5- Summary of Recommended Facility Plan

5.1 – Basin 1 Action Plan

Basin 1 Sanitary Sewer Relay Project shown in yellow

5.1.1 – Basin 1 Sanitary Sewers

The recommended project is the improvement of existing sewers by upsizing along the existing alignment, up to the connection to the MIS near Wilson Drive. This new sewer was shown to reduce basement backup risks and provide flood protection that meets design goals for the separated sewer service area.

This alternative includes the following components:

- Disconnection of MH 118 (North Woodburn Street/East Lawnwood Place Intersection) and MH 105 (North Morris Boulevard/East Lawnwood Place Intersection), thereby removing interconnection between Basins 1 and 6 at those locations.
- Upsizing of sanitary piping from MH 91 (East Kenmore Place/North Newhall Street Intersection) to MH 98 (North Larkin Street- south of North Larkin Street/East Olive Street Intersection) from 8-inch diameter to 10-inch diameter.
- Reconstruction of sanitary sewer from MH 98 to MH 103 (North Larkin Street/East Olive Street Intersection) upsize pipe to 15-inch diameter.
- Reconstruction of sanitary sewer on East Olive Street from MH 103 to MH 10022 (West of North Wilson Drive) and upsize pipe to 18-inch diameter.

5.1.2 – Basin 1 Temporary Flood Control Relief Point

The temporary flood control relief point at Olive and Woodburn will convey flows directly to an existing 72-inch storm sewer along Olive Street, which subsequently discharges to the Milwaukee River. The intent is that the temporary flood control relief point will only operate during rainfall events larger than 2 inches in 1 hour.

5.1.3 – Basin 1 Storm Sewers

The recommended storm drainage improvement consists of a new storm sewer on Newhall Avenue, connecting to the recently enlarged storm sewer pipe in Capitol Drive.

Basin 1 Storm Sewer Project shown in Blue

The existing storm sewers at the intersection of North Newhall Street and East Kenmore Place are over capacity during a 2-inch, 1-hour storm. Diverting a portion of the stormwater from North Newhall Street to the East Capitol Drive storm sewer will provide relief to the North Newhall Street/East Kenmore Place intersection. North Newhall Street storm sewer improvements include the upsizing of approximately 700 feet of storm sewer piping to 24-inch diameter from the North Newhall Street/East Kenmore Place intersection to the North Newhall Street/East Capitol Drive intersection.

The direction of the storm sewer piping will be reversed to flow south and connect to the southernmost storm sewer on East Capitol Drive. Results of the analysis show that street flooding near the North Newhall Street/East Kenmore Place intersection is resolved with these improvements for a 2-inch, 1-hour storm event.

It is anticipated that inlets will be incorporated at intersections and at intermediate spacing along North Newhall Street. Sustainable design elements will also be considered during design. Surface flooding has also been observed at the intersection of Wilson Drive and Olsen Avenue.

5.1.4 - Basin 1 North Newhall Water Quality Impacts

No additional water quality measures are proposed since the storm sewers would not add new imperviousness to existing storm discharges to the Milwaukee River at the capitol Drive outfall. Instead, the proposed storm sewer provides a second pipe system as a complement to the existing pipe system that drains Newhall Street. As a result, the Village does anticipate increased pollutant loads and no additional Best Management Practices are proposed at this time.

5.2 – Basin 2 Action Plan

Other than routine maintenance and rehabilitation of the sewer system, no specific interventions (i.e., replacement or upsizing of existing sewers) are recommended for Basin 2 sewers.

5.3 – Basin 3 Action Plan

Other than routine maintenance and rehabilitation of the sewer system, no specific interventions (i.e., replacement or upsizing of existing sewers) are recommended for Basin 3 sewers.

5.4 – Basin 5 Action Plan

Other than routine maintenance and rehabilitation of the sewer system, no specific interventions (i.e., replacement or upsizing of existing sewers) are recommended for Basin 3 sewers.

