

Sanitary Sewer System Modeling and Capacity Analysis for Year 2030 and Year 2050 Forecast Development in Bloomington's South Loop District

Hydraulic modeling and capacity analysis of Bloomington's sanitary sewer system, for year 2030 and year 2050 revised forecast development in Bloomington's South Loop District, has been completed. The analysis indicates that several of the mainline segments within the South Loop district do not have adequate capacity to serve the updated forecast development scenarios for years 2050 as well as 2030. Maps showing the mainline segments where modeling indicated inadequate capacity are attached for review.

Hydraulic modeling was completed utilizing H2OMAPSWMM Software (from MWH Soft). The model was originally built in 2008 by the City's consultant, Black and Veatch, as part of the City's *Comprehensive Sanitary Sewer System Hydraulic Model* project. Updates to this model reflecting system pipe changes, as well as revised flow forecasts, were input by City staff. Hydraulic analysis examines the calculated volume and level of flow in the sanitary sewer system pipes, over a 24 hour period, under wet weather conditions. Pipes where modeled flow levels exceeded 85% full, under peak flow conditions, were considered as unacceptable and the associated pipe systems were examined for potential upgrade.

Modeled Sewer flow loading was based upon the following:

1. For the majority of properties located outside of the South Loop District, the estimated max day - average daily flow rates from the year 2030 wet weather flow scenario in the original 2008 B&V model were used.
2. For the properties located in the South Loop District that are not expected to experience any future redevelopment, current average daily consumption records during winter months were used along with a thirty percent multiplier to reflect the max day use.
3. For properties in the South Loop, Normandale Lakes, and Penn American Districts, sewer flows were estimated by comparing the most recent development projections with Met Council SAC unit flow rates. Note that these development projections were taken from the City's Forecast Tracker component within the Geographic Information System which is maintained by Bloomington's Planning Division.

Analysis indicates that the total average daily sewer flow rates (out of the South Loop District) could increase the existing flows by **2.5** times in year **2030** and by **3.2** times in year **2050**. Analysis also indicates that the total peak sewer flow rates (out of the South Loop District) could increase the existing flows by **3.0** times in year **2030** and by **3.6** times in year **2050**.

Year 2030 H2OMAP SWMM Modeling Results

H2OMAP SWMM modeling results (under the **year 2030** development forecasts) indicated that there were **twenty-eight pipe segments** in the South Loop District where projected flow rates **exceeded 85% full**. The total length of these segments is about **8,500 feet** involving **8-inch through 36-inch pipe**.

Year 2050 H2OMAP SWMM Modeling Results

H2OMAP SWMM modeling results (under the **year 2050** development forecasts) indicated that there were **forty-nine pipe segments** in the South Loop District where projected flow rates **exceeded 85% full**. The total length of these segments is about **16,150 feet** involving **8-inch through 36-inch pipe**.

Potential System Upgrades to Accommodate 2050 Development in the South Loop District

The pipe segments showing signs of unacceptable flows, in the South Loop District, are generally located in the same areas for both the 2030 and the 2050 development forecasts. The system upgrades necessary to serve the 2050 versus the 2030 development are characterized primarily as increases in pipe diameter and length. As the development densities increase roadway infrastructure improvements would occur throughout the district. In an effort to protect these new roadways and keep restoration costs in check, it is recommended that the sewer system improvements necessary to serve the 2050 development be completed. (It would not be prudent to tear up a road with a fifty year design life just twenty years after construction to increase a sewer pipe diameter or extend a line when the need was identified earlier).

The following system upgrades were entered into the model in an attempt to minimize the number of pipe segments showing indications of unacceptable flow characteristics within the **2050** modeling results. (An estimated cost is included for each improvement which was based on the unit rates within the 2008 Black and Veatch Comprehensive Sanitary Sewer System Hydraulic Model Report. Note that detailed design would be necessary to develop a more accurate estimate):

1. Ten segments or 3,300 feet of 18-inch RCP in East American Blvd would be replaced by 21-inch PVC. (Estimated cost **\$1,225,000**).
2. Three segments or 1,037 feet of 8-inch VCP in 28th Ave S would be replaced by 12-inch PVC. (Estimated cost **\$221,000**). (Note this work was recommended in the 2008 Black and Veatch report as item CIP-03).
3. Eight segments or 2,400 feet of 21-inch RCP in 24th Ave S would be replaced by 24-inch PVC. (Estimated cost **\$962,000**).
4. Three segments or 700 feet of 12-inch VCP in E Old Shakopee Rd and 24th Ave S would be replaced by 15-inch PVC. (Estimated cost **\$150,000**).
5. One segment or 400 feet of 27-inch PVC would be installed in Killebrew Dr. (Estimated cost **\$175,000**). (Note this work was recommended in the 2008 Black and Veatch report as item CIP-02).
6. Six segments or 3,900 feet of 36-inch RCP in Cedar Ave S/TH 77 would be replaced by 48-inch RCP. (Estimated cost **\$2,680,000**). (Note this work was recommended in the 2008 Black and Veatch report as item CIP-01).
7. As an alternate to item 6 above new pumps would be installed at the old main lift station along with forcemain rehabilitation to divert flow south away from the over burdened 36" RCP. (Estimated cost **\$1,885,000**).

Summary

When the system upgrades identified above were entered into the sewer model, the resulting data output for all of the pipes within the South Loop District indicated pipes running below 85% full. The estimated cost for these upgrades would be roughly \$5 million to \$6 million (according to unit prices in the 2008 Black and Veatch report). Again the most accurate cost estimate for this work would require a detailed engineering design because of conflicts with traffic, LRT, extremely large storm sewer lines, ground water, and other public utility lines. Staff will continue to update the sewer model as pipes in the system are upgraded, as flow monitoring calibration information becomes available, and as forecast development is completed.

South Loop District Sewer Modeling for Year 2050 Forecast Development

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- Alternate 1 Pipe Upgrades to Accommodate Increased Flows

