawn and landscaping
OUTSIDE THE BUILDING	STORM SEWER SURCHARGE	✓ Downspouts that drain directly to the sewer ✓ Illegal connection to the sanitary sewer ⚠ Exceeded sewer capacity ⚠ Blockages in the system ⚠ Defective connections ✓ Clogged Inlet	• Backup through the sump pump pit • Backup on streets and properties • Backup through basement drains
INSIDE THE BUILDING	SANITARY SEWER SURCHARGE	⚠ Infiltration due to cracks or broken pipes during extreme rain events ⚠ Exceeded sewer capacity ⚠ Downspouts that drain to the sewer ⚠ Blockages in the system ⚠ Sump pumps discharging to the sewer	• Backup through floor drains, shower drains and toilet fixtures • Backup through the ejector pump pit
INSIDE THE BUILDING	PUMP FAILURE	⚠ Loss of power ✓ Lack of pump maintenance ✓ Absence of battery backup ✓ Absence of back flow prevention ✓ Insufficient capacity	• Sump pump pit overflow causing basement flooding • Ejector pump pit overflow causing basement flooding
INSIDE THE BUILDING	SEEPAGE	✓ Property flooding (overland flow) ✓ Cracks, holes or joints in elements through which water seeps in ✓ Cracked drainage tiles around basement walls ✓ Inadequate flood proofing ✓ Improper grading ✓ Low openings into the building (door, window) ✓ Downspout or sump pump discharge close to the foundation	• Seepage through the basement floor, walls, and roof • Seepage through the crawl space • Seepage around door and window frames • Flow over a doorway threshold • Flow through a broken window • Seepage over the top of a foundation wall

⚠ = Beyond property owner's control
✓ = Within property owner's control

Results in property loss, structural damage, disruption of life, and unforeseen expenses.

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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PROPERTY FLOODING

FLOOD TYPE: OUTSIDE

Property flooding takes place in yards due to water collecting on the site quicker than it can drain, as well as by improper grading or obstruction of the flow of stormwater.

WHAT CAN CAUSE IT?

- Extreme rain events
- Melting snow
- Stormwater backup ; stormwater discharge from adjacent properties
- Sump pump or downspout discharge
- Improper grading of the property
- Alleys/roads above the grade of yards
- Impervious surfaces like parking lots, driveways and other paved areas
- Pervious pavement not maintained
- Obstruction of stormwater flow due to installation of any landscaping or built features (garages, patios, gazebos) that change the grade of the property
- Clogged gutters

PROPERTY FLOODING IMPACTS

Temporary ponding due to improper site grading

Window well drain backup

Yard flooding

Ponding due to discharge from downspouts

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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STREET FLOODING

FLOOD TYPE: OUTSIDE

Flooding of streets takes place when water is not able to drain off the street into the sewer system due to the quantity of water or obstructions in the conveyance system.

WHAT CAN CAUSE IT?

- Extreme rain events
- Melting snow
- Saturated or frozen ground
- Stormwater or river/stream flooding
- Sewer backup
- Blocked culverts or clogged inlets
- Stormwater from adjacent properties with large impervious areas

STREET FLOODING IMPACTS

Water damage to vehicles

Limited access for people and vehicles

Flooded yards and garages

Wake caused by vehicles passing through flooded streets

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SEEPAGE

FLOOD TYPE: INDOORS

Properties can flood due to water that seeps into the building through cracks, holes or joints in the building elements like basement floors and walls. This cause of flooding is known as 'seepage'.

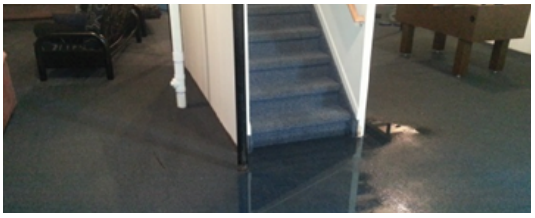
WHAT CAN CAUSE IT?

- Property flooding (overland flow)
- Cracks, holes and joints in basement floors and walls, and roofs
- Cracked drainage tiles around basement walls
- Inadequate flood proofing
- Improper grading
- Low openings into the building (door or window)
- Downspout or sump pump discharge too close to the foundation

SEEPAGE OF WATER INTO THE BUILDING CAN TAKE PLACE FROM VARIOUS LOCATIONS.

Roof / Ceilings

Joints between floors and walls



Floors

Walls / Crawlspaces

Doors / Entryways

Windows

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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SANITARY SEWER SURCHARGE

FLOOD TYPE: INSIDE

A sanitary or combined sewer surcharge takes place when the sewer system backs up due to exceeded capacity. This is typically due to clogging, or infiltration of water into the system from improper connections or defects in the system. In the case of combined sewers, surcharge could be related to runoff that exceeds the capacity of the sewer.

WHAT CAN CAUSE IT?

- Inflow and infiltration of water into the sewer through cracks or broken pipes during extreme rain events
- Downspouts that incorrectly drain to the sanitary sewer
- Exceeded sewer capacity
- Blockages in the sewer system
- Sump pumps that discharge to the sewer

SANITARY SEWER SURCHARGE IMPACTS

Backup through floor drains, shower drains and toilet fixtures in the basement

Basement flooding due to pump failure

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Planning for Resilient Communities

STORM SEWER SURCHARGE

FLOOD TYPE: OUTSIDE AND INSIDE

A storm sewer surcharge takes place when the amount of stormwater exceeds the capacity of the sewer system. This is typically due to clogging or extreme rain events that cause storm water to back up into streets, yards, and buildings.

WHAT CAN CAUSE IT?

- Downspouts that drain directly to the sewer
- Illegal connections to the sanitary sewer
- Exceeded sewer capacity
- Blocked or defective connections in the system
- Clogged inlet

STORM SEWER SURCHARGE IMPACTS

Backup on properties

Backup on streets

Backup through basement drains

PUMP FAILURE

FLOOD TYPE: INSIDE

Sump pumps remove groundwater from the foundation drains surrounding the building, while ejector pumps remove grey water (waste water from toilet fixtures, showers and sinks) from basements. However, these pumps can fail, causing water to flood the pits and eventually basements.

WHAT CAN CAUSE IT?

- Loss of power
- Lack of pump maintenance
- Absence of battery backup
- Absence of back flow prevention
- Insufficient capacity

PUMP FAILURE IMPACTS

Backup through the ejector pump pit

Flooding of the ejector pump pit

Flooding of the sump pump

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Appendix 2

Public Surveys

RESIDENTIAL PROPERTY SURVEY

The Water Solutions Project
Pilot Property Survey

Please help us understand the flooding issues related to your building and property by filling out the survey below. The term 'building' refers to the primary structure and the term 'property' refers to the site. Your feedback will help us recommend appropriate flood mitigation measures for your property.

1. What is the address of your property? _____
2. What type of use does your property fall under? □ Single-Family Residential □ Multi-Family Residential □ Downtown Retail □ Commercial
3. Are you a tenant or property owner? □ Tenant □ Property Owner
4. How long have you been at this address? _____ years
5. Does your **BUILDING** experience any flooding issues? □ YES □ NO
6. As per your knowledge, approximately when was the first time you noticed your building flood? *(e.g.: May 2010)* _____
7. If your building does experience flooding, please indicate the source, cause, extent and period of flooding in the table below:

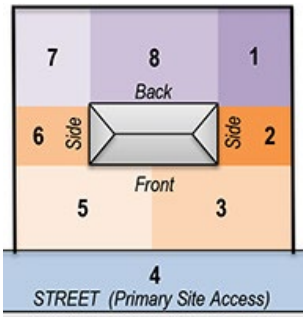
Source of flooding	Cause/Rain Event						Extent of flooding			Period of flooding			Any idea what causes the flooding?
	Light rain/ Drizzle	Medium rain	Heavy rains	Sudden deluge	Melting snow	Other event	Flooding (upto 4 inches of water)	Flooding (more than 4 inches of water)	Moving water	Less than 4 hours	Between 4 and 24 hours	More than 24 hours	
□ Roof	□	□	□	□	□	□	□	□	□	□	□	□	
□ Floor drain or bathroom fixture	□	□	□	□	□	□	□	□	□	□	□	□	
□ Basement wall seepage	□	□	□	□	□	□	□	□	□	□	□	□	
□ Floor seepage	□	□	□	□	□	□	□	□	□	□	□	□	
□ Doorway / window	□	□	□	□	□	□	□	□	□	□	□	□	
□ Window well	□	□	□	□	□	□	□	□	□	□	□	□	
□ Sanitary sewer back-up	□	□	□	□	□	□	□	□	□	□	□	□	
□ Sump pump failure	□	□	□	□	□	□	□	□	□	□	□	□	
□ Other:_____ _____	□	□	□	□	□	□	□	□	□	□	□	□	

8. Does your building have any protection from sewer back-ups? Please select all that apply.
   □ Overhead sewer □ Check valve □ Stand Pipe □ Floor Drain Plug □ Not sure □ None □ Other:_____
9. Briefly describe/list all the improvements that have been made to the building to prevent flooding or seepage.

