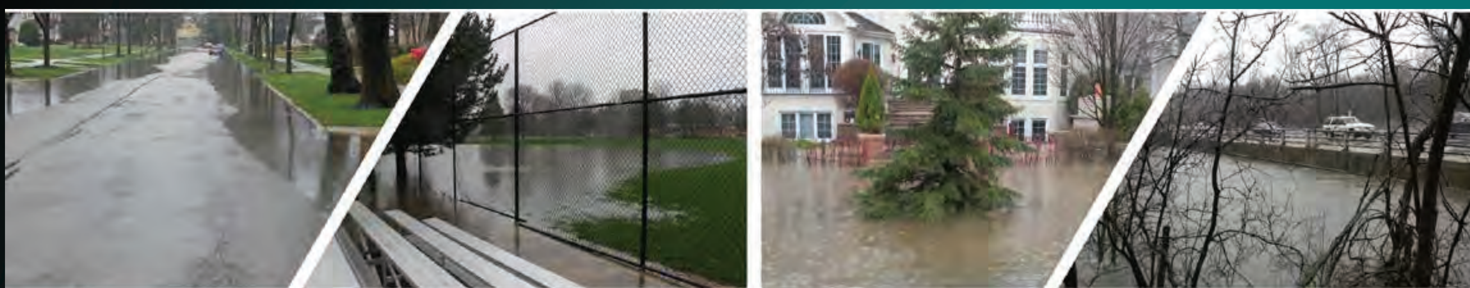
Village of River Forest

Stormwater Master Plan



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CHAPTER 1 BACKGROUND

1.1 INTRODUCTION

The Village of River Forest (Village) is a fully developed community of 2.5 square miles with an extensive sewer system comprised mainly of approximately 25 miles combined sewers, supplemented by relief sewers and combined sewer overflows, with approximately 5 miles of storm sewer, most of which was constructed in 2015 as part of Phase 1 of the North Watershed Combined Sewer Separation Project. Many of the drainage systems are interconnected, and when coupled with overland flow routes, depressional storage areas, varying river levels, etc., create complex conditions that affect the performance of the system and its ability to handle runoff during storm events. The Village's municipal boundary is shown below in Figure 1:

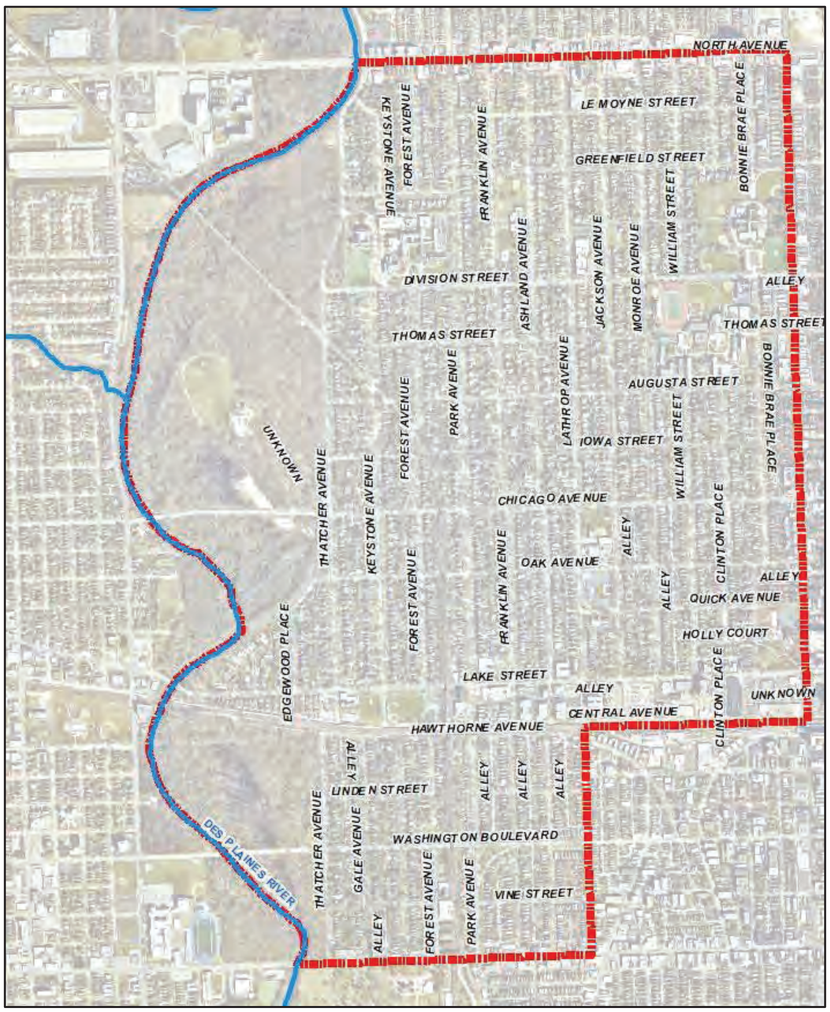


Figure 1. River Forest Municipal Boundary

In recent years, the Village has experienced several storm events that have resulted in flooding throughout the Village, both from basement backups and rear yard depressions. A few of these storms include September 2008, April 2013, and May 2020. The Village identified the need to comprehensively evaluate the Village-wide system. A Village-wide sewer study was initiated in 2021 in which a computer model was developed of the Village's entire sewer system consisting of approximately 25 miles of sewers and over 800 drainage structures. This study established a baseline understanding of the capacity of the Village's existing sewer systems and, on a concept level, investigated a number of projects to improve sewer capacity and to reduce flooding and basement backups.

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

1.2 PURPOSE AND SCOPE

The purpose of this SMP is to:

- Determine the current levels of flood protection throughout the Village;
- Develop a prioritized Capital Improvement Plan that meets the desired protection level;
- Evaluate stormwater issues related to the Village's ordinances and system maintenance.
- Provide resources to property owners to mitigate stormwater issues.

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

CHAPTER 2 STUDY DEVELOPMENT

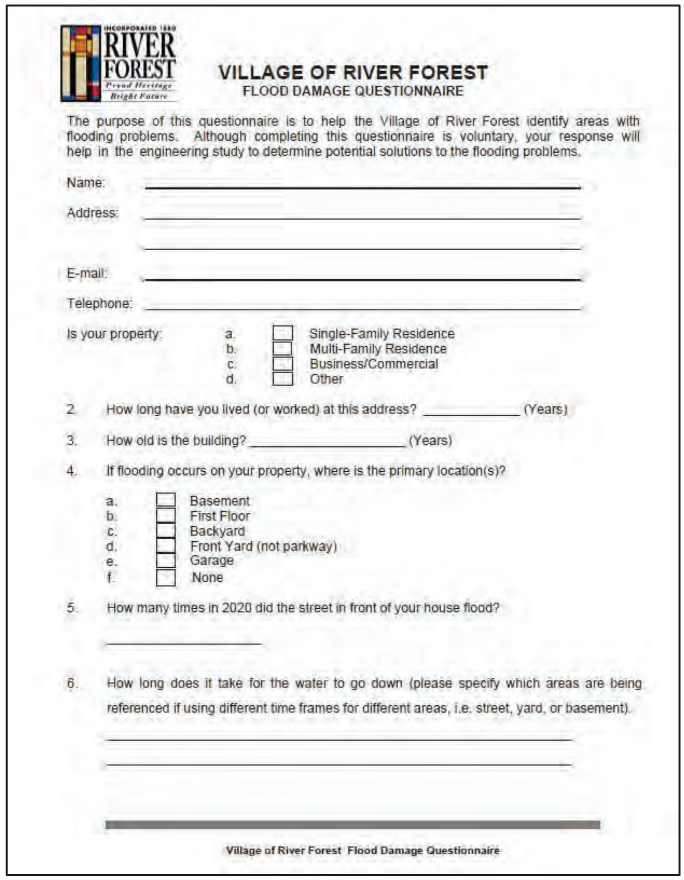
2.1 DATA COLLECTION

CBBEL used the November 2013 North Watershed Combined Sewer Separation Project Facilities Plan Report as the baseline for the North study area. For the Central and South study areas the data used for the analysis was obtained from the GIS database supplemented by field survey.

2.1.1 Village Staff and Public Involvement

Participation from Village staff and the public was sought to understand the historic and recent drainage issues throughout the Village. The extent and nature of known existing stormwater conditions and concerns in the Village were identified through various means including discussions with the Village staff, a public open house, and flood survey questionnaires. The previous study for the north section of the Village was used as the template for the current SMP with additional applicable data and information from recent studies and construction documents added.

Available during public meetings and posted on the Village's website, residents were requested to fill out a flood survey questionnaire flood survey questionnaires to address their concerns of flooding issues, in addition to being able to share photographs of past flooding (Figure 2). CBBEL reviewed specific accounts and photographs of flooding from various storm events that were reported by residents. Two rainfall events mentioned repeatedly included May 2020 and June 2021. Detailed consideration was taken to quantify the full extent of the flooding problems located throughout the Village.



INCORPORATED 1880 RIVER FOREST Proud Heritage Bright Future

VILLAGE OF RIVER FOREST
FLOOD DAMAGE QUESTIONNAIRE

The purpose of this questionnaire is to help the Village of River Forest identify areas with flooding problems. Although completing this questionnaire is voluntary, your response will help in the engineering study to determine potential solutions to the flooding problems.

Name: ____________

Address: ____________

E-mail: ____________

Telephone: ____________

Is your property: a. ☐ Single-Family Residence b. ☐ Multi-Family Residence c. ☐ Business/Commercial d. ☐ Other

2. How long have you lived (or worked) at this address? ________ (Years)

3. How old is the building? ________ (Years)

4. If flooding occurs on your property, where is the primary location(s)?
   a. ☐ Basement
   b. ☐ First Floor
   c. ☐ Backyard
   d. ☐ Front Yard (not parkway)
   e. ☐ Garage
   f. ☐ None

5. How many times in 2020 did the street in front of your house flood? ________

6. How long does it take for the water to go down (please specify which areas are being referenced if using different time frames for different areas, i.e. street, yard, or basement). ________

Village of River Forest Flood Damage Questionnaire

Figure 2. Flood Survey Questionnaire

2.1.2 Sewer Data Collection

The Village GIS database provided a majority of the required input data for the sewer system, including manhole locations, rim elevations, sewer locations, inverts, and diameters. The database was supplemented with limited field survey and design engineering plans of the North study area completed in 2013. Invert data was not comprehensive, however the Village GIS data combined with the limited field survey was sufficient for model buildout with some interpolation of inverts.

2.1.3 Floodplain Maps

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel 387J and 389J, for Cook County, Illinois and Incorporated Areas, effective August 19, 2008, the Des Plaines River contains Zone AE Special Flood Hazard Areas (SFHA) outside its banks, while portions of the Village along the Des Plaines River are denoted as Zone X (Other Flood Areas) (**Exhibit 1**). The majority of the Village is located outside of the SFHA.

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

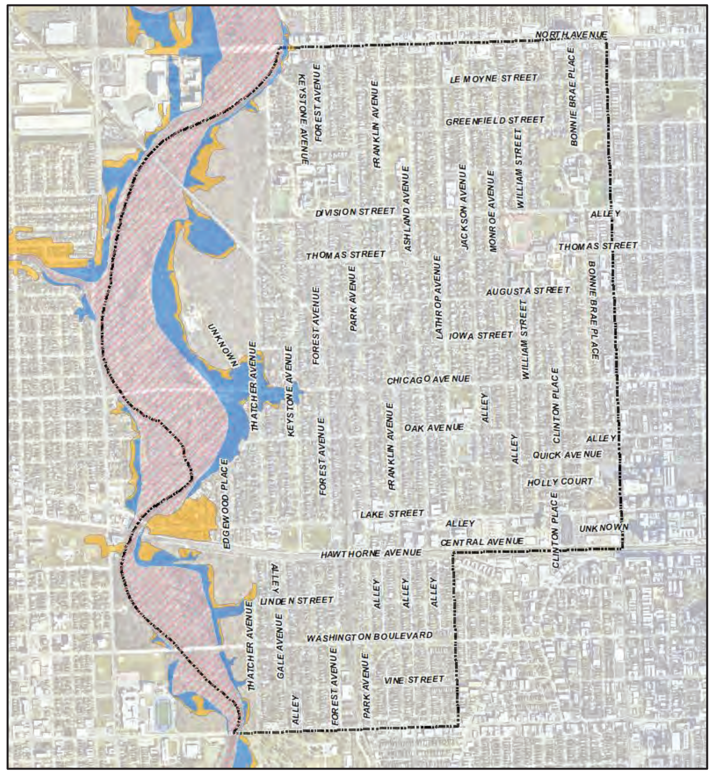


Figure 3. Cook County FEMA FIRM Panel 389J

There are two areas of the Village impacted by the Des Plaines River floodplain. The Zone AE floodplain where the river crosses Chicago Avenue extends into the Village to just east of Keystone Avenue. There are four homes within the mapped floodplain, however the exact elevations of these homes and their flood protection status is unknown. The second area is located just north of Lake Street and east of the river. This area is mapped as Zone X floodplain (500-yr). A flood protection berm exists on either side of Lake Street at this location; when the river is at flood stage, the Village enacts emergency measures to build a temporary flood barrier across Lake Street to protect the potentially vulnerable areas east of the river.

CHAPTER 3 DESCRIPTION OF EXISTING DRAINAGE SYSTEM

3.1 EXISTING SEWER NETWORK AND LIMITATIONS

The Village was primarily developed prior to modern stormwater management practices. As such, there is limited stormwater storage, poor overland flow routes in rear yard areas and most notably a combined sewer system, none of which were designed based on current rainfall standards. It is unknown what rainfall standard, if any, was used in the original design. However, we do know that the industry standards for rainfall have been revised upward at least four times in the last half century. This means that when using the current standard, known as Bulletin 75, a storm or combined sewer must be increasingly larger compared to earlier rainfall standards to maintain the same design service level. The industry design standard for the sizing of a stormwater conveyance system is a 10-year event, which is an event that happens on average once in 10-years. An equivalent description is a storm that has a 10% chance of happening in a given year. Larger storm events, such as a 100-year event (1% annual chance), will exceed the capacity of the system and generate overland flow. Designing for a 100-year event is typically cost-prohibitive and can cost multiple times that of a 10-year design. Aside from cost, there tend to be other prevailing challenges such as depth, cover, and utility conflicts that come with larger pipe sizes.

With the Village being majority combined sewer system in addition to having older residential structures, sewer backups are the main flooding issue. A sewer backup will occur and impact residential structures once the water level in the combined sewer exceeds the basement elevation of an adjacent home with a gravity flow sewer connection (**Figure 4**).

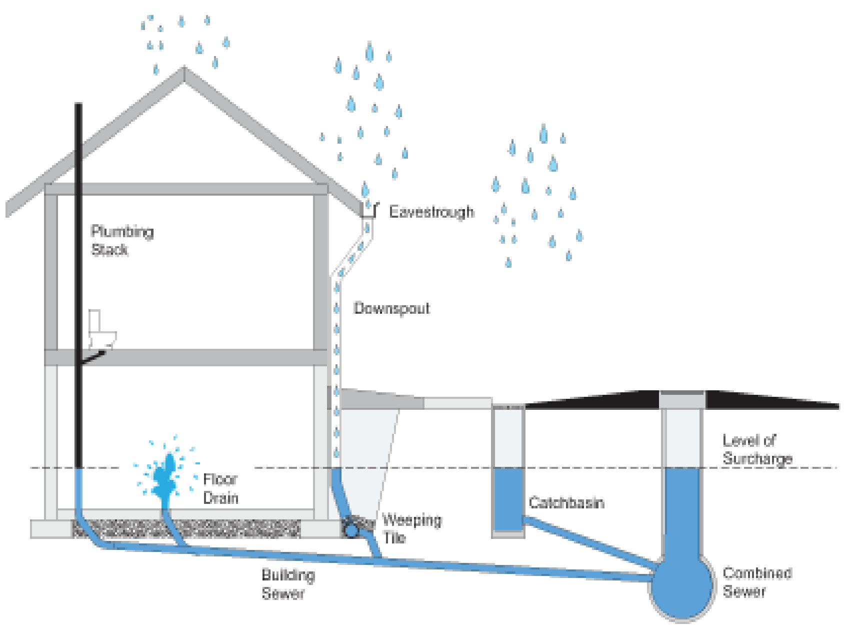


Figure 4. Sewer Backup Schematic

3.2 WATERSHED DESCRIPTIONS

There are three main watersheds within the Village, referred to as the North, Central, and South Area watersheds. The watersheds are shown on **Exhibit 2** and **Figure 5** below:

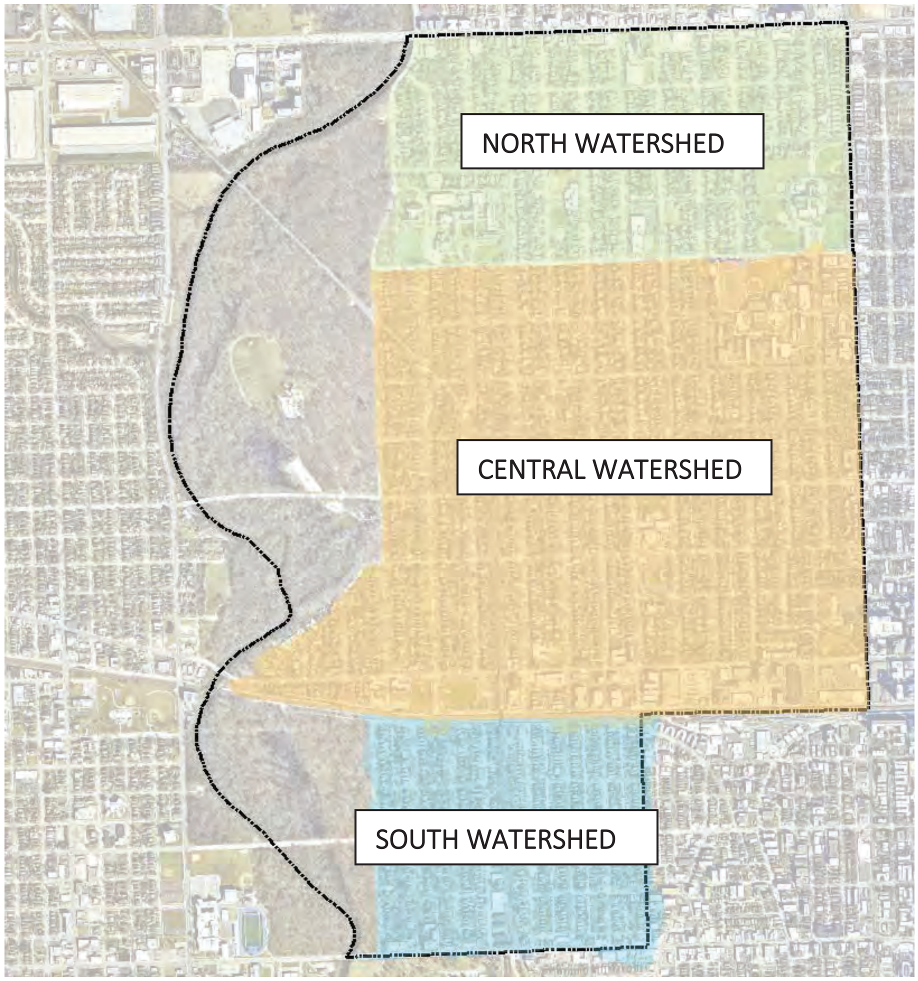


Figure 5 - Major Watersheds

<u>North Watershed</u>

The North Watershed is 280 acres in size and includes all sewers tributary to both an existing storm sewer outfall to the river and the remaining combined sewer that is tributary to the MWRDGC's Elmwood Park Outfall Sewer located along North Avenue, as shown on **Exhibit 3.** The Elmwood Park Outfall Sewer conveys flow to the 5'6" x 6'10.5" MWRDGC Upper Des Plaines Interceptor No. 2 (Interceptor No. 2), which conveys flow south to the Stickney Wastewater Reclamation Plant. When Interceptor No. 2 reaches capacity, flow is diverted to an 11.5' Reinforced Concrete Pipe (RCP). The 11.5' RCP conveys flows to a control structure that includes sluice gates. The sluice gates control the volume of combined sewer flow that can enter the MWRD Tunnel and Reservoir Plan (TARP) drop shaft. The 12' diameter drop shaft conveys flows to the TARP 30' diameter deep tunnel. Because the deep tunnel has limited capacity, MWRD needs to restrict the combined sewer inflow. When the sluice gates are closed, flow is diverted to the Combined Sewer Overflow (CSO) located under North Avenue at the Des Plaines River. The MWRD interceptor serves a large area including other communities and was frequently subject to surcharging, causing basement backup throughout the service area. In 2015, Phase 1 of a major improvement called the Northside Stormwater Management Project (2015 Northside Project) was constructed. This project constructed a new 9’x6’ box culvert outfall to the Des Plaines River and an upstream storm sewer network which partially separated the sewers within the North Watershed. The project was conceived in two phases; only Phase 1 has been constructed to date. Phase 1 included the construction of a trunk storm sewer along Greenfield Street and Keystone Avenue to the new outfall ranging in size from 66” to 96”. Lateral storm sewers ranging from 30” to 42” were constructed north of Division Street along William Street, Monroe Avenue, Jackson Avenue, Lathrop Avenue, Ashland Avenue, Franklin Avenue, Park Avenue, and Forest Avenue that tied into the new trunk sewer on Greenfield Street. An additional storm sewer ranging from 12” to 18” was constructed on Thatcher Avenue from Greenfield Street to the new outfall at the Des Plaines River.

Exhibit 3 shows the storm, combined, sanitary, and MWRD sewers in the North Watershed. **Figure 6** below shows the areas that have been separated versus the remaining combined sewer areas:

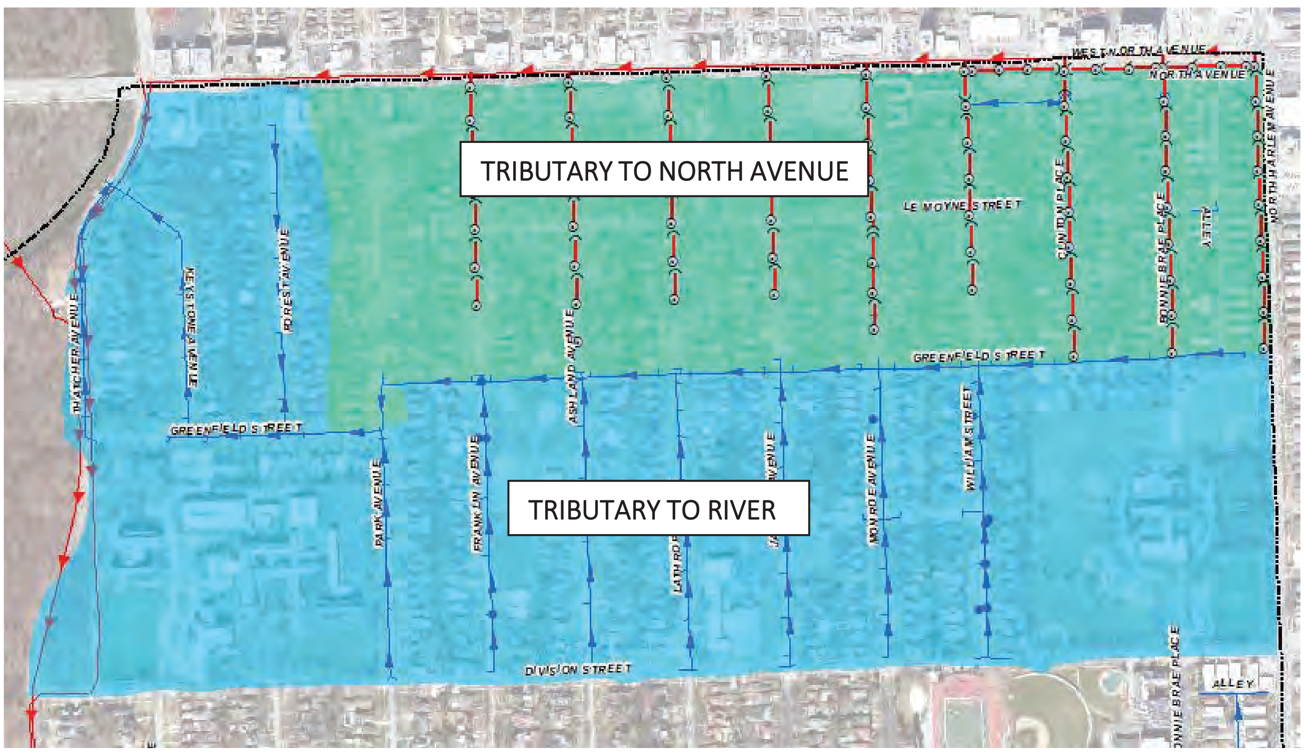


Figure 6. North Watershed – Storm vs Combined

The 2015 Northside Project addressed the major overland flooding issues that existed in this area. Sanitary sewer flows continue to drain to the North Avenue interceptor for the entire North Watershed; therefore this area remains subject to surcharging. However, the Village has installed backflow prevention valves at the discrete connection points to the interceptor sewer. In combination with the reduced flows due to the sewer separation project, anecdotal reports indicate that the project has significantly reduced basement backup issues in the North Watershed despite Phase 2 not having been constructed.

