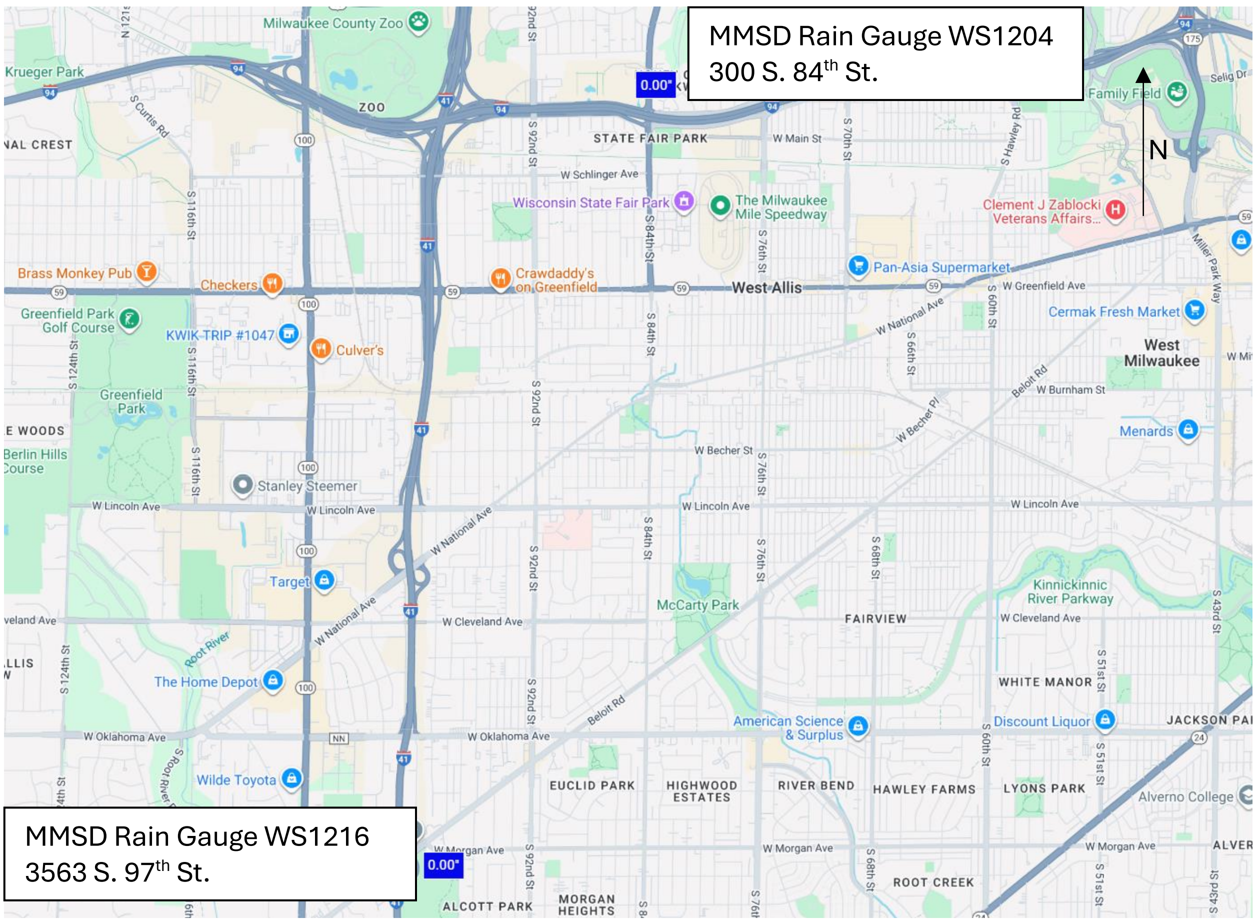
Mayor and Alderpersons:

This report is intended to provide information about the flooding event that took place on August 9 and August 10, 2025. Since the flooding event, the Engineering Department has been analyzing data that has been collected on flooding locations, rain gauges, and flow monitoring sites to try to understand how the City systems responded during the flooding. In addition, we have done a very high-level analysis of main pipe sizes to convey a storm of this magnitude and the costs associated with those pipes. Our conclusions are as follows.

<u>OVERVIEW OF AUGUST RAINFALL DATA</u>

On August 9, 2025, rain was predicted for the southeast region of Wisconsin. Intense rainfall began at approximately 7:30pm in West Allis and its surrounding communities. After only one-hour, local MMSD rain gauges had already measured between 2.15 and 2.51 inches of rain. This equates to 1.34 and 1.56 gallons per minute (based upon one inch of rain over one square foot in one hour). Below are the locations of the MMSD rain gauges that were used for the rain data.



This burst of rain immediately began to cause localized flooding as catch basins and storm sewers are not designed to carry this much rain in such a short time. There were several waves of heavy rainfall. Based upon the data from the MMSD rain gauges, this is the summary of rain that fell around West Allis by hour. Note: There could be areas where there were heavier rainfalls.