_____
_____

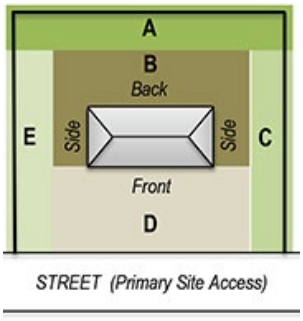
The Water Solutions Project
Pilot Property Survey

10. During a rain event, what happens to the following areas of your property? (Please refer to the accompanying diagram for the area numbers)



Area	Cause/Rain Event						Type of flooding			Period of flooding		
	Light rain/ Drizzle	Medium rain	Heavy rain	Sudden deluge	Melting snow	Other event	Ponding (up to 4 inches of water)	Ponding (more than 4 inches of water)	Moving water	Less than 4 hours	Between 4 and 24 hours	More than 24 hours
□ 1	□	□	□	□	□	□	□	□	□	□	□	□
□ 2	□	□	□	□	□	□	□	□	□	□	□	□
□ 3	□	□	□	□	□	□	□	□	□	□	□	□
□ 4	□	□	□	□	□	□	□	□	□	□	□	□
□ 5	□	□	□	□	□	□	□	□	□	□	□	□
□ 6	□	□	□	□	□	□	□	□	□	□	□	□
□ 7	□	□	□	□	□	□	□	□	□	□	□	□
□ 8	□	□	□	□	□	□	□	□	□	□	□	□

11. What features does your property currently have and where are they located? (Please refer to the accompanying diagram for the location codes)



Type of feature	Location of feature				
	A	B	C	D	E
□ Fence or wall	□	□	□	□	□
□ Shrubs/planting areas	□	□	□	□	□
□ Raised planter beds	□	□	□	□	□
□ Raised mounds	□	□	□	□	□
□ Structures (sheds, gazebos, above ground pool, detached garage)	□	□	□	□	□
□ Patios or play areas	□	□	□	□	□
□ Permeable pavers	□	□	□	□	□
□ Rain garden or bioswale	□	□	□	□	□
□ Parking lot / Driveway	□	□	□	□	□
□ Sump pump	□	□	□	□	□
□ Yard drainage	□	□	□	□	□
□ Other:_____	□	□	□	□	□

12. List all the improvements that have been made to the property to prevent standing water or flooding.

_____

_____

_____

COMMERCIAL PROPERTY SURVEY

The Water Solutions Project
Pilot Property Survey

Please help us understand the flooding issues related to your building and property by filling out the survey below. The term 'building' refers to the primary structure and the term 'property' refers to the site. Your feedback will help us recommend appropriate flood mitigation measures for your property.

1. What is the address of your property? _____
2. What type of use does your property fall under? □ Single-Family Residential □ Multi-Family Residential □ Downtown Retail □ Commercial
3. Are you a tenant or property owner? □ Tenant □ Property Owner
4. How long have you been at this address? _____ years
5. Does your **BUILDING** experience any flooding issues? □ YES □ NO
6. As per your knowledge, approximately when was the first time you noticed your building flood? *(e.g.: May 2010)* _____
7. If your building does experience flooding, please indicate the source, cause, extent and period of flooding in the table below:

Source of flooding	Cause/Rain Event						Extent of flooding			Period of flooding			Any idea what causes the flooding?
	Light rain/ Drizzle	Medium rain	Heavy rains	Sudden deluge	Melting snow	Other event	Flooding (upto 4 inches of water)	Flooding (more than 4 inches of water)	Moving water	Less than 4 hours	Between 4 and 24 hours	More than 24 hours	
□ Roof	□	□	□	□	□	□	□	□	□	□	□	□	
□ Floor drain or bathroom fixture	□	□	□	□	□	□	□	□	□	□	□	□	
□ Basement wall seepage	□	□	□	□	□	□	□	□	□	□	□	□	
□ Floor seepage	□	□	□	□	□	□	□	□	□	□	□	□	
□ Doorway / window	□	□	□	□	□	□	□	□	□	□	□	□	
□ Window well	□	□	□	□	□	□	□	□	□	□	□	□	
□ Sanitary sewer back-up	□	□	□	□	□	□	□	□	□	□	□	□	
□ Sump pump failure	□	□	□	□	□	□	□	□	□	□	□	□	
□ Other:_____ _____	□	□	□	□	□	□	□	□	□	□	□	□	

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   □ Overhead sewer □ Check valve □ Stand Pipe □ Floor Drain Plug □ Not sure □ None □ Other:_____
9. Briefly describe/list all the improvements that have been made to the building to prevent flooding or seepage.

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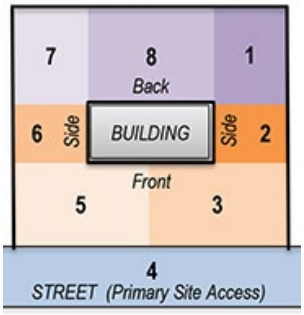
_____

The Water Solutions Project
Pilot Property Survey

10. During a rain event, what happens to the following areas of your property? (Please refer to the accompanying diagram for the area numbers)



Area	Cause/Rain Event						Type of flooding			Period of flooding		
	Light rain/ Drizzle	Medium rain	Heavy rain	Sudden deluge	Melting snow	Other event	Ponding (up to 4 inches of water)	Ponding (more than 4 inches of water)	Moving water	Less than 4 hours	Between 4 and 24 hours	More than 24 hours
□ 1	□	□	□	□	□	□	□	□	□	□	□	□
□ 2	□	□	□	□	□	□	□	□	□	□	□	□
□ 3	□	□	□	□	□	□	□	□	□	□	□	□
□ 4	□	□	□	□	□	□	□	□	□	□	□	□
□ 5	□	□	□	□	□	□	□	□	□	□	□	□
□ 6	□	□	□	□	□	□	□	□	□	□	□	□
□ 7	□	□	□	□	□	□	□	□	□	□	□	□
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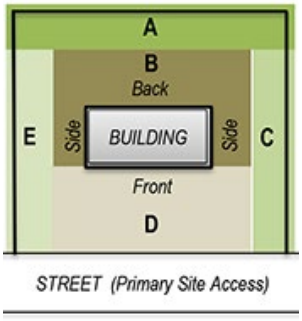

Type of feature	Location of feature				
	A	B	C	D	E
□ Fence or wall	□	□	□	□	□
□ Shrubs/planting areas	□	□	□	□	□
□ Raised planter beds	□	□	□	□	□
□ Raised mounds	□	□	□	□	□
□ Structures (sheds, gazebos, above ground pool, detached garage)	□	□	□	□	□
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□ Permeable pavers	□	□	□	□	□
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□ Parking lot / Driveway	□	□	□	□	□
□ Sump pump	□	□	□	□	□
□ Yard drainage	□	□	□	□	□
□ Other:_____	□	□	□	□	□

12. List all the improvements that have been made to the property to prevent standing water or flooding.

_____

_____

_____

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Appendix 3

Letters to Residents

VILLAGE·OF·WINNETKA

Incorporated in 1869

Office of the Public Works Director
(847) 716-3534

Dear Boal Parkway Neighborhood Resident:

The Village of Winnetka has developed a large-scale, multi-year plan to mitigate stormwater flooding and related damage throughout the Village. Information about the Stormwater Management Program can be found on the Village maintained website at: http://winnetkastormwaterplan.com.

As part of a related but separate program, the Village is working to address localized stormwater issues for small residential and business areas through readily implementable solutions. The program is funded by a Federal grant, administered by the State, and is being conducted cooperatively with the Villages of Glenview and Niles, and the support of a consultant team led by Baxter & Woodman. Further information about this program can be found at the project website: www.WaterSolutionsProject.org.

The first study area selected for this program is the Boal Parkway neighborhood. We realize that your input was sought through past surveys, and we are grateful for the information you and your neighbors provided; however, the attached survey requests more detailed information. Your responses here and participation in this process will help develop a plan for your neighborhood. The goal of this plan is to provide a suite of flood protection measures which can be undertaken swiftly and locally.

In addition to requesting your response to this survey, we also invite you to attend a workshop at the Public Works Facility (1390 Willow Road) on Wednesday, June 11 at 7:00 p.m. to delve further into localized stormwater management issues around Boal Parkway. You can bring your completed survey to the workshop, send it with a neighbor that is attending the workshop, or drop it off at the Public Works Facility. If you are unable to attend the workshop, please send your completed survey to Public Works. If you have any questions about this process, please contact me or Assistant Village Engineer Susan Chen at (847) 716-3568.

Very truly yours,

Steven M. Saunders
Director of Public Works/Village Engineer

Enclosure

510 Green Bay Road, Winnetka, Illinois 60093

VILLAGE·OF·WINNETKA

Incorporated in 1869

Office of the Public Works Director
(847) 716-3534

Dear Boal Parkway Neighborhood Resident:

The Village has received an abundance of valuable information about flooding along Boal Parkway through surveys that have been submitted and the additional input received at the June 11 workshop. Now the consultant team is evaluating potential solutions which will be presented at a second workshop that will be held at the Public Works Facility (1390 Willow Road) on Thursday, June 19 at 7:00 p.m.

We invite you to attend the June 19 workshop, whether or not you attended the workshop on June 11. You will have the opportunity to provide feedback on the recommended solutions. If you have any questions about this process, please contact me or Assistant Director of Public Works and Engineering, Jim Bernahl at (847) 716-3261 or jbernahl@winnetka.org.

Very truly yours,

Steven M. Saunders

Steven M. Saunders
Director of Public Works/Village Engineer

Village of Niles

"Where People Count"

Public Services
6849 W Touhy Avenue, Niles, Illinois 60714
Telephone (847) 588-7900 • Fax (847) 588-7950

Dear Milwaukee Avenue Area Property Owner/Occupant.

The Village of Niles established a Stormwater Commission in September 2008 and since then has been working steadily to address flooding through various initiatives. These initiatives include improvements in the operation and maintenance of the sewer system, development of a public education program, and new infrastructure. No single initiative solves the problem of flooding by itself, but the various initiatives are all part of the solution. More detailed information about the Stormwater Commission can be found on the Village maintained website at: http://www.vniles.com/392/Stormwater-Commission.

As part of a new initiative, the Village is working to address localized stormwater issues for small residential and business areas through readily implementable solutions. The program is funded by a Federal grant, administered by the State, and is being conducted cooperatively with the Villages of Winnetka and Glenview, and the support of a consultant team led by Baxter & Woodman. Further information about this program can be found at the project website: www.WaterSolutionsProject.org.

One of the study areas selected for this project is along Milwaukee Avenue, between Ballard Road and Dempster Street. A survey requesting detailed information about flooding on your property is enclosed with this letter. Your response to this survey and participation in this project will help develop a plan for the area. The goal of this project is to provide a suite of additional flood protection measures which can be undertaken swiftly and locally.