The original modeling for the North Watershed was completed using USEPA SWMM v.5.0. As part of the current stormwater master plan the modeling was converted to XP-SWMM. Additional offsite area was accounted for in the most updated modeling to the MWRDGC interceptor from Elmwood Park and Chicago. The modeling completed for this area reflects the current state of the system with Phase 1 of the 2015 Northside Project completed and with all sanitary/combined sewers draining to North Avenue. The mapping of the results is based upon the simulated water surface elevations for a given storm event and does not reflect the backflow prevention that the Village has installed. Therefore, actual experienced basement backups in the North Watershed are significantly less than as indicated by the exhibits.

Central Watershed

The Central watershed is the largest of the three main watersheds at approximately 720 acres. There are two somewhat distinct drainage systems within the Central watershed separated roughly along Oak Avenue. North of Oak Avenue is drained by a traditional combined sewer system. Each north-south street contains a combined sewer lateral, generally a small diameter, which flows to an east-west trunk sewer on Chicago Avenue. The trunk sewer flows west and ties into the MWRD system at Thatcher Avenue. When the small diameter sewers exceed capacity, the system surcharges and basement flooding in the watershed can occur.

The second system is located south of Oak Avenue. This area also contains a similar traditional combined sewer network draining to a trunk sewer on Lake Street, which ties into the MWRD system near the Des Plaines River. However, the Lake Street area also has a relief sewer network with a connection to the MWRD system and overflow to the river. The relief sewer network extends east down Lake Street and into the residential system, providing overflow relief and reducing the likelihood of system surcharging and basement flooding.

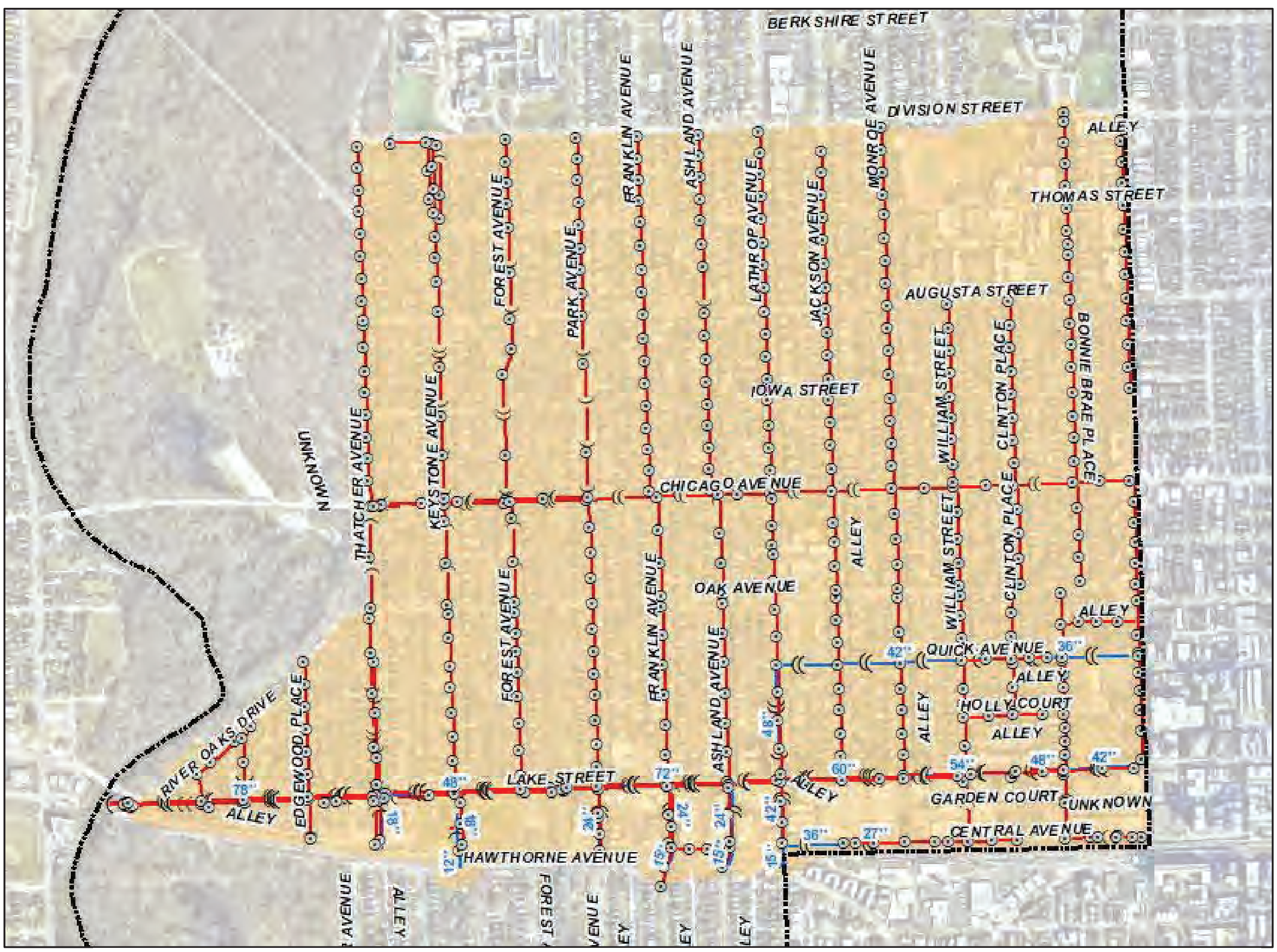


Figure 7. Central Watershed Drainage System

South Watershed

The South watershed, approximately 210 acres in size, is a mostly traditional combined sewer drainage area that has been supplemented with a relief sewer system over the years. Based on CBBEL site investigations, the relief sewer system provides approximately 14 overflow connections from the combined sewer system via 15-to-18-inch diameter PVC pipes. These connections allow flow to enter the relief sewer when the combined sewer surcharges. There are two main relief sewer systems within the area: the Washington Boulevard/Thatcher Avenue relief sewer and the Madison Avenue relief sewer. These two relief sewers meet at the intersection of Thatcher Avenue and Madison Avenue. The relief sewer drains to the Deep Tunnel system by MWRD. The sewer map can be found on **Exhibit 5**.

The two relief sewer systems are different in how they accept local stormwater runoff. The Madison Avenue relief sewer has only the 15-to-18-inch diameter overflow connections to the combined sewer. However, the Washington Boulevard/Thatcher Avenue relief sewer has direct connections to the roadway inlets and catch basins in addition to the overflow connections to the combined sewer. Therefore, this relief sewer accepts stormwater runoff from every rainfall event.

Drainage within the South area is generally as follows: domestic waste and initial stormwater runoff are conveyed by both the combined sewer and relief sewer system to either the MWRD interceptor sewer located at the intersection of Thatcher Avenue and Madison Avenue or to the deep tunnel drop shaft located adjacent to the Des Plaines River. The interceptor sewer and deep tunnel shaft drain to the Stickney WWRP. During surcharge conditions, flow from the combined sewer enters the relief sewer system via 14 overflow connections. The relief sewer system drains south and west, ultimately connecting to the Deep Tunnel system at a drop shaft on the bank of the Des Plaines River. During major storm events when the Deep Tunnel system reaches capacity, a combined sewer overflow to the Des Plaines River, located at an outfall on the east riverbank just north of the bridge crossing at Madison Avenue, is accessed.

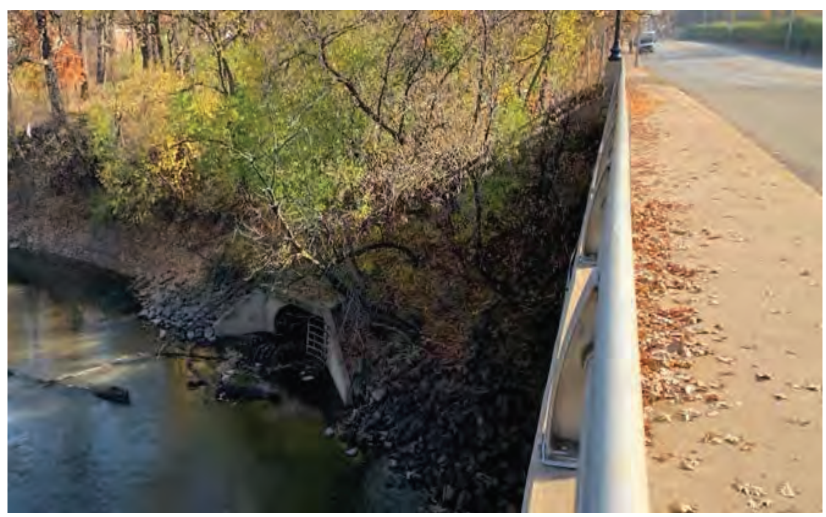


Figure 8. Combined Sewer Overflow Outfall at Madison Street

Exhibit 5 and **Figure 9** show the limits of the watershed and the major trunk and relief sewers.

Figure 9 - South Watershed Drainage System

CHAPTER 4 HYDROLOGIC AND HYDRAULIC MODEL DEVELOPMENT

For the SMP, most of the data used for the analysis was obtained via the Village's GIS database and supplemented by limited field survey. For the North Watershed, the more detailed hydrologic and hydraulic analysis, previously prepared using the EPA SWMM model was converted to an XP-Software Stormwater and Wastewater Management Model (XP-SWMM) to be consistent with the study methodology for the Village's remaining sewer network. Due to the unique nature of the Village and the independent outlets, the sewer network was divided into three models: North, Central, and South. The XP-SWMM software is a dynamic modeling program that determines the hydrologic response (runoff mode) from a storm event and routes the runoff through a sewer network (hydraulic mode). The XP-SWMM software was chosen for the analysis for its ability to simulate overland flows and surface storage combined with a sewer network to identify localized flooding problems.

4.1 SUBBASIN DELINEATION

The computer modeling required input data for the sewer system as well as the tributary watershed. For the watershed, the Cook County 1-foot interval aerial topographic mapping was used to delineate the drainage area tributary to each section of sewer and necessary subbasins. The subbasin delineation completed from the 2013 Northside Study was also used for the SMP. The approximately 2.0 square mile watershed area for the Village was subdivided into over 550 subbasins with an average size of approximately 3 acres. **Exhibits 3, 6 & 7** show the delineated subbasins for the North, Central, and South study areas. Additional details were used in areas where drainage boundaries were required to capture known drainage problems identified by Village staff and residents.

The Central and South watersheds include areas that were referred to as "non-contributing subbasins". These are primarily rear yard depressional areas that do not contribute runoff to the combined sewer system for the storm events analyzed ($\leq$10-year event). While there may be some existing private property drainage connections from these areas to the Village combined sewer, whether permitted or not, they are not widespread. These areas may contribute runoff during a 100-year event, but for the purposes of evaluating basement flooding, these subbasins were removed from the hydrologic portion of the model. The non-contributing areas are shown on **Exhibits 6 and 7**.

4.2 LAND USE

The Land Use parameter refers to the various land cover types that exist within each subbasin. Each type of land use will generate a different amount of runoff for a given amount of rainfall. For instance, a residential lawn is a pervious surface that will allow a certain amount of infiltration before the soil becomes saturated and runoff begins to occur. Streets, roofs, driveways, sidewalks, etc., are impervious surfaces with little or no infiltration. Therefore, a drainage area with a higher percentage of impervious surface will generate more runoff than the same area with a lower impervious percentage. For each subbasin, a Runoff Curve Number (RCN) calculation was completed using GIS database shapefiles for impervious and pervious surfaces. The RCN is essentially a weighted parameter that reflects the imperviousness of a subbasin; a higher RCN will generate more runoff than a lower RCN. Other watershed parameters, such as each subbasin's time of concentration, were generated through GIS tools that analyze the contour mapping.

4.3 DATA ENTRY

Storm sewer diameters, inverts, lengths, etc., were obtained from the sewer data collection described previously. The XP-SWMM model for the North Watershed was based on the previous study. The baseline included the Phase 1 improvements that were completed in 2015. Another major element to the sewer system's function, overland flow routes, were also input to the model. By reviewing the topography, the routing of overland flow was determined and input to the model. If a sewer does not have sufficient capacity to convey the tributary runoff, it will become surcharged and eventually back up out of the manhole rim. When this occurs, water will flow by gravity along overland flow routes that follow the topography. Where overland flow routes converge at depressional areas, ponding areas were entered into the model so that the depth and volume of ponding could be modeled. Elevation data for roadway depressions was obtained from the Cook County aerial topography.

4.4 CRITICAL DURATION AND DESIGN STORMS

A critical duration analysis was completed using the XP-SWMM model. A series of design storms were simulated on the existing Village sewer system utilizing rainfall depths published in the Illinois State Water Survey (ISWS) Bulletin 75 and Huff rainfall distributions. The critical duration refers to the duration of a storm that produces maximum water surface elevations, flood depths or flow rates. A range of storm events were simulated. In sewer capacity studies, the short duration and high intensity storms are normally the critical events; for the Village's systems, it was determined that the 1-hour event was critical.

This SMP focuses on basement flooding and a decision was made by the Village to evaluate whether a 10-year level of protection for basement flooding could be obtained. Therefore, the critical 1-hour duration storm was simulated using the XP-SWMM models for storm events up to the 10-year recurrence interval. Table 1 shows the rainfall depths of the various 1-hour duration storm events considered in the analysis.

Table 1. ISWS Bulletin 75 Rainfall Depths

Storm Event	Storm Duration	Rainfall Depth (in)
2-year	1-hour	1.57
5-year	1-hour	2.02
10-year	1-hour	2.42

The term “10-year storm” is used to define a rainfall event recurrence interval that statistically has the same 10% chance of occurring in any given year. Table 2 shows the recurrence and statistical probability of a storm happening in a given year.

Table 2. Design Storm Statistics

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

4.5 MODEL RESULTS AND CURRENT LEVEL OF PROTECTION

The XP-SWMM models for the North, Central, and South watershed were run for the 2-, 5-, and 10-year, 1-hour storm events. The models generate a tremendous amount of data which needed to be characterized in a simple manner that depicts whether an area of the Village is at-risk of basement flooding. The greatest storm event the system can handle without flood risk is referred to as the Level of Protection (LOP). While some homes may have flood protection systems such as overhead sewers, this assessment ignores that possibility and focuses on the relative risk of basement floor elevation versus water level in the sewer system.

The metric used to analyze the combined sewer LOP is the “freeboard depth”, which is a measurement of how far below street level the water in the sewer system is when at its peak level. A greater freeboard depth means the water level is further below street level and less likely to back up into adjacent homes. To quantify the approximate LOP at each manhole, peak water depths were divided into three color-coded categories as stated below and shown in Figure 1. Note that the basement elevations of each home are unknown and varies within each block; the freeboard depth thresholds described below are assumptions agreed upon with the Village and do not guarantee flood protection.

- Green: greater than 4-feet below street level – achieves LOP
- Yellow: between 2- and 4-feet below street level – near LOP
- Red: less than 2-feet below street level or above street level – does not achieve LOP

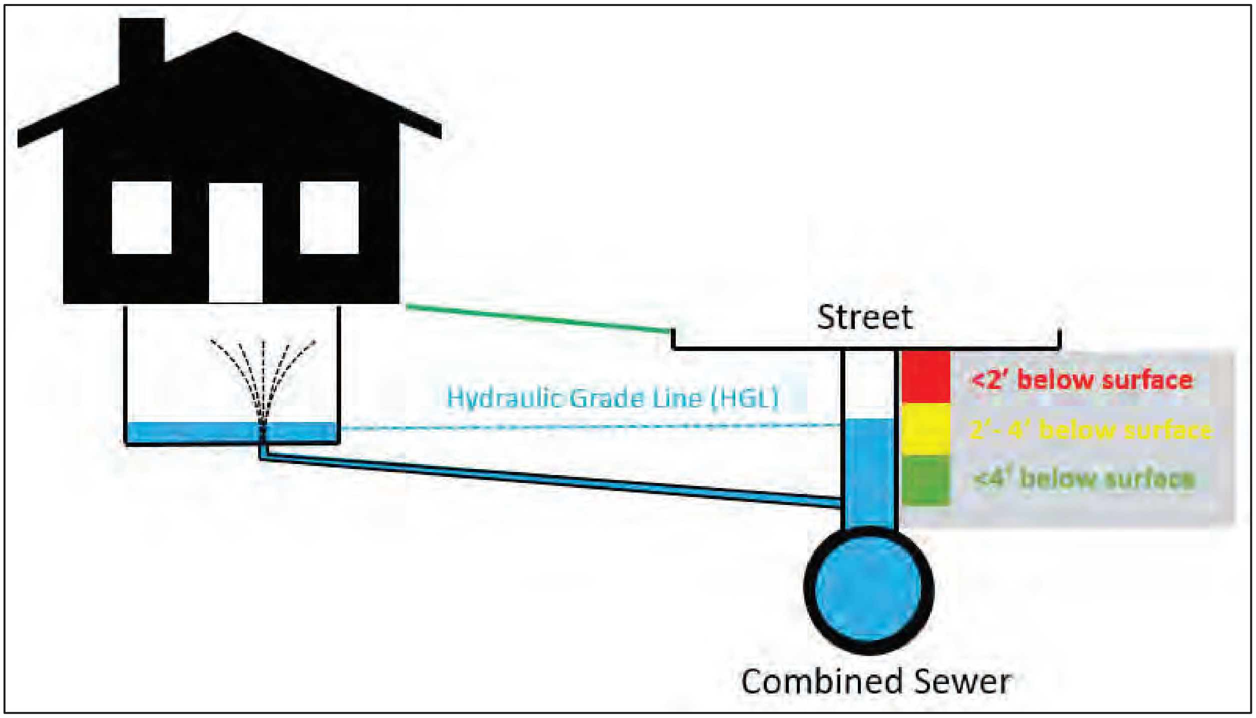


Figure 10. Sewer Modeling Level of Protection Schematic

The Village-wide modeling of the existing sewer system was simulated for 2-year, 5-year, and 10-year storm events within each watershed. The freeboard depth at each manhole was evaluated according to the color-coding system shown in Figure 10. The results are described below:

North Watershed

The basement flooding LOP for the North watershed is the most difficult to characterize. The 2015 Northside Project separated the combined sewers in half of the watershed. Sanitary flow from all of the area continues to drain to the interceptor sewer on North Avenue, which is subject to surcharging and potential backup throughout the North watershed. The flow reduction achieved via the sewer separation project reduced the likelihood of surcharging the interceptor sewer, however that sewer drains a large area outside of the Village's control. More importantly, due to the sewer separation, the remaining combined sewers in the North watershed can generally handle the stormwater runoff if the interceptor sewer is clear. Also critical for protecting the North watershed are backflow prevention devices that the Village installed on each of the combined sewer lines before they connect to the interceptor sewer. Although the LOP can vary depending on storm conditions and depends on mechanical protection, we characterize the North watershed as having a 10-year LOP. **Exhibits 8 through 10** depict the freeboard depth results for the 2-, 5-, and 10-year events. Note that the exhibits show the freeboard depths based on the potential interceptor sewer backup and do not reflect the Village's backflow prevention.

Central Watershed

The Central watershed is the largest and most challenged watershed in the Village. The neighborhood buildout is most dense in this watershed, creating large impervious areas and very few open space opportunities for stormwater management. The combined sewer network follows the street grid and is comprised mostly of small diameter sewers with limited capacity. There are some exceptions. Near Lake Street, there is a relief sewer network that accepts overflow connections from the combined sewer system. The relief sewer flows east to west down Lake Street and ultimately into the Deep Tunnel system. Due to the presence of the relief sewer, some areas in proximity to Lake Street have a higher LOP. In general, the LOP for the Central watershed is very low and is characterized as a 1-2 year LOP. Areas in close proximity to the Lake Street relief sewer have a 2-5 year LOP. **Exhibits 11 through 13** depict the freeboard depth results for the 2-, 5-,and 10-year events.

South Watershed

The South watershed is similar to the Lake Street area within the Central watershed. The small diameter combined sewer network is supplemented with a relief sewer network that flows south to Madison Street and ultimately to the Deep Tunnel system. This relief system is more expansive than the Lake Street system and more integrated throughout the combined sewer network, although it is not thoroughly integrated. Therefore, the LOP within the South watershed varies significantly depending on the proximity to a relief sewer connection. The LOP varies between 2- and 10-year protection. **Exhibits 14 through 16** depict the freeboard depth results for the 2-, 5-, and 10-year events.

CHAPTER 5 PROPOSED LEVEL OF PROTECTION

The Village's desire is to evaluate whether a 10-year LOP for basement flooding can feasibly be achieved. The 10-year criteria is considered an industry standard for the design of stormwater collection systems. While some circumstances may dictate the need for a higher standard, the 10-year standard is considered to be the best balance of project cost and level of protection. There are also physical limitations, in particular for a combined sewer system, that often prevent using a higher design standard. Depending on the relative elevations of the ground level, trunk sewers, MWRD interceptor sewers, basement floor, and the sewer service laterals, it is often not reasonably feasible to design a system to a higher level of protection on a Village-wide basin.

As described previously, the LOP for much of the Village is a 2-year or less. To determine the improvements that would be needed to raise the basement flooding LOP to the desired 10-year level, a modeling analysis was completed. Potential improvement projects were evaluated for each of the study areas to gain a 10-year level of protection. Note that the projects developed were conceptual in nature and developed to understand the scope of improvements that would be needed; they are not necessarily recommended projects and did not consider cost effectiveness of each project.

5.1 NORTH WATERSHED IMPROVEMENTS

Major improvements were made to the North Watershed in 2015 which addressed the major overland flooding issues that existed prior to the project. As stated previously, the area remains at risk of surcharging due to the MWRD's North Avenue interceptor sewer, however this risk has been mitigated in part with backflow prevention devices. Modeling of larger storm events indicates that some overland flooding risk remains within the Phase 2 area. Therefore, to further mitigate the risk of surcharging and to address the remaining overland flooding risk, one potential improvement for the North Watershed is to complete Phase 2 of the Northside Stormwater Management Project.

Project #1 – Northside Sewer Separation Phase 2

Figure 11 - North Watershed Phase 2 Sewer Separation

The project would involve separating the remaining combined sewer in the area by constructing storm sewer laterals that would tie into the Phase 1 trunk storm sewer on Greenfield Street. The proposed laterals range in size from 12” to 36” and would be constructed between North Avenue and Greenfield Street on Park Avenue, Franklin Avenue, Ashland Avenue, Lathrop Avenue, Jackson Avenue, Monroe Avenue, Willam Street, Clinton Place, Bonnie Brae Place, and Harlem Avenue. The project was conceptually designed prior to 2015 but was not part of the constructed improvements. **Figure 11** and **Exhibit 17** show the proposed Phase 2 project. This project is estimated to cost $12.8 million (2025 costs).

5.2 CENTRAL WATERSHED IMPROVEMENTS

As described elsewhere in this report, there are two general areas within the Central watershed that have different infrastructure and resulting level of protection. The primary difference is that near Lake Street, there is a relief sewer network that increases the level of protection and also provides for additional project opportuinities. Therefore, the improvements that were investigated for the Central watershed are presented accordingly below.

Central Area Core

The Central Area Core is the majority of the Central Watershed and is generally located between Division Street and Oak Avenue. This area includes a traditional combined sewer network with small diameter sewers and no rellief sewer network. It has the lowest LOP in the Village and the fewest open space areas that could be used for stormwater management. Developing improvement projects in this area that achieve a 10-year LOP from basement flooding is very challenging. Many stormwater retrofit projects involve a storage volume component. Stormwater storage is often used to attenuate runoff and pipe flows so that the existing pipe system can handle a given storm event. In a combined sewer system, an improvement project may include construction of storm sewers to separate an area, convey it to a storage basin, and then slowly release it back to the combined system. Another approach would be to provide underground storage integrated to the combined system without sewer separation. Both of these approaches require land area, either for an above- or below-ground storage system. The lack of available open space for sotrmwater management features means that all improvements must remain within the current right of way. Two different conceptual projects were developed and modeled based on this key constraint.

Project #2 – Central Area Sewer Separation

Project #2 is a full sewer separation of the Central Area Core, from Division Street to Oak Avenue and Thatcher Avenue to Harlem Avenue. The new separate sewer system would follow the street grid, tying into a main trunk sewer along Chicago Avenue, ranging in size from 30” to 108”, with a new outfall at the Des Plaines River. The system would require approximately 48,000 LF of new storm sewer to be constructed and would be designed to convey the 10-year storm event. Such a project would be a major undertaking, requiring significant coordination with multiple regulatory agencies including the MWRDGC.

