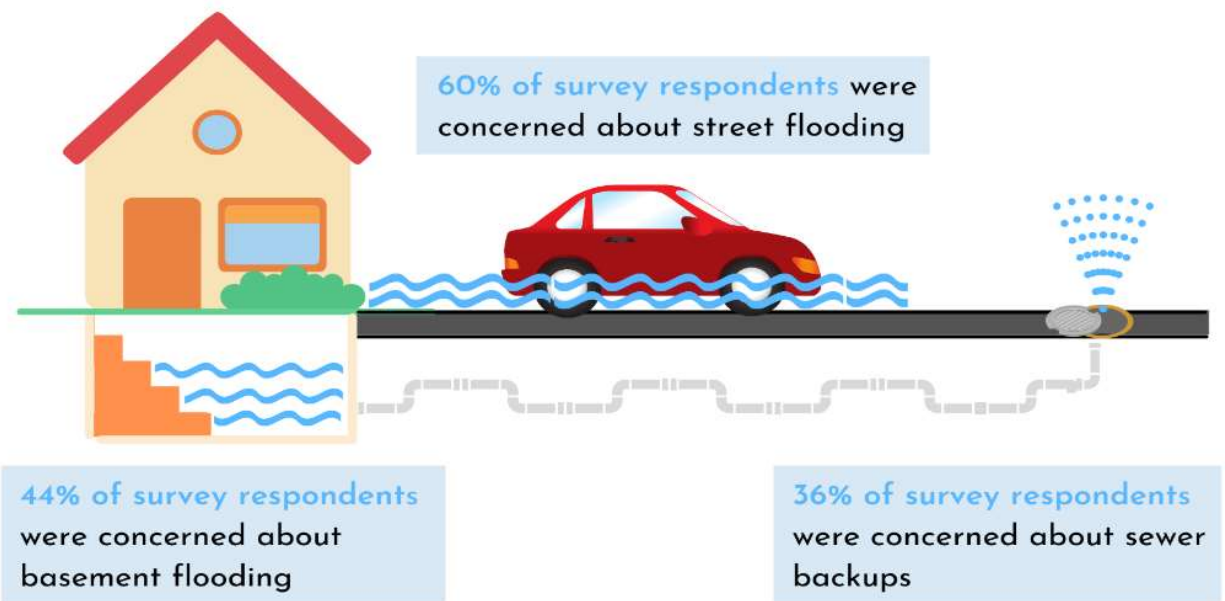


Basement and Street Flooding in Evanston

May 2024 by Richard Lanyon

“We are Water | Submerged streets, wet basements: Many Evanstonians concerned about flooding” is the title of an article in the *Evanston RoundTable* that appeared on October 4, 2021. The article was prepared by local water activists and educators from Citizens’ Greener Evanston’s Watershed Collective and researchers from Northwestern’s Center for Water Research who came together in early 2020 to better understand water-related challenges in the City of Evanston to inform evidence-based solutions. Researchers circulated a questionnaire widely to solicit responses from all parts of the city. The following graphic summarized responses submitted by 750 respondents to the questionnaire.



While a significant portion of survey respondents expressed concern about three types of flooding, the survey results appeared to lack specific information about when the flooding occurred, the frequency that respondents experienced flooding, and the perceived or known cause of flooding. While expressions of concern offer generalizations, the lack of specifics provides little on which the city government can act. The authors appear to recognize this lack with this statement in the article: “Survey data reveal discrepancies between concerns about flooding and reported occurrences of flooding in Evanston, which could be due to lower rates of reporting in certain neighborhoods.” The authors reported that most survey respondents were from the northern parts of the city in Wards 6 and 7.

Street Flooding

It is probable that most residents of the city have little understanding of the infrastructure that drains the city. To better understand basement and street flooding, as well as sewer backup, it is essential to know that two types of sewers handle Evanston’s stormwater—combined sewers and storm sewers. Combined sewers exist throughout the city and were the first type of sewers

constructed in Evanston. Combined sewers convey dry weather sewage and wet weather combined sewage and stormwater to receiving facilities owned and operated by the Metropolitan Water Reclamation District (MWRD).

To help the smaller and older combined sewers handle stormwater, relief sewers were constructed in the Evanston 1990 Relief Sewer Program. Construction of this program occurred over 18 years, starting in 1991 and ending in 2008, at a cost of \$210 million, much of which was paid for by local sewer use fees. Combined and relief sewers are the most prevalent in the city as shown by the brown (combined) and green (relief) areas in Figure 1.