In addition to requesting your response to this survey, we also invite you to attend a pair of workshops at the Chateau Ritz (9100 Milwaukee Avenue, Niles). The first workshop will be held on Thursday, July 24 at 4:30 pm and the second will be held on Tuesday, August 19th at 4:30 pm. The purpose of the first workshop is to help the project team better understand the flooding problem in the study area, while the second workshop gives you the opportunity to provide input on a draft plan for the area. You can bring your completed survey to the first workshop, send it with a neighbor that is attending the workshop, or drop it off at the Public Services Facility (6849 W. Touhy Avenue, Niles). If you are unable to attend the first workshop, please send your completed survey to Public Services by July 24. If you have any questions about this process, please contact me at (847) 588-7900.

Sincerely,

Dan Randolph
Village of Niles
Engineering Division
Office: 847.588.7900
E-mail: djr@vniles.com

The Village of Glenview

Community Development Department
Engineering Services Division
(847) 904-4340 direct
(847) 724-1752 fax

Dear Dewes-Henley-Harlem Neighborhood Resident:

The Village of Glenview adopted its Flood Risk Reduction Program in April 2010 and since then has been working steadily to address flooding through various initiatives. These initiatives include the construction of large-scale drainage improvement projects, such as the one scheduled to begin in your neighborhood in the coming weeks, but also include the establishment of cost-sharing programs for drainage improvements on private property. No single initiative solves the problem of flooding by itself, but the various initiatives are all part of the solution. More detailed information about the Flood Risk Reduction Program can be found on the Village maintained website at: http://www.glenview.il.us/Pages/Stormwater-Task-Force.aspx.

As part of a new initiative, the Village is working to address localized stormwater issues for small residential and business areas through readily implementable solutions. The program is funded by a Federal grant, administered by the State, and is being conducted cooperatively with the Villages of Winnetka and Niles, with the support of a consultant team led by Baxter & Woodman. Further information about this program can be found at the project website: www.WaterSolutionsProject.org.

One of the study areas selected for this project is the block bounded by Dewes Street on the north, Harlem Avenue on the east, Henley Street on the south, and Washington Street on the west. A survey requesting detailed information about flooding on your property is enclosed with this letter. Your response to this survey and participation in this project will help develop a plan for your neighborhood. The goal of this project is to provide a suite of additional flood protection measures which can be undertaken swiftly and locally.

In addition to requesting your response to this survey, we also invite you to attend a pair of workshops in the Community Room at the Village's Police Department (2500 East Lake Avenue). The first workshop will be held on Tuesday, July 22 at 6:30 pm and the second will be held on Tuesday, August 12 at 6:30 pm. The purpose of the first workshop is to help the project team better understand the flooding problem in your neighborhood, while the second workshop gives you the opportunity to provide input on a draft plan for your neighborhood. You can bring your completed survey to the first workshop, send it with a neighbor that is attending the workshop, or drop it off in the Community Development Department at Village Hall (1225 Waukegan Road). If you are unable to attend the first workshop, please send your completed survey to Village Hall by July 22. If you have any questions about this process, please contact me at (847) 904-4334.

Very truly yours,

James Tigue, C.F.M.
Engineering Technician

Enclosure

VILLAGE·OF·WINNETKA
Incorporated in 1869

Office of the Public Works Director
(847) 716-3534

Dear West Elm District Property Owner/Occupant:

The Village of Winnetka has developed a large-scale, multi-year plan to mitigate stormwater flooding and related damage throughout the Village. Information about the Stormwater Management Program can be found on the Village maintained website at: http://winnetkastormwaterplan.com.

As part of a related but separate program, the Village is working to address localized stormwater issues for small business and residential areas through readily implementable solutions. The program is funded by a Federal grant, administered by the State, and is being conducted cooperatively with the Villages of Glenview and Niles, and the support of a consultant team led by Baxter & Woodman. Further information about this program can be found at the project website: www.WaterSolutionsProject.org.

One of the study areas selected for this program is the West Elm District. We realize that your input was sought through past surveys, and we are grateful for the information you and your neighbors provided; however, the attached survey requests more detailed information. Your responses here and participation in this process will help develop a plan for the District. The goal of this plan is to provide a suite of flood protection measures which can be undertaken swiftly and locally.

In addition to requesting your response to this survey, we also invite you to attend a pair of workshops at the Public Works Facility (1390 Willow Road). The first workshop will be held on Tuesday, July 29 from 7:30 a.m. to 9:00 a.m. and the second will be held on Monday, August 11 from 7:30 a.m. to 9:00 a.m. The purpose of the first workshop is to delve further into localized stormwater management issues around the West Elm District, while the second workshop gives you the opportunity to provide input on a draft plan for the District. You can bring your completed survey to the first workshop, send it with a neighbor that is attending the workshop, or drop it off at the Public Works Facility located at 1390 Willow Road. If you are unable to attend the first workshop, please send your completed survey to Public Works by July 29. If you have any questions about this process, please contact me or Assistant Director of Public Works and Engineering James J. Bernahl at (847) 716-3568.

Very truly yours,

Steven M. Saunders
Director of Public Works/Village Engineer

Enclosure

Appendix 4

Sample Site Plan

WATER SOLUTIONS PROJECT

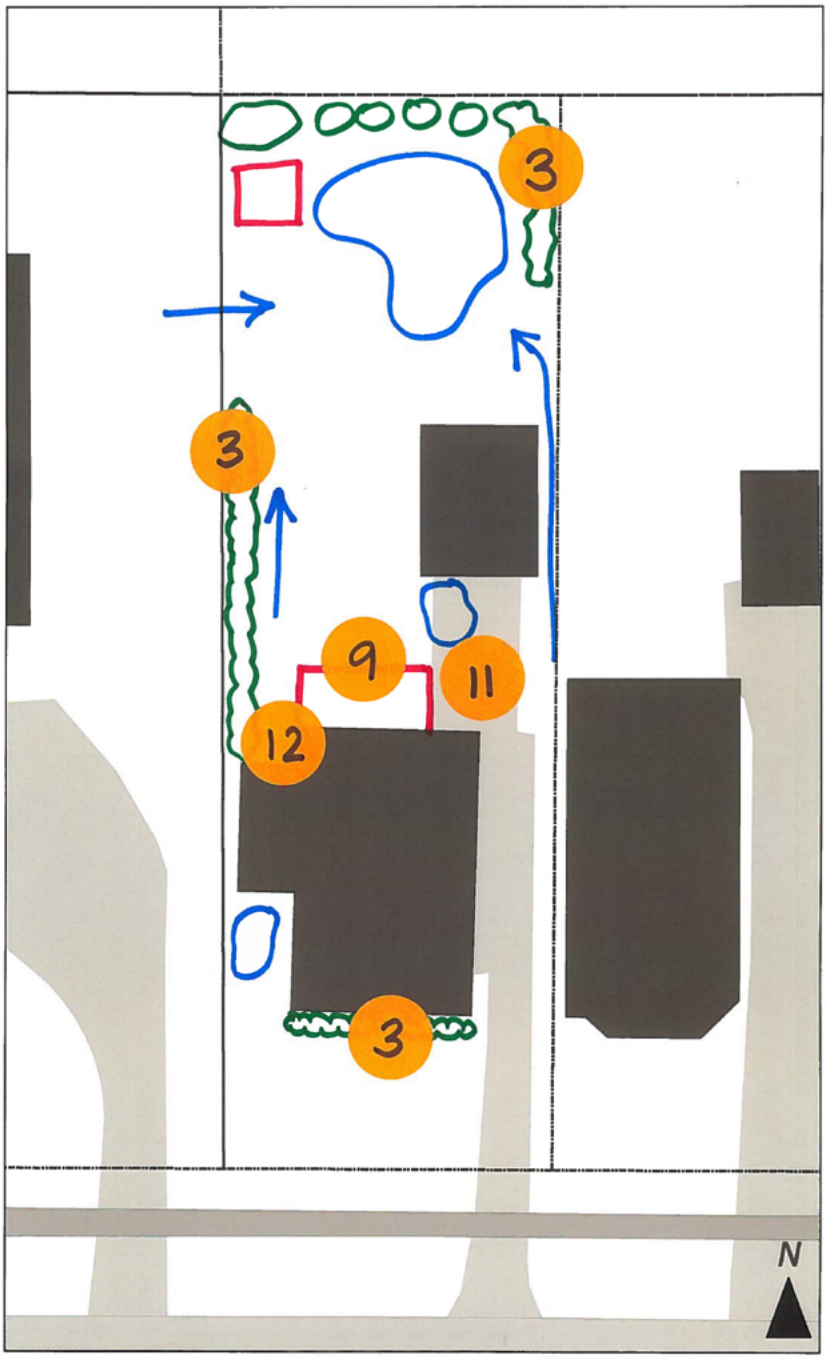
Planning for Resilient Communities

EXAMPLE STUDY AREA #1 OPEN HOUSE

On the map below, please indicate the following with the provided markers and stickers:

- Outside or inside areas that have any type of water ponding/flooding. Please also indicate the direction of flow.
- Any major landscaped areas Any major structural improvments like patios, etc.
- Please use the stickers 2 to indicate all the following features that you mark on your property-

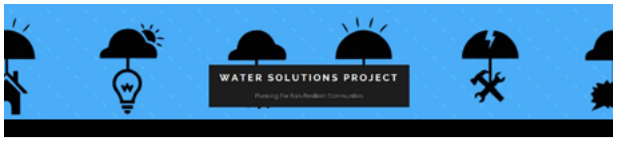
1. Fence
2. Wall
3. Shrubs/planting area
4. Raised planter bed
5. Raised mound
6. Shed
7. Gazebo
8. Detached garage
9. Patio
10. Play area
11. Permeable pavers
12. Downspout
13. Sump pump discharge
14. Surface parking
15.
16.



Appendix 5

Presentations

BOAL PARKWAY PRESENTATION #1

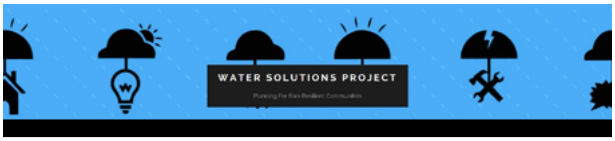


Welcome

Please take a few minutes to review the boards spread around the room. The presentation will begin at 7:20.