A project of this magnigtude would need to be constructed in stages over several years. A logical progression would be to first construct the main trunk sewer and outfall on Chicago Avenue from the Des Plaines River to somewhere just east of Thatcher Avenue. Additional projects would follow from west to east, extending the trunk sewer and separating the sewers on each north-south street. Note that such an undertaking would inevitably identify the need or desire to replace other utilities or reconstruct roadways; any such costs are unknown and are not included in the project’s cost estimate.

This concept is estimated to cost a total of $76 million (2025 costs) and is shown on **Figure 12** and **Exhibit 18. Figure 12** indicates a potential phasing breakdown, although many unknown factors could influence project phasing. **Table 3** summarizes a potential breakdown of costs according to the phasing shown in the figure:

Table 3. Central Sewer Separation (Project #2) – Potential Phasing

Phase	Estimated Cost of Phase
1	$7.7 million
2	$21.3 million
3	$28.9 million
4	$18.3 million
TOTAL	**$76.2** million

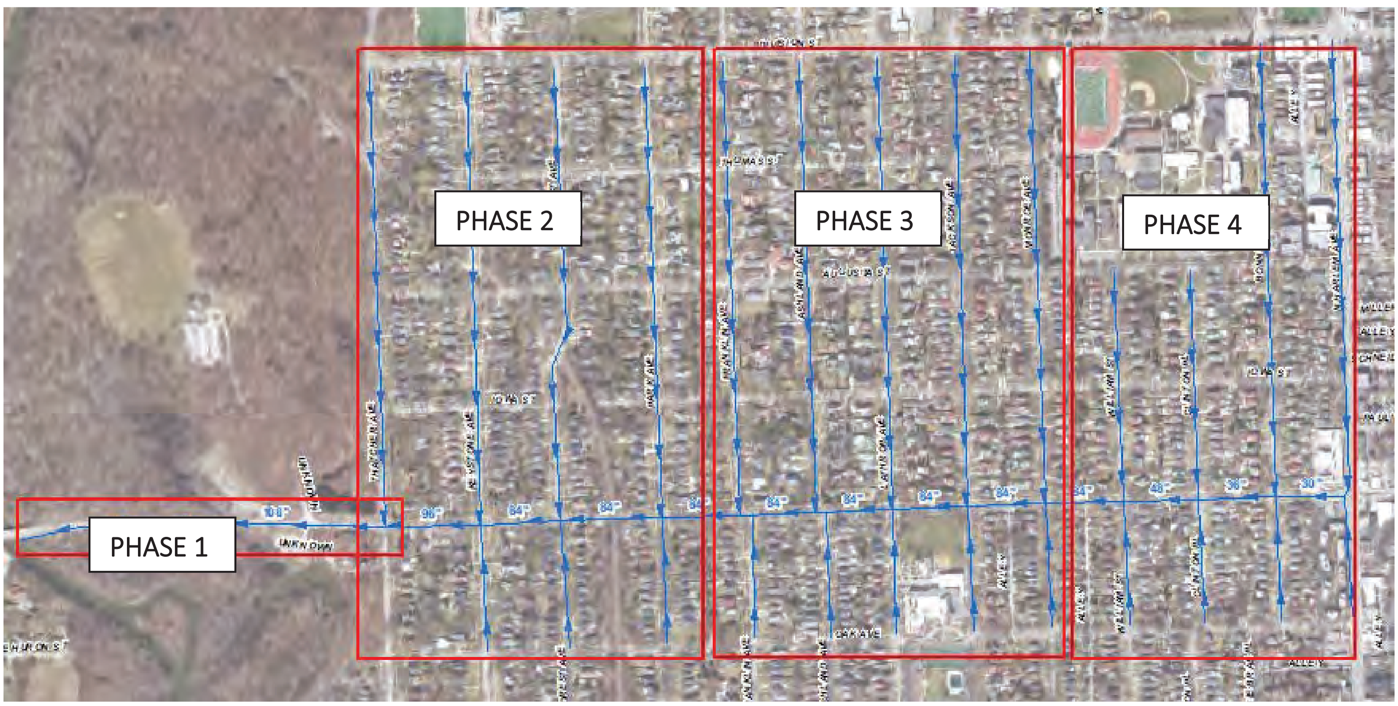


Figure 12 - Central Area Sewer Separation (Project #2)

Project #3 – Chicago Avenue Trunk Sewer and Vault System

Project #3 is an alternate approach to achieving a 10-yr LOP in the Central Area Core that involves improvements only to the combined sewer system rather than sewer separation. It would not be considered in addition to Project #1 but rather as an alternate. Due to general capacity constraints with the MWRD system, upsizing of connections to interceptor sewers are generally not allowed. This project assumes that flow into the MWRD system cannot be increased. Therefore, a significant volume of underground storage is needed to achieve the desired 10-year LOP without increasing the outlet capacity. Due to the open space limitations described previously, the underground storage would need to be located within the right of way. Storage could be provided via a modular precast vault system such as StormTrap or by using box culverts. A 48" main trunk sewer would be constructed on Chicago Avenue to receive flow from each of the linear storage elements. The Chicago Avenue combined sewer would maintain the same point of connection to the MWRD system.

This concept would have many challenges, with the greatest being the potential utility conflicts that may arise due to the storage vaults. A greater vault height would minimize the footprint of disturbance, which typically reduced project costs. However, a greater height is more likely to conflict with other utilities, particularly sewer and water service lines. It also has an inherently lower level of protection than sewer separation (Project #2) because it remains limited by the outlet capacity to the MWRD system. In addition to these challenges, it has a higher estimated cost than Project #2. Therefore, from a conceptual level, it does not appear to be a viable alternative but has been included for thoroughness.

The concept project is estimated to cost $88 million (2025 costs) and is shown on **Figure 13** and **Exhibit 19**.

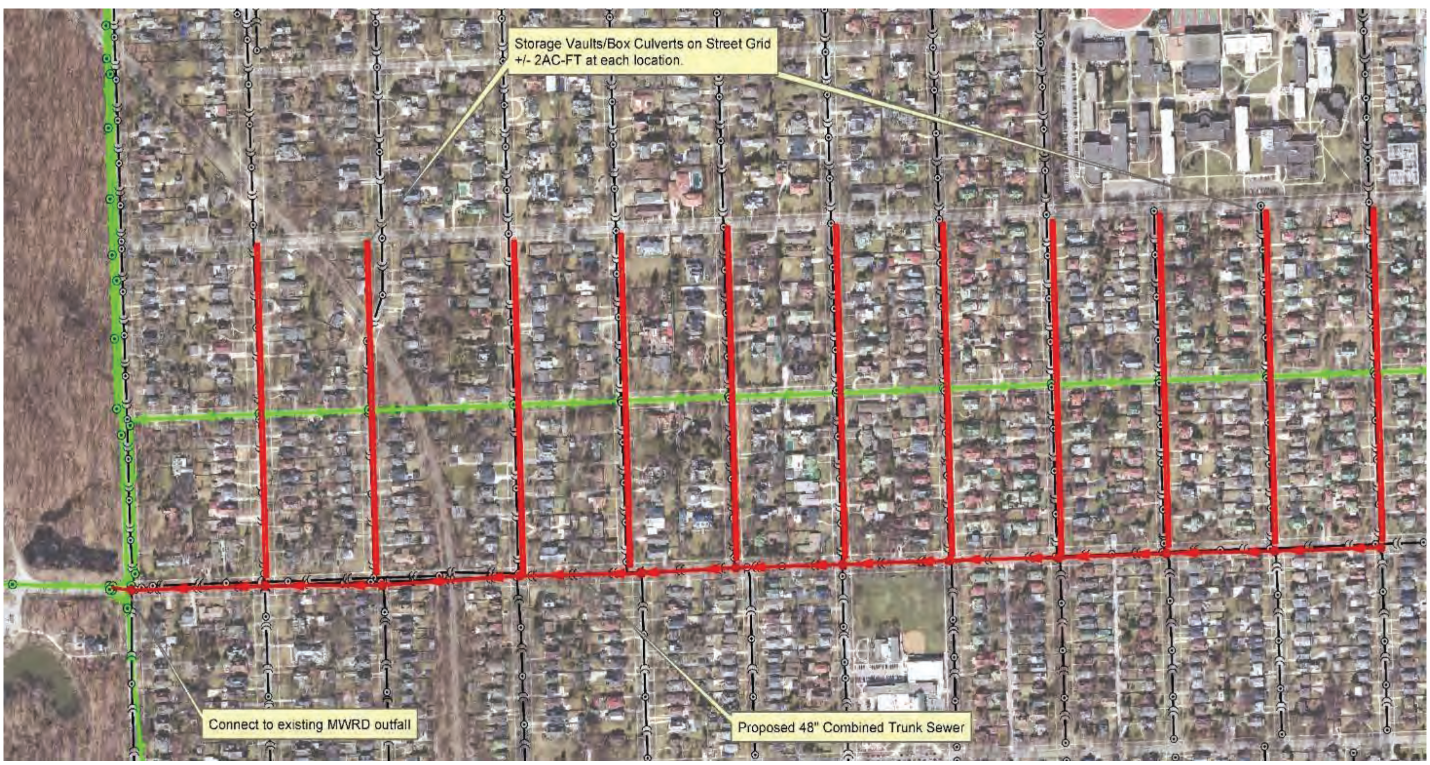


Figure 13. Central Area – Trunk Sewer and Vault Concept (Project #3)

Project #4 – Lake Street Area Improvements

Project #4 would take advantage of the open space that exists at Keystone Park to construct aproximately 7 ac-ft of an underground storage in a vault system. The storage vault would receive inflow from a combined sewer and a relief sewer on Lake Street. The conections from these two sewer systems into the vault would be set so they function as overflows; when the combined and relief sewers begin to surcharge, they would access the vault storage via the overflow connections. The effect of the storage will be to lower the hydraulic gradeline both at the vault as well as extending further upstream through th residential areas. The project would include another vault within the right of way at Franklin Avenue, which would have a similar effect. The overall result will be a lowering of system water levels and increase in freeboard depth to provide a 10-year LOP.

This concept project is estimated to cost $10.2 million (2025 costs) and is shown on **Figure 14** and **Exhibit 20**.

Figure 14 - Lake Street Area Improvements (Project #4)

5.3 SOUTH WATERSHED IMPROVEMENTS

Projects #5,6,7 - South Area Improvements

Similar to the rest of the Village, the South area is lacking in open space opportunities to provide significant stormwater storage facilities. Therefore, conveyance options were investigated. The best opportunities to increase the level of protection were found to be by expanding the existing relief sewer system with storm sewer extensions, as well as installing a new large diameter relief sewer down Park Avenue. In addition to this expansion of the relief sewer system, two of the lateral overflow connections can be lowered along Madison Avenue at Franklin Avenue and Ashland Avenue. The lowering of these two overflow connections helps convey surcharges into the relief sewer more quickly. In addition, 6 of the 14 overflow connections would be plugged as a result of the expanded relief and storm sewer system.

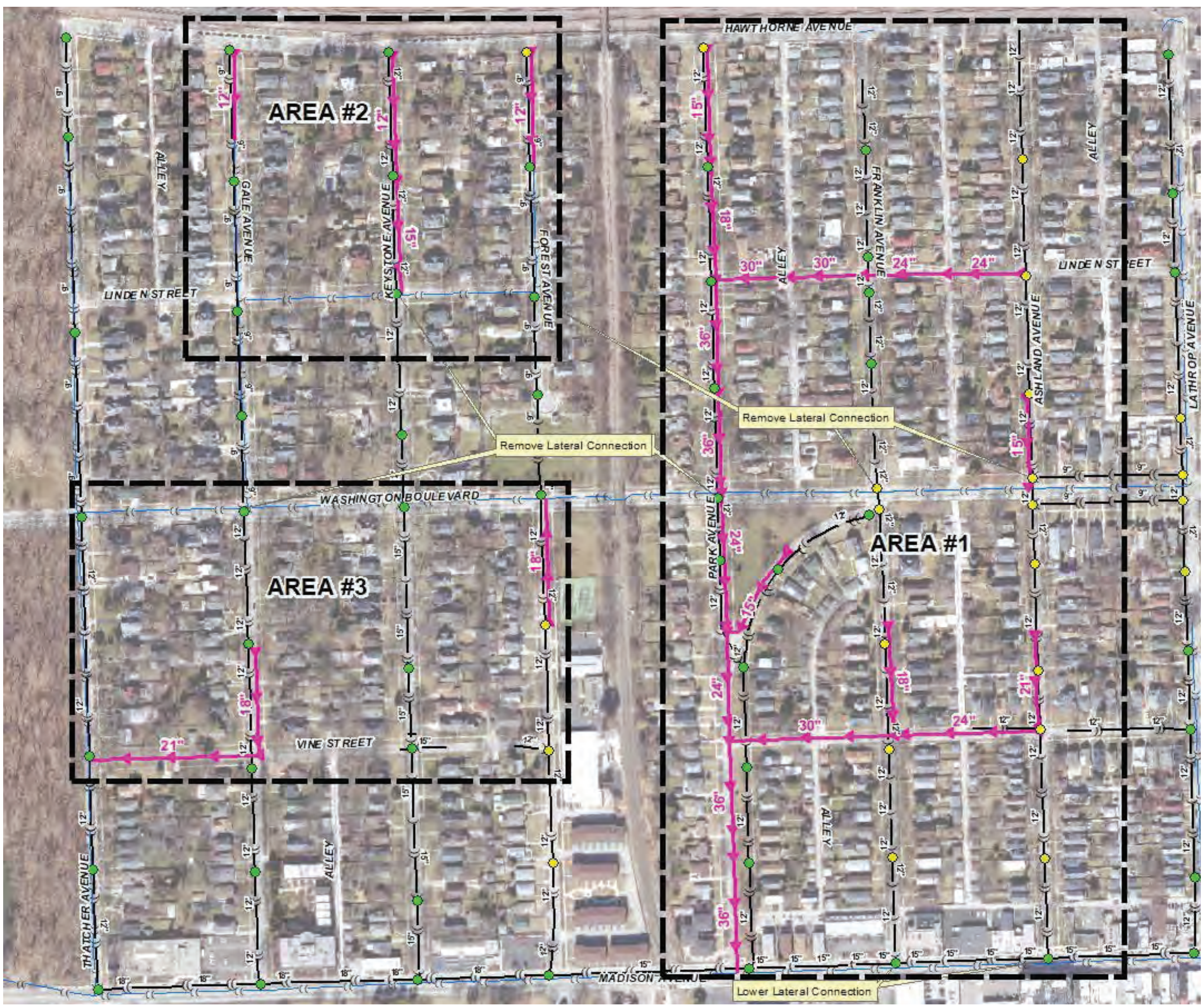


Figure 15 - South Area Improvements

The south watershed improvements could be separated into multiple project packages. **Exhibit 21** and **Figure 15** show three potential project areas that have a logical geographic grouping; The improvements could be divided into smaller packages if desired. This overall concept project (all three areas) is estimated to cost $7.8 million (2025 costs).

5.4 SUMMARY OF PROJECTS

The following projects were conceptually developed to achieve a 10-year level of protection from basement flooding:

Table 4. Summary of Projects Investigated

Project	Estimated Cost
Project #1 – Northside Sewer Separation Phase 2	$12.8 million
Project #2 - Central Area Sewer Separation	$76 million
Project #3 - Chicago Avenue Trunk Sewer and Vault System	$88 million
Project #4 - Lake Street Area Improvements	$10.2 million
Project #5 - South Watershed Improvements Area #1	$5.9 million
Project #6 - South Watershed Improvements Area #2	$0.9 million
Project #7 - South Watershed Improvements Area #3	$1.0 million

The concept level cost estimates are included in Appendix 1.

CHAPTER 6 PROJECT RANKING

A prioritization process for ranking the conceptual projects was developed. This process often includes development of a Benefit-Cost Ratio (BCR) where damages are calculated for various types of flooding. The BCR process is more applicable to flooding in separate sewered areas where overland flooding of structures is a greater concern. There are established procedures and data for calculating flood damages from overland flooding where surface floodwaters enter a residential structure. A project's "benefit" comes from the elimination of these financial damages. A BCR greater than one demonstrates, theoretically, that the cost of the project is justified because over its lifetime it will reduce damages by a greater amount.

Basement flooding damages can vary tremendously where a basement can be finished or unfinished, and where two adjacent homes can have significantly different basement flood depths (and corresponding damage) from the same storm due simply to the basement elevation. Because the River Forest SMP is focused primarily on basement backup protection where the BCR process is not applicable, a modified approach was needed. The purpose of the ranking is not to establish the cost effectiveness of individual projects such as with a BCR calculation, but rather to compare the relative effectiveness of one project compared to the others. A simplified approach was developed in which the model nodes (sewer manholes) that changed from red to either yellow or green in the flood mapping as a result of the project were identified. This change indicates that the conceptual project would create a significant reduction in the 10-year hydraulic gradeline elevation and therefore reduce the frequency that basement flooding would occur. The properties in the vicinity surrounding each identified node were estimated and counted to determine the number of "benefitting properties". The estimated project cost was divided by the number of benefitting properties to arrive at a cost per property. Again, this metric is not intended to evaluate the cost effectiveness of the individual project but can be used to prioritize the projects against each other.

The results of the project ranking analysis are summarized below and in Appendix 2:

Table 5. Project Ranking Summary

Rank[1]	Project	Level of Service[2]	# of Benefitting Properties[3]	EOPC[4]	Avg. Cost Per Property
1	South Watershed - Area #2	10-yr	65	$ 909,810	$ 13,997
2	South Watershed - Area #3	10-yr	54	$ 1,022,030	$ 18,926
3	South Watershed - Area #1	10-yr	270	$ 5,878,044	$ 21,771
4	Central Watershed - Lake Street Vault	10-yr	419	$ 10,207,320	$ 24,361
5	North Watershed - Northside Sewer Separation Phase 2	10-yr	469	$ 12,852,172	$ 27,403
6	Central Watershed - Sewer Separation	10-yr	1051	$ 76,144,388	$ 72,449

NOTES:

1. *Rank is determined by the average cost per benefitting property.*
2. *All projects were analyzed for the 10-year event and benefits were determined on basis of 10-yr storm design.*
3. *Benefitting Properties were estimated based upon proximity to combined sewers with substantial reduction in 10-year HGL. See report for additional discussion.*
4. *Engineer's Opinion of Probable Construction Cost, based on 2025 costs.*

CHAPTER 7 GREEN INFRASTRUCTURE

The potential projects introduced in this report are large scale that would require extensive planning, funding, and implementation efforts. Green infrastructure manages stormwater on a very small scale. It generally does not provide the same level of flood protection as traditional stormwater management systems but can be a targeted solution that does reduce stormwater runoff and nuisance drainage problems.

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

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

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

A majority of the Village is serviced by a combined sewer system, therefore stormwater not infiltrated into the ground or retained on site is ultimately collected in the sewers and sent to an MWRD wastewater treatment plant where it is then treated. The implementation of green infrastructure would incrementally reduce the amount of runoff that is sent to the combined sewer systems and help minimize combined sewer overflow (CSO) events. It is required that all new developments or redevelopments adhere to the MWRD WMO requirements via the usage of green infrastructure to provide benefits to the existing sewer system, by retaining the initial rainfall on site.

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

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

Given the magnitude of flooding problems throughout the Village, it is our opinion that the bulk of any funding resources should be directed to traditional mitigation practices, including a cost share program for backflow preventers for individual structures. However, we do recommend that green infrastructure should be an important part of the overall SMP.

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

1. *Provide an incentive program for Green Infrastructure*. The incentive program would reduce the cost-sharing portion of the installation of a backflow preventer by a property owner if they install an approved BMP on their property. While the incentive program would not eliminate the entire cost of a backflow preventer, it would give homeowners some control over the cost they pay and also introduce and educate

more residents to the benefits of having green features on their property. Ultimately, widespread implementation will not occur unless residents see the BMPs as beneficial; the incentive program would help to accelerate the rate of exposure for residents to BMPs.

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

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

- Green Roads:
- Green Alleyways
- Island rain gardens (based on available space)
- Rain barrels and downspout disconnection
    - Program for downspout disconnection and rain barrel assistance (**Figure 16** and **Figure 17**)
    - Limited to private property
- Permeable pavement
    - Pilot program in selected areas around businesses

Figure 16. Downspout

Figure 17. Rain Barrel

CHAPTER 8 STORMWATER ADMINISTRATION

8.1 STORMWATER REGULATIONS AND POLICIES

Stormwater ordinances regulate the management of stormwater for development sites. Development within the Village falls under the jurisdiction of two ordinances, including the Village's stormwater ordinance (Chapter 13 of the Village's Code of Ordinances) and the MWRD's Watershed Management Ordinance (WMO). Permit applicants must demonstrate that the requirements of both ordinances are met.

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

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

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

8.2 OPERATIONS AND MAINTENANCE

Operation and maintenance of the sewer system is a very straightforward process, as the system largely works by gravity without need for human intervention. The Village's stormwater system is comprised of thousands of inlets, catch basins, and manholes, plus miles of sewer mains. Physically inspecting all of the system at any regular interval is challenging, and it is questionable whether it would be cost effective. To some extent, it is inevitable that items in need of repair will be identified after a problem has arisen or is soon to arise. Maintenance of the system should be focused on components that are directly related to the performance of the system, i.e. the ability to collect stormwater and to convey it away from streets, etc. The Village also has an annual sewer maintenance program, is regularly reviewing the long-term capital improvements, encouraging environmental best practices, and has implemented assistance programs to reduce individual home flooding.

There are hundreds of inlet grates and open lid manholes that tend to accumulate debris which can cause blockages and lead to localized ponding. Catch basins and inlets allow stormwater into the sewer system, and catch basins have a "sump" built into the structure. The sump is just the portion of the structure that is below the outflow pipe, and it is intended to collect roadway debris. Once the sump is filled, debris can be drained out into the system and cause siltation of the sewers, which decreases capacity. Catch basin cleaning is the most important maintenance task for the sewer system. Cleaning needs to be done with a vactor truck. The Village has implemented a plan to keep storm water drains clean in accordance with a 5-year cycle. As with any maintenance task, more is always better. The current policy is very proactive and appears to be sufficient. No problems related to siltation of the sewer system have been identified. We do not recommend using maintenance funds to increase the cleaning frequency.

8.3 WATER QUALITY ASSESSMENT

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

With the exception of the portion within the North Watershed that was constructed in 2015, all runoff in the Village is combined with household waste and conveyed through the combined sewer system to MWRD water treatment facilities. The treatment plants remove these wastes and pollutants before discharging the processed water back to a local waterway. Therefore, water quality management in the Village is largely handled by this process.

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

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

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

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

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

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

CHAPTER 9 PRIVATE PROPERTY DRAINAGE SOLUTIONS

While this SMP report focuses primarily on the Village's sewer systems, their capacities, potential improvements, etc., many of the drainage problems experienced within the Village occur on private property. Private property drainage problems within the Village can be generalized into three categories; basement backups, rear yard flooding, and riverine flooding. This section is not intended to be an exhaustive source but provides homeowners with potential solutions they may wish to explore further to improve their particular situation.

9.1 BASEMENT BACKUP PROTECTION

As described throughout this report, the majority of homes within the Village are connected to a combined sewer system. Homes in a combined sewer area are generally at-risk of basement flooding when there is an unbroken gravity connection that drains household waste into the combined sewer. This unbroken system, i.e. no pumps or backflow prevention, was common for residential construction until at least the 1970s.

During a storm event, water levels in the combined sewer system rise due to the inflow of runoff from streets, lawns, roofs, etc. With the unbroken gravity system, the rising water levels can simply back up through the home's sanitary service line. Often, a floor drain or other plumbing facilities in the home's basement are the lowest open point in the system. If the sewer system's level is higher than the floor drain or other opening, water from the sewer system will back up into the basement.

There are several methods which provide protection from basement backups. Each has varying levels of protection, cost, and maintenance requirements. The particular construction of a home may impact which types of flood protection are feasible or best suited for use. Homeowners should investigate their particular situation and consult with an engineer or plumbing professional to arrive at the best solution. The following are a few examples of basement backup protection methods:

<u>*Backflow Prevention Valves:*</u>

Backflow valves, often called "check valves", are plumbing fittings installed on the sewer line that leaves the house. They contain some type of flap within the valve and are oriented so that if water is pushed up the line (backflow) the flap is pushed tight against a sealing surface, preventing water from continuing to backup beyond the valve.