		WS1204/ 300 s 84th north of State Fair Park	WS1216/ 3563 s 97th near Alcott Park		WS1204/ 300 s 84th north of State Fair Park	WS1216/ 3563 s 97th near Alcott Park
Timestamp		Rainfall in Gauge			Rainfall by Hour	
Aug 9, 2025, 7:00PM		0.00	0.00			
Aug 9, 2025, 7:30PM		0.00	0.12			
Aug 9, 2025, 8:00PM		0.67	1.50		0.67	1.50
Aug 9, 2025, 9:00PM		2.69	3.01		2.02	1.51
Aug 9, 2025, 10:00PM		2.91	3.18		0.22	0.17
Aug 9, 2025, 11:00PM		3.77	4.76		0.86	1.58
Aug 10, 2025, 12:00AM	Midnight. Gauge reset	5.53	6.53		1.76	1.77
Aug 10, 2025, 1:00AM		0.55	1.51		0.55	1.51
Aug 10, 2025, 2:00AM		0.73	2.09		0.18	0.58
Aug 10, 2025, 3:00AM		1.57	2.91		0.84	0.82
Aug 10, 2025, 4:00AM		1.57	2.91		0.00	0.00
Aug 10, 2025, 5:00AM		1.58	2.92		0.01	0.01
Aug 10, 2025, 6:00AM		1.58	2.92		0.00	0.00
Aug 10, 2025, 7:00AM		1.98	3.07		0.40	0.15
Aug 10, 2025, 8:00AM		2.31	3.12		0.33	0.05
Aug 10, 2025, 9:00AM		2.31	3.12		0.00	0.00
Aug 10, 2025, 10:00AM		2.31	3.12		0.00	0.00
Aug 10, 2025, 11:00AM		2.32	3.12		0.01	0.00
Aug 10, 2025, 12:00PM		2.32	3.13		0.00	0.01
Aug 10, 2025, 1:00PM		2.46	3.25		0.14	0.12
Aug 10, 2025, 2:00PM		2.52	3.30		0.06	0.05
Aug 10, 2025, 2:30PM		2.52	3.30		0.00	0.00
Total for each Gauge		**8.05**	**9.83**			
Average of 2 Gauges	**8.94**					

The largest hourly rainfall was between 7:35pm and 8:35pm on August 9, 2025.

	WS1204/ 300 s 84th north of State Fair Park	WS1216/ 3563 s 97th near Alcott Park		WS1204/ 300 s 84th north of State Fair Park	WS1216/ 3563 s 97th near Alcott Park
Timestamp	Rainfall in Gauge			Largest hourly rainfall	
Aug 9, 2025, 7:35PM	0.01	0.35			
Aug 9, 2025, 8:00PM	0.67	1.50			
Aug 9, 2025, 8:35PM	2.16	2.86		2.15	2.51

Rainfall events are categorized by the amount of rain that falls during a specific time period. Often these events are called a 10-year storm or a 100-year storm. Many people believe this means that a storm with that amount of rainfall will occur once every 100 years. This is somewhat correct provided that each day is a new 100 years. These terms were developed as a way to describe the probability of a rain event occurring. It has gone full circle and now has gone back to describing rain events with the percentage of probability that a storm of that size will occur. A 100-year storm has a 1% chance of occurring every year. A 10-year storm has a 10% chance of occurring every year. The August 9-10 storm has been classified as a 1000-year storm meaning it has a 0.1% chance of happening every year. The National Oceanic and Atmospheric Administration (NOAA) has stated that the August 9-10, 2025 storms broke previous Wisconsin state records for total amounts of rainfall.

WEST ALLIS STORM SEWER DESIGN

The City of West Allis has a standard for the design of the storm sewer system. The storm sewer system is designed for a 5-year storm. A 5-year storm means that there is a 20% chance that a storm of this size will occur each year. This size storm is 1.61 inches of rain in one hour which when calculated over one square foot of pavement equates to 1 gallon per minute of rain. Because the frequency of the 5-year storm is more than the 100-year storm but less rain per hour, it is a typical amount of rain that can fall 20% of the time in a given year. That is why West Allis uses it as our design standard. Other communities use the 10-year storm. Almost no communities use the 100-year storm. To demonstrate how rare a 1000-year storm is, the Southeast Wisconsin Regional Planning Commission (SEWRPC) does not provide design parameters for the 1000-year storm.

Storm sewers are designed based on areas that flow by gravity to specifically designed low points. Often these engineered low points coincide with naturally created low points. In fact, engineers try to use the natural topography to design roads and sewers whenever possible.

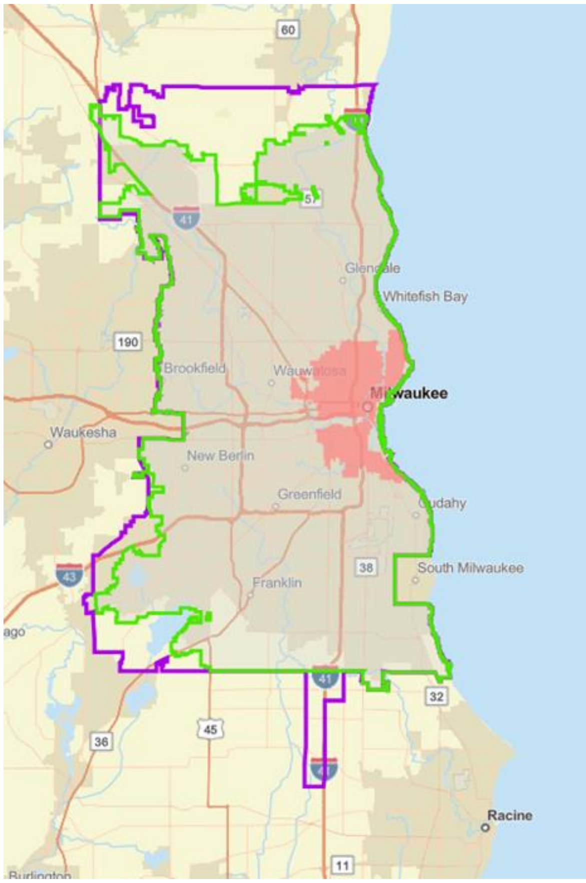
To calculate the capacity and size needed for a storm sewer, the amount of land that will drain to a storm sewer is quantified in acres. Then, a coefficient is applied to that area based on the characteristics of the area such as the amount of pavement and grass or the zoning of the lands. This determines how much stormwater will run overland via streets, sidewalks, and yards into the catch basins which connect to the storm sewers. The more pavement or higher coefficient, the more stormwater runs off (overland). The lower the coefficient, the more stormwater soaks into the ground before running off. Examples of this would be a field or large grass area.