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

1

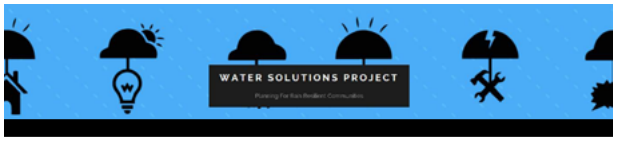


Project Background

- Separate from Other Village Initiatives
- Funded by a Federal Grant
- Additional Study Areas in Glenview and Niles

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

2

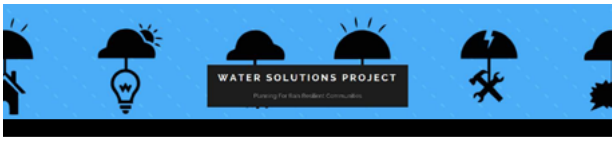


Agenda

- Project Background
- Purpose of this Study
- Flooding Overview
- Resident Input

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

3



Purpose of this Study

- Address Localized Stormwater Issues
- Readily Implementable Solutions

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

4

Flooding Overview

- #1 Natural Disaster in the United States (FEMA.gov)
  - Stream Flooding
  - Stormwater Flooding

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

5

2 What Causes it to Happen?

Beyond Property Owner's Control

- Extreme Rain and/or Melting Snow
- Saturated or Frozen Ground
- Storm Sewer or Culvert Blockage

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

6

BOAL PARKWAY PRESENTATION #1

WATER SOLUTIONS PROJECT

1 Where does it Happen?

OUTSIDE	INSIDE
Street Flooding	Sanitary/Combined Sewer Surcharge
Property Flooding	Pump Failure
Storm Sewer Surcharge	Seepage

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

7

WATER SOLUTIONS PROJECT

2 What Causes it to Happen?

Within Property Owner's Control

- Landscaping or Grading
- Downspout or Sump Pump Discharges
- Inadequate Flood Proofing

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

8

WATER SOLUTIONS PROJECT

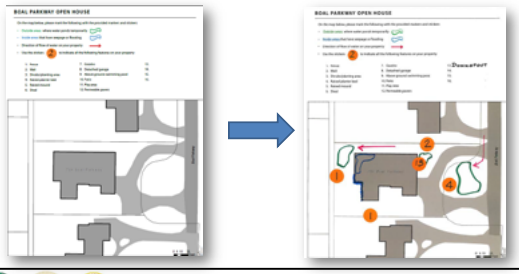
3 What are the Effects?

- Damage to Personal Property
- Limited Access for People and Vehicles

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

9

WATER SOLUTIONS PROJECT



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

10

WATER SOLUTIONS PROJECT

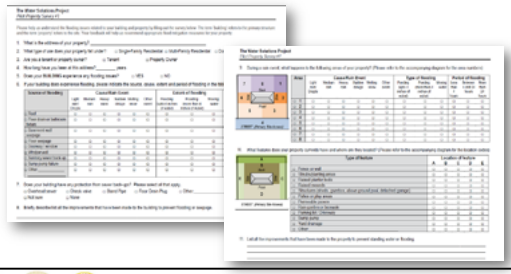
Resident Input

- Small Group Discussion
- Annotate Maps
- Fill Out Survey

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

11

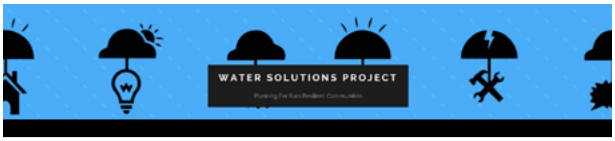
WATER SOLUTIONS PROJECT



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

12

BOAL PARKWAY PRESENTATION #2

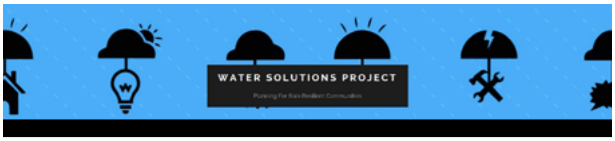


Welcome

Please take a few minutes to review the boards spread around the room. The presentation will begin at 7:10.

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

1

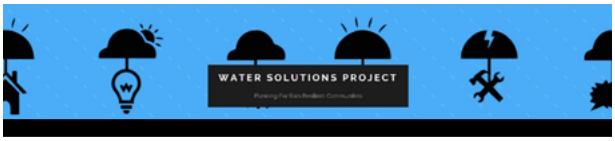


Agenda

- Purpose of this Study
- Potential Solutions
- Resident Feedback

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

2



Purpose of this Study

- Address Localized Stormwater Issues
- Readily Implementable Solutions

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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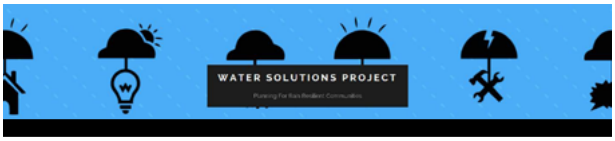
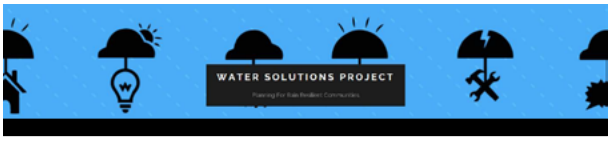


Potential Solutions

- Neighborhood Scale
- Individual Property Scale

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

4



Augment Golf Course Berms

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

5

Lower Road Profile

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

6

BOAL PARKWAY PRESENTATION #2

WATER SOLUTIONS PROJECT

Pumping Station


PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

7

WATER SOLUTIONS PROJECT

Overland Flow Path

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

8

WATER SOLUTIONS PROJECT

Outside the Building

- Landscaped Areas
- Paved Areas

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

9

WATER SOLUTIONS PROJECT

Yard Drainage System

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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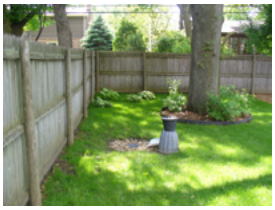
WATER SOLUTIONS PROJECT

Sump Pump System



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

11

WATER SOLUTIONS PROJECT

Check Valve

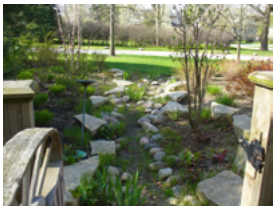

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

12

BOAL PARKWAY PRESENTATION #2

WATER SOLUTIONS PROJECT

Overland Flow Path

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

13

WATER SOLUTIONS PROJECT

Rain Garden


PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Rain Barrel


PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Trench Drain

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Driveway Berm


PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Inside the Building

- General Flooding
- Sump Pump Failure
- External Stairwell Flooding
- Sewer Back-Up
- Seepage
- Window Well Flooding

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

18

BOAL PARKWAY PRESENTATION #2

WATER SOLUTIONS PROJECT

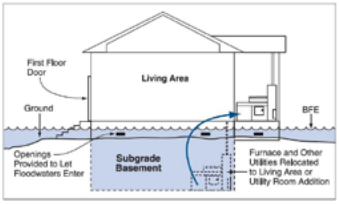
Elevate Mechanical Equipment

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

19

WATER SOLUTIONS PROJECT

Wet Floodproofing

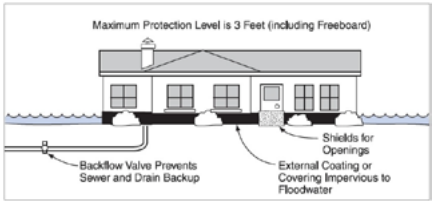


PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

20

WATER SOLUTIONS PROJECT

Dry Floodproofing

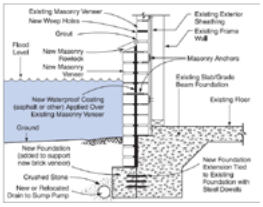


PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

21

WATER SOLUTIONS PROJECT

Waterproof Membrane



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

22

WATER SOLUTIONS PROJECT

Sump Pump Back-Up

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

23

WATER SOLUTIONS PROJECT

Sump Pump Air Gap

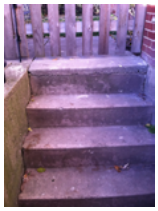
PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

24

BOAL PARKWAY PRESENTATION #2

WATER SOLUTIONS PROJECT

Short Barrier Wall



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

25

WATER SOLUTIONS PROJECT

Sump Pump System

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Raised Window Well

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Glass Block Window

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Window Well Area Drain

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

29

WATER SOLUTIONS PROJECT

Epoxy Injection

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

30

BOAL PARKWAY PRESENTATION #2

Downspout Extension

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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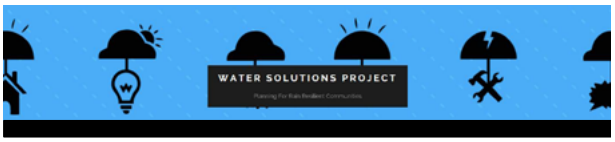
Resident Feedback

- Preferences
- Concerns
- Questions

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

32



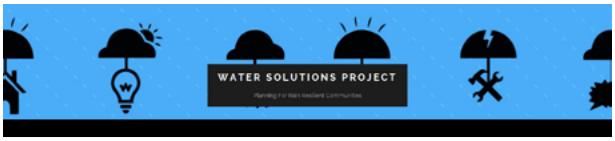
Next Steps

- Draft Pilot Study Completed – June 30
- Project Completed – September 19

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

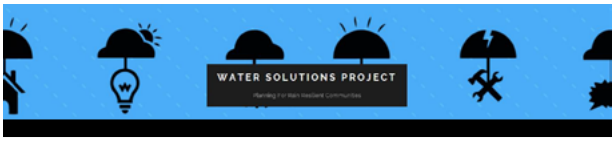
33

GLENVIEW PRESENTATION #1



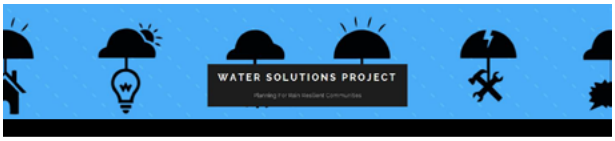
Welcome

Please take a few minutes to review the boards spread around the room. The presentation will begin at 7:10.