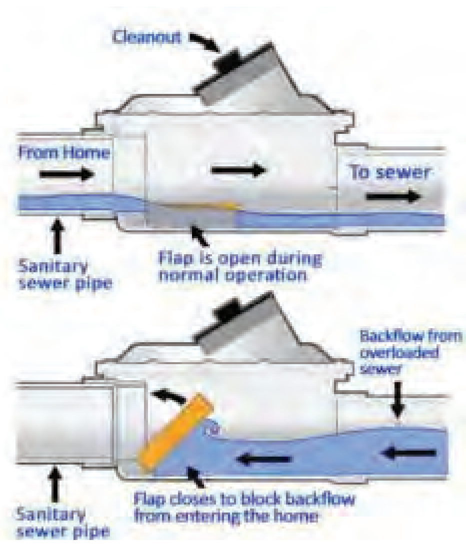


Figure 18 - Backflow Valve Detail

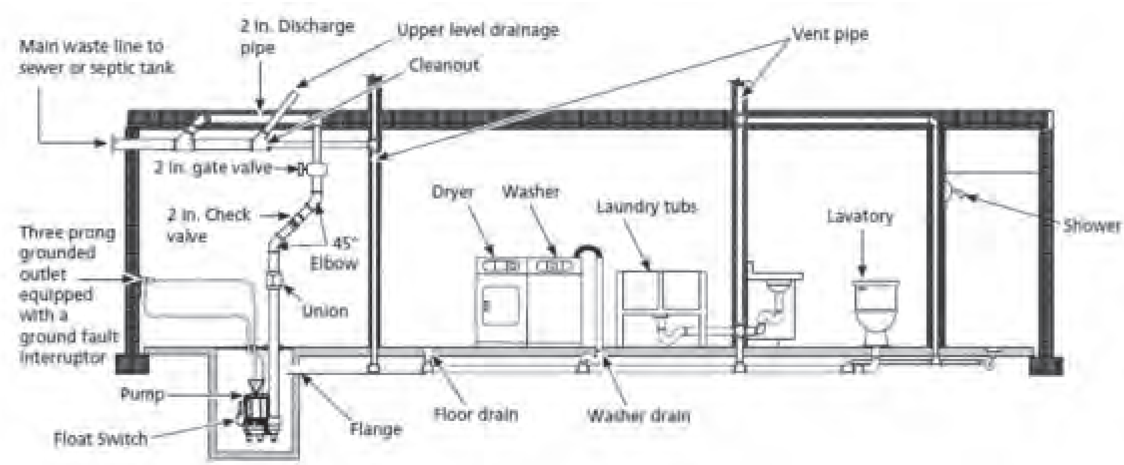
Backflow valves can be installed inside the basement. This normally requires cutting open the floor, installing the valve, and patching the concrete. They can also be installed outside of the home, somewhere between the home and the connection to the combined sewer. The preferred location may depend on cost, impacts and ease of maintenance.

A backflow valve is the easiest and least expensive basement protection measure. However, there are several cons. One, routine maintenance is needed to ensure the flap is operating and sealing properly. Depending on the valve location, this may be very difficult. Two, it is the least reliable method. Debris can prevent the valve from sealing properly and backflow can still occur. Three, the use of plumbing facilities is limited or non-existent during a storm event while the flap gate is closed.

Overhead Sewer Conversion:

Current plumbing codes require an overhead sewer system, which means that any basement level plumbing is piped to a sealed ejector pit. The ejector pit pumps the water up, usually to the underside of the first floor, and from there it drains by gravity through the home's service line out to the sewer in the street. With this system, the water level in the sewer would need to be near the first floor of the home before it could reach the basement plumbing, which is further protected with check valves downstream of the ejector pit which prevent any water from escaping the sealed system.

An overhead sewer conversion mimics this design. Each home will require its own modifications to implement the conversion. One or more drain pipes may need to be cut into the floor so that all basement level plumbing can be piped to a new ejector pit. The ejector pit discharge is piped to connect with household plumbing from the upper floors. Typically, a new service line exiting the house is installed. Variations on this basic premise will be required to suit each particular situation.



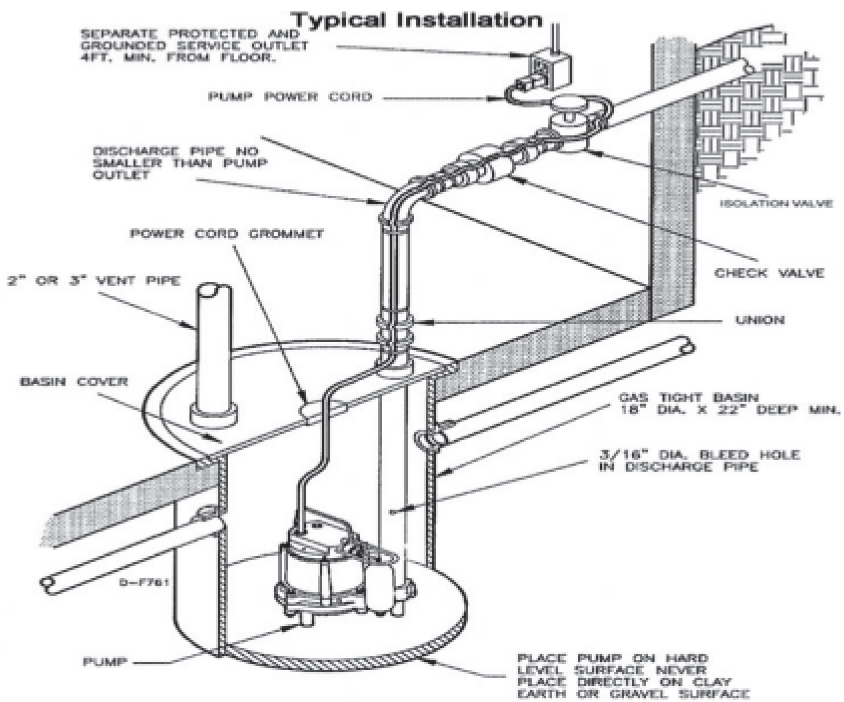


Figure 19A/B - Overhead Sewer Details

An overhead sewer system is considered to be the most reliable and best method of basement protection. It is also commonly the most expensive. Failures of this type of system are rare and maintenance needs are limited.

Outdoor Flood Protection:

Another type of system is often referred to as a basement “flood control” system. This is similar to an overhead system but constructed outside of the home. It intercepts the household service line and relies on backflow valves to prevent backup into the house. When the sewer system levels are high, household waste is pumped under pressure out through the sewer line rather than pumping up and then flowing by gravity as in an overhead system. This type of system is often similar in cost to overhead sewers and is utilized when an overhead system cannot be easily implemented.

Village Subsidy Program:

In 1995, the Village initiated a subsidy program to help provide financial assistance to property owners interested in installing flood-prevention infrastructure. The program continues today. The intent of this program is to offset a portion of the expense that a property owner will incur when safeguarding their building from sewer back-ups. Residents should contact the Village for further details.

9.2 REAR YARD FLOOD PROTECTION

A common problem for private properties within the Village, in particular residential properties, is poor drainage of rear yard areas. Depending on the particular topography, a home's rear yard may be lower than the front or even the street or alley. It could be higher in elevation but overland drainage to the street/alley may be blocked by the home, detached garage, shed, fence, sidewalk, etc. This often leaves a "disconnected" rear yard drainage area. Installing rear yard drains connected to the sewer system is problematic for two reasons. One, depending on the relative elevations, these connections are subject to backup much like a basement. Two, the limited capacity of the combined sewer system should not be further burdened with unnecessary runoff.

One way for homeowners to improve rear yard drainage is to install an infiltration Best Management Practice (BMP). These may be referred to as rain gardens, bioretention cells, bioinfiltration basins, bioswales, or other names. They are all similar features which provide for temporary holding of stormwater and promote infiltration into the ground.

An infiltration BMP is a sunken landscaped area that collects excess rainfall that runs off from streets, sidewalks, roofs, etc. The collection area allows the runoff to pool and infiltrate into the soil below. The rain garden contains plants and other vegetation that naturally filters the water, improving the overall quality. The soil is specially designed to facilitate plant growth and has a high ratio of void space which can temporarily hold water during a storm event. The allowance of the water to pool on the surface contains ponding to a defined area and decreases the peak flow into the local storm sewer system, which also helps to mitigate basement flooding.

Other stormwater management methods that can be used in a rear yard setting include downspout disconnection, rain barrels, permeable pavement, and drywells. These three techniques provide temporary holding capacity for runoff in a way that is compatible with typical rear yard uses.

There are many resources available to homeowners that describe each of these BMP techniques, how to choose and implement them, typical costs, etc. One highly recommended resource is produced by the Metropolitan Water Reclamation District of Greater Chicago and therefore is most relevant to the area. The MWRDGC's Green Neighbor Guide, included in Appendix 3, is a manual that promotes responsible ways for homeowners to manage stormwater. These same techniques can serve to improve nuisance ponding or flooding in rear yard settings.

Details on each technique are included in Appendix 3. A few summary points relevant to the issue of year yard ponding is provided below:

Table 5. Rear Yard Drainage BMP Summary

Downspout Disconnection 	• Reduces inflow to the combined sewer system and indirectly reduces basement flooding; • All downspouts should already be disconnected per Village requirements.
Rain Barrels  	• Provide limited holding capacity but can reduce the amount of runoff contributing to rear yard ponding issues. • Remember to drain the barrels between storms so that the storage capacity is available.
Rain Gardens and Bioswales 	• As stated in the MWRD's manual, site selection is important. Keep 10' away from homes, and make sure there is a safe overflow route for water. • Local soils are often not suitable and will not pass the "test" recommended in the manual. This does not mean rain gardens cannot be used. Over-excavating the BMP and replacing with an engineered soil mix will provide holding capacity for runoff and will help the plants grow. The preferred soil is typically a mix of sand, topsoil, and wood mulch. • Sunny locations allow for a greater variety of plants, but there are plenty of shade-friendly varieties that will work in a rain garden.

Permeable Pavement 	• Rear yard patios can use permeable pavement to reduce runoff • Most paver system recommend at least 4" of stone base. In a permeable system using clean stone (no fines), the stone base would hold approximately 1.4" of rain falling on it before water would begin to runoff into the surrounding yard. • A deeper stone base can be used to hold greater rainfall, however this requires more excavation and greater costs.
Dry Wells 	• Dry wells can connect poorly draining low points in a backyard. • Capacity is provided by the amount of stone used – much like with permeable pavement, a greater depth of stone provides more holding capacity for runoff.

9.3 RIVERINE FLOOD PROTECTION

While there is a major floodplain within the Village associated with the Des Plaines River, it is primarily located within undeveloped Forest Preserve land. There are limited areas where the floodplain impacts residential areas. One is a finger of 100-year floodplain that extends down Chicago Avenue and impacts the area near the intersection of Chicago and Thatcher Avenues:

Figure 20 - FEMA FIRM at Chicago & Thatcher Ave

The second area is a residential pocket east of the river at Lake Street. This area is outside of the 100-year floodplain but within 500-year floodplain. It is protected by a partial levee system that must be manually extended across Lake Street when the river nears flood stage.

Figure 21 - FEMA FIRM at Lake Street

Lowering the flood elevation of the Des Plaines River is certainly beyond the scope of what the Village can accomplish. Grading improvements to create a “levee” for an individual home are sometimes possible but frequently limited by existing features such as streets, sidewalks, homes, etc. Given the typical lot size within the Village, this is likely an impractical option to provide flood protection.

Overall, the Village is well protected from riverine flooding with the exception of the two noted areas. A homeowner who wants to raise their level of protection from riverine flooding can generally consider two options: wet floodproofing and dry floodproofing. Wet floodproofing is applicable where the first floor of a house is above the flood elevation but the basement level may be below and subject to flooding. Wet floodproofing seeks to modify the home’s mechanical and other systems and select compatible finishes that will incur relatively minor damage from a flood event. Dry floodproofing may be used where the flood elevation is higher than the first floor. It uses structural elements such as glass block windows, watertight doors, and other building modifications to withstand flooding.

The best available resource on floodproofing of structures is FEMA's "Homeowner's Guide to Retrofitting; Six Ways to Protect Your Home from Flooding". Chapter 3.4 of this resource (Floodproofing) has been included in Appendix 3. The full document can be found online at https://agents.floodsmart.gov/sites/default/files/fema_nfip-homeowners-guide-retrofitting-2014.pdf

NOTE: AERIAL PHOTOGRAPH TAKEN FROM ARCMAP ONLINE COOK COUNTY AERIAL IMAGERY 2020

0 1,000 2,000 Feet
1 inch = 1,000 feet

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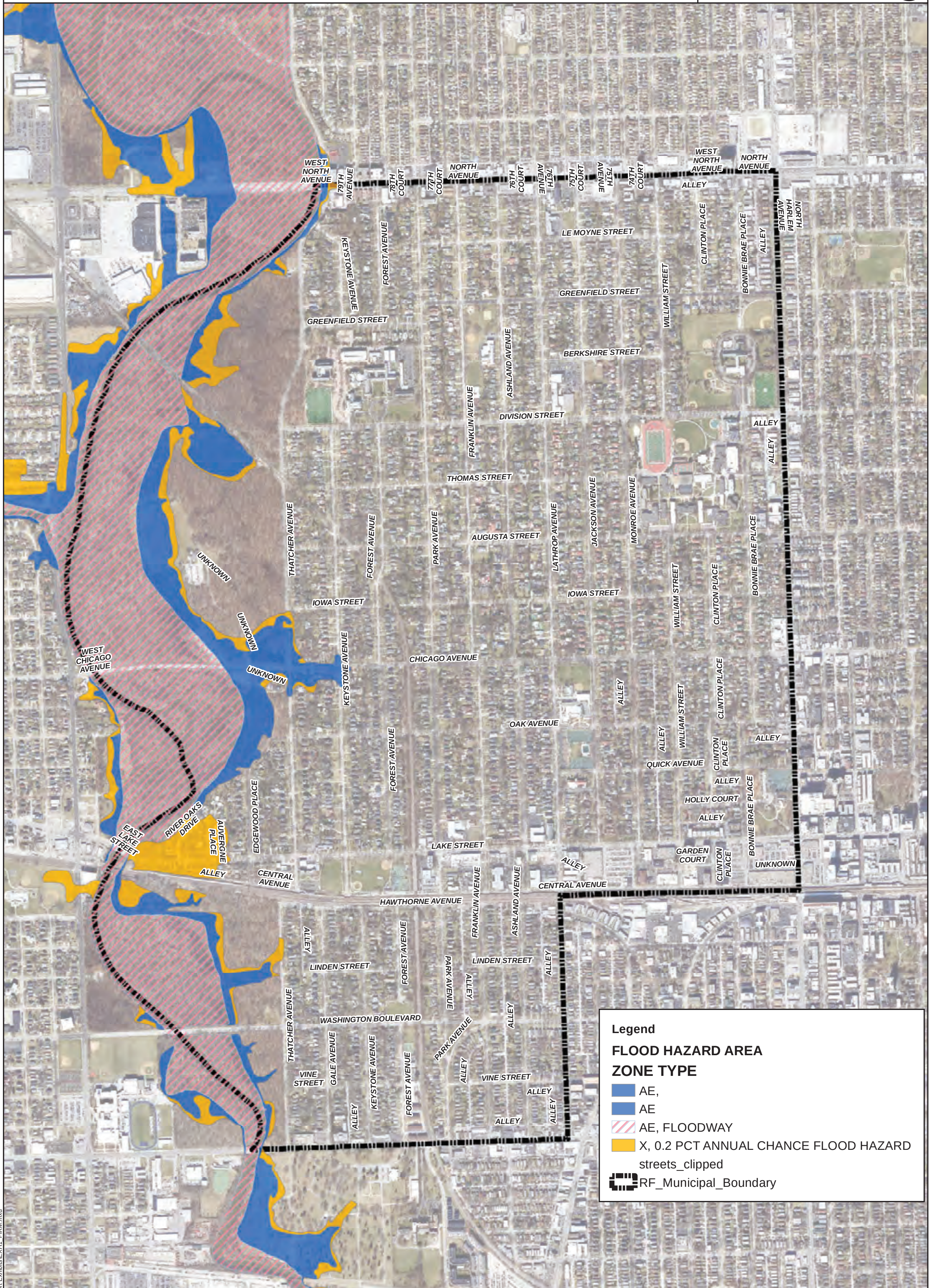

CLIENT:	TITLE:	PROJ# 20-0263
VILLAGE OF RIVER FOREST	*FLOOD INSURANCE RATE MAP*	DATE: 11/22/2024
		SHEET 1 OF 1

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9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0500

DSGN.	BMK	SCALE:	1 "= 1,000 '
DWN.	BMK	USER:	jjulkowski
CHKD.	MJB	PLOT DATE:	11/22/2024
FILE NAME:	EXH1_FIRM		

EXH 1

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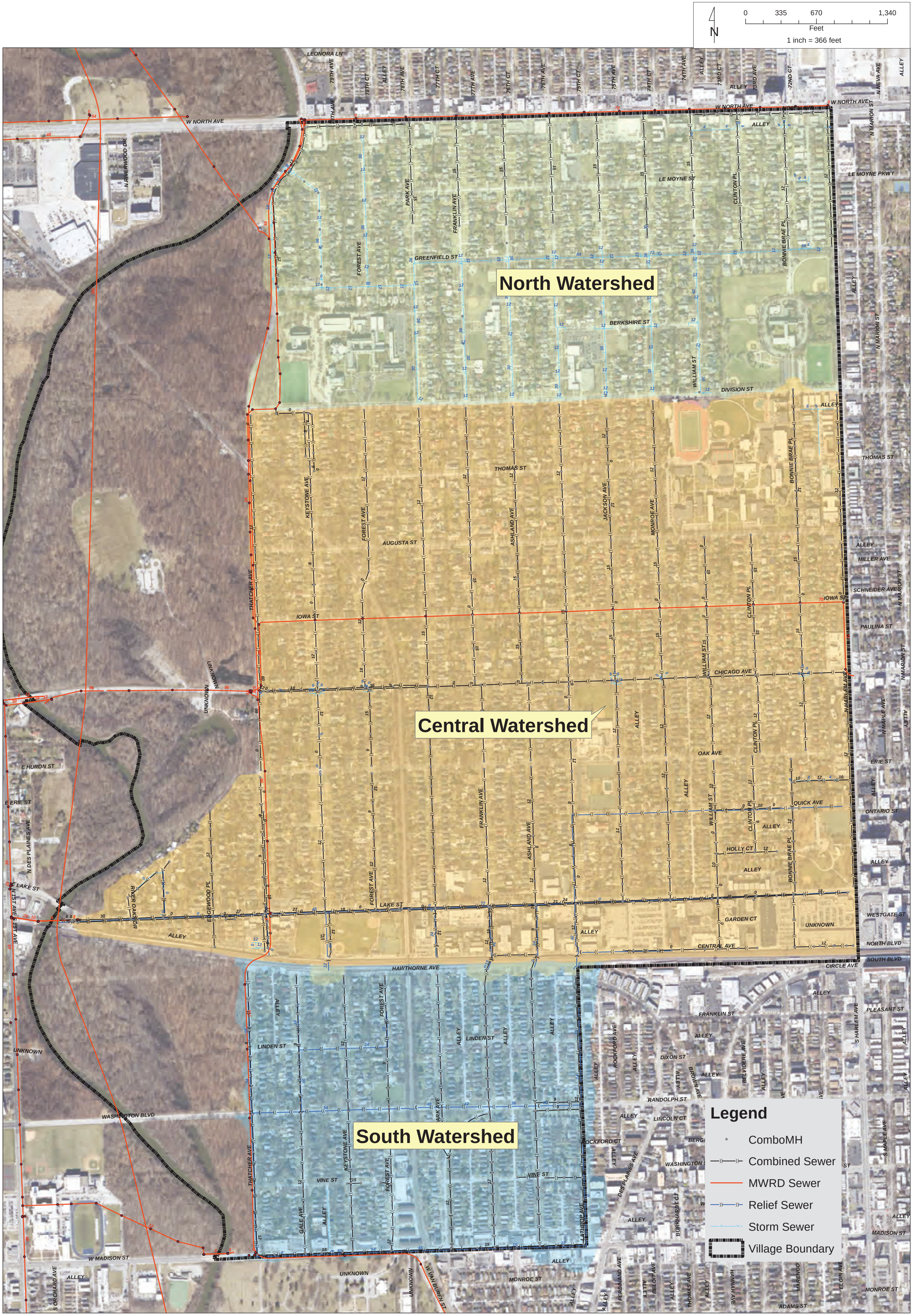

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(847) 823-0500

CLIENT:
VILLAGE OF RIVER FOREST

No.	DATE	NATURE OF REVISION	
			DSN.
			CHKD.
			SCALE
			GIS USER
			MODEL ArcGIS 9.2

FILE NAME:
DATE:

TITLE:
MAJOR WATERSHEDS

PROJ. NO. 00-000
SHEET 1 OF 1
DRAWING NO.
EXH 2

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VILLAGE OF RIVER FOREST

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DWN.	BMK
CHKD.	JJJ
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TITLE:

NORTH AREA SEWER MAP

PROJ. NO. 21-0272
DATE:
SHEET 0 OF 0
DRAWING NO.
EXH 3

CHRISTOPHER B. BURKE ENGINEERING LTD. 9575 West Higgins Road, Suite 600 Rosemont, Illinois 60018 (847) 823-0500	CLIENT: VILLAGE OF RIVER FOREST	TITLE: NORTH WATERSHED SEWER MAP	PROJ. NO. 21-0272 DATE: SHEET 0 OF 0 DRAWING NO. EXH 3

NO.	DATE	NATURE OF REVISION	CHKD.

DSGN.	BMK
DWN.	BMK
CHKD.	JJJ
SCALE:	1 inch = 400 feet
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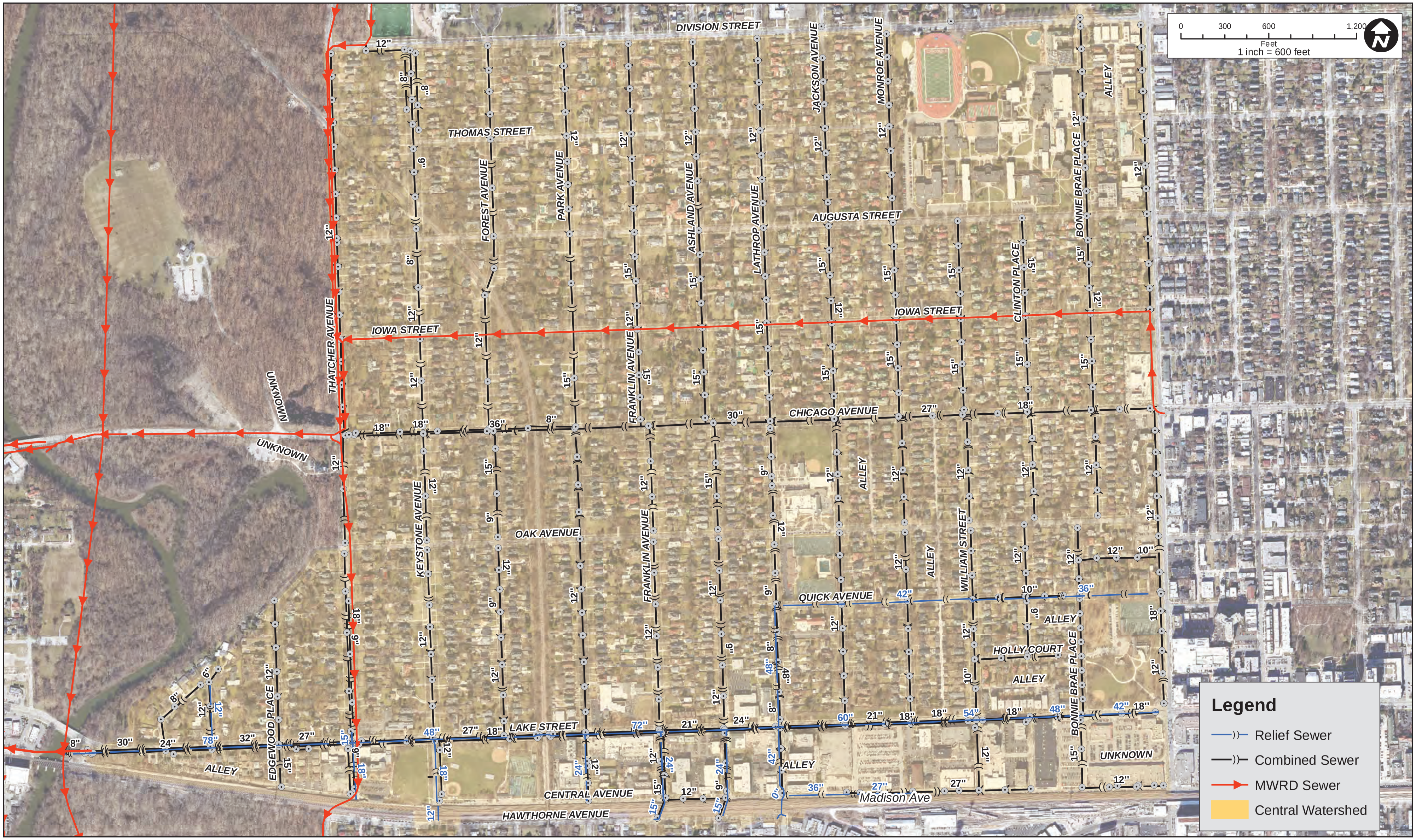

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Rosemont, Illinois 60018
(847) 823-0500

CLIENT:
VILLAGE OF RIVER FOREST

NO.	DATE	NATURE OF REVISION	CHKD.

