

Technical Memorandum – City of Comstock Flood Control Levee

To: Bruce Spiller
From: Randy Engelstad, PE; Gregg Thielman, PE, CFM; Jerry Bents, PE
Subject: AWD-00018 Land Management Improvements Evaluation No. 1 (Comstock, MN)
Date: 7/1/2013
Project: FM Metro Flood Risk Management Project

1.0 Purpose of Memorandum

This memorandum is to review the conceptual plan and design assumption for the proposed levee alignments for the City of Comstock, MN.

2.0 Levee Elevations

Levee elevations for this project were based off of Phase 7.0 HEC-RAS modeling of option VE13A for the FM Metro Diversion. The 1 percent chance elevation at Comstock, MN based off of this modeling was an elevation of approximately 922.30 and the 0.2 percent chance elevation at Comstock, MN was also at an elevation of approximately 922.30. For the design of the levee, the 1 percent chance and 0.2 percent chance elevations were rounded up to the nearest half foot. The 1 percent chance and 0.2 percent chance elevations are the same since the city of Comstock is located in the upstream staging area of the FM Diversion. To meet FEMA requirements to certify the levee after construction the levee must maintain a freeboard of 3 to 3.5 feet above the 1 percent chance floodplain elevation, the higher elevation being on the upstream end of the levee. The proposed levee elevations for Comstock would be set at 926.50 on the north end of the city to provide 4 feet of freeboard. The additional 1 foot of freeboard over the required amount was factored in based on an assumed levee settlement amount of 6 inches and 6 inches of topsoil to be placed on top of the clay levee. The top elevation of the proposed levee on the south side of town was 927.00, assuming the same amount of topsoil and assumed settlement as the north levee section while adding an extra half foot of freeboard for the upstream portion of the levee.

3.0 Closures

As part of the proposed levee project Clay County Highway 2 (CH 2) is to be raised to an elevation of 926.67 at the edge of the driving lane which is the height of the levee at this location. The tie in elevation for this road raise on CH 2, along with Trunk Highway 75 west of the levee is above the 1 percent chance elevation. This will provide access for the residents of Comstock by not having to construct an earthen closure during a high water event. Where the levee crosses CH 2 east of Comstock, an earthen levee will be constructed to protect against waters above the 1 percent chance elevation. The railroad closure on the north and south side will also need to have earthen closures constructed to provide protection above a 1 percent chance event.



4.0 Levee Alignment

The levee alignment on the west side of Comstock was dictated by the sight distance required for the CH2 road raise. The current alignment of the road raise will require the speed limit west of the levee on CH 2 to be reduced to 40 MPH. The alignment on the north and east side of Comstock was given adequate distance for an internal ditch which will be constructed along the levee. The City of Comstock requested that future development to be taken into account in the levee layout. South of CH 2 and east of the BNSF railroad, an area for future development was included in the levee protection for Comstock. This will allow for an access road and lots to be developed in the future along with an interior drainage ditch along the levee. The alignment of the levee east of the railroad on the south side provides protection of the existing ditch that runs adjacent to the railroad. West of the railroad tracks on the south side, the alignment of the levee was placed to include the secondary internal pond along with the future commercial expansion.

5.0 Internal and External Drainage

5.1 External Drainage

The following describes the existing drainage patterns for the area within and surrounding the City of Comstock with no diversion ditches or levee project in place. East of the railroad, storm water from the adjacent field southeast of town drains north along the railroad and under CH 2 through culverts and continues along the railroad where it crosses under the railroad north of town and drains northwest. An existing drainage ditch runs through the field located southwest of town and west of the railroad. This flow continues northward where it crosses under CH2 through a culvert and continues north through the west side of town.

Under the proposed levee options, existing flow from the southeast will be diverted by an external ditch installed around the outside of the levee. This ditch will carry the storm/flood water to the east and then north around town. There will be no culverts through the levee for water to enter town. Existing flow from west of the railroad coming from the south side of Comstock will be diverted to a proposed external ditch which will carry the water west along the levee. Water will travel north and discharge into the original drainage ditch. A 20' bench will be constructed between the levee and the external ditch, which will be placed at the adjacent field elevation, to help protect the stability of the proposed levee.

5.2 Internal Drainage



Interior drainage east of the railroad will continue to drain to the north, however, instead of exiting town through an existing ditch on the east side of the railroad, the water will enter an internal ditch which will carry the water to a new lift station to be installed in an interior storm water pond. The structure will include gates that will be closed in times of high water. Once closed, storm water and snow melt can accumulate in the proposed pond as shown in the attached site plan drawing. A pump station will be installed that will drain the pond. There is also a pond located in the southwest corner which will be utilized for interior drainage storm water storage. A ditch will be constructed to connect the two ponds and storm water will be able to flow freely between both ponds where additional storage can be utilized.

5.2.1 Internal Storage

The proposed ponds were initially sized to provide additional fill for the proposed levee. After the ponds were sized, rainfall analysis was performed using storm events listed by NOAA Atlas 14 Precipitation-Frequency Atlas of the United States for Minnesota. The 2, 5, 10, 25, 50, and 100-yr rainfall events were modeled using the LiDAR surface combined with the proposed ponds for the available internal storage. A review of the existing ground contours and building locations found that the lowest structure in town had an approximate elevation of 920.00. The 920.00 elevation was used as the critical elevation. The available internal storage at the critical elevation is approximately 4 inches of runoff, 58 acre-feet of storage, with no outflow or pumping from the pond. Interior drainage ditches along the levee were not taken into consideration for preliminary internal storage design; these ditches will provide additional internal storage when they are constructed.

6.0 Miscellaneous Design Information

6.1 Sewage Lagoons

New sewage lagoons are to be constructed within the levee. The current sewage lagoons north of town do not have adequate protection against the 100 and 500-yr flood. Sewage lagoons are to be constructed near Comstock where a newly constructed levee will provide protection against high water events.

6.2 Development Space

The levee design southeast of Comstock allows for a future residential development area including streets and lot layout. Appropriate space was allowed for the construction of internal ditching along the levee while providing space for street and lots. The future development area will be able to include a storm sewer system which will connect to the existing ditch that runs adjacent to the east side of the railroad tracks.