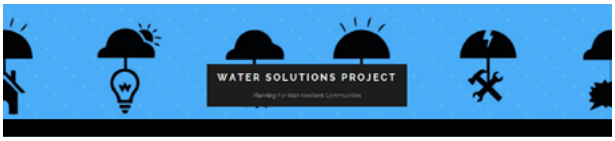
Agenda

- Project Background
- Purpose of this Study
- Flooding Overview
- Resident Input



Project Background

- Separate from Other Village Initiatives
- Funded by a Federal Grant
- Additional Study Areas in Winnetka and Niles

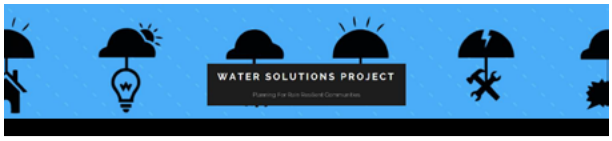


Purpose of this Study

- Address Localized Stormwater Issues
- Readily Implementable Solutions

Flooding Overview

- #1 Natural Disaster in the United States (FEMA.gov)
  - Stream Flooding
  - Stormwater Flooding



1 Where does it Happen?

OUTSIDE	INSIDE
Street Flooding	Sanitary/Combined Sewer Surcharge
Property Flooding	Pump Failure
Storm Sewer Surcharge	Seepage

GLENVIEW PRESENTATION #1

WATER SOLUTIONS PROJECT

2 What Causes it to Happen?

⚠ Beyond Property Owner's Control

- Extreme Rain and/or Melting Snow
- Saturated or Frozen Ground
- Storm Sewer or Culvert Blockage

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

7

WATER SOLUTIONS PROJECT

2 What Causes it to Happen?

Within Property Owner's Control

- Landscaping or Grading
- Downspout or Sump Pump Discharges
- Inadequate Flood Proofing

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

3 What are the Effects?

- Damage to Personal Property
- Limited Access for People and Vehicles

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

9

WATER SOLUTIONS PROJECT

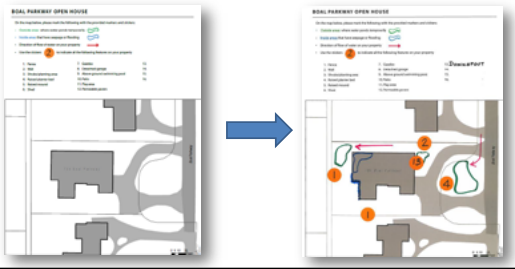
Resident Input

- Small Group Discussion
- Annotate Maps
- Fill Out Survey

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

10

WATER SOLUTIONS PROJECT



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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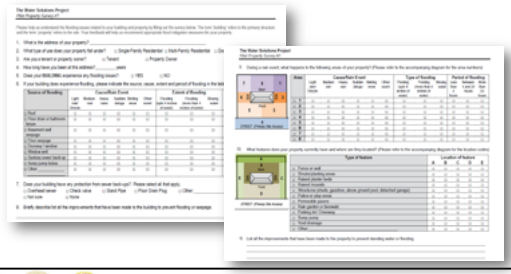
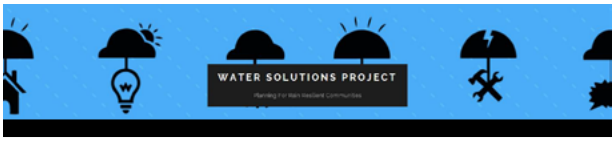
WATER SOLUTIONS PROJECT



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

12

GLENVIEW PRESENTATION #2



Welcome

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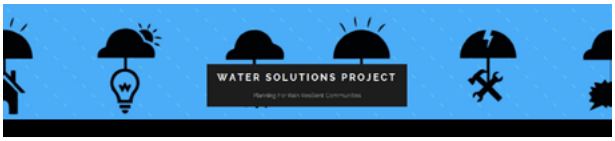
PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

1



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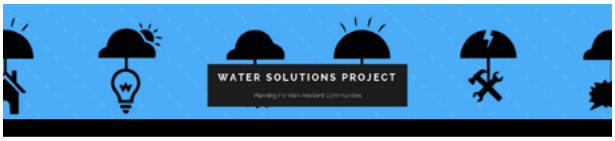

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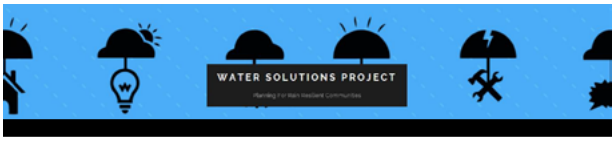

Potential Solutions

- Neighborhood Scale
- Individual Property Scale

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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Raise Sidewalk

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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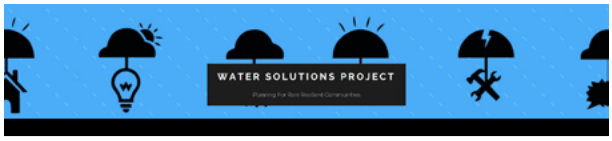

Re-Direct Overflow

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

6

GLENVIEW PRESENTATION #2

WATER SOLUTIONS PROJECT

Outside the Building

- Landscaped Areas
- Paved Areas

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

7

WATER SOLUTIONS PROJECT

Yard Drainage System

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Sump Pump System

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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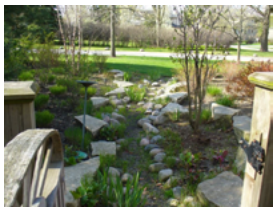
WATER SOLUTIONS PROJECT

Overland Flow Path



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Rain Garden

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Rain Barrel

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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GLENVIEW PRESENTATION #2

WATER SOLUTIONS PROJECT

Trench Drain

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Driveway Berm

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Inside the Building

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PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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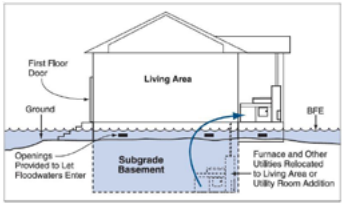
WATER SOLUTIONS PROJECT

Wet Floodproofing



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WATER SOLUTIONS PROJECT

Elevate Mechanical Equipment

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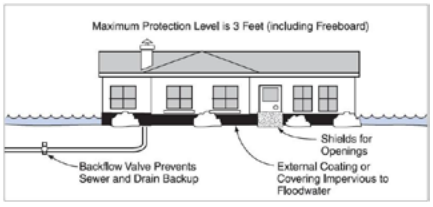
Dry Floodproofing



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

18

GLENVIEW PRESENTATION #2

WATER SOLUTIONS PROJECT

Check Valve

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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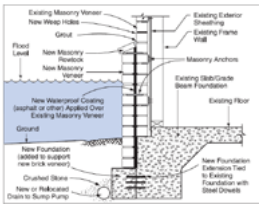
WATER SOLUTIONS PROJECT

Waterproof Membrane



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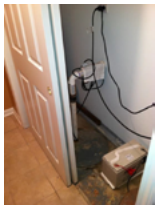
WATER SOLUTIONS PROJECT

Sump Pump Back-Up



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WATER SOLUTIONS PROJECT

Sump Pump Air Gap

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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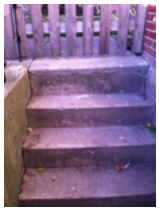
WATER SOLUTIONS PROJECT

Short Barrier Wall



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Sump Pump System

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

24

GLENVIEW PRESENTATION #2

WATER SOLUTIONS PROJECT

Raised Window Well


PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Glass Block Window

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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Window Well Area Drain

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WATER SOLUTIONS PROJECT

Downspout Extension

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WATER SOLUTIONS PROJECT

Resident Feedback

- Preferences
- Concerns
- Questions

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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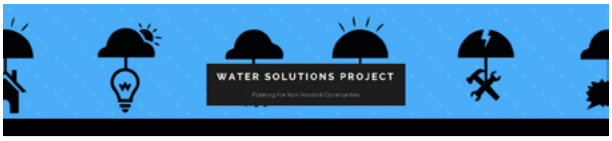
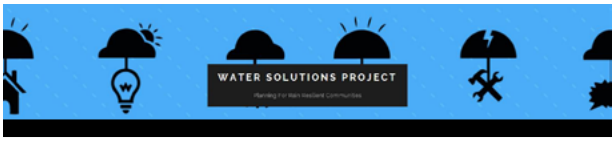
GLENVIEW PRESENTATION #2



Next Steps

- Draft Pilot Study Completed – August 22
- Project Completed – September 19

NILES PRESENTATION #1



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PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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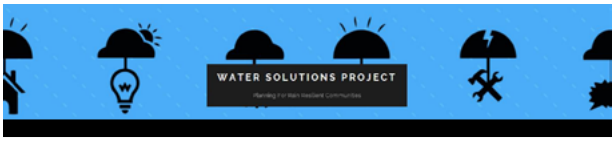

Agenda

- Project Background
- Purpose of this Study
- Flooding Overview
- Resident Input

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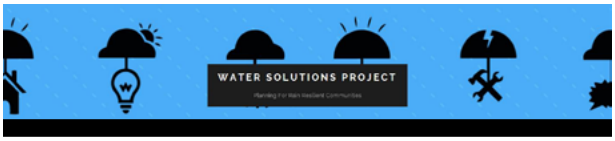

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- Separate from Other Village Initiatives
- Funded by a Federal Grant
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PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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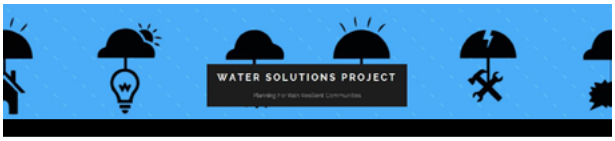