FILE NAME

DSGN. JLW
DWN. JLW
CHKD. JJJ
SCALE: 1"=
PLOT DATE:
CAD USER:
MODEL:

TITLE:
CENTRAL STUDY AREA
SEWER MAP

PROJ. NO. 210272
DATE: 8/11/22
SHEET 0 OF 0
DRAWING NO.
EXH 4

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(847) 823-0500

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VILLAGE OF RIVER FOREST

NO.	DATE	NATURE OF REVISION	CHKD.

DSGN.
DWN. JLW
CHKD. JJJ
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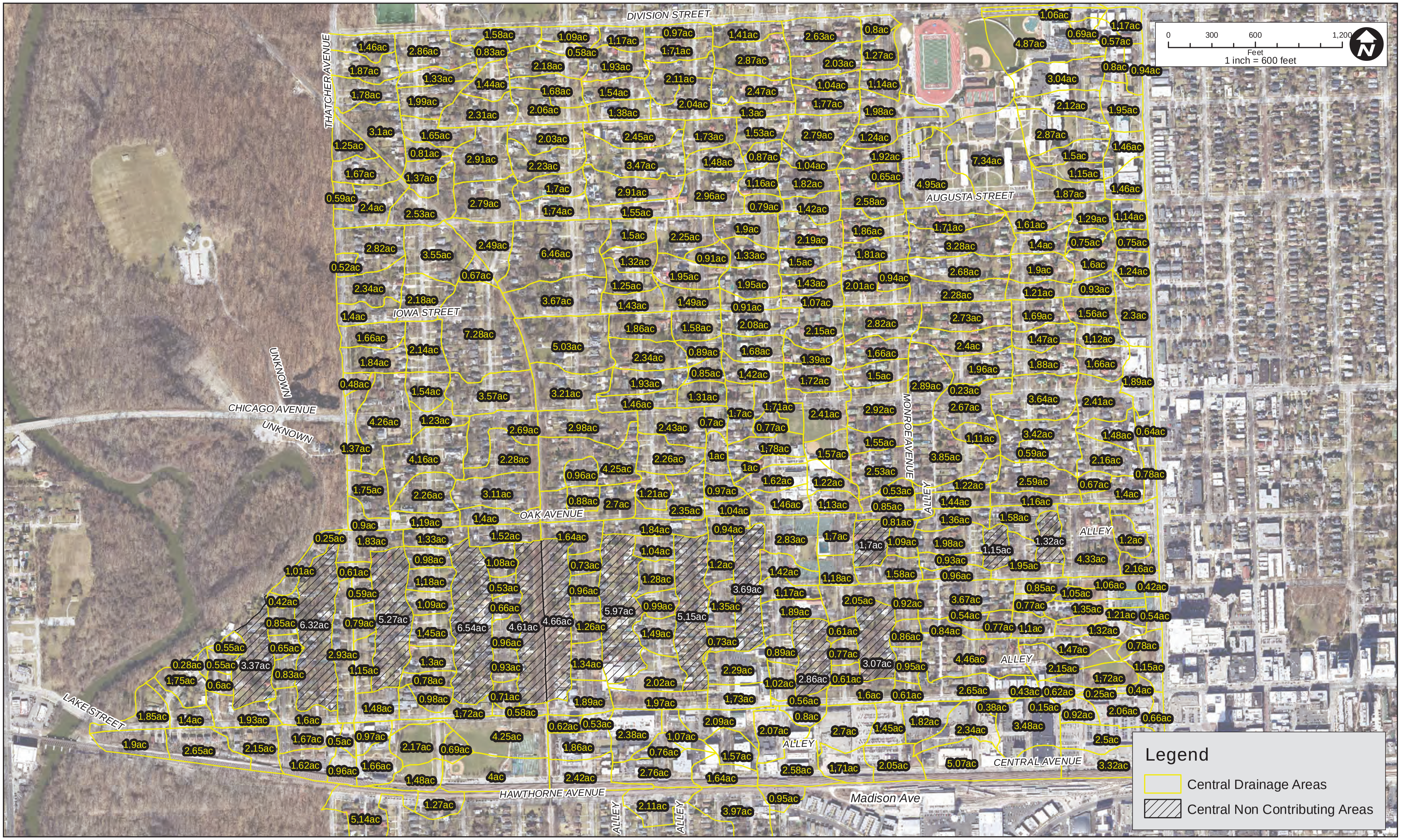
SEWER MAP

PROJ. NO. 210272
DATE: 7/10/24
SHEET 0 OF 0
DRAWING NO.
EXH 5



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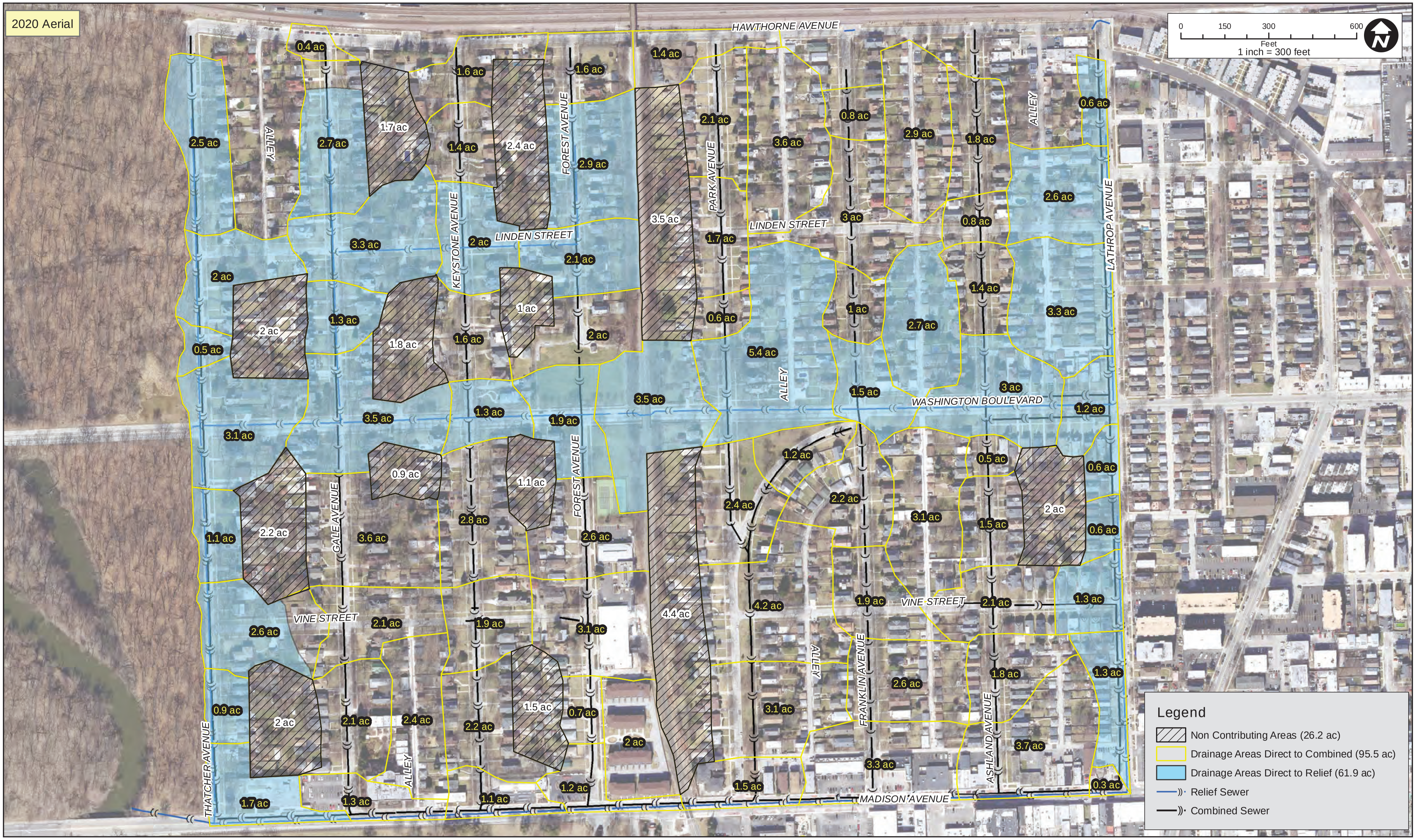

CHRISTOPHER B. BURKE ENGINEERING LTD 9575 West Higgins Road, Suite 600 Rosemont, Illinois 60018 (847) 823-0500	CLIENT: VILLAGE OF RIVER FOREST	DSGN.: JLW DWN.: JLW CHKD.: JJJ SCALE: 1"= PLOT DATE: CAD USER: MODEL: NO. DATE NATURE OF REVISION CHKD. FILE NAME Path: N:\RIVER FOREST\210272\GIS\Exhibits\Report Exhibits\EXH7_South Subbasin Map.mxd	TITLE: SOUTH WATERSHED SUBBASIN MAP
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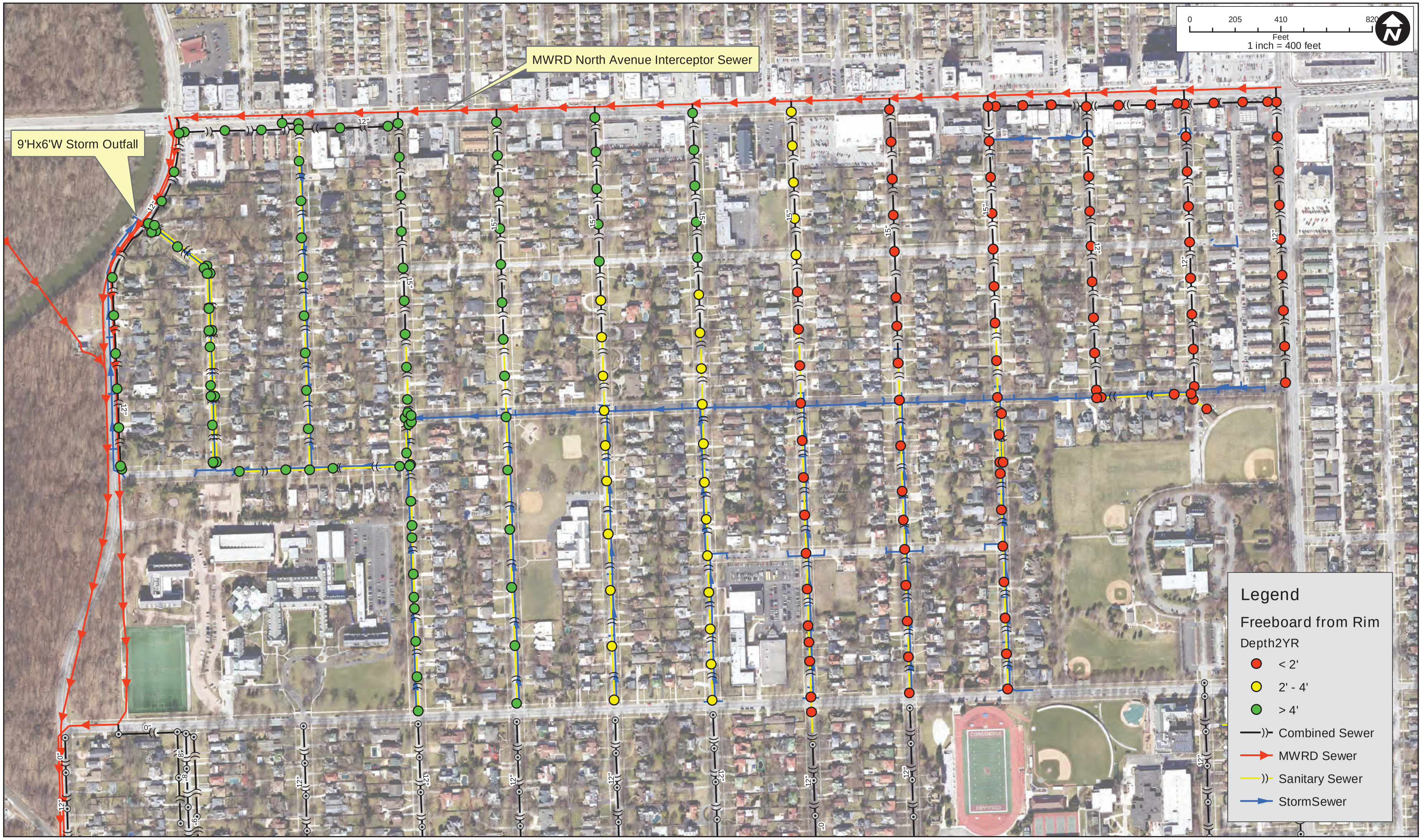

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CLIENT: VILLAGE OF RIVER FOREST

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DWN.	BMK
CHKD.	JJJ
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PROJ. NO. 21-0272
DATE:
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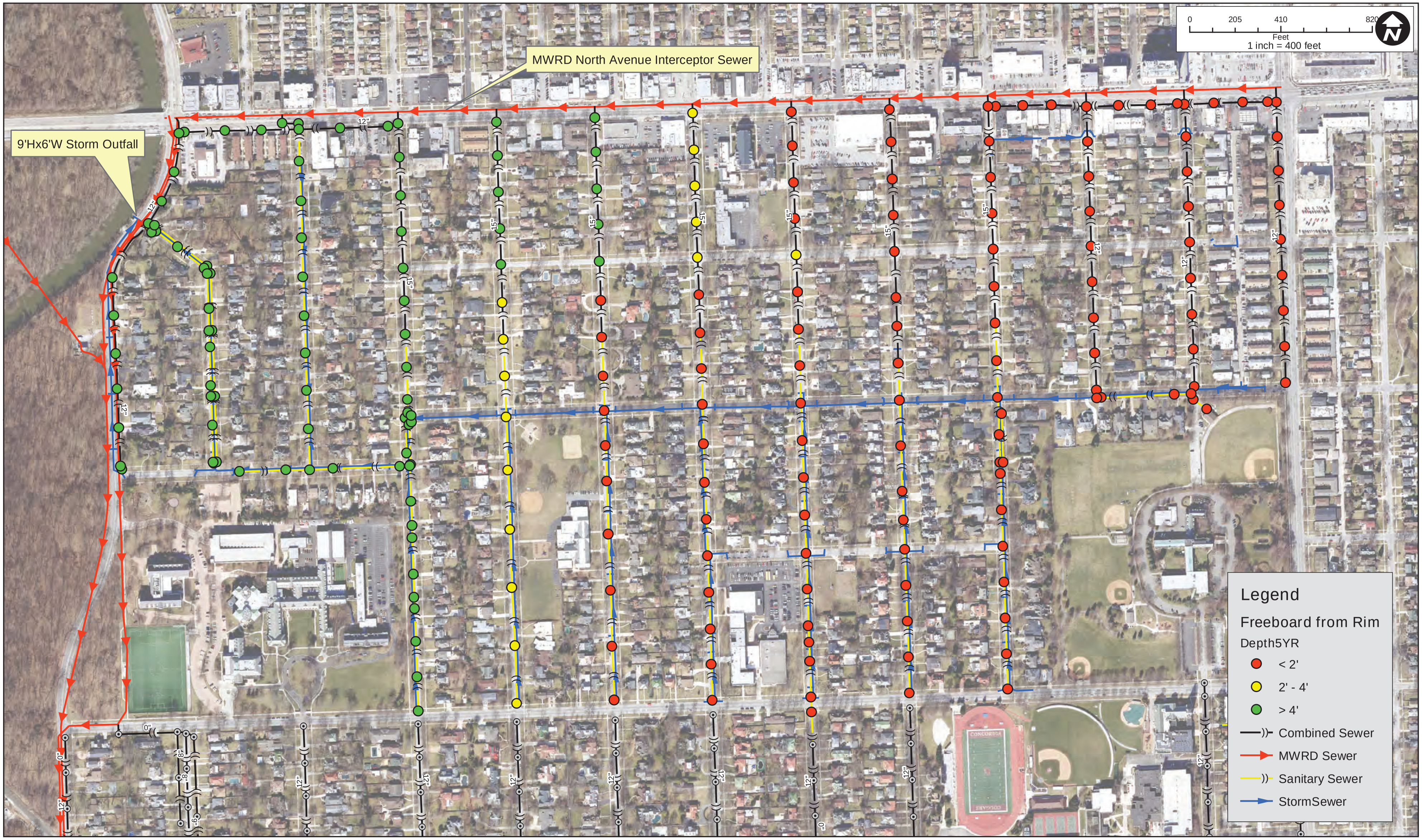

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Rosemont, Illinois 60018
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CLIENT:
VILLAGE OF RIVER FOREST

NO.	DATE	NATURE OF REVISION	CHKD.		
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				DWN.	BMK
				CHKD.	JJJ
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DATE:
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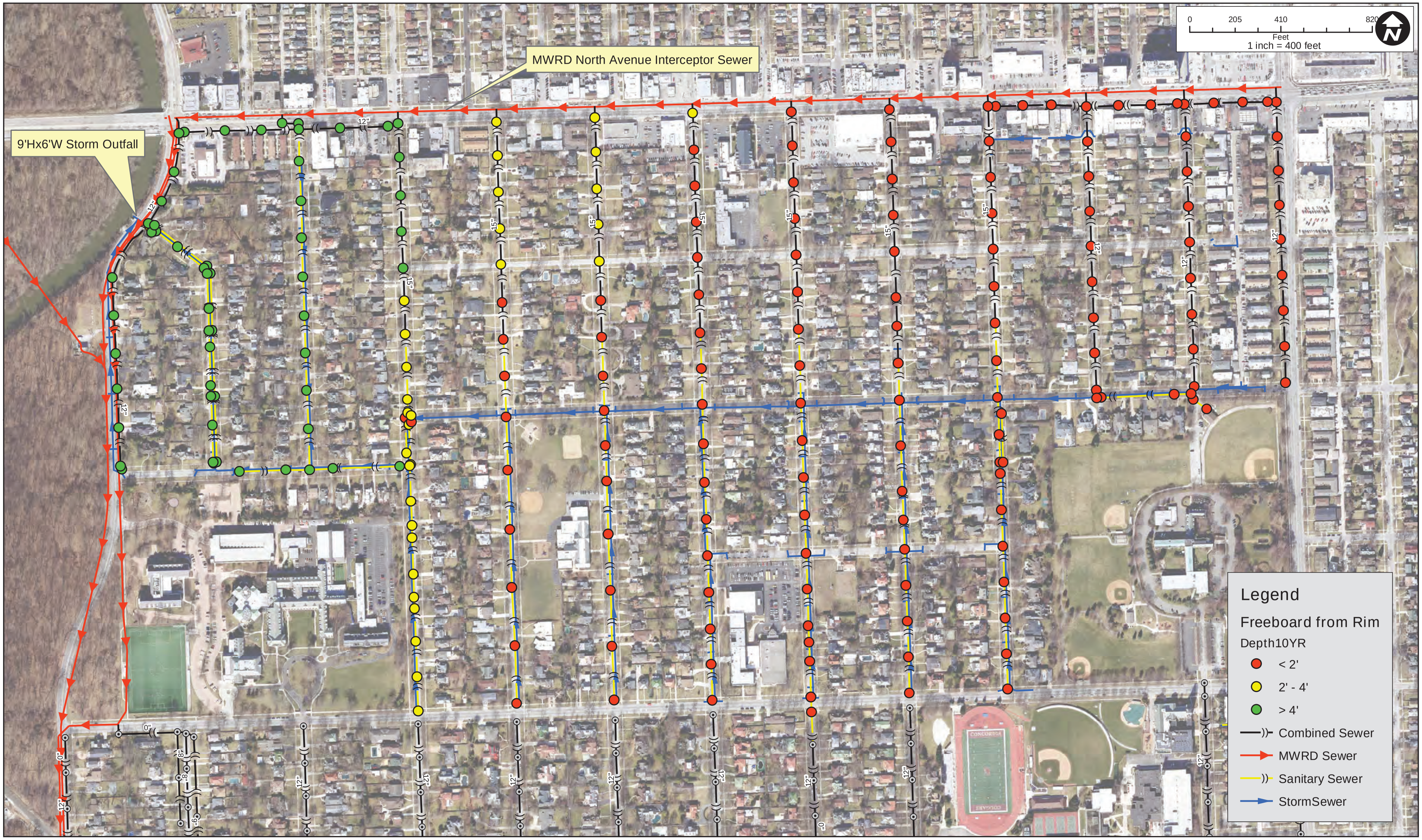

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Rosemont, Illinois 60018
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VILLAGE OF RIVER FOREST

NO.	DATE	NATURE OF REVISION	CHKD.		
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2-YEAR STORM
COMBO/SANITARY SEWER FREEBOARD DEPTHS

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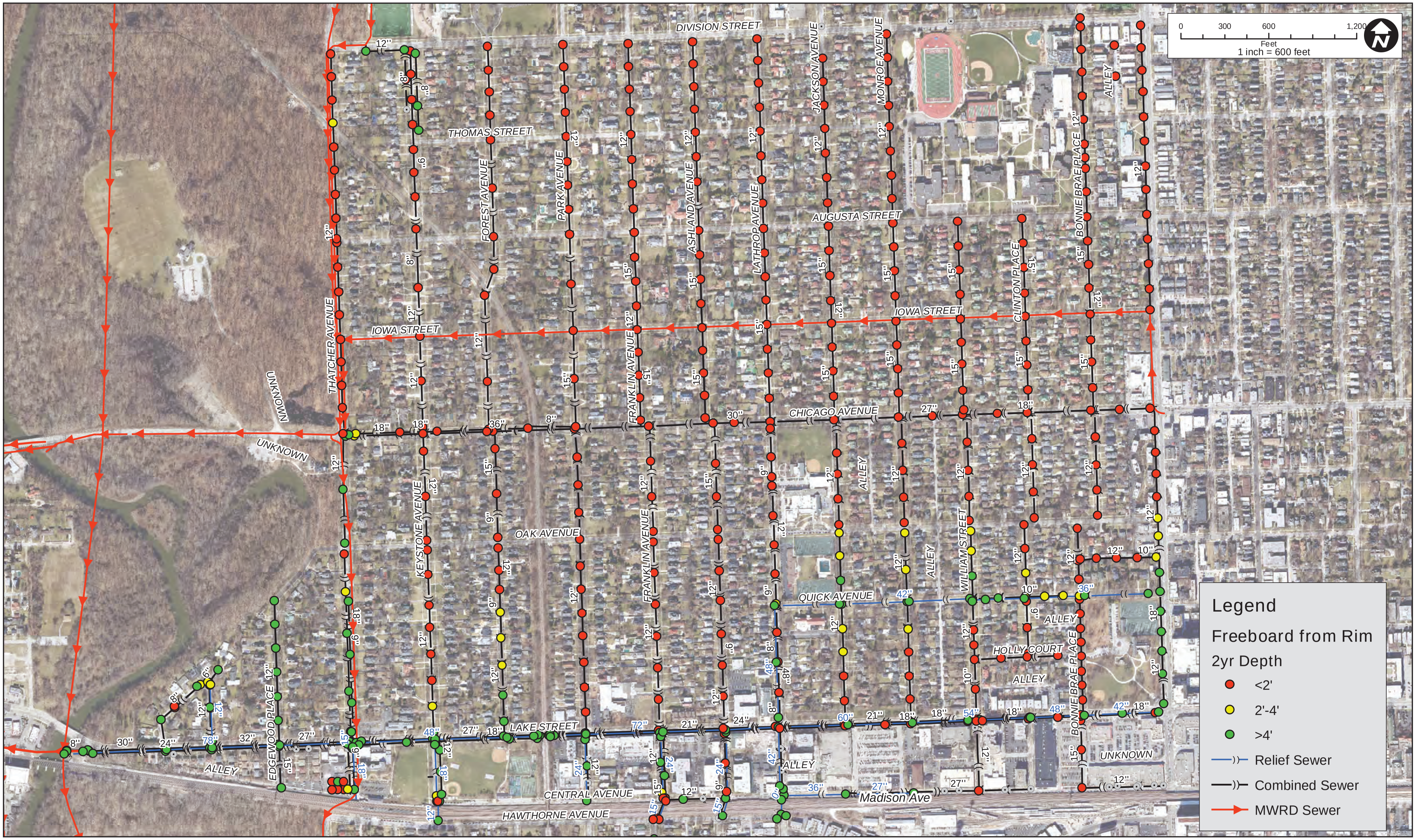

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CLIENT:
VILLAGE OF RIVER FOREST

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FILE NAME

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DWN. JLW
CHKD. JJJ
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TITLE:
EXISTING CONDITIONS - CENTRAL WATERSHED
2-YEAR STORM
COMBINED SEWER FREEBOARD DEPTHS