5.5 – Basin 6 Action Plan

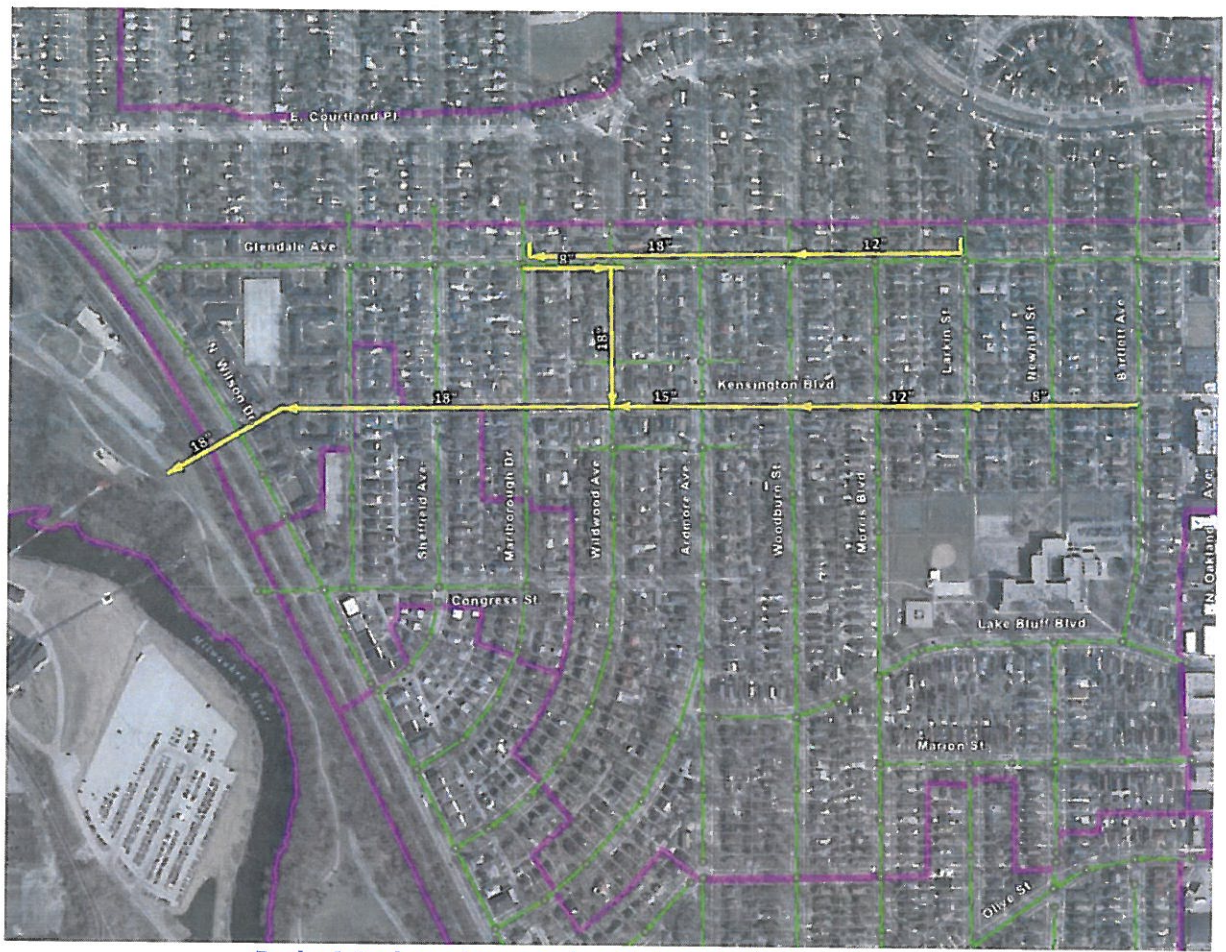
5.5.1 – Basin 6 Sanitary Sewers

The recommended project is the construction of a new sanitary sewer alignment on Kensington Boulevard, the connection of this new sewer to the MIS, and the upsizing of the existing sanitary sewers on Glendale Avenue. This new layout reduces basement backup risks and provides flood protection that meets design goals for the separated sewer service area.

- Separate Shorewood's system from Whitefish Bay's system, and
- Provide a new connection to the MIS

5.5.2 – Basin 6 Temporary Flood Control Relief Points

The alternative improvements modeled and discussed earlier were developed under the criteria of preventing basement backups in Basin 6 during a 2-inch rainstorm. I/I reduction improvements, especially on private property will take several years to complete. Until private property improvements are completed, some level of basement backup protection will be provided for rainstorms exceeding 2-inches by constructing two temporary flood control relief points.