Purpose of this Study

- Address Localized Stormwater Issues
- Readily Implementable Solutions

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

4

Flooding Overview

- #1 Natural Disaster in the United States (FEMA.gov)
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  - Stormwater Flooding

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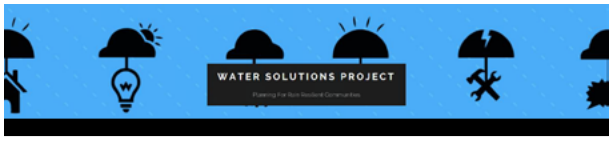

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6

NILES PRESENTATION #1

WATER SOLUTIONS PROJECT

2 What Causes it to Happen?

⚠ Beyond Property Owner's Control

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- Saturated or Frozen Ground
- Storm Sewer or Culvert Blockage

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

7

WATER SOLUTIONS PROJECT

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PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

8

WATER SOLUTIONS PROJECT

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- Damage to Personal Property
- Limited Access for People and Vehicles

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

9

WATER SOLUTIONS PROJECT

Resident Input

- Small Group Discussion
- Annotate Maps
- Fill Out Survey

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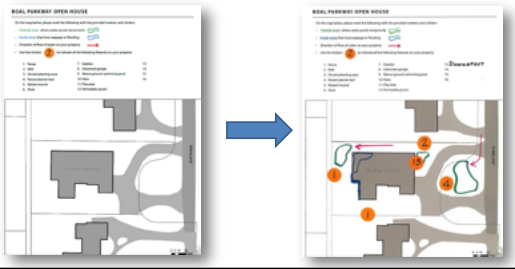
WATER SOLUTIONS PROJECT



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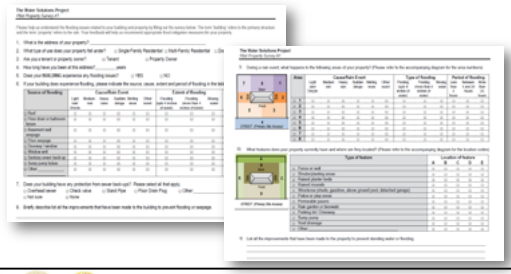
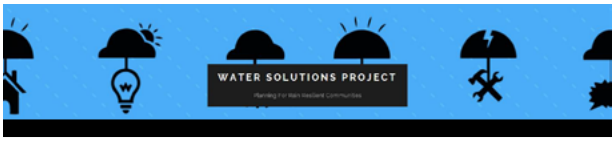
WATER SOLUTIONS PROJECT



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

12

NILES PRESENTATION #2



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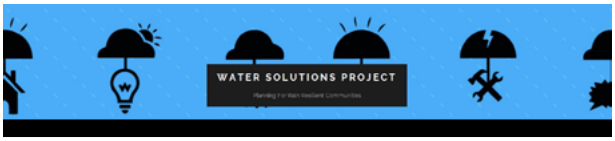

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- Potential Solutions
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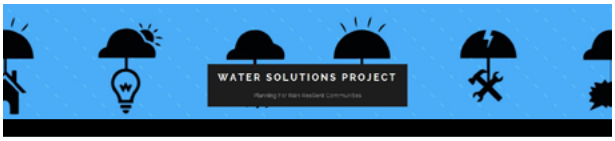

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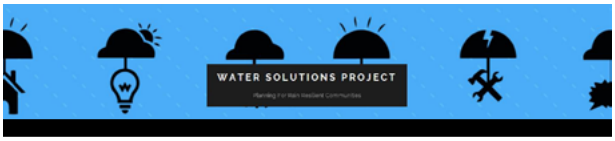

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- Address Localized Stormwater Issues
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PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

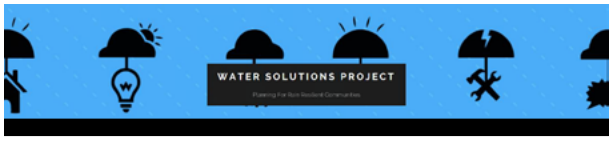
4

Potential Solutions

- District Scale
- Individual Property Scale

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

5



District Scale

- Pocket Parks
- Above Ground Detention
- Underground Detention
- Parking Lot Improvements

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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NILES PRESENTATION #2

WATER SOLUTIONS PROJECT

Pocket Parks

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Above Ground Detention

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Underground Detention

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Parking Lot Improvements

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Parking Lot Improvements

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Individual Property Scale

- Exterior Improvements
- Building Improvements

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

12

NILES PRESENTATION #2

WATER SOLUTIONS PROJECT

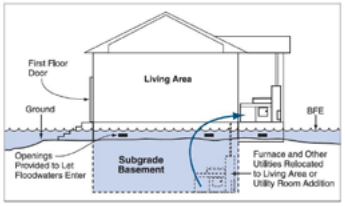
Driveway Berm

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

13

WATER SOLUTIONS PROJECT

Wet Floodproofing



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

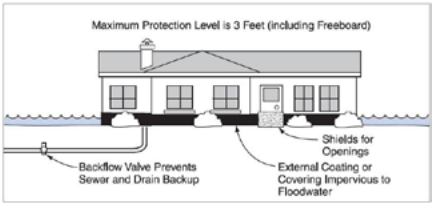
Elevate Mechanical Equipment

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

15

WATER SOLUTIONS PROJECT

Dry Floodproofing



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

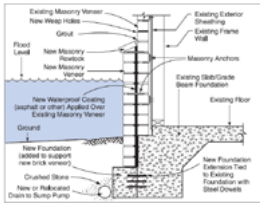
Check Valve

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

17

WATER SOLUTIONS PROJECT

Waterproof Membrane



PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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NILES PRESENTATION #2

WATER SOLUTIONS PROJECT

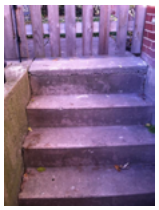
Sump Pump Back-Up


PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

19

WATER SOLUTIONS PROJECT

Short Barrier Wall




PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Sump Pump System

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

21

WATER SOLUTIONS PROJECT

Raised Window Well


PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

22

WATER SOLUTIONS PROJECT

Glass Block Window

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

23

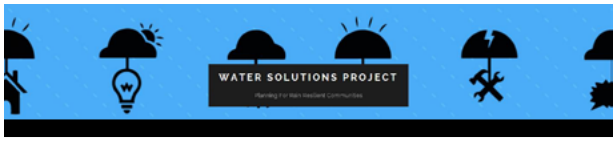
WATER SOLUTIONS PROJECT

Epoxy Injection

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

24

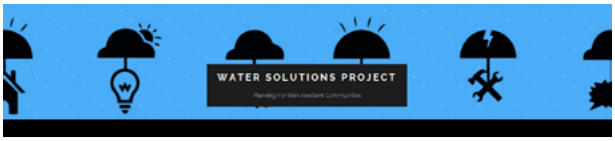
NILES PRESENTATION #2



Downspout Extension

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

25

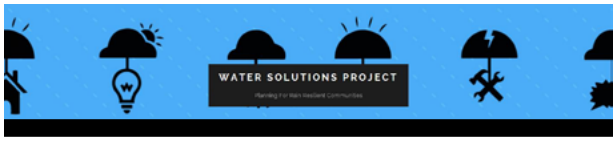


Resident Feedback

- Preferences
- Concerns
- Questions

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

26



Next Steps

- Draft Pilot Study Completed – August 22
- Project Completed – September 19

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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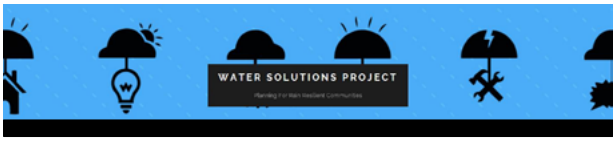
WINNETKA #2 PRESENTATION #1



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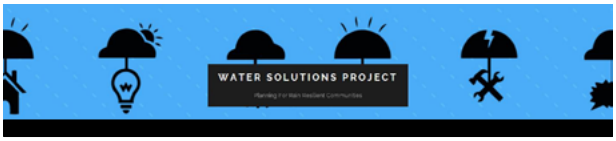

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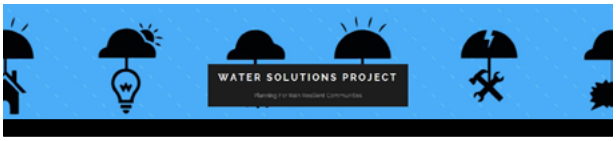

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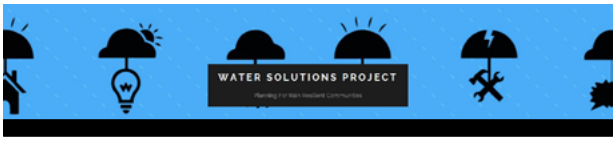

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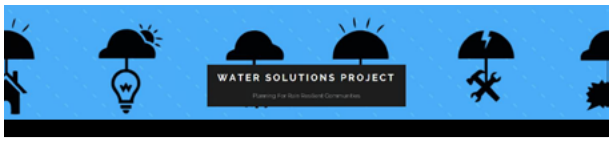

1 Where does it Happen?

OUTSIDE	INSIDE
Street Flooding	Sanitary/Combined Sewer Surcharge
Property Flooding	Pump Failure
Storm Sewer Surcharge	Seepage

WINNETKA #2 PRESENTATION #1

2 What Causes it to Happen?

⚠ Beyond Property Owner's Control

- Extreme Rain and/or Melting Snow
- Saturated or Frozen Ground
- Storm Sewer or Culvert Blockage

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

7

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PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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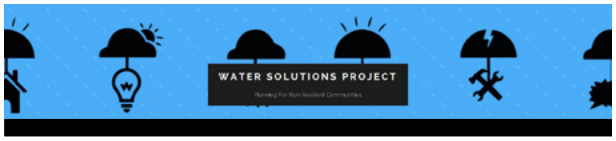