PROJ. NO. 210272
DATE: 8/11/22
SHEET 0 OF 0
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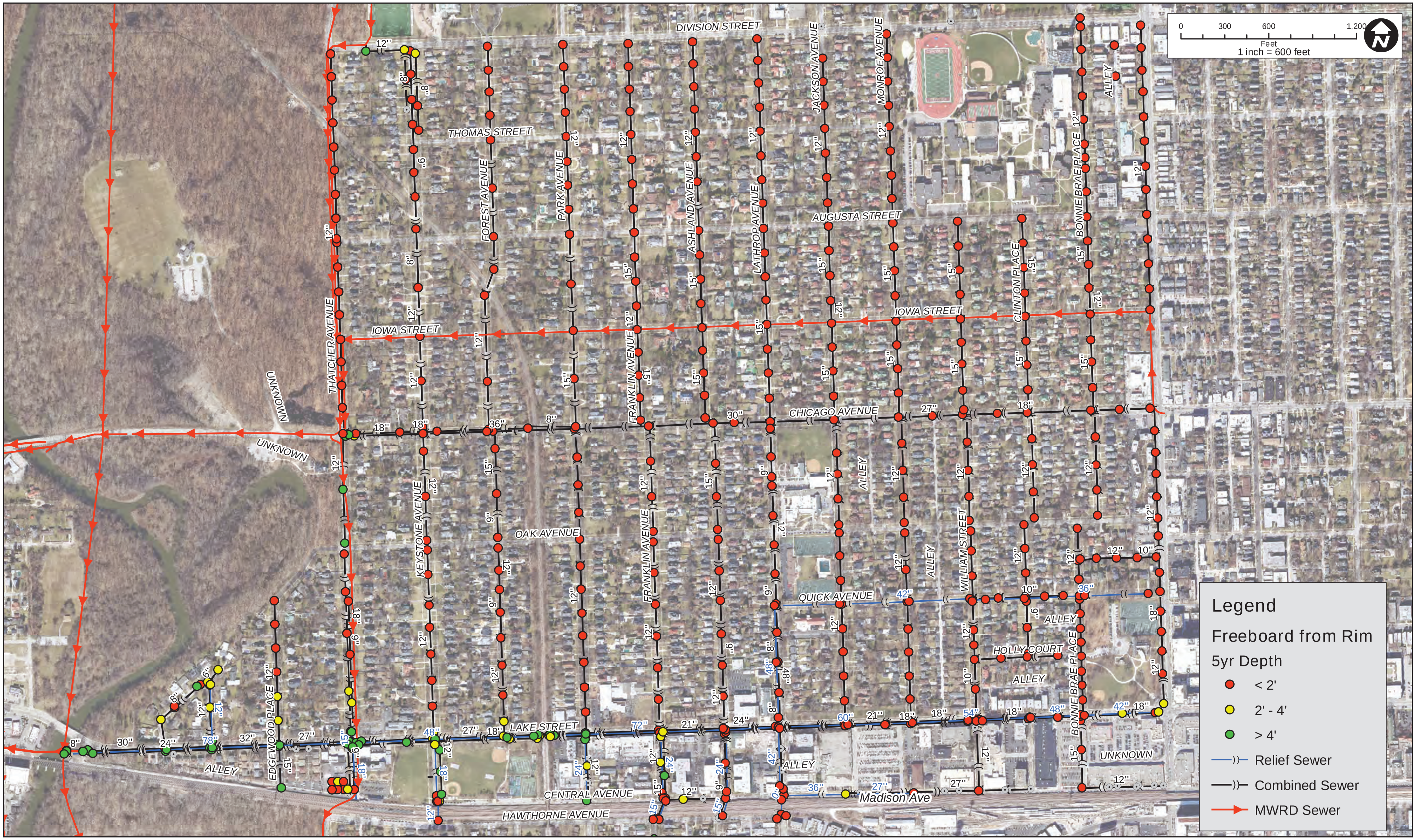

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(847) 823-0500

CLIENT:
VILLAGE OF RIVER FOREST

NO.	DATE	NATURE OF REVISION	CHKD.
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DWN.	JLW
CHKD.	JJJ
SCALE:	1"=
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TITLE:
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DATE: 8/11/22
SHEET 0 OF 0
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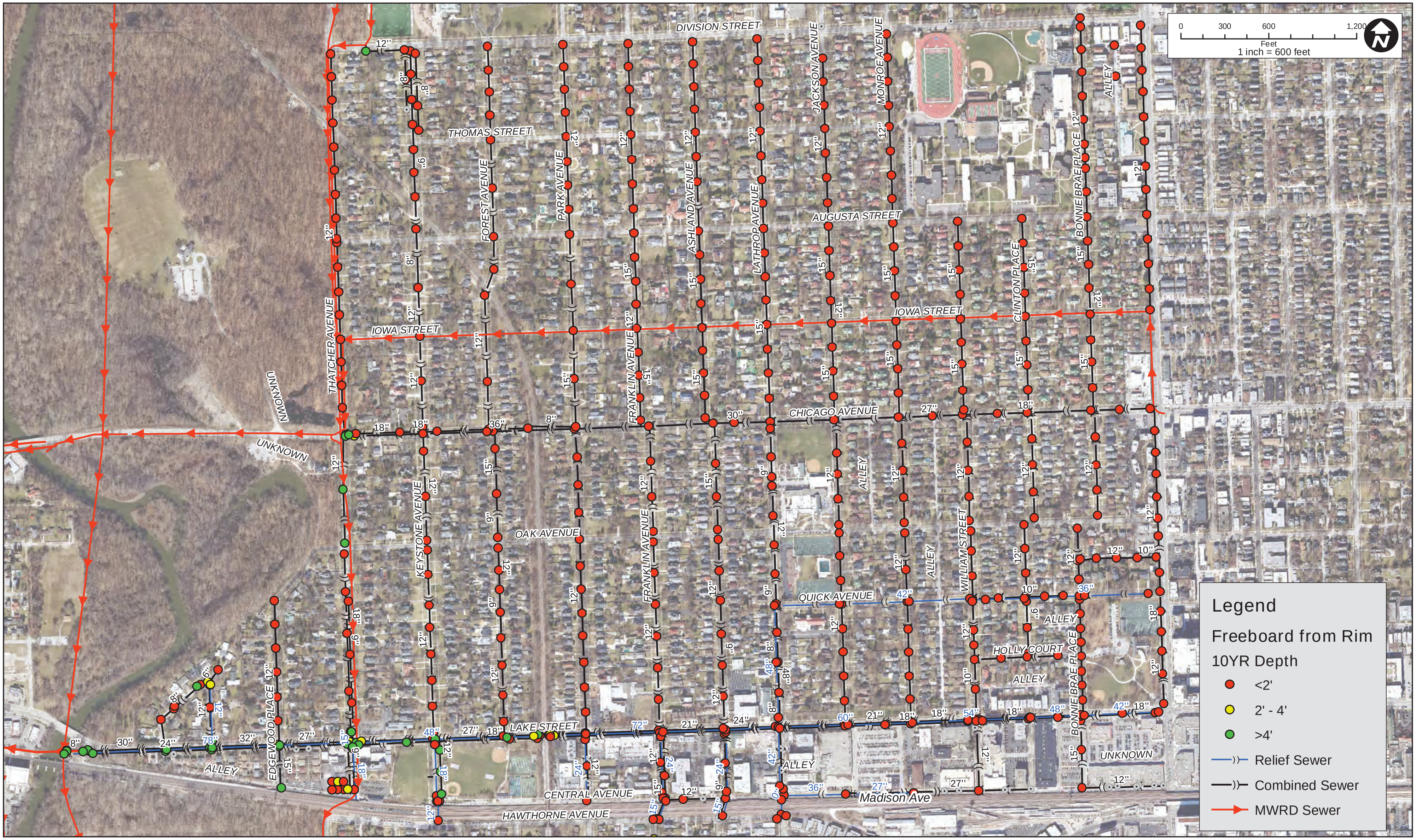
EXH 12



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VILLAGE OF RIVER FOREST

NO.	DATE	NATURE OF REVISION	CHKD.

FILE NAME

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DWN.	JLW
CHKD.	JJJ
SCALE:	1"=
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TITLE:

EXISTING CONDITIONS - CENTRAL WATERSHED
10-YEAR STORM
COMBINED SEWER FREEBOARD DEPTHS

PROJ. NO. 210272
DATE: 8/11/22
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DRAWING NO.
EXH 13

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CLIENT:

VILLAGE OF RIVER FOREST

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FILE NAME			

DSGN.	JLW
DWN.	JLW
CHKD.	JJJ
SCALE:	1"=
PLOT DATE:	
CAD USER:	
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TITLE:

EXISTING CONDITIONS - SOUTH **WATERSHED**
2-YEAR STORM
COMBINED SEWER **FREEBOARD** DEPTHS

PROJ. NO. 210272
DATE:
SHEET 0 OF 0
DRAWING NO.
EXH 14

CHRISTOPHER B. BURKE ENGINEERING LTD
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CLIENT:

VILLAGE OF RIVER FOREST

NO.	DATE	NATURE OF REVISION	CHKD.
FILE NAME			

DSGN.	JLW
DWN.	JLW
CHKD.	JJJ
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PLOT DATE:	
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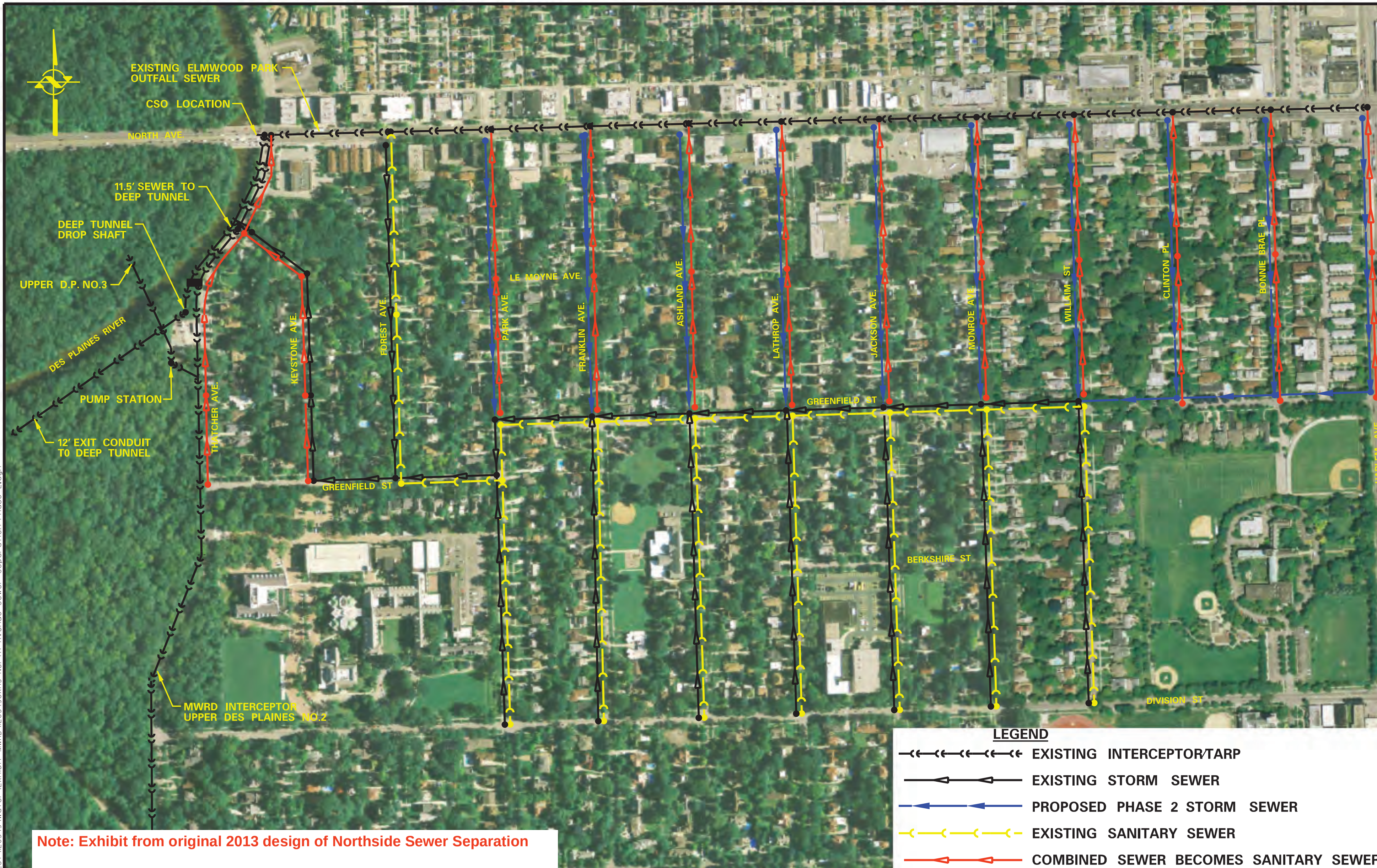
TITLE:

EXISTING CONDITIONS - SOUTH **WATERSHED**
5-YEAR STORM
COMBINED SEWER **FREEBOARD** DEPTHS

PROJ. NO. 210272
DATE: 8/11/22
SHEET 0 OF 0
DRAWING NO.
EXH **15**

CHRISTOPHER B. BURKE ENGINEERING LTD 9575 West Higgins Road, Suite 600 Rosemont, Illinois 60018 (847) 823-0500	CLIENT: VILLAGE OF RIVER FOREST	DSGN. JLW DWN. JLW CHKD. JJJ SCALE: 1"= PLOT DATE: CAD USER: MODEL: NO. DATE NATURE OF REVISION CHKD. FILE NAME	TITLE: EXISTING CONDITIONS - SOUTH **WATERSHED** 10-YEAR STORM COMBINED SEWER **FREEBOARD** DEPTHS
PROJ. NO. 210272 DATE: 8/11/22 SHEET 0 OF 0 DRAWING NO. EXH **16**			



Note: Exhibit from original 2013 design of Northside Sewer Separation

CHRISTOPHER B. BURKE ENGINEERING LTD. 9575 West Higgins Road, Suite 600 Rosemont, Illinois 60018 (847) 823-0500	CLIENT: VILLAGE OF RIVER FOREST	TITLE: NORTH AVENUE SEWER SEPARATION PROJECT PHASE 2	DSGN: BH / DATE: 02/26/2013
	PROJECT NO. 12-0349 / SCALE: 1"=400'		DWN: EAT / EXH 17

$dcte$
N:\RIVER FOREST\120349\Water\Exhibit MWRD\120349exh3 North Avenue Sewer Separation-Phase 2.dgn

CHRISTOPHER B. BURKE ENGINEERING LTD 9575 West Higgins Road, Suite 600 Rosemont, Illinois 60018 (847) 823-0500	CLIENT: VILLAGE OF RIVER FOREST	TITLE: CENTRAL WATERSHED PROPOSED SEWER SEPARATION

NO.	DATE	NATURE OF REVISION	CHKD.

FILE NAME

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DWN.	JLW
CHKD.	JJJ
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

PROJ. NO. 210272
DATE: 11/9/22
SHEET 0 OF 0
DRAWING NO.
EXH 18

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CLIENT:
VILLAGE OF RIVER FOREST

NO.	DATE	NATURE OF REVISION	CHKD.
FILE NAME			

DSGN.	JLW
DWN.	JLW
CHKD.	JJJ
SCALE:	1"=
PLOT DATE:	
CAD USER:	
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TITLE:
Central Watershed - Feasibilty Concept
Chicago Avenue Trunk Sewer
with Vault Storage

PROJ. NO. 00-0000
DATE:
SHEET 0 OF 0
DRAWING NO.
EXH 19

CHRISTOPHER B. BURKE ENGINEERING LTD 9575 West Higgins Road, Suite 600 Rosemont, Illinois 60018 (847) 823-0500	CLIENT: VILLAGE OF RIVER FOREST	TITLE: LAKE STREET STORAGE VAULT CONCEPT	PROJ. NO. 210272 DATE: SHEET 0 OF 0 DRAWING NO. EXH 20

NO.	DATE	NATURE OF REVISION	CHKD.

FILE NAME

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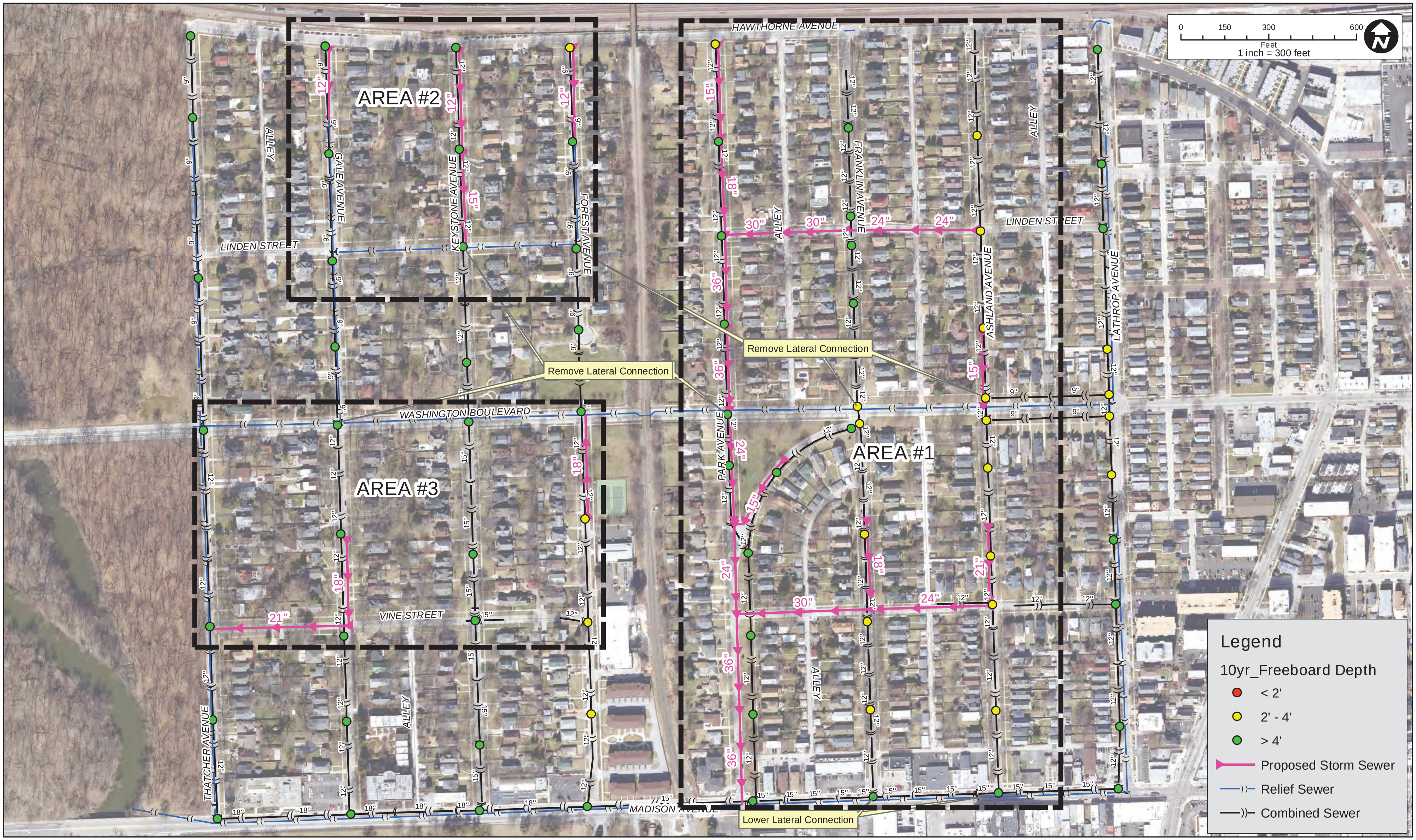

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Rosemont, Illinois 60018
(847) 823-0500

CLIENT:
VILLAGE OF RIVER FOREST

NO.	DATE	NATURE OF REVISION	CHKD.

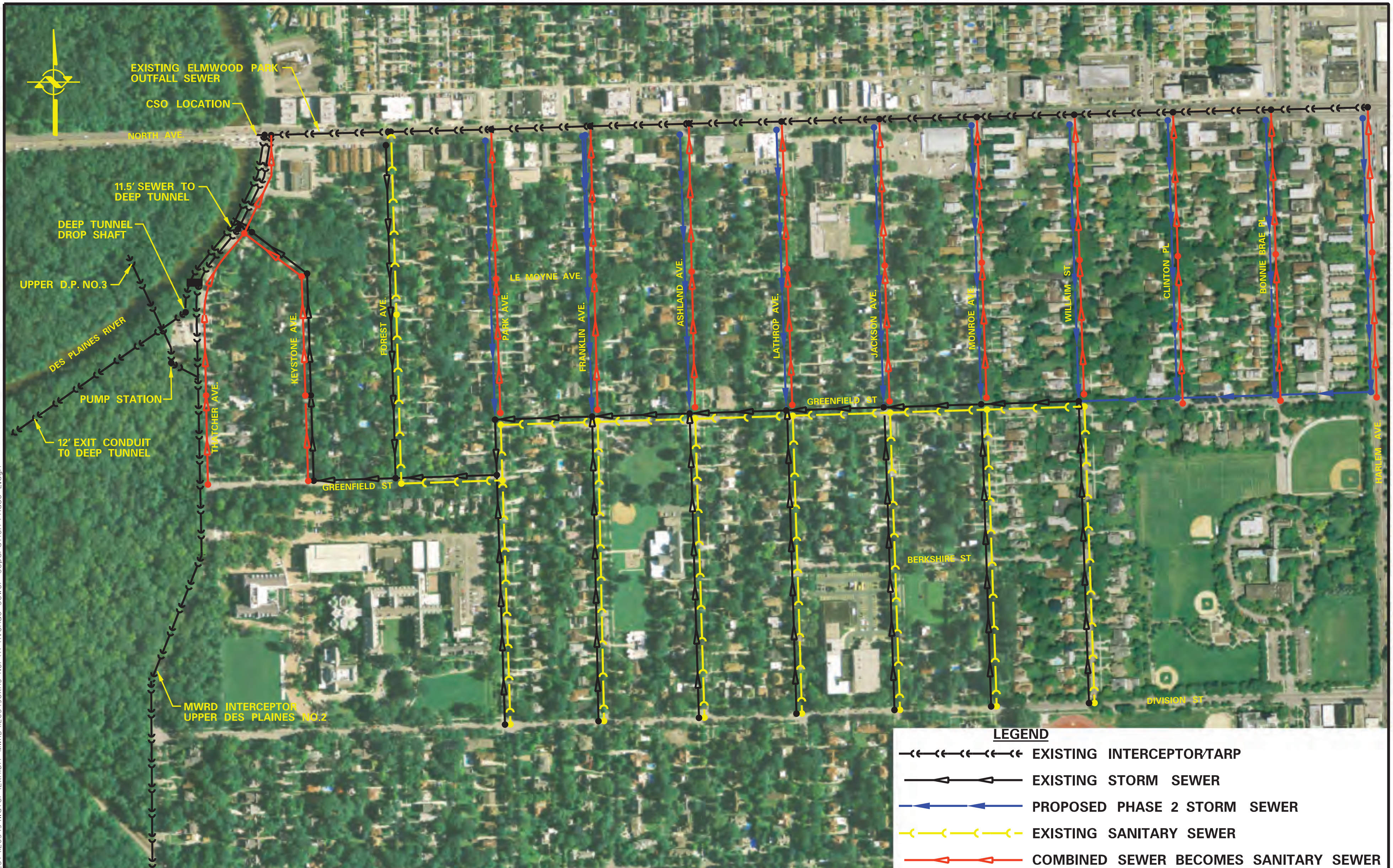
FILE NAME

DSGN.	JLW
DWN.	JLW
CHKD.	JJJ
SCALE:	1"=300'
PLOT DATE:	11/9/22
CAD USER:	
MODEL:	

TITLE:
PROPOSED CONDITIONS - SOUTH WATERSHED
10-YEAR STORM EVENT
COMBINED SEWER WATER DEPTHS

PROJ. NO. 210272
DATE: 7/10/24
SHEET 0 OF 0
DRAWING NO.
EXH 21

Appendix 1 – Conceptual Cost Estimates



LEGEND

- EXISTING INTERCEPTOR/TARP
- EXISTING STORM SEWER
- PROPOSED PHASE 2 STORM SEWER
- EXISTING SANITARY SEWER
- COMBINED SEWER BECOMES SANITARY SEWER

CHRISTOPHER B. BURKE ENGINEERING LTD. 9575 West Higgins Road, Suite 600 Rosemont, Illinois 60018 (847) 823-0500	CLIENT: VILLAGE OF RIVER FOREST		TITLE: NORTH AVENUE SEWER SEPARATION PROJECT PHASE 2	DSGN: BH	DATE: 02/26/2013
	PROJECT NO. 12-0349	SCALE: 1"=400'		DWN: EAT	EXHIBIT 3

$date$
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NORTHSIDE STORMWATER MANAGEMENT PROJECT - PHASE 2

