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Maximum Water Surface Elevation for Inflow Design Flood (IDF) at White Tank Flood Retarding Structure No.3 under Current Conditions

By
Bing Zhao, Ph.D., P.E.
Civil Engineer
Hydrology Branch, Engineering Division
Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, AZ 85009

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1. Objective

The main objective of this study is to determine the maximum water surface elevation for Inflow Design Flood (IDF) at White Tank Flood Retarding Structure No.3(WT #3) under current conditions. The IDF maximum water surface elevations under future conditions will also be determined, and compared with those under current conditions. The results of this study will be compared with those of a previous study.

2. Methodology

2.1 Inflow Design Flood (IDF)

The IDF used in this study is the 1/2 PMF (Probable Maximum Flood). The PMF results from the 6-hour local PMP (Probable Maximum Precipitation) by running the NRCS TR-20 model (NRCS, 1998). The NRCS TR-20 model is a rainfall-runoff model. Based on NRCS (1998), the 6-hour local PMP is the most critical storm since it gives the highest maximum water surface elevation with the largest outflow at WT #3. The IDF hydrograph ordinates for this study are obtained by dividing the 6-hour local PMF hydrograph ordinates by 2. The IDF will be the inflow to reservoir routing for WT #3.

2.2 Reservoir Routing Model

The reservoir routing model is developed by modifying the NRCS TR-20 model (NRCS, 1998). The modifications include (1) replacing the reservoir stage-storage rating curve with the new rating curve based on FCDMC 1998 topography; (2) using three different initial routing stages (i.e., empty reservoir elevation , sediment pool elevation, emergency spillway crest elevation); and (3) using both existing and future

conditions (i.e., without/with future inlet improvement). The sediment pool elevation corresponds to the elevation of 500 ac-ft storage. The sediment pool elevation (1197.1') for 500 ac-ft is based on the 1998 topography while the NRCS sediment pool elevation (1196.5') for 500 ac-ft in NRCS TR-20 model is based on the old topography. The split flows for existing conditions along Beardsley Canal at Olive Avenue and Northern Avenue are based on White Tanks ADMP (WLB, 1992). The split flows for future conditions are from NRCS TR-20 model (NRCS, 1998).

3. Results for IDF (1/2 PMF) Routing

3.1 Maximum Water Surface Elevations under Existing Conditions

For the existing conditions, the future WT #3 inlet improvement is not included in the TR-20 model. The split flows along Beardsley Canal at Olive Avenue and Northern Avenue are based on White Tanks ADMP (WLB, 1992). The three initial routing stages correspond to empty reservoir, the anticipated sediment pool, and full reservoir (at emergency spillway crest). The digital TR-20 models (hfpmfex.dat, hfpmfex1.dat, hfpmfex2.dat) and their output files can be found in the pocket of this report. The results are obtained by running TR-20 (PC version 2.04 Test). The results can be seen in Table 1.

Table 1. Maximum Water Surface Elevations for Existing Conditions

Initial Routing Stage	Maximum Water Surface Elevation under Existing Condition When Routing IDF (1/2 PMF)	*TR-20 Input File Name*	*TR-20 Output File Name*
Start Routing at 1176'(empty reservoir elevation)	**1210.34'**	**Hfpmfex.dat**	**Hfpmfex.out**
Start Routing at 1197.1'(sediment pool elevation)	**1210.85'**	**Hfpmfex1.dat**	**Hfpmfex1.out**
Start Routing at 1210'(emergency spillway crest elevation)	**1213.02'**	**Hfpmfex2.dat**	**Hfpmfex2.out**

3.2 Maximum Water Surface Elevations under Future Conditions

For the future conditions, the future WT #3 inlet improvement is included in the TR-20 model. There is an existing earthen channel along the west bank of Beardsley Canal with roadway crossings at Olive Avenue and Northern Avenue. The future inlet improvement is the upgrade of the earthen channel, which will allow the channel to carry more flow to WT #3. The split flows along Beardsley Canal at Olive Avenue and Northern Avenue are based on NRCS (1998). The three initial routing stages correspond to empty reservoir, the anticipated sediment pool, and full reservoir (at emergency spillway crest). The digital TR-20 models (halfpmf1.dat, halfpmf1.dat, halfpmf2.dat) and their output files can be found in the pocket of this report. The results are obtained by running TR-20 (PC version 2.04 Test). The results can be seen in Table 2.