Once the coefficient has been applied to the acreage, then the rainfall intensity is applied. Rainfall intensity is the inches/hour of rain. The rainfall intensity is calculated from formulas provided by SEWRPC. For the 5-year storm, it is that 1.61 inches/hour discussed previously. Multiplied all together, we get the volume of stormwater that the storm sewer needs to hold and convey in cubic feet per second. $Q=CIA$.

There are tables that tell engineers how much water a storm sewer can hold at a specific slope. Slope is important because the steeper the slope, the faster the stormwater runs, the more stormwater can be conveyed in a smaller diameter pipe. Based on the slope of the pipe, and the amount of stormwater needed to be conveyed, engineers are able to determine which size pipe works for that area.

The larger the design storm, the larger the storm sewers need to be to convey the larger amounts of rain. Larger pipes may not be able to be used however, due to the receiving pipe or stream may not have capacity for the stormwater trying to be conveyed.

RIVER AND CREEK JURISDICTION



Source: MMSD Website

The Milwaukee Metropolitan Sewerage District (MMSD) is the unit of government responsible for the flood management of rivers and creeks in its sewage treatment area. This is mainly Milwaukee County; however, it does stretch out into Waukesha County, up into Ozaukee County, and down into Racine County.

MMSD has been working throughout their boundary on flood management projects. They are currently working on a mitigation project at McCarty Park to provide an overflow around the grate should it become completely blocked. This overflow goes back into Honey Creek downstream of the grate.

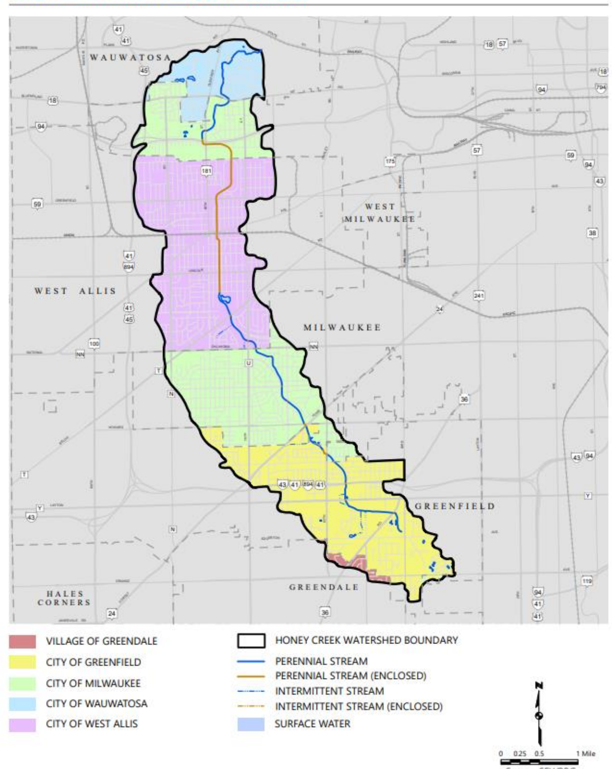
None of the stormwater from West Allis goes into the deep tunnel. West Allis has a separated sewer system. Only sanitary sewer flow goes into the deep tunnel. If the deep tunnel is closed, the interceptor pipes become full which then backs up into the local systems. But no stormwater from West Allis goes into the deep tunnel.

HONEY CREEK

Honey Creek travels through several communities. It originates in the City of Greenfield. It then heads north through the City of Milwaukee. Honey Creek continues until approximately W. Arthur Avenue at the north end of McCarty park where it enters the twin box storm sewer underground. From there, it continues north until it reaches the north side of I94 in the City of Milwaukee. There enters the City of Wauwatosa, ultimately connecting to the Menomonee River.

Honey Creek was an open-ditch creek until the mid-1960s. MMSD enclosed it with a twin box storm sewer (some call it a culvert). The design storm for the twin box sewer was the 100-year storm. MMSD has an easement for the sewer through many private properties. Portions of the West Allis storm sewer system are designed to drain into the Honey Creek twin box sewer system.

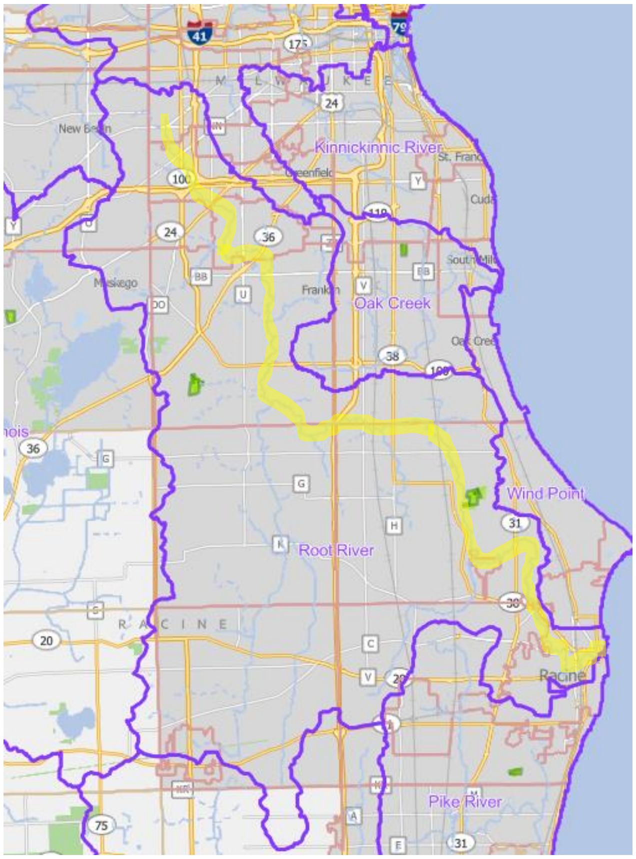
Map 1.1
Civil Divisions Within the Honey Creek Watershed



Source: SEWRPC Website.