Cost Estimate - Revised to Reflect Updated Phase 2 Limits

Village of River Forest
CBBEL Project No. 13-0532

Revised December 20, 2022 (Costs Updated January 17, 2025)

COST ESTIMATE

Item		IDOT Code	Description	Unit	Quantity	Unit Cost	Cost
1		20101200	TREE ROOT PRUNING	EACH	5	$ 200.00	$ 1,000.00
2		20101300	TREE PRUNING (1 TO 10 INCH DIAMETER)	EACH	122	$ 150.00	$ 18,300.00
3		20101350	TREE PRUNING (OVER 10 INCH DIAMETER)	EACH	170	$ 150.00	$ 25,500.00
4	*	20800250	TRENCH BACKFILL, SPECIAL	CU YD	13,989	$ 45.00	$ 629,505.00
5		25200200	SUPPLEMENTAL WATERING	UNIT	64	$ 150.00	$ 9,600.00
6		28000500	PERIMETER EROSION BARRIER	FOOT	100	$ 4.00	$ 400.00
7		28000510	INLET FILTERS	EACH	117	$ 200.00	$ 23,400.00
8		40600100	BITUMINOUS MATERIALS (PRIME COAT)	GALLON	4,352	$ 1.00	$ 4,352.00
9		40600300	AGGREGATE (PRIME COAT)	TON	88	$ 8.00	$ 704.00
10		40603335	HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50	TON	5,118	$ 115.00	$ 588,570.00
11		42400800	DETECTABLE WARNINGS	SQ FT	20	$ 50.00	$ 1,000.00
12		44000156	HOT-MIX ASPHALT SURFACE REMOVAL, 1 3/4"	SQ YD	26,770	$ 3.50	$ 93,693.90
13	*	44201723	CLASS D PATCHES, SPECIAL, 6 INCH	SQ YD	16,743	$ 80.00	$ 1,339,440.00
14	*	44201796	CLASS D PATCHES, SPECIAL, 12 INCH	SQ YD	1,309	$ 115.00	$ 150,535.00
16		550A2320	STORM SEWERS, RUBBER GASKET, CLASS A, TYPE 1 12"	FOOT	3,226	$ 175.00	$ 564,550.00
17		550A2340	STORM SEWERS, RUBBER GASKET, CLASS A, TYPE 1 18"	FOOT	475	$ 225.00	$ 106,875.00
18		550A2380	STORM SEWERS, RUBBER GASKET, CLASS A, TYPE 1 30"	FOOT	4,162	$ 350.00	$ 1,456,700.00
19		550A2400	STORM SEWERS, RUBBER GASKET, CLASS A, TYPE 1 36"	FOOT	5,688	$ 400.00	$ 2,275,200.00
22		550A2540	STORM SEWERS, RUBBER GASKET, CLASS A, TYPE 2 18"	FOOT	425	$ 250.00	$ 106,250.00
23	*	56103000	DUCTILE IRON WATER MAIN 6"	FOOT	27	$ 250.00	$ 6,750.00
24	*	56103100	DUCTILE IRON WATER MAIN 8"	FOOT	1,103	$ 250.00	$ 275,750.00
29	*	56300100	ADJUSTING SANITARY SEWERS, 8-INCH DIAMETER OR LESS	FOOT	200	$ 150.00	$ 30,000.00
30	*	56400500	FIRE HYDRANT TO BE REMOVED	EACH	3	$ 750.00	$ 2,250.00
31	*	56400820	FIRE HYDRANTS, WITH AUXILIARY VALVE AND VALVE BOX	EACH	3	$ 9,000.00	$ 27,000.00
32	*	60200305	CATCH BASINS, TYPE A, 4'-DIAMETER, TYPE 3 FRAME AND GRATE	EACH	117	$ 5,500.00	$ 643,500.00
33	*	60218300	MANHOLES, TYPE A, 4'-DIAMETER, TYPE 1 FRAME, OPEN LID	EACH	2	$ 7,500.00	$ 15,000.00
34	*	60221000	MANHOLES, TYPE A, 5'-DIAMETER, TYPE 1 FRAME, OPEN LID	EACH	68	$ 8,500.00	$ 578,000.00
35	*	60223700	MANHOLES, TYPE A, 6'-DIAMETER, TYPE 1 FRAME, OPEN LID	EACH	1	$ 9,500.00	$ 9,500.00
37	*	60255500	ADJUSTING STRUCTURES	EACH	80	$ 850.00	$ 68,000.00
38		67000400	ENGINEER'S FIELD OFFICE, TYPE A	CAL MO	7	$ 2,500.00	$ 17,500.00
39	*	67100100	MOBILIZATION	L SUM	1	$ 500,000.00	$ 500,000.00
40		78000200	THERMOPLASTIC PAVEMENT MARKING - LINE 4"	FOOT	620	$ 2.00	$ 1,240.00
41		78000400	THERMOPLASTIC PAVEMENT MARKING - LINE 6"	FOOT	160	$ 3.00	$ 480.00
42		78000600	THERMOPLASTIC PAVEMENT MARKING - LINE 12"	FOOT	360	$ 5.00	$ 1,800.00
43		78000650	THERMOPLASTIC PAVEMENT MARKING - LINE 24"	FOOT	445	$ 8.00	$ 3,560.00
45	*	X0426200	SITE DEWATERING	L SUM	1	$ 90,000.00	$ 90,000.00
46	*	X2520700	SODDING, SPECIAL	SQ YD	1,411	$ 18.00	$ 25,398.00
47	*	X4420500	TEMPORARY PAVEMENT PATCHING	SQ YD	5,000	$ 40.00	$ 200,000.00
48	*	X7010216	TRAFFIC CONTROL AND PROTECTION (SPECIAL)	L SUM	1	$ 350,000.00	$ 350,000.00
49	*	Z0013798	CONSTRUCTION LAYOUT	L SUM	1	$ 60,000.00	$ 60,000.00
50	*	NA	TEMPORARY STONE	L SUM	1	$ 40,000.00	$ 40,000.00
51	*	NA	COMBINATION CONCRETE CURB AND GUTTER REMOVAL AND REPLACEMENT	FOOT	1,693	$ 50.00	$ 84,650.00
52	*	NA	PCC SIDEWALK REMOVAL & REPLACEMENT, 5 INCH	SQ FT	132	$ 20.00	$ 2,640.00
53	*	NA	PCC DRIVEWAY PAVEMENT REMOVAL AND REPLACEMENT, 6" (HI-EARLY STRENGTH)	SQ YD	777	$ 100.00	$ 77,700.00
54	*	NA	EXPLORATION TRENCH, SPECIAL	FOOT	200	$ 75.00	$ 15,000.00
55	*	NA	REMOVING STRUCTURES	EACH	127	$ 750.00	$ 95,250.00
61	*	NA	SEWER CHECK VALVE, 12"	EACH	3	$ 10,000.00	$ 30,000.00
62	*	NA	SEWER CHECK VALVE, 15"	EACH	6	$ 11,000.00	$ 66,000.00
63	*	NA	SEWER CHECK VALVE, 18"	EACH	1	$ 13,000.00	$ 13,000.00
71	*	NA	SANITARY SERVICE REPLACEMENT	FOOT	175	$ 150.00	$ 26,250.00
72	*	NA	SANITARY SERVICE CONNECTION	EACH	5	$ 5,000.00	$ 25,000.00
73	*	NA	SHUT DOWN WATER MAIN CONNECTIONS	EACH	2	$ 5,000.00	$ 10,000.00
74	*	NA	WATER SERVICE LINE, SHORT RECONNECTION	EACH	18	$ 4,000.00	$ 72,000.00
75	*	NA	WATER SERVICE LINE, LONG RECONNECTION	EACH	151	$ 5,000.00	$ 755,000.00
76	*	NA	TREE PROTECTION	L SUM	1	$ 10,000.00	$ 10,000.00
77	*	NA	PRE-CONSTRUCTION SEWER TELEVISING	L SUM	1	$ 10,000.00	$ 10,000.00
78	*	NA	POST-CONSTRUCTION SEWER TELEVISING	L SUM	1	$ 25,000.00	$ 25,000.00
79	*	NA	AS-BUILT DRAWINGS	L SUM	1	$ 25,000.00	$ 25,000.00

*Indicates Special Provision

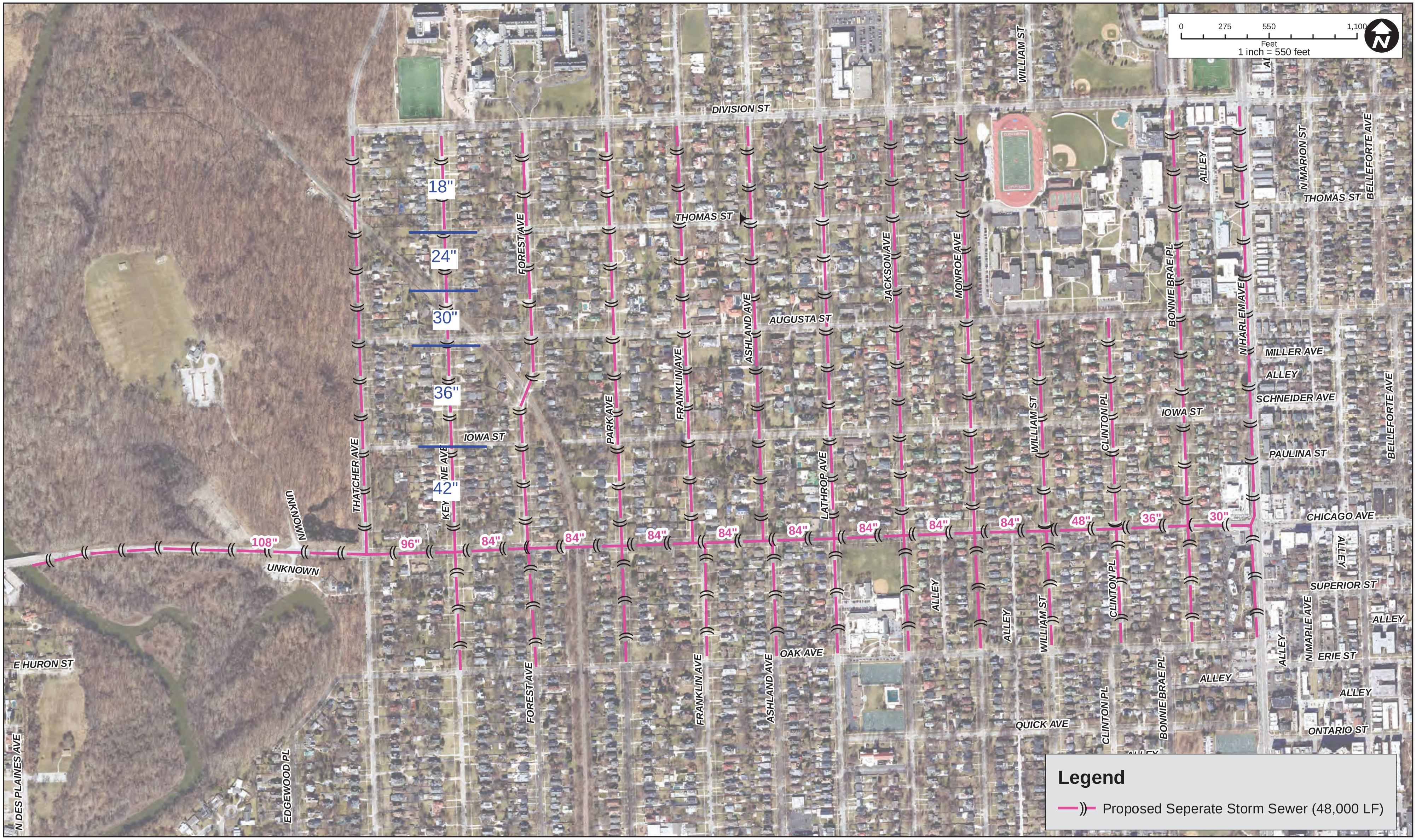
SUBTOTAL TOTAL= $ 11,683,792.90

CONTINGENCY (10%) = $ 1,168,379.30

ESTIMATED TOTAL COST $ 12,852,172.20

NOTES:

1. THIS ESTIMATE IS BASED ON THE DESIGN FOR THE NORTHSIDE STORMWATER MANAGEMENT PROJECT - PHASE 2 COMPLETED BY CBBEL IN 2016.
2. THIS ESTIMATE DOES NOT INCLUDE ROW ACQUISITION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING UTILITES.
3. THIS ESTIMATE ASSUMES 2025 CONSTRUCTION COSTS.
4. THIS ESTIMATE ASSUMES ALL EXCAVATED MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.
5. THIS ESTIMATE DOES NOT INCLUDE ANY VILLAGE/PRIVATE UTILITY REMOVAL AND REPLACEMENT/RELOCATION.



CHRISTOPHER B. BURKE ENGINEERING LTD
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0500

CLIENT:
VILLAGE OF RIVER FOREST

NO.	DATE	NATURE OF REVISION	CHKD.
FILE NAME			

DSGN.	JLW
DWN.	JLW
CHKD.	JJJ
SCALE:	1"=
PLOT DATE:	
CAD USER:	
MODEL:	

TITLE:
CENTRAL STUDY AREA
-PROPOSED CHICAGO AVENUE SEPERATE SEWER

PROJ. NO. 210272
DATE: 11/9/22
SHEET 0 OF 0
DRAWING NO.
EXH

CHRISTOPHER B. BURKE ENGINEERING LTD
9575 WEST HIGGINS ROAD, SUITE 600
ROSEMONT, IL 60018

VILLAGE OF RIVER FOREST — CALCULATED BY: JRS

CHICAGO AVENUE SEPARATE STORM SYSTEM — CHECKED BY: AJS

CONCEPT COST ESTIMATE

DATE: DECEMBER 21, 2022 (COSTS UPDATED JANUARY 17, 2025)

				CHICAGO AVENUE SEPARATE STORM SYSTEM	
	ITEM	**UNIT**	**UNIT COST**	**QUANTITY**	**TOTAL COST**
SESC	TREE REMOVAL/PROTECTION	L. SUM	$ 100,000.00	1	$ 100,000.00
	PARKWAY RESTORATION - SODDING	SQ YD	$ 18.00	24,900	$ 448,200.00
	TEMPORARY CONSTRUCTION FENCE	FOOT	$ 15.00	500	$ 7,500.00
STORM SEWER	TRENCH BACKFILL	CU YD	$ 45.00	116,780	$ 5,255,100.00
	STORM SEWER, RCP 12"	FOOT	$ 175.00	4,800	$ 840,000.00
	STORM SEWER, RCP 18"	FOOT	$ 225.00	7,150	$ 1,608,750.00
	STORM SEWER, RCP 24"	FOOT	$ 275.00	12,850	$ 3,533,750.00
	STORM SEWER, RCP 30"	FOOT	$ 325.00	4,275	$ 1,389,375.00
	STORM SEWER, RCP 36"	FOOT	$ 375.00	7,575	$ 2,840,625.00
	STORM SEWER, RCP 42"	FOOT	$ 425.00	7,150	$ 3,038,750.00
	STORM SEWER, RCP 48"	FOOT	$ 500.00	425	$ 212,500.00
	STORM SEWER, RCP 84"	FOOT	$ 1,000.00	3,400	$ 3,400,000.00
	STORM SEWER, RCP 96"	FOOT	$ 1,200.00	425	$ 510,000.00
	STORM SEWER, RCP 108"	FOOT	$ 1,350.00	2,100	$ 2,835,000.00
	STORM SEWER REMOVAL	FOOT	$ 30.00	2,400	$ 72,000.00
	STORM SEWER JACKED IN PLACE, 18"	FOOT	$ 1,000.00	50	$ 50,000.00
	STORM SEWER JACKED IN PLACE, 30"	FOOT	$ 1,500.00	50	$ 75,000.00
	STORM SEWER JACKED IN PLACE, 36"	FOOT	$ 1,750.00	50	$ 87,500.00
	DRAINAGE STRUCTURE REMOVAL	EACH	$ 750.00	245	$ 183,750.00
	CONFLICT STRUCTURE (INTERSECTIONS)	EACH	$ 65,000.00	10	$ 650,000.00
	OUTLET TO DES PLAINES RIVER	L. SUM	$ 1,900,000.00	1	$ 1,900,000.00
	INLET, TYPE A, HIGH CAPACITY FRAME AND GRATE	EACH	$ 3,000.00	292	$ 876,000.00
	RCP PIPE FITTING (WITH RISER), 84"	EACH	$ 17,000.00	7	$ 119,000.00
	PIPE TRANSITION 84" - 96"	EACH	$ 19,000.00	1	$ 19,000.00
	PIPE TRANSITION 96" - 108"	EACH	$ 22,000.00	1	$ 22,000.00
	RCP PIPE FITTING (WITH RISER), 108"	EACH	$ 22,000.00	2	$ 44,000.00
	MANHOLES, 4'-DIAMETER, TYPE A, T1F CL	EACH	$ 7,500.00	38	$ 285,000.00
	MANHOLES, 5'-DIAMETER, TYPE A, T1F CL	EACH	$ 8,500.00	22	$ 187,000.00
	MANHOLES, 10'-DIAMETER, TYPE A, T1F CL	EACH	$ 45,000.00	1	$ 45,000.00
PAVEMENT	HOT-MIX ASPHALT SURFACE REMOVAL	SQ YD	$ 3.50	161,600	$ 565,600.00
	PAVEMENT REMOVAL	SQ YD	$ 15.00	22,230	$ 333,450.00
	AGGREGATE SUBGRADE IMPROVEMENT	CU YD	$ 50.00	380	$ 19,000.00
	REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL	CU YD	$ 50.00	380	$ 19,000.00
	GEOTECHNICAL FABRIC FOR GROUND STABILIZATION	SQ YD	$ 3.00	1,120	$ 3,360.00
	HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50, 2"	TON	$ 115.00	2,620	$ 301,300.00
	HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50, 1.5"	TON	$ 110.00	14,250	$ 1,567,500.00
	HOT-MIX ASPHALT BINDER COURSE, IL-19.0 N50, 4"	TON	$ 110.00	5,230	$ 575,300.00
	POLYMERIZED LEVELING BINDER, IL-4.75, N50, 0.75"	TON	$ 125.00	6,790	$ 848,750.00
	AGGREGATE BASE COURSE, TYPE B, 12"	SQ YD	$ 18.00	22,230	$ 400,140.00
	CLASS D PATCHES, SPECIAL	SQ YD	$ 70.00	43,700	$ 3,059,000.00
	BITUMINOUS MATERIALS (TACK COAT)	POUND	$ 1.00	124,040	$ 124,040.00
	COMBINATION CONCRETE CURB AND GUTTER REMOVAL AND REPLACEMENT	FOOT	$ 50.00	24,115	$ 1,205,750.00
	PCC SIDEWALK REMOVAL AND REPLACEMENT	SQ FT	$ 15.00	19,200	$ 288,000.00
	DRIVEWAY REMOVAL AND REPLACEMENT	SQ YD	$ 100.00	300	$ 30,000.00
	DETECTABLE WARNINGS	SQ FT	$ 50.00	3,840	$ 192,000.00
UTILITY	RELOCATE / ADJUST WATER MAIN	FOOT	$ 400.00	2,400	$ 960,000.00
	REMOVE AND REPLACE SANITARY SEWER	FOOT	$ 400.00	2,400	$ 960,000.00
	NEW PARALLEL 8" WATER MAIN (INCLUDES HYDRANTS & VAULTS)	FOOT	$ 500.00	6,000	$ 3,000,000.00
	NEW WATER SERVICE WITH B-BOX	EACH	$ 5,000.00	27	$ 135,000.00
	NEW SANITARY SERVICE WITH CLEANOUT	EACH	$ 5,000.00	27	$ 135,000.00
	NEW 8" SANITARY SEWER	FOOT	$ 400.00	13,150	$ 5,260,000.00
MISC.	MISC. SESC (1%)		L. SUM	1	$ 600,000.00
	MOBILIZATION (4%)		L. SUM	1	$ 2,100,000.00
	TRAFFIC CONTROL AND PROTECTION (3%)		L. SUM	1	$ 1,600,000.00
	CONSTRUCTION LAYOUT (0.5%)		L. SUM	1	$ 260,000.00

SUBTOTAL TOTAL= $	**55,176,990.00**
CONTINGENCY & MINOR ITEMS (20%) = $	11,035,398.00
CONSTRUCTION TOTAL = $	**66,212,388.00**
DESIGN ENGINEERING & PERMITTING (7.5%)= $	4,966,000.000
CONSTRUCTION ENGINEERING (7.5%)= $	4,966,000.000
PROJECT TOTAL= $	**76,144,388.00**

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW ACQUISITION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING UTILITES.
2. THIS ESTIMATE ASSUMES 2025 CONSTRUCTION COSTS.
3. THIS ESTIMATE ASSUMES ALL EXCAVATED MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.
4. THIS ESTIMATE DOES NOT INCLUDE ANY VILLAGE/PRIVATE UTILITY REMOVAL AND REPLACEMENT/RELOCATION.
5. THIS ESTIMATE ASSUMES ALL STREETS WITH SEWERS 48" OR LARGER WILL BE RECONSTRUCTED. ALL OTHER STREETS WILL BE PATCHED AND RESURFACED.

CHRISTOPHER B. BURKE ENGINEERING LTD
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0500

CLIENT: -

NO.	DATE	NATURE OF REVISION	CHKD.		
				DSGN.	JLW
				DWN.	JLW
				CHKD.	JJJ
				SCALE:	1"=
				PLOT DATE:	
				CAD USER:	
				MODEL:	
FILE NAME					

TITLE: Central Area - Feasibilty Concept
Chicago Avenue Trunk Sewer
with Vault Storage
10-year Design

PROJ. NO. 00-0000
DATE:
SHEET 0 OF 0
DRAWING NO.
EXH

CHRISTOPHER B. BURKE ENGINEERING LTD
9575 WEST HIGGINS ROAD, SUITE 600
ROSEMONT, IL 60018

VILLAGE OF RIVER FOREST
CHICAGO AVENUE TRUNK SEWER WITH VAULT STORAGE
CONCEPT COST ESTIMATE
DATE: DECEMBER 21, 2022 (COSTS UPDATED JANUARY 17, 2025)

CALCULATED BY: JRS
CHECKED BY: AJS

				CHICAGO AVENUE TRUNK SEWER WITH VAULT STORAGE	
	ITEM	**UNIT**	**UNIT COST**	**QUANTITY**	**TOTAL COST**
SESC	TREE REMOVAL/PROTECTION	L. SUM	$ 150,000.00	1	$ 150,000.00
SESC	PARKWAY RESTORATION - SODDING	SQ YD	$ 18.00	50,200	$ 903,600.00
STORM SEWER	TRENCH BACKFILL	CU YD	$ 45.00	88,930	$ 4,001,850.00
STORM SEWER	STORM SEWER, RCP 12"	FOOT	$ 175.00	2,200	$ 385,000.00
STORM SEWER	STORM SEWER, RCP 18"	FOOT	$ 225.00	220	$ 49,500.00
STORM SEWER	STORM SEWER, RCP 48"	FOOT	$ 500.00	5,250	$ 2,625,000.00
STORM SEWER	REINFORCED CONCRETE BOX CULVERT (12' X 5')	FOOT	$ 1,900.00	14,300	$ 27,170,000.00
STORM SEWER	DRAINAGE STRUCTURE REMOVAL	EACH	$ 750.00	110	$ 82,500.00
STORM SEWER	CONFLICT STRUCTURE (INTERSECTIONS)	EACH	$ 65,000.00	11	$ 715,000.00
STORM SEWER	JUNCTION CHAMBER (CONNECTION TO MWRD OUTFALL)	EACH	$ 175,000.00	1	$ 175,000.00
STORM SEWER	INLET, TYPE A, HIGH CAPACITY FRAME AND GRATE	EACH	$ 3,000.00	88	$ 264,000.00
STORM SEWER	MANHOLES, 7'-DIAMETER, TYPE A, T1F CL	EACH	$ 14,000.00	12	$ 168,000.00
PAVEMENT	PAVEMENT REMOVAL	SQ YD	$ 15.00	46,720	$ 700,800.00
PAVEMENT	AGGREGATE SUBGRADE IMPROVEMENT	CU YD	$ 50.00	780	$ 39,000.00
PAVEMENT	REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL	CU YD	$ 50.00	780	$ 39,000.00
PAVEMENT	GEOTECHNICAL FABRIC FOR GROUND STABILIZATION	SQ YD	$ 3.00	2,340	$ 7,020.00
PAVEMENT	HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50, 2"	TON	$ 115.00	5,500	$ 632,500.00
PAVEMENT	HOT-MIX ASPHALT BINDER COURSE, IL-19.0 N50, 4"	TON	$ 110.00	10,990	$ 1,208,900.00
PAVEMENT	AGGREGATE BASE COURSE, TYPE B, 12"	SQ YD	$ 18.00	46,720	$ 840,960.00
PAVEMENT	BITUMINOUS MATERIALS (TACK COAT)	POUND	$ 1.00	31,540	$ 31,540.00
PAVEMENT	COMBINATION CONCRETE CURB AND GUTTER REMOVAL AND REPLACEMENT	FOOT	$ 50.00	39,690	$ 1,984,500.00
PAVEMENT	PCC SIDEWALK REMOVAL AND REPLACEMENT	SQ FT	$ 15.00	8,800	$ 132,000.00
PAVEMENT	DRIVEWAY REMOVAL AND REPLACEMENT	SQ YD	$ 100.00	4,770	$ 477,000.00
PAVEMENT	DETECTABLE WARNINGS	SQ FT	$ 50.00	1,760	$ 88,000.00
UTILITY	NEW PARALLEL 8" WATER MAIN (INCLUDES HYDRANTS & VAULTS)	FOOT	$ 500.00	14,300	$ 7,150,000.00
UTILITY	NEW WATER SERVICE WITH B-BOX	EACH	$ 5,000.00	286	$ 1,430,000.00
UTILITY	NEW SANITARY SERVICE WITH CLEANOUT	EACH	$ 5,000.00	286	$ 1,430,000.00
UTILITY	NEW 8" SANITARY SEWER	FOOT	$ 400.00	14,300	$ 5,720,000.00
MISC.	MISC. SESC (1%)		L. SUM	1	$ 590,000.00
MISC.	MOBILIZATION (4%)		L. SUM	1	$ 2,350,000.00
MISC.	TRAFFIC CONTROL AND PROTECTION (3%)		L. SUM	1	$ 1,760,000.00
MISC.	CONSTRUCTION LAYOUT (0.5%)		L. SUM	1	$ 300,000.00

SUBTOTAL TOTAL=	**$ 63,600,670.00**
CONTINGENCY (20%) =	$ 12,720,134.00
CONSTRUCTION TOTAL =	**$ 76,320,804.00**
DESIGN ENGINEERING & PERMITTING (7.5%)=	$ 5,724,100.000
CONSTRUCTION ENGINEERING (7.5%)=	$ 5,724,100.000
PROJECT TOTAL=	**$ 87,769,004.00**

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW ACQUISITION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING UTILITES.
2. THIS ESTIMATE ASSUMES 2025 CONSTRUCTION COSTS.
3. THIS ESTIMATE ASSUMES ALL EXCAVATED MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.
4. THIS ESTIMATE DOES NOT INCLUDE ANY VILLAGE/PRIVATE UTILITY REMOVAL AND REPLACEMENT/RELOCATION.
5. THIS ESTIMATE ASSUMES ALL ROADWAYS WITHIN THE PROJECT LIMITS WILL BE RECONSTRUCTED.