Basin 6 Sanitary Sewer Relay Project shown in yellow

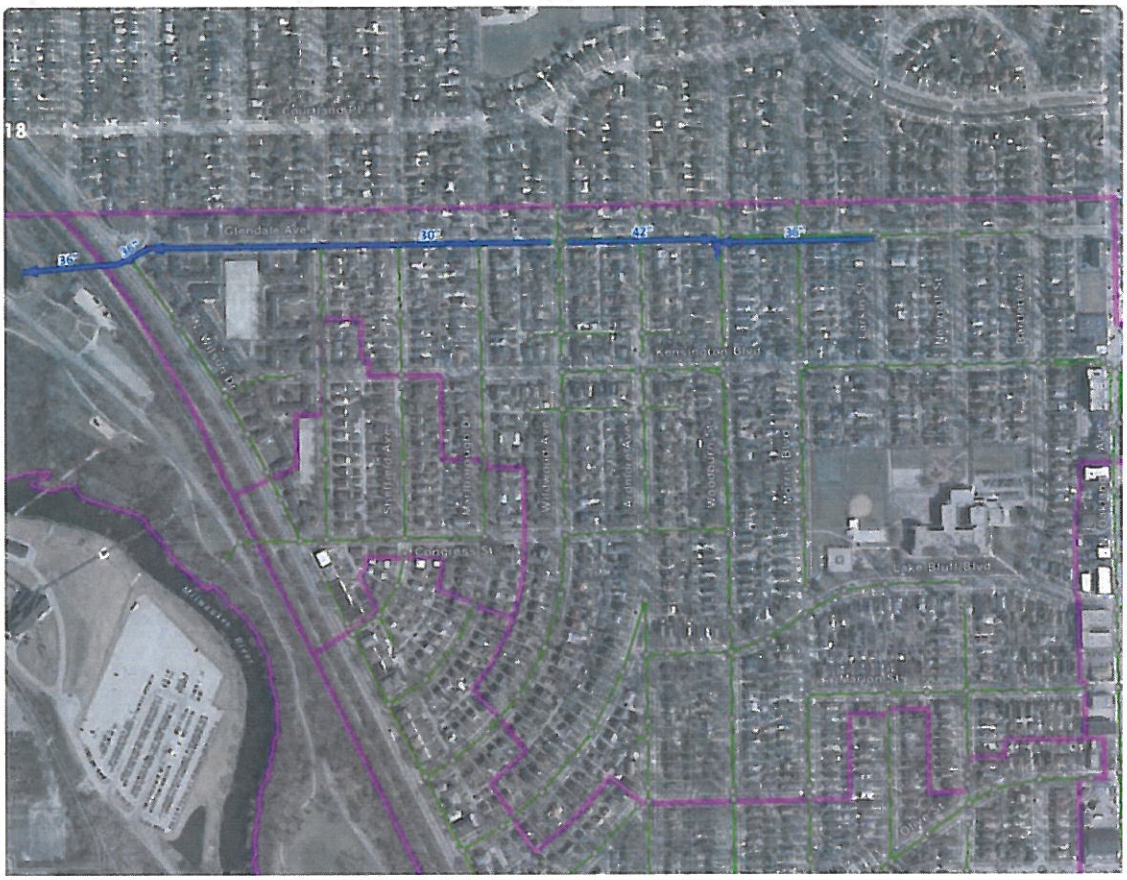
A temporary flood control relief pipe will be installed on Lake Bluff between the Morris sanitary sewer and the Woodburn storm sewer to provide additional basement backup protection on Morris. The overflow rate required would be very small at approximately 90 gpm, which is 0.1% of the 90,000 gpm flow in the large diameter Woodburn storm sewer during a 3-inch rainstorm.

A gravity flood control relief point will also be built at Kensington and Wildwood. The sanitary sewer on Kensington between the MIS and Wildwood will be upsized from 18-inch to 21-inch.

5.5.3 – Basin 6 Storm Sewers

As for storm sewer and drainage improvements, the recommendations for Basin 6 include new storm sewer pipes on Glendale Avenue. A storm sewer is proposed to extend west on Glendale Avenue from Wildwood Avenue draining to a pond in Estabrook Park, which flows to the Milwaukee River.

Storm sewers are also proposed to extend east and west on Glendale Avenue from Woodburn Street. New curb inlets would be installed at each intersection.



Basin 6 Storm Sewer Project shown in blue

5.5.4 - Basin 6 Glendale Avenue Water Quality Impacts

No additional water quality measures are proposed since the storm sewers would not add new imperviousness to existing storm discharges to the Milwaukee River at the Glendale Avenue outfall. Instead, the proposed storm sewer provides a second pipe system as a complement to the existing pipe system that drains Glendale Avenue. As a result, the Village does anticipate increased pollutant loads and no additional Best Management Practices are proposed at this time.

5.6 – Combined Area NORTH Action Plan

5.6.1. Combined Sewers

The recommended solution is the construction of combined sewers on Kensington, Murray, Lake Bluff, and Prospect to increase drainage capacity and reduce basement backups in the northern third of the combined sewer service area.