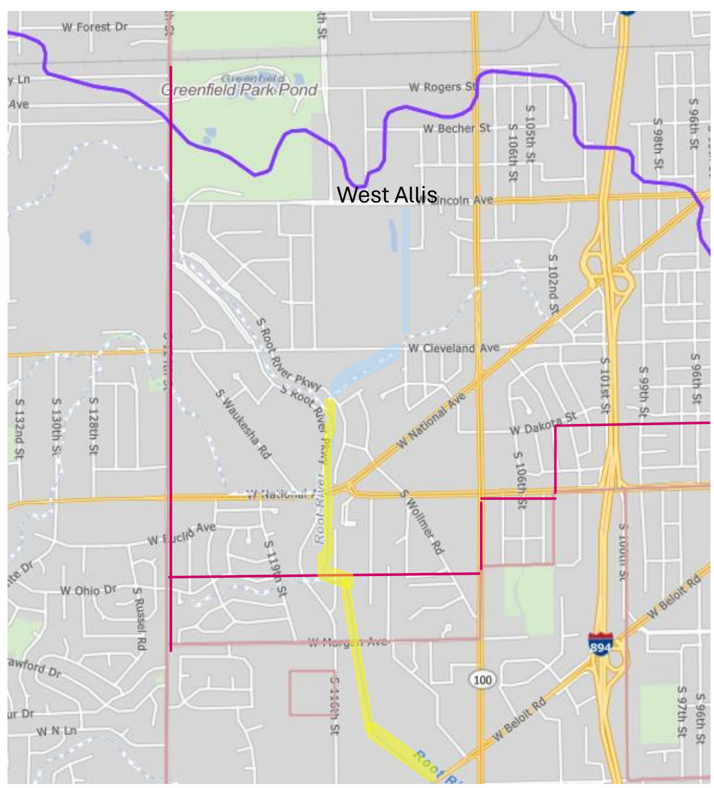
ROOT RIVER

The Root River is also under MMSD jurisdiction. But, in West Allis, it flows through Milwaukee County lands. The Root River begins around the border of West Allis and New Berlin. It has a large drainage area through many communities. It is highlighted in yellow on the maps below.



The Root River is an open river for the portion within West Allis.

Tributary to Root River is Hale Creek. (light blue highlight). It is entirely in West Allis. It begins south of W. Lincoln Avenue, heads south under W. Cleveland Avenue where it joins with an unnamed tributary to Root River. It also is an open creek section.



Source for both images: Wisconsin Department of Natural Resources Surface Water Data Viewer

HONEY CREEK FLOODING

As was described previously, the West Allis storm sewer system in the Honey Creek area drains into the twin box sewer. It does this through catch basins in the streets, alleys and in the back and side yards of many homes along Honey Creek.

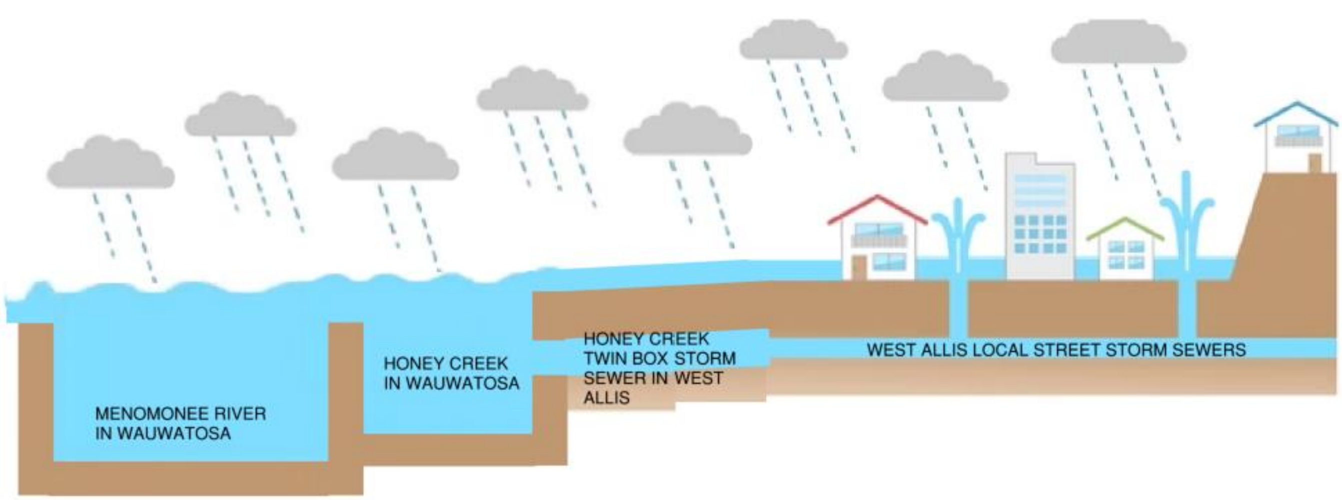
The region had seen rain earlier in the evening. The northwest portion of the area which drains to the Menomonee River (Menomonee Falls, and northwest Milwaukee) had rain start around 4:30pm. This started increasing the level of the Menomonee River. Honey Creek is connected to the Menomonee River. So, when the rain started in West Allis and south of West Allis, Honey Creek was already getting backed up by the Menomonee River. This left less room for the rain runoff from the West Allis storm sewers to go into Honey Creek.