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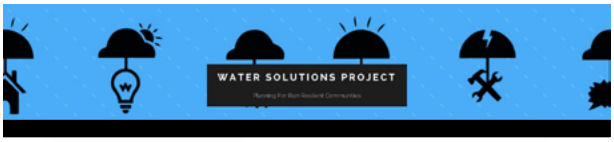

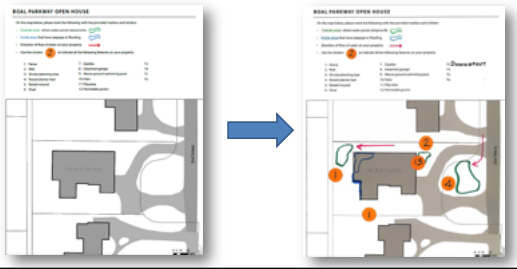

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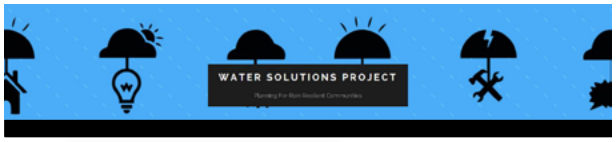

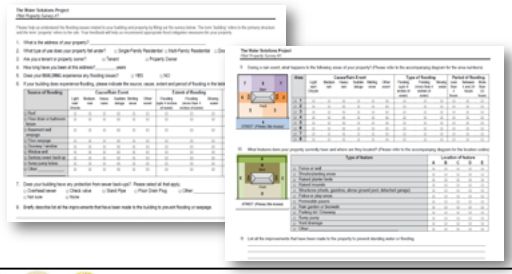

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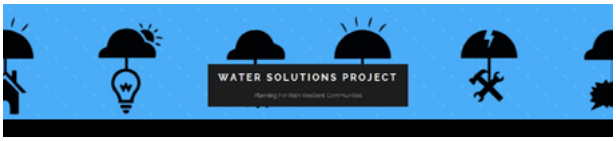
12

WINNETKA #2 PRESENTATION #2



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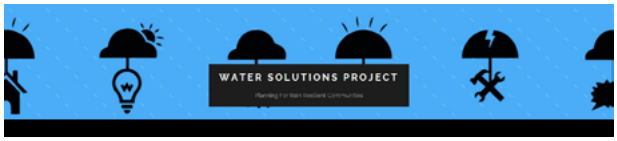

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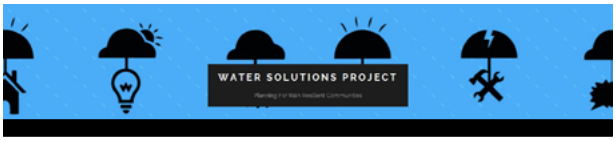

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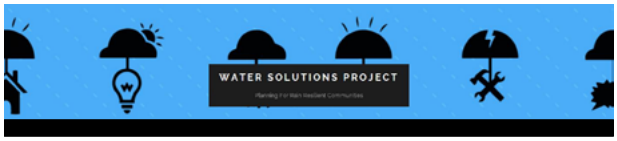

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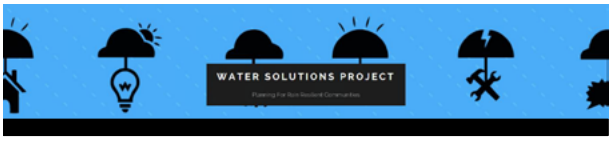
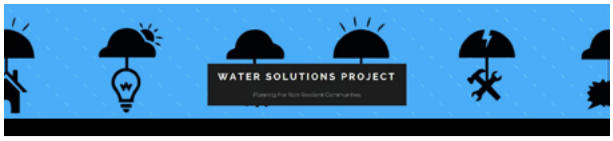


Potential Solutions

- Neighborhood Scale
- Individual Property Scale

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

5



Neighborhood Scale

Green Infrastructure
Streetscape Improvements

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

6

WINNETKA #2 PRESENTATION #2

WATER SOLUTIONS PROJECT

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

7

WATER SOLUTIONS PROJECT

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

8

WATER SOLUTIONS PROJECT

Individual Property Scale

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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WATER SOLUTIONS PROJECT

Driveway Berm

PROJECT TEAM: BAXTER & WOODMAN + TESKA ASSOCIATES, INC. + EMPIRICAL HYDROLOGY

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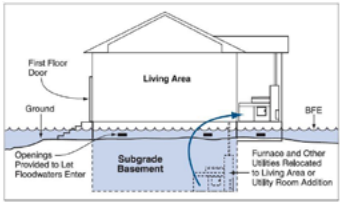
WATER SOLUTIONS PROJECT

Wet Floodproofing



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WATER SOLUTIONS PROJECT

Elevate Mechanical Equipment

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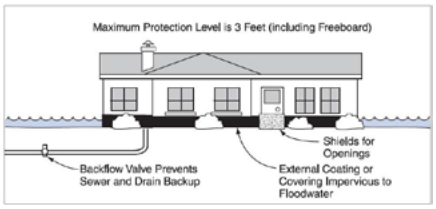
WINNETKA #2 PRESENTATION #2

WATER SOLUTIONS PROJECT

Dry Floodproofing

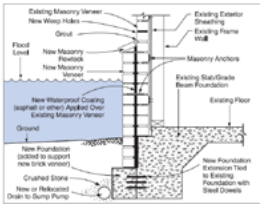


WATER SOLUTIONS PROJECT

Check Valve

WATER SOLUTIONS PROJECT

Waterproof Membrane



WATER SOLUTIONS PROJECT

Sump Pump Back-Up

WATER SOLUTIONS PROJECT

Short Barrier Wall

WATER SOLUTIONS PROJECT

Sump Pump System

WINNETKA #2 PRESENTATION #2

WATER SOLUTIONS PROJECT

Raised Window Well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Glass Block Window

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Epoxy Injection

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Downspout Extension

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WATER SOLUTIONS PROJECT

Resident Feedback

- Preferences
- Concerns
- Questions

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WATER SOLUTIONS PROJECT

Next Steps

- Draft Pilot Study Completed – August 22
- Project Completed – September 19

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Appendix 6

Individual Lot Solutions

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Type of Problem		Solution	Purpose	Ideal Applications	Limitations and Other Considerations	Cost Range
Outside the Building	Landscaped Areas	Construct a rain garden	Reduces the period of inundation by increasing the rates of infiltration and evapotranspiration	Where no municipal sewer system is nearby	Clayey soils and high groundwater limit the rate of infiltration	$1,500-$6,000
		Install a yard drainage system	Convey stormwater from the yard to the municipal sewer system	Where the municipal sewer system is nearby and lower than the flood prone area	May require removal of trees or relocation of utility service lines	$2,000-$10,000
		Excavate high ground or fill in a low-lying area	Create a suitable overland flow path from the flood prone area	Where a small amount of excavation allows overland flow from a low lying area of the yard to the street	Must not create a flooding problem on another property and fill in known flooding areas (especially regulatory floodplain) requires compensatory excavation	$2,000-$8,000
		Install a rain barrel	Reduce the amount of runoff to flood prone area	Where the area contributing runoff is small	Storage capacity can be overwhelmed by intense rain	$100-$300
		Install a sump pit, sump pump, and discharge line	Pump water out of the stairwell	Where the ground is sloped to drain away from the stairwell	Requires a discharge point that does not create a flooding problem on another property	$5,000-$7,500
		Remove debris from inlets	Prevent clogged storm drains	Any storm drain inlet	Inlets should be cleaned regularly	$100-$200
		Clean storm sewers	Prevent clogged storm sewers	Any storm sewer	Requires special equipment and may require pre-cleaning television inspection	$2-$5 per foot
		Remove debris from gutters and downspouts	Prevent water from overflowing the gutter and accumulating in low areas	Where the branches of mature trees hang over the gutters	Gutters and downspouts should be cleaned regularly	$500-$1,000
		Install foam gutter filters	Prevent leaves and debris from entering the gutter while water passes through the filter	Where the branches of mature trees hang over the gutters	The foam filters should be specially shaped to fit snugly in the gutters and should be factory treated with UV protection and a fungicide	$1,000-$2,000
		Install a check valve on the sewer service line	Allow the free flow of water through the sewer service and prevent backflow	Where the sewer system reaches or exceeds its capacity from time to time	Debris within the sewer service line can prevent proper operation	$2,500-$8,000
	Paved Areas	Reconstruct pavement with permeable pavers	Store water in the aggregate below the pavers and allow it to infiltrate into the soil	Anywhere	Clayey soils and high groundwater limit the rate of infiltration	$10-$20 per square foot
		Reconstruct pavement to drain	Prevent water from accumulating on paved areas	Where a ground slope of 1% or more can be attained	Fill in known flooding areas (especially regulatory flooplain) requires compensatory excavation	$5-$10 per square foot
		Remove debris from inlets	Prevent clogged storm drains	Any storm drain inlet	Inlets should be cleaned regularly	$100-$200
		Clean storm sewers	Prevent clogged storm sewers	Any storm sewer	Requires special equipment and may require pre-cleaning television inspection	$2-$5 per foot
		Construct planter box	Reduces the period of inundation by increasing the rates of infiltration and evapotranspiration	Where no municipal sewer system is nearby and drainage can be directed to planter box	Clayey soils and high groundwater limit the rate of infiltration	$2,000-$4,000
		Remove debris from gutters and downspouts	Prevent water from overflowing the gutter and accumulating in low areas	Where the branches of mature trees hang over the gutters	Gutters and downspouts should be cleaned regularly	$500-$1,000
		Install foam gutter filters	Prevent leaves and debris from entering the gutter while water passes through the filter	Where the branches of mature trees hang over the gutters	The foam filters should be specially shaped to fit snugly in the gutters and should be factory treated with UV protection and a fungicide	$1,000-$2,000
		Install a trench drain and a drainage system	Convey stormwater from the paved area to the municipal sewer system	Where the municipal sewer system is nearby and lower than the paved area	May require relocation of utility service lines	$2,000-$10,000
		Construct a driveway berm	Prevent overland flow from the street from flooding a garage	Where the garage floor is lower that the street	The height of the driveway berm depends on the level of protection desired. Fill in known flooding areas (especially regulatory floodplain) requires compensatory storage.	$2,000-$5,000

Notes: 1. The cost estimates in this matrix are intended for use as a planning tool in selecting one or more of the potential solutions. A contractor's detailed cost estimate may vary from these preliminary cost estimates.
2. The cost estimates include the cost of labor and materials, but do not include the cost to obtain permits, if applicable.