CHRISTOPHER B. BURKE ENGINEERING LTD 9575 West Higgins Road, Suite 600 Rosemont, Illinois 60018 (847) 823-0500	CLIENT: VILLAGE OF RIVER FOREST	DSGN. JLW DWN. JLW CHKD. JJJ SCALE: 1"= PLOT DATE: CAD USER: MODEL:	TITLE: PROPOSED CONDITIONS - CENTRAL STUDY AREA LAKE STREET VAULT CONCEPT

NO.	DATE	NATURE OF REVISION	CHKD.

FILE NAME

PROJ. NO. 210272
DATE:
SHEET 0 OF 0
DRAWING NO.
EXH 3

CHRISTOPHER B. BURKE ENGINEERING LTD
9575 WEST HIGGINS ROAD, SUITE 600
ROSEMONT, IL 60018

VILLAGE OF RIVER FOREST — CALCULATED BY: JRS

LAKE STREET VAULT CONCEPT — CHECKED BY: AJS

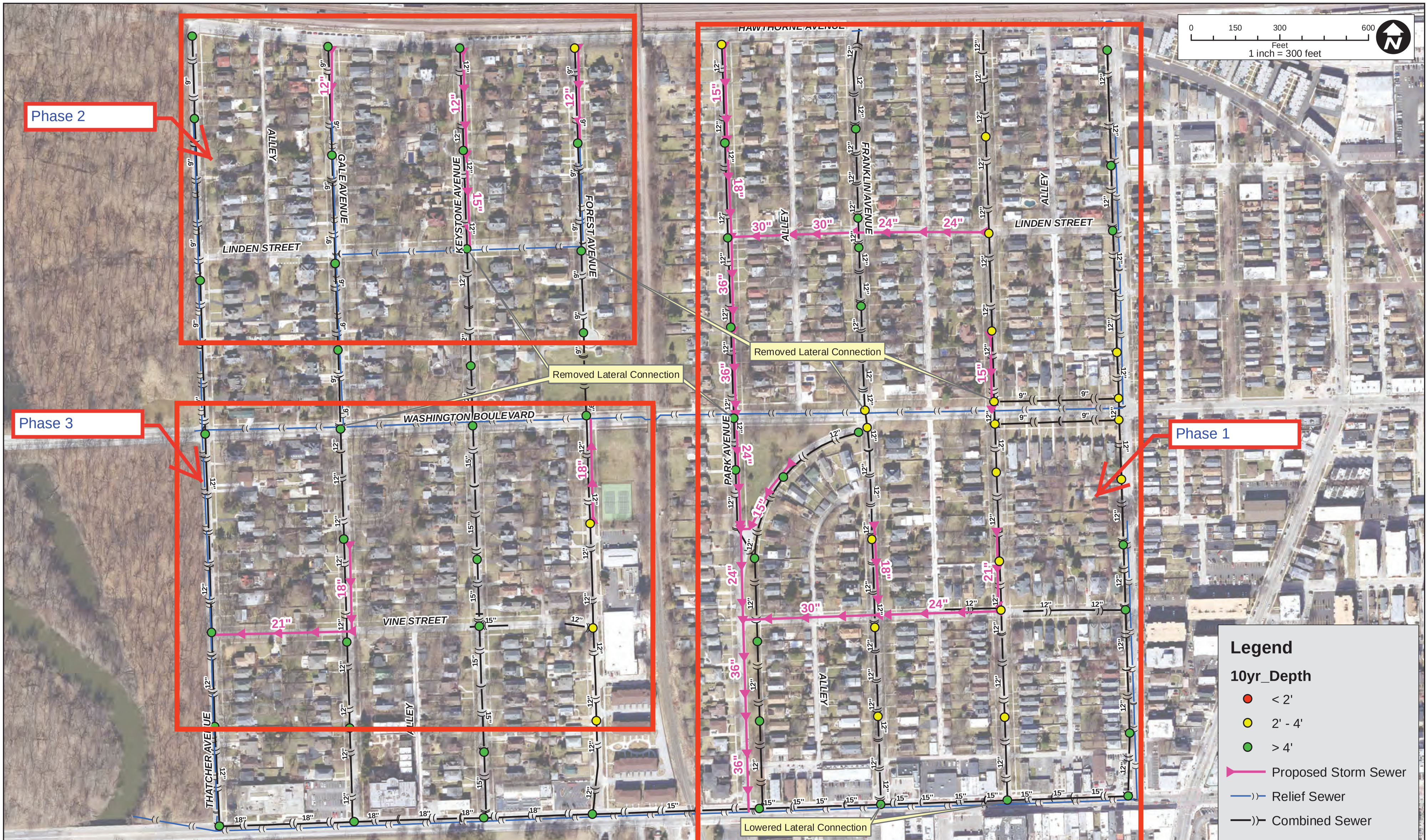
CONCEPT COST ESTIMATE

DATE: DECEMBER 21, 2022 (COSTS UPDATED JANUARY 17, 2025)

				LAKE STREET VAULT	
	ITEM	**UNIT**	**UNIT COST**	**QUANTITY**	**TOTAL COST**
SESC	TREE REMOVAL/PROTECTION	L. SUM	$ 20,000.00	1	$ 20,000.00
SESC	TOPSOIL FURNISH AND PLACE, 6"	SQ YD	$ 14.00	9,700	$ 135,800.00
SESC	SEEDING, CLASS 1A	ACRE	$ 5,000.00	2.0	$ 10,000.00
SESC	EROSION CONTROL BLANKET	SQ YD	$ 3.00	9,700	$ 29,100.00
SESC	PARKWAY RESTORATION - SODDING	SQ YD	$ 18.00	1,300	$ 23,400.00
SESC	TEMPORARY CONSTRUCTION FENCE	FOOT	$ 15.00	1,500	$ 22,500.00
STORM SEWER	TRENCH BACKFILL	CU YD	$ 45.00	3,520	$ 158,400.00
STORM SEWER	STORM SEWER, RCP 12"	FOOT	$ 225.00	50	$ 11,250.00
STORM SEWER	STORM SEWER, RCP 18"	FOOT	$ 275.00	130	$ 35,750.00
STORM SEWER	STORM SEWER, RCP 48"	FOOT	$ 650.00	50	$ 32,500.00
STORM SEWER	REINFORCED CONCRETE BOX CULVERT, 10' X 7'	FOOT	$ 2,250.00	425	$ 956,250.00
STORM SEWER	STORM SEWER REMOVAL	FOOT	$ 30.00	480	$ 14,400.00
STORM SEWER	DRAINAGE STRUCTURE REMOVAL	EACH	$ 750.00	6	$ 4,500.00
STORM SEWER	UNDERGROUND STORAGE VAULT (STORMTRAP)	AC FT	$ 450,000.00	9	$ 4,050,000.00
STORM SEWER	CONFLICT STRUCTURE (INTERSECTIONS)	EACH	$ 65,000.00	1	$ 65,000.00
STORM SEWER	CONNECTIONS TO EXISTING MANHOLES	EACH	$ 6,000.00	3	$ 18,000.00
STORM SEWER	MANHOLES, 4'-DIAMETER, TYPE A, T1F CL	EACH	$ 8,000.00	2	$ 16,000.00
STORM SEWER	MANHOLES, 5'-DIAMETER, TYPE A, T1F CL	EACH	$ 11,000.00	1	$ 11,000.00
STORM SEWER	MANHOLES, 7'-DIAMETER, TYPE A, T1F CL	EACH	$ 30,000.00	1	$ 30,000.00
STORM SEWER	JUNCTION CHAMBER	EACH	$ 175,000.00	1	$ 175,000.00
PAVEMENT	PAVEMENT REMOVAL	SQ YD	$ 15.00	1,470	$ 22,050.00
PAVEMENT	AGGREGATE SUBGRADE IMPROVEMENT	CU YD	$ 50.00	30	$ 1,500.00
PAVEMENT	REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL	CU YD	$ 50.00	30	$ 1,500.00
PAVEMENT	GEOTECHNICAL FABRIC FOR GROUND STABILIZATION	SQ YD	$ 3.00	80	$ 240.00
PAVEMENT	HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50, 2"	TON	$ 125.00	180	$ 22,500.00
PAVEMENT	HOT-MIX ASPHALT BINDER COURSE, IL-19.0 N50, 4"	TON	$ 115.00	350	$ 40,250.00
PAVEMENT	AGGREGATE BASE COURSE, TYPE B, 12"	SQ YD	$ 18.00	1,470	$ 26,460.00
PAVEMENT	CLASS D PATCHES, SPECIAL	SQ YD	$ 85.00	200	$ 17,000.00
PAVEMENT	BITUMINOUS MATERIALS (TACK COAT)	POUND	$ 1.00	1,000	$ 1,000.00
PAVEMENT	COMBINATION CONCRETE CURB AND GUTTER REMOVAL AND REPLACEMENT	FOOT	$ 50.00	1,210	$ 60,500.00
PAVEMENT	PCC SIDEWALK REMOVAL AND REPLACEMENT	SQ FT	$ 15.00	1,200	$ 18,000.00
PAVEMENT	DRIVEWAY REMOVAL AND REPLACEMENT	SQ YD	$ 100.00	90	$ 9,000.00
PAVEMENT	DETECTABLE WARNINGS	SQ FT	$ 50.00	80	$ 4,000.00
UTILITY	RELOCATE / ADJUST WATER MAIN	FOOT	$ 400.00	50	$ 20,000.00
UTILITY	REMOVE AND REPLACE SANITARY SEWER	FOOT	$ 400.00	50	$ 20,000.00
UTILITY	NEW PARALLEL 8" WATER MAIN (INCLUDES HYDRANTS & VAULTS)	FOOT	$ 550.00	425	$ 233,750.00
UTILITY	NEW WATER SERVICE WITH B-BOX	EACH	$ 5,000.00	8	$ 40,000.00
UTILITY	NEW SANITARY SERVICE WITH CLEANOUT	EACH	$ 5,000.00	8	$ 40,000.00
UTILITY	NEW 8" SANITARY SEWER	FOOT	$ 400.00	425	$ 170,000.00
MISC.	MISC. SESC (1%)		L. SUM	1	$ 70,000.00
MISC.	KEYSTONE PARK RESTORATION		L. SUM	1	$ 250,000.00
MISC.	MOBILIZATION (4%)		L. SUM	1	$ 270,000.00
MISC.	TRAFFIC CONTROL AND PROTECTION (3%)		L. SUM	1	$ 200,000.00
MISC.	CONSTRUCTION LAYOUT (0.5%)		L. SUM	1	$ 40,000.00

SUBTOTAL TOTAL= $	**7,396,600.00**
CONTINGENCY & MINOR ITEMS (20%) = $	1,479,320.00
CONSTRUCTION TOTAL = $	**8,875,920.00**
DESIGN ENGINEERING & PERMITTING (7.5%)= $	665,700.000
CONSTRUCTION ENGINEERING (7.5%)= $	665,700.000
PROJECT TOTAL= $	**10,207,320.00**

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW ACQUISITION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING UTILITES.
2. THIS ESTIMATE ASSUMES 2025 CONSTRUCTION COSTS.
3. THIS ESTIMATE ASSUMES ALL EXCAVATED MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.
4. THIS ESTIMATE DOES NOT INCLUDE ANY VILLAGE/PRIVATE UTILITY REMOVAL AND REPLACEMENT/RELOCATION.
5. IT IS ASSUMED THAT KEYSTONE PARK WILL BE RESTORED TO PRE-CONSTRUCTION CONDITIONS.



CHRISTOPHER B. BURKE ENGINEERING LTD
9575 West Higgins Road, Suite 600
Rosemont, Illinois 60018
(847) 823-0500

CLIENT:

VILLAGE OF RIVER FOREST

NO.	DATE	NATURE OF REVISION	CHKD.
FILE NAME			

DSGN.	JLW
DWN.	JLW
CHKD.	JJJ
SCALE:	1"=300'
PLOT DATE:	11/9/22
CAD USER:	
MODEL:	

TITLE:

SCENARIO 2 PROPOSED CONDITIONS -
SOUTH STUDY AREA
10-YEAR STORM
COMBINED SEWER WATER DEPTHS

PROJ. NO. 210272
DATE: 11/9/22
SHEET 0 OF 0
DRAWING NO.
EXH 5

CHRISTOPHER B. BURKE ENGINEERING LTD
9575 WEST HIGGINS ROAD, SUITE 600
ROSEMONT, IL 60018

VILLAGE OF RIVER FOREST — CALCULATED BY: JRS
SOUTH STUDY AREA — CHECKED BY: AJS
CONCEPT COST ESTIMATE
DATE: DECEMBER 21, 2022 (COSTS UPDATED JANUARY 17, 2025)

				SOUTH STUDY AREA - PHASE 1		SOUTH STUDY AREA - PHASE 2		SOUTH STUDY AREA - PHASE 3		SOUTH STUDY AREA - TOTAL COMBINED PROJECT	
	ITEM	UNIT	UNIT COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST
SESC	TREE REMOVAL/PROTECTION	L. SUM	$ 20,000.00	1	$ 10,000.00	1	$ 5,000.00	1	$ 5,000.00	1	$ 20,000.00
	PARKWAY RESTORATION - SODDING	SQ YD	$ 18.00	900	$ 16,200.00	200	$ 3,600.00	200	$ 3,600.00	1,300	$ 23,400.00
STORM SEWER	TRENCH BACKFILL	CU YD	$ 45.00	6,320	$ 284,400.00	960	$ 43,200.00	940	$ 42,300.00	8,220	$ 369,900.00
	STORM SEWER, RCP 12"	FOOT	$ 175.00	625	$ 109,375.00	1,225	$ 214,375.00	150	$ 26,250.00	2,000	$ 350,000.00
	STORM SEWER, RCP 15"	FOOT	$ 200.00	875	$ 175,000.00	350	$ 70,000.00	0	$ -	1,225	$ 245,000.00
	STORM SEWER, RCP 18"	FOOT	$ 225.00	625	$ 140,625.00	0	$ -	700	$ 157,500.00	1,325	$ 298,125.00
	STORM SEWER, RCP 21"	FOOT	$ 275.00	300	$ 82,500.00	0	$ -	475	$ 130,625.00	775	$ 213,125.00
	STORM SEWER, RCP 24"	FOOT	$ 300.00	1,475	$ 442,500.00	0	$ -	0	$ -	1,475	$ 442,500.00
	STORM SEWER, RCP 30"	FOOT	$ 350.00	900	$ 315,000.00	0	$ -	0	$ -	900	$ 315,000.00
	STORM SEWER, RCP 36"	FOOT	$ 425.00	1,250	$ 531,250.00	0	$ -	0	$ -	1,250	$ 531,250.00
	STORM SEWER REMOVAL	FOOT	$ 30.00	450	$ 13,500.00	75	$ 2,250.00	75	$ 2,250.00	600	$ 18,000.00
	DRAINAGE STRUCTURE REMOVAL	EACH	$ 750.00	10	$ 7,500.00	1	$ 750.00	2	$ 1,500.00	13	$ 9,750.00
	CONFLICT STRUCTURE (INTERSECTIONS)	EACH	$ 65,000.00	2	$ 130,000.00	0	$ -	0	$ -	2	$ 130,000.00
	INLET, TYPE A, HIGH CAPACITY FRAME AND GRATE	EACH	$ 3,000.00	40	$ 120,000.00	4	$ 12,000.00	8	$ 24,000.00	52	$ 156,000.00
	MANHOLES, 4'-DIAMETER, TYPE A, T1F CL	EACH	$ 7,500.00	10	$ 75,000.00	6	$ 45,000.00	5	$ 37,500.00	21	$ 157,500.00
	MANHOLES, 5'-DIAMETER, TYPE A, T1F CL	EACH	$ 8,500.00	4	$ 34,000.00	1	$ 8,500.00	0	$ -	5	$ 42,500.00
	MANHOLES, 6'-DIAMETER, TYPE A, T1F CL	EACH	$ 10,000.00	2	$ 20,000.00	0	$ -	0	$ -	2	$ 20,000.00
	MANHOLES, 9'-DIAMETER, TYPE A, T1F CL	EACH	$ 35,000.00	2	$ 70,000.00	0	$ -	0	$ -	2	$ 70,000.00
PAVEMENT	HOT-MIX ASPHALT SURFACE REMOVAL	SQ YD	$ 3.50	13,300	$ 46,550.00	0	$ -	0	$ -	13,300	$ 46,550.00
	HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50, 1.5"	TON	$ 115.00	1,170	$ 134,550.00	0	$ -	0	$ -	1,170	$ 134,550.00
	POLYMERIZED LEVELING BINDER, IL-4.75, N50, 0.75"	TON	$ 125.00	560	$ 70,000.00	0	$ -	0	$ -	560	$ 70,000.00
	CLASS D PATCHES, SPECIAL	SQ YD	$ 80.00	4,800	$ 384,000.00	900	$ 72,000.00	900	$ 72,000.00	6,600	$ 528,000.00
	BITUMINOUS MATERIALS (TACK COAT)	POUND	$ 1.00	8,920	$ 8,920.00	0	$ -	0	$ -	8,920	$ 8,920.00
	COMBINATION CONCRETE CURB AND GUTTER REMOVAL AND REPLACEMENT	FOOT	$ 50.00	2,150	$ 107,500.00	350	$ 17,500.00	460	$ 23,000.00	2,960	$ 148,000.00
	PCC SIDEWALK REMOVAL AND REPLACEMENT	SQ FT	$ 15.00	4,000	$ 60,000.00	400	$ 6,000.00	800	$ 12,000.00	5,200	$ 78,000.00
	DRIVEWAY REMOVAL AND REPLACEMENT	SQ YD	$ 75.00	280	$ 21,000.00	0	$ -	0	$ -	280	$ 21,000.00
	DETECTABLE WARNINGS	SQ FT	$ 50.00	800	$ 40,000.00	80	$ 4,000.00	160	$ 8,000.00	1,040	$ 52,000.00
UTILITY	RELOCATE / ADJUST WATER MAIN	FOOT	$ 400.00	500	$ 200,000.00	50	$ 20,000.00	100	$ 40,000.00	650	$ 260,000.00
	REMOVE AND REPLACE SANITARY SEWER	FOOT	$ 400.00	500	$ 200,000.00	50	$ 20,000.00	100	$ 40,000.00	650	$ 260,000.00
	ADJUST WATER SERVICES	EACH	$ 5,000.00	10	$ 50,000.00	5	$ 25,000.00	5	$ 25,000.00	20	$ 100,000.00
	ADJUST SANITARY SERVICES	EACH	$ 5,000.00	10	$ 50,000.00	5	$ 25,000.00	5	$ 25,000.00	20	$ 100,000.00
MISC.	MISC. SESC (1%)		L. SUM	1	$ 40,000.00	1	$ 10,000.00	1	$ 10,000.00	1	$ 60,000.00
	MOBILIZATION (4%)		L. SUM	1	$ 140,000.00	1	$ 30,000.00	1	$ 30,000.00	1	$ 200,000.00
	TRAFFIC CONTROL AND PROTECTION (3%)		L. SUM	1	$ 110,000.00	1	$ 20,000.00	1	$ 20,000.00	1	$ 150,000.00
	CONSTRUCTION LAYOUT (0.5%)		L. SUM	1	$ 20,000.00	1	$ 5,000.00	1	$ 5,000.00	1	$ 30,000.00

	Phase 1	Phase 2	Phase 3	Total Combined Project
SUBTOTAL TOTAL=	**$ 4,259,370.00**	**$ 659,175.00**	**$ 740,525.00**	**$ 5,659,070.00**
CONTINGENCY & MINOR ITEMS (20%) =	$ 851,874.00	$ 131,835.00	$ 148,105.00	$ 1,131,814.00
CONSTRUCTION TOTAL =	**$ 5,111,244.00**	**$ 791,010.00**	**$ 888,630.00**	**$ 6,790,884.00**
DESIGN ENGINEERING & PERMITTING (7.5%)=	$ 383,400.000	$ 59,400.000	$ 66,700.000	$ 509,500.000
CONSTRUCTION ENGINEERING (7.5%)=	$ 383,400.000	$ 59,400.000	$ 66,700.000	$ 509,500.000
PROJECT TOTAL=	**$ 5,878,044.00**	**$ 909,810.00**	**$ 1,022,030.00**	**$ 7,809,884.00**

NOTES:
1. THIS ESTIMATE DOES NOT INCLUDE ROW ACQUISITION, TEMPORARY OR CONSTRUCTION EASEMENTS, OR RELOCATING ANY EXISTING UTILITES.
2. THIS ESTIMATE ASSUMES 2025 CONSTRUCTION COSTS.
3. THIS ESTIMATE ASSUMES ALL EXCAVATED MATERIAL TO BE HAULED-OFF MEETS CCDD REQUIREMENTS.
4. THIS ESTIMATE DOES NOT INCLUDE ANY VILLAGE/PRIVATE UTILITY REMOVAL AND REPLACEMENT/RELOCATION.
5. THIS ESTIMATE ASSUMES PARK AVENUE, LINDEN STREET AND VINE STREET WILL BE PATCHED AND RESURFACED. ALL OTHER STREETS WILL BE PATCHED ONLY.

Appendix 2 – Project Ranking

Village of River Forest - Stormwater Master Plan
Project Prioritization

Rank[1]	Project	Level of Service[2]	# of Benefitting Properties[3]	EOPC[4]	Avg. Cost Per Property
1	South Watershed - Area #2	10-yr	65	$ 909,810	$ 13,997
2	South Watershed - Area #3	10-yr	54	$ 1,022,030	$ 18,926
3	South Watershed - Area #1	10-yr	270	$ 5,878,044	$ 21,771
4	Central Watershed - Lake Street Vault	10-yr	419	$ 10,207,320	$ 24,361
5	North Watershed - Northside Sewer Separation Phase 2	10-yr	469	$ 12,852,172	$ 27,403
6	Central Watershed - Sewer Separation	10-yr	1051	$ 76,144,388	$ 72,449

NOTES:

1. *Rank is determined by the average cost per benefitting property.*
2. *All projects were analyzed for the 10-year event and benefits were determined on basis of 10-yr storm design.*
3. *Benefitting Properties were estimated based upon proximity to combined sewers with substantial reduction in 10-year HGL. See report for additional discussion.*
4. *Engineer's Opinion of Probable Construction Cost, based on 2025 costs.*