The rain then began to fall in and around West Allis. The entire Milwaukee County area is an area that is largely urbanized and covered with homes, sidewalks, parking lots, and driveways. This means the rain runoff reached the storm sewers quickly. As the event continued, the grate at McCarty Park became covered with debris as did many street catch basins. The rain runoff continued to enter into the Honey Creek sewer and West Allis storm sewers through the debris until the storm sewers were full of rainwater or the runoff could not get through the debris blocking the catch basins and McCarty Park grate. Once the sewers were full of rainwater, the runoff backed up and came out of the catch basins and manhole lids in the area. It also backed up into storm sewer laterals from private properties impacting sump pumps. Then the stormwater in the McCarty Park pond rose, over topped the grate at W. Arthur Avenue and continued down the streets.

The rain continued to fall over the entire region increasing the levels of the Menomonee River to a point where Honey Creek could not push water into the Menomonee River; the Menomonee River was backing up into Honey Creek which then caused even more back up in West Allis.

Already at capacity, the additional rainfall could not enter the storm sewer system or stay within the storm sewer pipes so it ran overland. As it did this, the runoff encountered buildings which acted like dams until the water could find a path around or through the structure. As stormwater ran around the structures, some erosion occurred due to the turbulence and velocity of the runoff. If the stormwater could not go around the structures, it could build up against structures which would put additional pressure on that structure. Stormwater would also leak in through gaps in windows and walls causing flooding in the structure.

HONEY CREEK FLOODING DIAGRAM



Source: AdobeStock/#458671908, edited by West Allis Engineering Dept.

Source: FEMA's National Flood Hazard Layer (NFHL) Viewer Website

The enclosed portion of Honey Creek is not listed by FEMA as a floodplain for the 100-year flood. It is termed "area of minimal flood hazard" from the October 2024 flood plain determinations. This is because Honey Creek is contained in the MMSD twin box sewer.

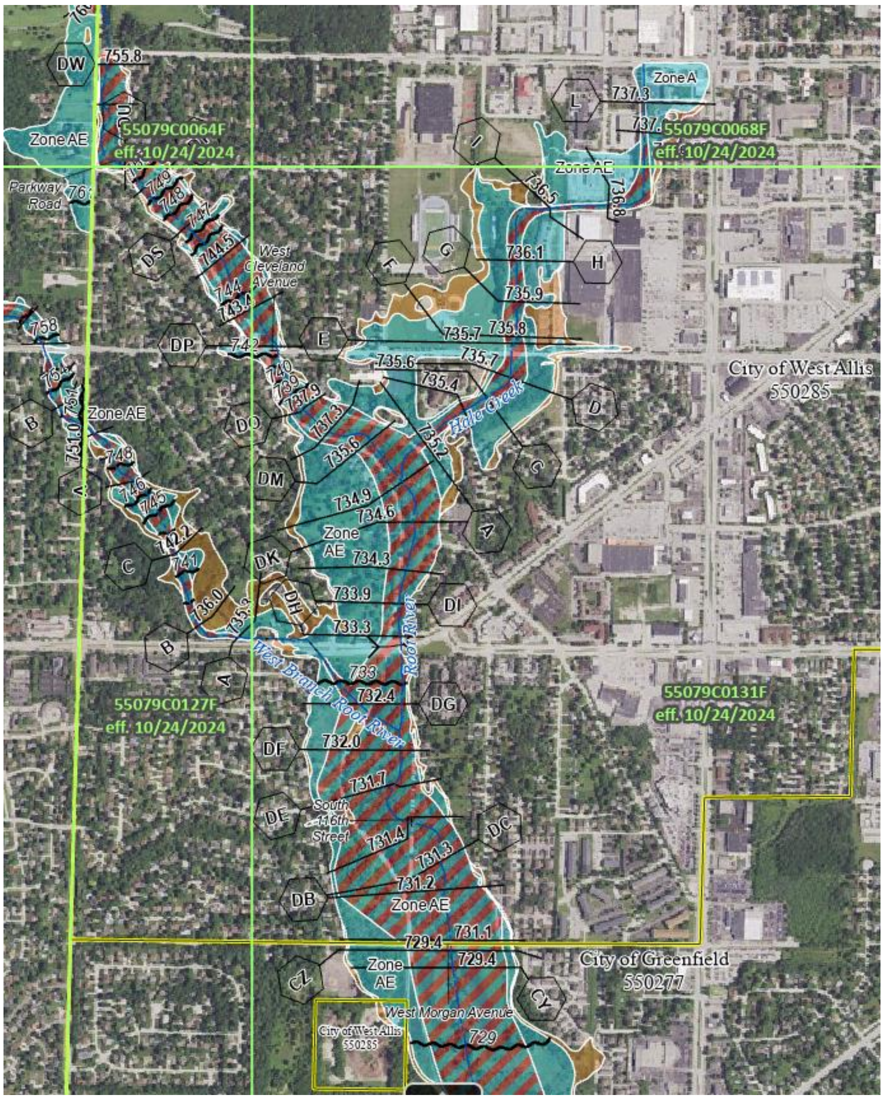
The dark lines are the major streets in the Honey Creek flood area. The blue line is the approximate location of Honey Creek in the twin box storm sewer.