North Area Combined sewer improvements shown in Red

The recommended solution is to follow the improvements included in Alternative 2. The recommendation is based on the following factors:

- Greater number of basement backups reported along the alignment, therefore Alternative 2 addresses more vulnerable properties directly.
- Leaves larger existing pipes in place on Cramer and Farwell, replaces smaller pipes on Murray and Prospect. Increases total available capacity more than Alternative 1, larger incremental benefit compared to existing system.
- Provides higher hydraulic capacity than Alternative 1, especially for the east half of the project service area.

- Eastern Lake Bluff segment provides protection to a pocket of highly susceptible area.
- Alignment follows roads in worse condition compared to Alternate 1 routing, provides opportunity to combine street program with sewer construction. The recommended project is a two year program, with a total estimated cost of $2.94 million.

5.6.2. Temporary Flood Control Relief Points

No new flood control relief points are proposed for the combined area north improvements.

5.6.3. Storm Sewers

No new storm sewers in the north combined area are proposed. A number of storm sewer segments have been constructed in this area since 2004, as part of the MMSD supported and funded Wet Weather Flow management project. This project was a comprehensive effort to reduce the wet weather flow in combined sewers.

5.6.4 – Combined Area NORTH Water Quality Impacts

The proposed project does not affect the stormwater quality conditions in the area. Previously, the water quality impacts of each storm sewer segment that removed flow form the combined sewers was mitigated by the construction of 59 rain gardens and installation of 289 rain barrels.

5.7 - Combined Area EAST CENTRAL Action Plan

5.7.1 – Combined Sewers

The recommended solution is to construct a new combined sewer on Jarvis Street to reroute flows in existing combined sewers, the upsizing and relaying of combined sewers on Ridgefield Circle, and the construction of new storm sewers on Ridgefield Circle for future connection to storm sewers.

Central East Area Combined Sewer Improvements shown in Red

The recommendation is based on the following factors:

- Achieves desired backup risk reduction on Richland Court without depending on future projects.
- Leaves existing Richland Court pipe in place. The large pipe will increase protection against backups.
- Involves less pipe construction than Alternative 1, and is therefore less costly.
- Addresses Ridgefield Circle basement backup and drainage issues, while partially depending on the future construction of the storm sewers in the combined area.
- Alignment follows roads currently in the 2011 road reconstruction program, does not increase the construction area.

The recommended project is coordinated with the 2011 street reconstruction program, though construction is likely to occur in 2012. The total estimated cost is $2.94 million.

Detail of the Wood Place Relief Point

5.7.2 – Temporary Flood Control Relief Points

There is one temporary flood control relief point at East Wood Place and Downer Avenue proposed to be constructed to relieve hydraulic surcharging in the combined trunk sewer system.

This relief point will require the construction of storm sewer outlets to allow gravity flow operation.

5.7.3 – Storm Sewers

A new storm sewer will be built on Ridgefield Circle and, for now, will be connected to the combined sewer on Downer. It is anticipated that the Village's long term separation policy will bring a storm sewer outlet to this location and thus achieve separation in the future.

5.7.4 – Combined Area EAST CENTRAL Water Quality Impacts

Despite the proposed storm sewer, there will be no changes to the water quality conditions in the area because the storm sewer will discharge into the existing combined sewer. The stormwater quality concerns associated with the establishment of a new outfall to Milwaukee River will be addressed as part of the overall separation plan for the combined sewer SOUTH area.

