CITY OF RAPID CITY

RAPID CITY, SOUTH DAKOTA 57701-5035

Engineering Services

300 Sixth Street
Telephone: (605) 394-4154
FAX: (605) 394-6636
Web: www.rcgov.org

MEMORANDUM

TO: Public Works Committee

FROM: Keith Johnson, Project Administrator

THROUGH: Dirk Jablonski, Public Works Director

SUBJECT: North Rapid High Level and Low Level Water System Modeling for NE Rapid City prepared by Ferber Engineering, Inc. dated June 29, 2007

DATE: August 8, 2007

Staff is requesting adoption of the above-referenced report.

A copy of the report is in the Caucus Room for your review.

The report includes the recommended water main sizing for Memorial Park and Farlow Avenue, East Mall Drive and East Anamosa Street.

If you have any questions please contact Keith Johnson.

- 24-inch Low Level main along East Boulevard/Maple Avenue from North Street to East Anamosa Street.

The system shown was analyzed with the North Rapid Booster station both at its current location at the intersection of Anamosa Street and Dilger Avenue and at a possible location at College Park as accommodated in the Anamosa Street Preliminary Design. No booster station design was completed; it was assumed that the future system would operate under the same characteristics as the existing booster station. **Appendix C contains the output information for the interim model with the booster station in both locations.**

8.0 Conclusions and Recommendations

8.1 Memorial Park and Farlow Avenue Water Main Reconstruction – W07-1634

The existing 20-inch ductile iron main in Dilger Avenue supplies water to the North Rapid Booster with about 20% of the total pipe flow being conveyed to the EAFB water main at Maple Avenue via a 16-inch main in Anamosa Street. The majority of this study focused directly on the size and arrangement of various water mains in the area of the Memorial Park and Farlow Avenue Water Main Reconstruction project. The design of the reconstruction project began as a 2,600-foot large diameter water transmission main replacement for the North Rapid Booster station supply. However, upon completion of this study it was found that more 16-inch PVC diameter main can be constructed to serve two purposes: first and foremost supply water to the North Rapid Booster and, secondly, to begin the third east-west transmission main along North Street.

Since most of the water supplied to EAFB is conveyed via the East Boulevard / Maple Avenue 18-inch main on a much more direct route, the Memorial Park and Farlow Avenue Water Main Reconstruction project using 16-inch mains is reasonable. Future CIP projects will be specified to reconstruct the existing East Boulevard / Maple Avenue 18-inch water main as a 24-inch ductile iron main.

The Memorial Park and Farlow Avenue Water Main Reconstruction project will not only include the Farlow Avenue transmission main, but will also extend 16-inch PVC along North Street east of Haines Avenue as far as possible within the current project budget. The ultimate goal is to tie the proposed 16-inch main to the 18-inch East Boulevard main.

To verify the adequacy of the proposed 16-inch water mains in Farlow Avenue and North Street the proposed 16-inch main in Farlow Avenue and the proposed 16-inch main in North Street from Farlow Avenue to East Boulevard were modeled in the existing conditions model. The layout can be seen in Exhibit 1. The model results are provided in Appendix D.

A comparison of the existing system to the same system with the proposed modifications was performed. A one (1) gallon per minute fire demand was placed on all junctions in the system and a fire flow analysis was completed under Peak Hour conditions. The one gallon per minute demand allows the model to determine the Total Flow Available within the pressure criteria outlined above. By running the existing conditions and the modified

conditions model under the same assumption, a comparison of the Total Flow Available provides a way to judge the immediate adequacy of the proposed improvements. It was found that with both proposed 16-inch water mains, some loss in Total Flow Available occurs, but adequate fire flows are still maintained within the system and at nearly all junctions. Figure 2 shows the Total Flow Available under existing conditions and the difference in Total Available Flow between the proposed and existing systems. Negative numbers represent the temporary lost available flow. A 22"x34" replica of Figure 2 can be found in the map pockets in Appendix E.

8.2 E. Mall Drive Connection – ST06-1334b

This water model was used to verify the findings in previous reports for the sizing of the proposed water mains in East Mall Drive between North Lacrosse Street and East North Street. The model shows that 16-inch North Rapid High Level and Low Level mains should be constructed from the Eglin Street Extension project on the south side of Interstate 90 to East Mall Drive. From the 16-inch mains at East Mall Drive 14-inch North Rapid High Level and Low Level mains should be constructed to North Lacrosse Street. The proposed 14-inch Low Level main should also be extended east along East Mall Drive to the intersection of East Mall Drive and East North Street and connected to the existing 14-inch water main.

8.3 E. Anamosa Street Extension – ST04-1397

The information provided in this study shows that in the interim buildout condition a 20-inch Low Level main and 16-inch North Rapid High Level main are needed in East Anamosa Street from WalMart to East North Street. In addition, the existing High Level 10-inch main in East Anamosa Street between Lacrosse St and WalMart should be replaced with a 12-inch main. The Low Level system should be extended using a 12-inch main extending from WalMart to Lacrosse Street. Eventually, this Low Level main will be connected to the 16-inch Low Level Van Buren Street water main via a 12-inch main in Lacrosse Street.

The Low Level and North Rapid High Level zones between the Eglin Street Extension project and the East Anamosa Street project should be connected with 20-inch and 16-inch diameter pipes, respectively. The alignment of the pipes will probably be along the future extension of Luna Drive. Regardless of the final location, the 16-inch and 20-inch mains must be extended to the future Luna Drive intersection and 12-inch mains can be constructed west of that location along East Anamosa Street.