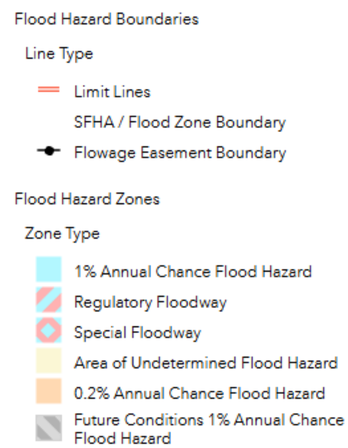
ROOT RIVER FLOODING

The area around Root River had a similar experience including Hale Creek. As the Root River watershed received rain and its level rose, Hale Creek also backed up. Both received the maximum amount of storm water, so they backed up into the West Allis storm sewer system impacting streets and homes.

Also, like with Honey Creek, debris traveled downstream creating local blockages not only in the Root River itself, but at bridges spanning over the Root River and Hale Creek. These blockages restricted flow in both the river and creek adding to the backups and overtopping of the banks.

The Root River, unlike Honey Creek, is in a flood plain.





Source: FEMA's National Flood Hazard Layer (NFHL) Viewer Website

The 1% annual chance flood hazard is the 100-year storm.

The 0.2% annual chance flood hazard is the 500-year storm

Note: FEMA does not analyze or map the 1000-year flood plain.

FLOODING IMPACTS

There were reports from all around the City inside and outside these 2 primary areas of flooding. Private properties were impacted the most. The damages ranged from water in the basement damaging carpets to basement wall collapses. These damages, no matter how small they sound, are incredibly impactful to the private property owner.

There also were impacts to public property. Fire Station 2 roof leaked, the new DPW facility had a sinkhole in the gravel near the foundation, and the City's storm and sanitary sewer systems experienced damage to catch basins, manholes and pipes. There was some minor erosion around the bridge abutments where Root River goes under W. Lincoln Avenue near S. 124th Street.

Due to the amount of stormwater in these two areas, the City let an emergency televising contract for both the sanitary sewer and storm sewer systems to determine if there was any underground structural damages. In the sanitary sewer system, there are 2 spot repairs that are needed. In the storm sewer system, there are 4 flood related spot repairs needed. We have added them to existing contracts to have them fixed as soon as possible, if they have not already been addressed by DPW.

ANALYSIS

Flooding events due to large rainfall events can be impactful to individuals and communities. Often, residents want to know what caused the flooding and what the community is going to do to prevent similar flooding from happening in the future. West Allis residents have the same questions and expectations.

Flood mitigation is a complex puzzle to solve. Engineers can design pipes to carry lots of rainwater, but there is a cost for those large pipes. Also, since weather is often unpredictable, there is always a probability of a storm event larger than what the engineers design the storm sewer system for. Typically, communities consider the storm event that is best for their community to design for and set that as the design standard. In the southeast region, a typical design storm for storm sewer pipe is a 5-year or 10-year design storm. This is based on the probabilities that a 5-year and 10-year storm occur more frequently than the larger 50-year or 100-year storms. This design philosophy has the community's storm sewer system containing the majority of storm events. West Allis uses a 5-year storm event to design the storm sewer system.

The Engineering Department did an extremely high-level study to find the pipe sizes and cost of those pipe sizes to see what would be needed to convey the 1000-year storm. Please note that the costs only include the cost of the storm sewer pipe, manholes, junction boxes and catch basins. It does not include the cost of relocating other existing utilities and their laterals; excavation; backfill; pavement, sidewalks, tree, and turf replacements; or possible easements that might be needed for larger pipes. It also presumes that the storm sewers can physically connect to the Honey Creek twin box sewer and that the twin box sewer has capacity for the stormwater.

Pipe sizes range from 15 inches (1.25 feet) in diameter to 126 inches (10.50 feet) in diameter. Manholes range from 48 inches (4.00 feet) in diameter to 108 inches (9.00 feet) in diameter. If a manhole structure larger than 108 inches in diameter is needed, it becomes what is called a junction chamber which is a large rectangular, often built-in-place, structure. For the 1000-year storm, 34 junction chambers that are approximately 14 feet long by 14 feet wide would be needed in addition to all the manholes.

To install all of the storm sewer pipes, manholes, catch basins, junction chambers, and frames/grates, the approximate cost is $23,250,000.00. Here is the breakdown by street:

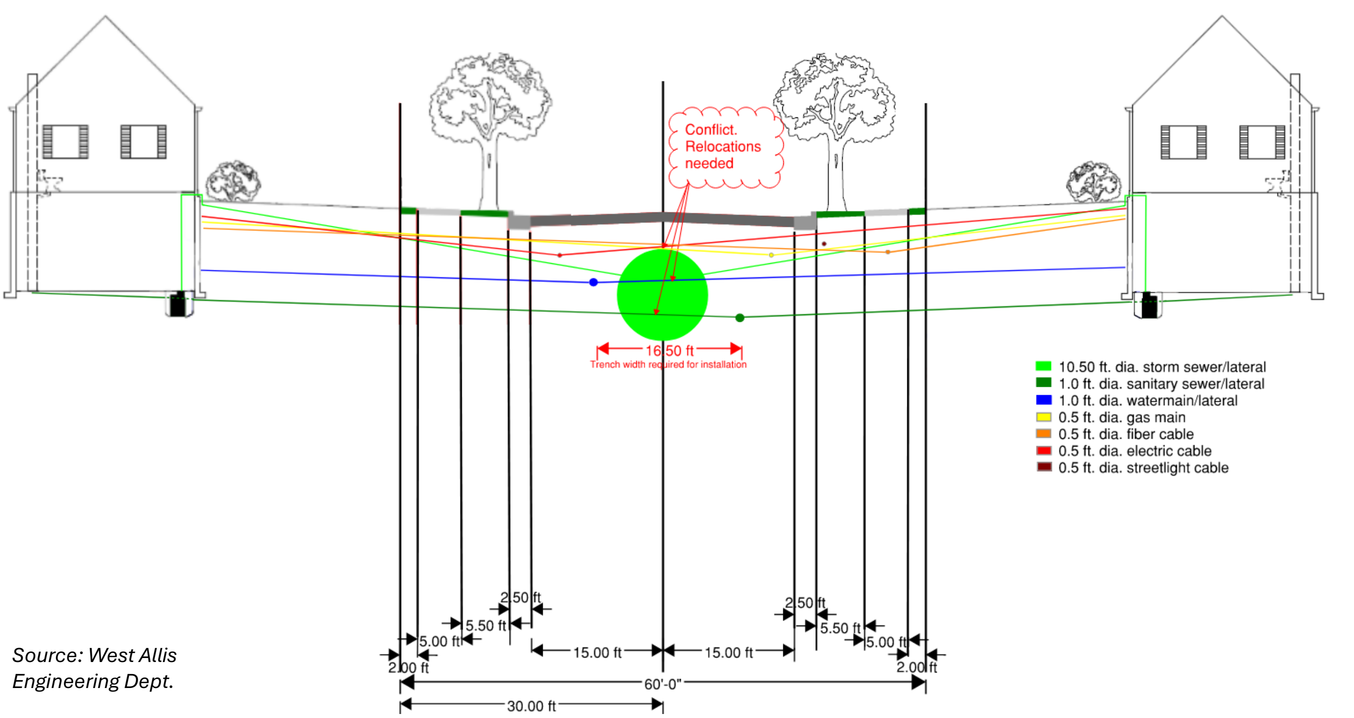
Area	Cost of Pipe	Cost of Structures	Cost of Frames	Subtotal
Orchard Street	$1,081,486.50	$ 540,575.00	$104,100.00	$1,726,161.50
Lapham Street	$ 916,308.00	$ 334,106.25	$ 92,350.00	$1,342,764.25
National Avenue	$3,568,586.00	$1,078,145.00	$312,500.00	$4,959,231.00
Rogers Street	$1,361,520.50	$ 770,438.75	$113,350.00	$2,245,309.25
Area from 80th St. to 81st St.; Rogers to Becher Streets	$ 137,120.40	$ 43,967.50	$ 12,450.00	$ 193,537.90
Becher Street	$2,326,095.50	$ 699,306.25	$145,450.00	$3,170,851.75
Grant Street	$1,635,167.50	$ 704,027.50	$136,150.00	$2,475,345.00
Lincoln Avenue	$1,954,024.50	$1,016,501.25	$217,650.00	$3,188,175.75
Hayes Avenue	$ 790,459.60	$ 184,433.75	$ 59,550.00	$1,034,443.35
Arthur Avenue	$2,003,698.10	$ 752,325.00	$121,050.00	$2,877,073.10
			TOTAL	**$23,212,892.85**

Again, many assumptions went into this analysis.

While some may want the City to budget for this cost, other factors need to be considered before decisions are made. The first is the assumption that there is capacity in Honey Creek during a 1000-year storm event. The City would need to hire a consulting firm to run a model to confirm this assumption. If there are areas of Honey Creek that do not have capacity, then pipes might have to be increased in size to hold the storm water that would be backing up into the storm sewer system. This means an increase in cost.

Another issue to consider is that the streets already have other utilities such as sanitary sewer, gas main, electric mains, watermain, fiber cable, and streetlight cables. There are Wisconsin codes about the required separation between a storm sewer, sanitary sewer and watermain. The code requires an 8-foot separation between the watermain and the sanitary sewer and storm sewer. That separation will be difficult with a 60-foot right-of-way and a 10.50-foot diameter storm sewer and/or the 14-foot-wide junction chamber. Relocation of utilities increases the cost of the project.