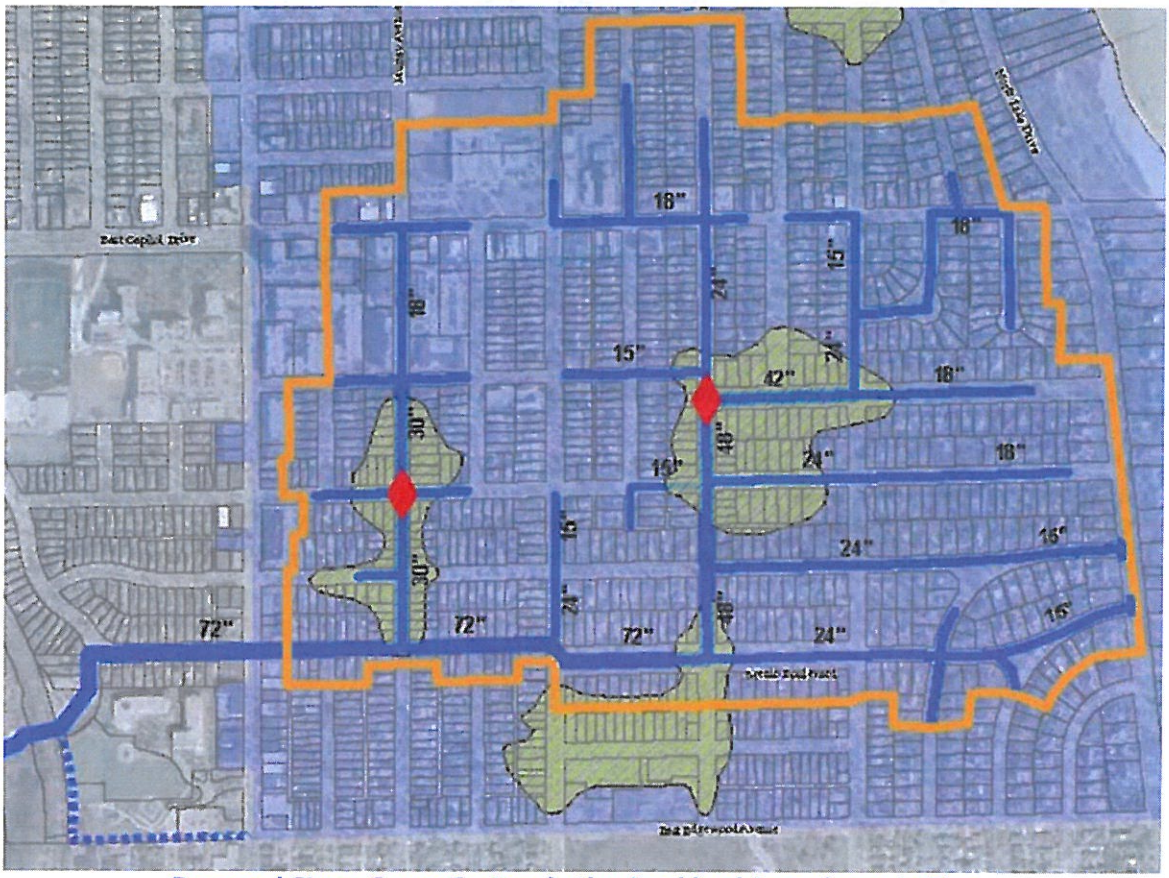
5.8 – Combined Area SOUTH Action Plan

5.8.1 – Combined Area SOUTH - Combined Sewers

No new combined sewers or combined sewer upgrades are proposed in the combined sewer service area south of capitol Drive.

5.8.2 – Combined Area SOUTH - Storm Sewers

The recommended solution is the construction of new storm sewers to relive the runoff flows within the combined sewers, thereby reducing basement backup risks in the entire combined area south of Capitol Drive. The reduction of flows will also increase drainage capacity in the entire system and provide basement backup risk reduction in areas north of Capitol Drive as well.



Proposed Strom Sewer System in the Combined Area shown in Blue

The recommended project provides for the construction of a deep and large pipe/tunnel that daylights at the Milwaukee River. This deep pipe is called the "Milwaukee River Outfall" because it provides the opportunity to construct new storm sewers that now have a discharge point to Milwaukee River.

The recommended project proposes conventional storm sewers throughout the area and each of these systems are intended to be connected to the new outfall. In addition to the conventional storm sewer system, a secondary collection system is proposed to be installed under the curb to provide a discharge location for potential future foundation drain disconnections in Shorewood.

5.8.3 –Temporary Flood Control Relief Points

There are two temporary flood control relief points proposed to be constructed to relieve hydraulic surcharging in the combined trunk sewer system. Both are located in areas that are topographically depressed. As a result, the sewer system is overloaded during extreme weather events. These overflows will act as "safety valves" to reduce hydraulic surcharging and the resulting basement back-ups in the system during catastrophic precipitation events. The use and need for these overflows will gradually diminish as the combined sewer system is virtually or completely separated.

The two are proposed to be located at:

1. Beverly Avenue and Murray Avenue
2. East Shorewood Boulevard and Prospect Avenue

Both will require the construction of storm sewer outlets to allow gravity flow operation. Gravity flow operation was chosen over pump operation because of the large flows that the system is subject to during extreme weather events.

5.8.4 – Combined Area SOUTH Water Quality Impacts

The intent of the proposed storm sewer project is to continue to provide first flush discharges to the MMSD system, just as it occurs presently. Together with the Department of Natural Resources Stormwater Specialist staff, the Village will determine the minimum amount of flow to direct to the Jones Island treatment plant to continue to realize the stormwater treatment and TSS reduction benefits at similar levels to the current levels.

Therefore, the water quality impacts of the proposed new outlet to the Milwaukee River will be mitigated by the continued direction of first flush runoff to the MMSD system for treatment.