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	Type of Problem	Solution	Purpose	Ideal Applications	Limitations and Other Considerations	Cost Range
Inside the Building	General Flooding	Carry flood insurance	Obtain financial assistance for future flood damages	Anywhere	None, since even buildings outside the floodplain can be covered by flood insurance	Varies depending on level of risk
		Elevate mechanical equipment and electrical components	Protect furnace, water heater, air conditioner, and electrical outlets during flood events	Anywhere	The height of the mechanical equipment and electrical components depends on the level of protection desired, but at least two feet above the 100-year flood elevation is recommended	$2,000-$10,000
		Construct a green roof	Reduce peak flows from roof	Larger buildings with flat roofs	Structural analysis and reinforcement may be necessary	$30-$50 per square foot
		Install a flood gate	Prevent overland flow through a door or window	Where flood depths are shallow (generally 3 feet or less)	Some flood gates remain in place permanently, while others can be removed and replaced prior to severe weather	$500-$1,000
		Install a flood wall	Keep flood waters away from the building foundation	Where flood depths are shallow (generally 3 feet or less)	Flood walls can be constructed of various materials including masonry, concrete, and soil	$30,00-$50,000
		Elevate the building	Raise the building so the lowest opening is above the expected flood elevation	Anywhere	The height of the building depends on the level of protection desired, but at least two feet above the 100-year flood elevation is recommended	$200,000-$500,000
	Sump Pump Failure	Install a back-up sump pump	Provide additional pumping capacity and protect against sump pump failure	Where a sump pump system has only one sump pump	Without a secondary power source, a back-up sump pump only protects against mechanical pump problems	$1,000-$1,500
		Install a back-up power source (battery or generator)	Provide an alternate power source so sump pumps can run when electric power is not available	Where the only power source for an existing sump pump system is electric power	None	$750-$5,000
		Keep a spare sump pump	Quickly replace a sump pump that has failed	Where the owner or occupant is capable of replacing a failed sump pump	Requires human intervention during a storm event	$100-$250
		Install an air gap outside the foundation wall	Provide an overflow for occasions when the sump pump is discharging directly into a surcharged sewer	Where the sump pump discharge has a direct connection to the sewer system	May require raising the elevation of the sump pump discharge line above ground elevation	$500-$2,500
		Increase pump capacity	Provide additional pumping capacity by adding a sump pump or replacing an existing pump	Where groundwater fills the sump pit faster than the sump pumps can empty the pit	May also require a larger diameter discharge line	$200-$1,500
		Increase the diameter of the discharge line	Provide additional capacity in the sump pump discharge line	Where the capacity of the sump pump system is limited by the capacity of the discharge line	May require removal of trees or the restoration of landscaped areas	$500-$3,000
		Repair discharge line	Restore the capacity of a failed discharge line	Where the capacity of the sump pump system is limited by root intrusion into the discharge line or a section of the pipe has collapsed	May require removal of trees or the restoration of landscaped areas	$500-$2,000
	Sewer Back-up	Repair sewer service line	Restore the capacity of a failed sewer service line	Where the capacity of the sewer service is limited by root intrusion into the service line or a section of the pipe has collapsed	May require removal of trees or the restoration of landscaped areas	$500-$2,000
		Install a check valve on the sewer service line	Allow the free flow of water through the sewer service and prevent backflow	Where an overhead sewer system cannot be installed	Debris within the sewer service line can prevent proper operation	$2,500-$8,000
		Install an overhead sewer system	Prevents sewer back-ups by raising plumbing from below the floor of the basement to the ceiling	In unfinished basements or in basements where the drywall has been removed	Some plumbing systems require extensive remodeling for overhead sewer conversion	$9,000-$12,000
		Install a stand pipe in a lower level plumbing fixture	Contains sewer back-ups by fitting a length of pipe in the floor drain	Where flood depths are shallow (generally 3 feet or less)	Tall stand pipes can allow the build-up of damaging pressure in the sewer service line	$300-$600
		Install a floor drain plug in a lower level plumbing fixture	Blocks sewer back-ups. Some plugs stop flow in either direction, while others utilize a float that does not interfere with the normal operation of the drain	Where flood depths are shallow (generally 3 feet or less)	Debris on the plug can prevent proper operation and high pressure in the sewer service line can eject the plug	$200-$500

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Type of Problem	Solution	Purpose	Ideal Applications	Limitations and Other Considerations	Cost Range
INSIDE THE BUILDING — EXTERNAL STAIRWELL FLOODING	Install a short barrier wall around stairwell	Prevent the overland flow of water into the stairwell	Where flood depths are shallow (6 inches or less at the top of the stairwell)	Building code requirements may dictate the minimum wall thickness	$500-$2,000
	Install an area drain connected to a drainage system	Drain water from the stairwell to prevent the flow of water over the threshold of the door	Where the area drain can be connected to an existing foundation drain in close proximity	An area drain should not be connected to the foundation drain where overland flow into the stairwell could overwhelm the capacity of the sump pump system	$800-$1,000
	Cover the entry	Prevent rainfall from entering the stairwell	Where the ground is sloped to drain away from the stairwell	May require extensive permitting and construction	$1,000-$4,000
	Install a sump pit, sump pump, and discharge line	Pump water out of the stairwell	Where the ground is sloped to drain away from the stairwell	Requires a discharge point that does not create a flooding problem on another property	$4,000-$6,000
WINDOW WELL FLOODING	Install an area drain connected to a drainage system	Drain water from the window well to prevent the window from breaking	Where the area drain can be connected to an existing foundation drain in close proximity	An area drain should not be connected to the foundation drain where overland flow into the window well could overwhelm the capacity of the sump pump system	$800-$1,000
	Replace an existing window well with a concrete window well	Prevent overtopping into the window well by raising the top of the well and prevent seepage at the joints between the window well and the foundation wall with a watertight seal	Where surface water flows over the top of the window well or where groundwater seeps into the window well	The height of the replacement window well depends on the level of protection desired, which could be set a certain distance above the existing well or it could be set to match the elevation of the lowest opeing into the building that cannot be raised	$3,000-$5,000
	Replace a glass pane window with a glass block window	Provide structural resistance against rising water in the window well	Where an alternate egress window is available	At least one window in the basement must remain as an egress window	$750-$1,500
WALL AND FLOOR SEEPAGE	Seal a crack with an epoxy injection	Prevent seepage by filling cracks in the foundation	Where seepage is due to a small number of isolated cracks	Seal may need to be replaced after several years	$250-$1,000
	Coat the foundation with a waterproof membrane	Prevent seepage by applying an asphalt sealant or a polyethylene film to the foundation wall	Slab-on-grade construction subject to shallow flooding where the waterproof membrane can be concealed by a decorative masonry veneer	May require removal of trees, or the restoration of paved and landscaped areas	$15,000-$30,000
	Repair the foundation drain	Restore the capacity of a failed foundation drain	Where the capacity of the foundation drain is limited by sediment deposits, root intrusion into the service line or a section of the pipe has collapsed	May require removal of trees, or the restoration of paved and landscaped areas	$2,000-$5,000
	Install a new interior foundation drain, sump pit, and sump pump	Capture water that seeps into the basement and convey it to a sump pump	In unfinished basements or in basements where the drywall has been removed	Manages seepage rather than preventing it	$12,000-$15,000
	Install a new exterior foundation drain, sump pit, and sump pump	Collect groundwater outside the foundation wall and convey it to a sump pump	Where there is little landscaping, paving, or decking immediately adjacent to the perimeter of the building	Requires a discharge point that does not create a flooding problem on another property	$10,000-$20,000
	Extend downspouts and sump pump discharges away from the foundation	Prevent water from accumulating adjacent to the building foundation	Where the ground begins sloping away from the foundation a short distance from the foundation	Downspouts and sump pump discharges should extend at least 6 feet away from a building foundation or far enough to ensure water does not drain back toward the foundation	$100-$500
	Re-grade landcaped areas or paved areas to slope away from the foundation	Prevent water from accumulating adjacent to the building foundation	Where a ground slope of 1% or more can be attained	May require removal of trees, or the restoration of paved and landscaped areas (fill in known flooding areas, especially regulatory floodplains, will require compensatory storage)	$2,500-$5,000
	Remove debris from gutters and downspouts	Prevent water from overflowing the gutter and accumulating adjacent to the building foundation	Where the branches of mature trees hang over the gutters	Gutters and downspouts should be cleaned regularly	$500-$1,000
	Install foam gutter filters	Prevent leaves and debris from entering the gutter while water passes through the filter	Where the branches of mature trees hang over the gutters	The foam filters should be specially shaped to fit snugly in the gutters and should be factory treated with UV protection and a fungicide	$1,000-$2,000

Notes: 1. The cost estimates in this matrix are intended for use as a planning tool in selecting one or more of the potential solutions. A contractor's detailed cost estimate may vary from these preliminary cost estimates.
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Appendix 7

Glossary

Acronym	*Definition*
BMP	Best Management Practices
CIP	Capital Improvement Program
FAR	Floor Area Ratio
FEMA	Federal Emergency Management Agency
GIS	Geographic Information Systems
MWRDGC	Metropolitan Water Reclamation District of Greater Chicago
SFHA	Special Flood Hazard Area
SSA	Special Service Area
SWAMP	Storm Water Area Management Program
SWTF	Storm Water Task Force

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Appendix 8

Digital Work Products

A compact disc is included with printed copies of this report.