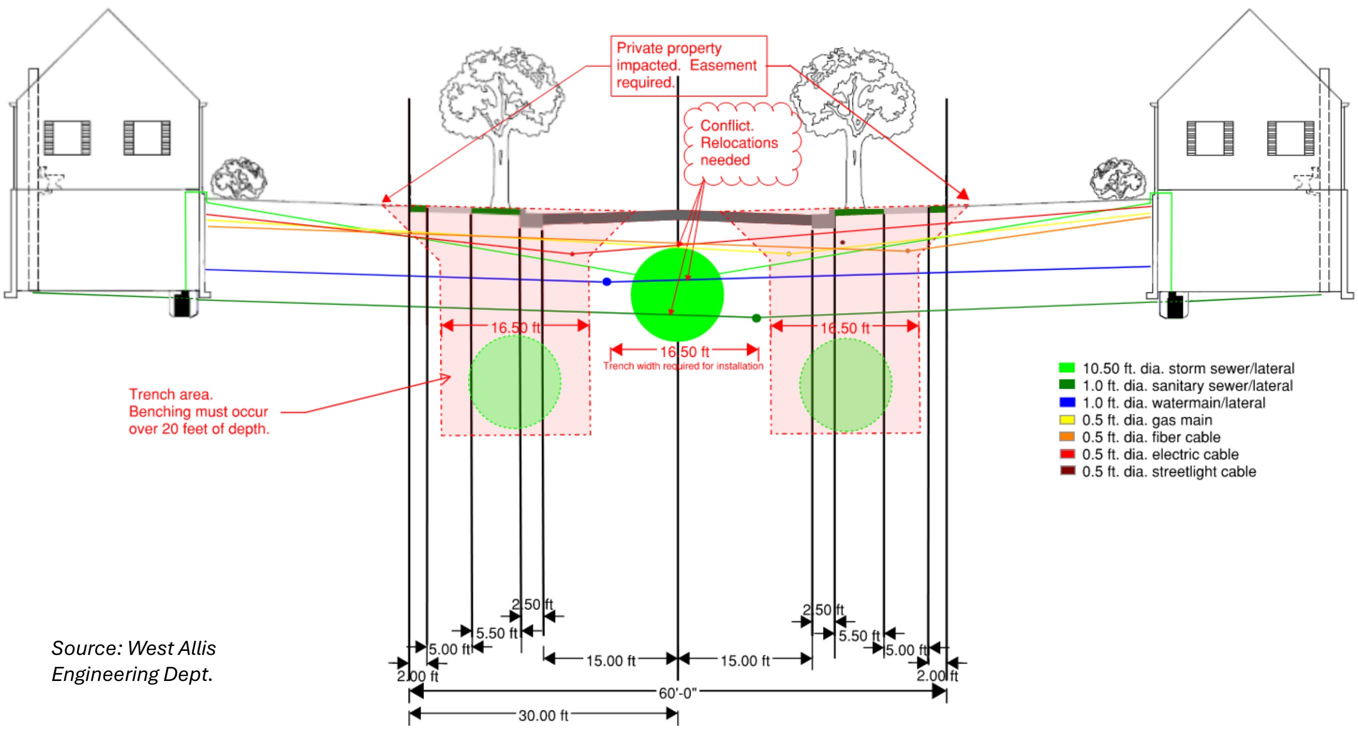
STREET CROSS-SECTION WITH LARGE DIAMETER STORM SEWER



Source: West Allis Engineering Dept.

In addition, consideration needs to be given to the construction process that would be used to install the large diameter storm sewer pipes. A tunnel method probably could not be used due to all the other utilities in the street. This leaves an open cut method. The trench width for a 10.50-foot diameter storm sewer is at a minimum 16.50 feet wide. Depending on where the storm sewer gets located within the right-of-way, the edge of the trench could impact city trees and even private property. Any easements that need to be obtained due to location close to private property which would increase the cost of the project.

STREET CROSS-SECTION WITH ALTERNATE LOCATIONS OF LARGE DIAMETER STORM SEWER DUE TO UTILITY CONFILCTS



Source: West Allis Engineering Dept.

As can be seen, the total estimated cost increases quickly beyond $23,250,000. It is important to remember that this extremely high-level design is only for the 1000-year storm. If the City experiences a 2000-year storm, then there could be flooding that occurs to the same level seen from the August 2025 floods. It might not be that severe. It is unknown. The point is that, with rain events, pipes cannot be built big enough to account for every storm event. West Allis has chosen to design for the more frequent storms knowing that the probability of a 1000-year storm is 0.1% chance of each rainfall. By designing for the frequent events, for the majority of rainfalls, there will not be frequent street flooding (except in very specific areas at creek/river crossings) that occurs and the potential for damage to private property is reduced.

<u>POSSIBLE FLOODING CAUSES</u>
The root cause of the flooding is a rainfall event that occurred which was larger than the storm sewer pipes were designed to carry.

There have been concerns reported about the condition of the storm sewer system in West Allis. The City cleans the storm sewers on a scheduled basis. The Department of Public Works also cleans the catch basins and streets throughout the City on a regular schedule. When streets are going to be reconstructed and on the 5-year capital plan, the storm sewers, manholes and catch basins are inspected to determine if they need replacement during the road construction. If the storm sewers are going to be replaced, the engineers will increase the size of the storm sewer, if possible, to add capacity into the storm sewer system. All of these practices help keep the storm sewer system in working order.

As noted previously, none of the stormwater in West Allis goes to the deep tunnel which is owned and operated by MMSD. West Allis has a separated sewer system meaning the sanitary wastewater and stormwater are in two separate pipes. There are interceptor pipes (Milwaukee Interceptor Sewer (MIS)) which take the wastewater from the West Allis sanitary sewers to the MMSD treatment plant. MMSD decides when to send wastewater to the deep tunnel. When MMSD closes the deep tunnel, if the interceptor pipes are full, they then back up into the local sanitary pipes which may already be at capacity. This could then potentially cause basement backups.

It has been suggested that the City has some valve that was not opened to allow the flood waters to recede. That is not accurate. The City does not have any valve it can open to reduce flooding. Also, there have been reports of three loud bangs that caused the flood waters to go down. There has been no corroboration of banging and flooding receding. Nothing in the storm sewer system would bang which was confirmed by the televising of the sanitary and storm sewer system.

It is very unfortunate, but the cause of the flooding is too much rain for the storm sewer systems, rivers and creeks of the southeast region to convey. Many of the other communities in southeastern Wisconsin experienced some degree of flooding from this event.

SUMMARY

The rain event of August 9 and 10, 2025 was a large storm event. It was beyond the design capacity of most, if not all, storm sewers in the region as well as the rivers and streams. Areawide flooding occurred throughout Milwaukee County and West Allis. To construct a system to contain a 1000-year storm event is not cost effective nor practical. Unfortunately, there is no existing storm sewer system that could have contained the amount of rain that fell especially within the timeframe it fell. This was a devastating event, and no analysis can replace what was lost. West Allis Mayor, Alderpersons and staff take this seriously. While we approach this with empathy, our responsibility is to evaluate the situation logically and identify ways to reduce future flooding risk. We will maintain the storm sewer system, increase pipe sizes where feasible and practicable, and continue responding to events thoughtfully and effectively.

Respectfully submitted,

Melinda K. Dejewski

Melinda K. Dejewski, PE
City Engineer