Those areas served by city storm sewers that convey only stormwater from where the rain falls to the North Shore Channel (NSC) or in two small areas to Lake Michigan are blue. Flow in storm sewers is not tainted by sewage; hence, it can be discharged, properly permitted by the Illinois Environmental Agency, to surface receiving waters. Most storm sewers were constructed as part of the city's 1990 Relief Sewer Program.

Those areas served by city relief sewers that convey excess stormwater from combined sewers and stormwater from streets to the Metropolitan Water Reclamation District's (MWRD) Mainstream Tunnel are green. As this excess stormwater can be tainted by sewage, it must be controlled to avoid discharge to surface waters. In an extreme event when the Mainstream Tunnel is full, the excess flow will be discharged to the NSC and reported as a combined sewer overflow. Some city relief sewers are tunnels about 60 feet below ground level. The Mainstream Tunnel is 200 feet below ground level and runs beneath the NSC.

Those areas served by city combined sewers—the oldest sewers, some exceeding 100 years—are brown and green. These sewers were built at a time when streets were narrow, and there were fewer parking lots and fewer automotive vehicles. The combined sewers don't have the capacity to safely drain away intense storm rainfall, which is why the relief sewers were built.

While the entire city is served by combined sewers to drain dry weather sewage, in about half of the city (the brown area in Figure 1), there are no relief sewers, and the combined sewers are fitted with restrictors in the street stormwater inlets. The restrictors admit a low constant rate of flow into the combined sewer to prevent overwhelming the sewer and reduce the incidence of sewer backup. Restricted stormwater will temporarily stand in the streets and gutters until the intensity of rainfall subsides, when it will begin to drain into the sewers. In the other half of the city, relief sewers or storm sewers quickly drain excess stormwater runoff. Temporary street flooding is expected to occur during intense storms in about half of the city. It is no wonder that 60% of the survey respondents expressed concern for street flooding. The drainage system is designed to work that way.