Table 2. Maximum Water Surface Elevations for Future Conditions

Initial Routing Stage	Maximum Water Surface Elevation under Existing Condition When Routing IDF (1/2 PMF)	TR-20 Input File Name	TR-20 Output File Name
Start Routing at 1176'(empty reservoir elevation)	**1211.51'**	**Halfpmf.dat**	**Halfpmf.out**
Start Routing at 1197.1'(sediment pool elevation)	**1211.75'**	**Halfpmf1.dat**	**Halfpmf1.out**
Start Routing at 1210'(emergency spillway crest elevation)	**1213.38'**	**Halfpmf2.dat**	**Halfpmf2.out**

3.3 Comparison between Existing Conditions and Future Conditions

Table 3 lists the water surface elevations for both the existing conditions and the future conditions. As expected, the maximum water surface elevations for the future conditions are higher than those for the existing conditions because more flows are carried to WT #3 under future conditions.

Table 3. Comparison for Maximum Water Surface Elevations between Existing Conditions and Future Conditions

Initial Routing Stage	Maximum Water Surface Elevation under Existing Conditions When Routing IDF (1/2 PMF)	Maximum Water Surface Elevation under Future Conditions When Routing IDF (1/2 PMF)
Start Routing at 1176'(empty reservoir elevation)	**1210.34'**	**1211.51'**
Start Routing at 1197.1'(sediment pool elevation)	**1210.85'**	**1211.75'**
Start Routing at 1210'(emergency spillway crest elevation)	**1213.02'**	**1213.38'**

3.4 Comparison between This Study and Previous Study

FCDMC (1989) conducted a hydrology study for WT #3. Table 4 lists the water surface elevations for the 1989 FCDMC study and this study. Since this study is based on NRCS (1998) hydrologic analysis, it is more updated than the 1989 FCDMC study. The comparison is only for reference purpose.

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Table 4. Comparison for Maximum Water Surface Elevations between This Study and Previous Study

This Study			Previous Study (FCDMC, 1989)		
Initial Routing Stage	Maximum Water Surface Elevation under Existing Conditions When Routing IDF (1/2 PMF)	Maximum Water Surface Elevation under Future Conditions When Routing IDF (1/2 PMF)	Initial Routing Stage	Maximum Water Surface Elevation under Existing Conditions When Routing IDF (1/2 PMF)	Maximum Water Surface Elevation under Future Conditions When Routing IDF (1/2 PMF)
Start Routing at 1176'(empty reservoir elevation based on 1998 topo)	**1210.34'**	**1211.51'**	Start Routing at 1180' (empty reservoir elevation based on old topo)	**1210.32'**	**1211.2'**
Start Routing at 1197.1'(sediment pool elevation based on 1998 topo)	**1210.85'**	**1211.75'**	Start Routing at 1197.3' (sediment pool elevation based on old topo)	**N/A**	**N/A**
Start Routing at 1210'(emergency spillway crest elevation based on 1998 topo)	**1213.02'**	**1213.38'**	Start Routing at 1209' (emergency spillway crest elevation based on old topo)	**1211.93'**	**1212.26'**

4. Summary and Conclusion

The maximum water surface elevations for White Tanks Flood Retarding Structure No.3 (WT #3) under both the existing conditions and the future conditions have been determined for Inflow Design Flood (IDF). The results were compared with a previous study (FCDMC, 1989). The IDF is the half PMF for the 6-hour local PMP. Three different initial routing stages were used, which are the empty reservoir elevation, sediment pool elevation, and emergency spillway crest elevation.

5. References

FCDMC (1989). "A Hydrologic analysis of the White Tanks Flood Retarding Structures #3 and #4"

NRCS (1998). "Hydrologic Analysis on White Tanks FRS #3."

WLB (1992). "White Tanks/Agua Fria Area Drainage Master Study, Part 2, ADMP," prepared for FCDMC.