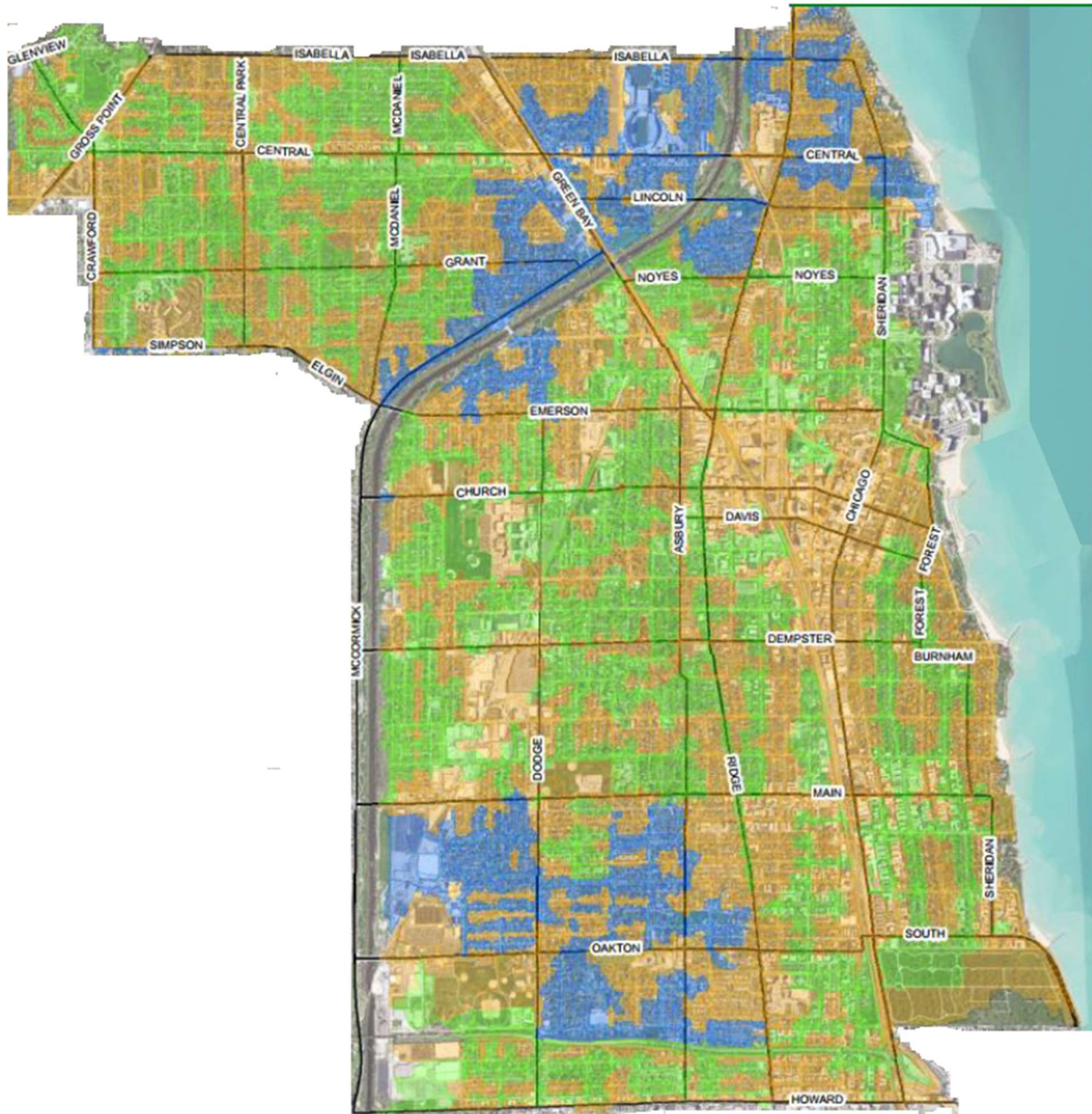


Figure 1. Stormwater drainage. Blue areas are served by storm sewers. Brown areas are served by combined sewers in dry and wet weather. Green areas have relief sewers to relieve excess stormwater in combined sewers and collect and convey excess stormwater.

Basement Flooding and Sewer Backup

Each month at Evanston Utilities Commission meetings, city staff presents information on a number of issues with which the commission members are concerned, and resident reports of “water in the basement” is one of those issues. Water in residential basements that is combined with sewage is labelled “basement backup.” Water that enters from outside the structure that is not tainted with sewage is labelled “basement flooding.” In response to each resident report of “water in the basement,” an inspection is made by a city staff member to determine the cause. For each resident report, the cause is attributed to a “private” cause or a “city” cause. Private causes may be related to a problem in the private sewer lateral connected to the city sewer or to defects in basement walls or openings. City causes may be related to a blockage in or work on the city sewer, or to surface water from alley or street flooding. Based upon the inspection, each resident report is assigned to one of four causes and reported as:

- Basement Backup Private
- Basement Backup City
- Basement Flooding Private
- Basement Flooding City

Since water in the basement may be caused by a rain event, the amount of precipitation on the day of the resident report is included in the information reported to the commission. An analysis was made for the years 2021, 2022, and 2023, and on any day in which 0.2 inches or more of rainfall occurred, the resident report was considered in the analysis to be rain related. The results of the analysis is presented in the following table.

Water in basement event by cause	Year	Number of events		Percent rain related	Number of sewer repair permits
		Total	Rain related		
Basement Backup Private	2021	113	41	36	199
	2022	131	62	47	202
	2023	98	21	21	202
Basement Backup City	2021	5	0	0	
	2022	2	0	0	
	2023	6	1	17	
Basement Flooding Private	2021	20	14	70	
	2022	14	6	43	
	2023	76	3	4	
Basement Flooding City	2021	1	1	100	
	2022	1	1	100	
	2023	0	0	0	

For the three-year period, Basement Backup Private varies annually between 21% and 47% rain related. More than half of the reports of Basement Backup Private were not rain related. It is

likely that more than half of the reports were due to failure of the private sewer lateral, either by root blockage, collapsed sewer pipe, solidified grease and oil, etc.

While 36% of the survey respondents expressed concern about sewer backup, the questionnaire apparently did not ask about the cause of respondents' concern. Based on the analysis, it is possible that the concern for sewer backup may be related to a lack of lateral sewer maintenance rather than to sewer backup caused by rainfall runoff.

Far fewer resident reports of basement backup were attributed to a city cause, and only one out of the 13 was possibly rain related.

Basement Flooding Private varied more widely between 4% and 70% rain related over the three years. Basement flooding reports were one-third of the number of basement backup reports. Basement flooding occurred less frequently than basement backup up during the three-year period.

Only two resident reports of basement flooding were city caused and both were rain related. In both cases, the rainfall amounts exceeded 1.5 inches and the flooding was caused by overflow from alleys into basement garages.

More survey respondents were concerned about basement flooding, 44%, than were concerned about basement backup, 36%, whereas basement flooding reports were one-third of the number of basement backup reports.

The high number of sewer repair permits indicates that private sewer maintenance is an ongoing concern. Permits are not needed for cleaning, flushing, or rodding private lateral sewers, and this type of maintenance is probably more numerous. Permits are only needed to repair or replace the sewer pipe or to install clean-out connections.

The author is grateful for the information provided in the We Are Water series of articles and for use of the graphic on page 1. Figure 1 was obtained from the front cover of the 2023 Evanston Stormwater Management Master Plan prepared by Hey and Associates.