UPPER MISSISSIPPI RIVER RESTORATION

LAKE ODESSA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

OPERATION AND MAINTENANCE MANUAL

APPENDIX C

GATE OPERATION PLAN

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2016 Update to Gate Operation Plan for Lake Odessa. The Flood of 2013 was the fastest rising flood event on record, rising 2.1 ft/day in the elevation band from spillway overtop to perimeter levee overtop. This gave less than a day and a half for the interior to fill before uncontrolled overtop; thus, some levee breaches occurred, two of which were of significant dimension. Two new spillways were designed to be placed in the locations of the two largest levee breaches. This allows enough inflow volume to fill the interior to within 1 foot of uncontrolled levee overtopping during a fast rising flood (2.1 ft/day) as was experienced in 2013. The original design was based on a 0.75 ft/day rate of rise based on the second largest flood on record at the time of that design (2009). Based on experience from the Flood of 2013, the construction of two additional spillways, and the prevention of flood damages to the Odessa system from the Flood of 2016 (performance tested), the Gate Operation Plan on page 632 (I-14) of the Detailed Project Report (Section J) should be replaced with the following information:

J. Gate Operation and Interior Water Levels. Not all levee failures are due to overtopping. High pore pressures can lead to piping failures, which is one reason it is recommended to restore the interior slopes of the perimeter levee to 1:5 (v:h). (See Appendix G, *Geotechnical Considerations*, for more details). During the rising water levels of a flood, pore pressures in the levee are lower when water levels in the interior refuge are high. The four spillways—Iowa River Spillway at RM 434.8; Prairie Pocket Spillway at RM 440.4; the newer ACM Spillway at RM 435.1; and ACM Spillway upstream on the Iowa River—have been designed to work together to fill the interior to within 1 foot of uncontrolled overtopping when it occurs due to a fast rising (2.1 ft/day) flood. Opening the gates of the outlet structure during a flood event will further aid in filling the interior of the Lake Odessa complex and reduce the risk of incurring levee damage or excessive scour to the interior. The gates of the inlet structure do not need to be opened prior to a flood because, from experience, too much sediment is drawn into the refuge.

The Mississippi River forecast is available at the tailwater of LD 17 (RM 437.1). The flood stage is 15.0 feet at this location, corresponding to a water surface elevation of 541.57 feet (1912 datum). The gates of the outlet structure do not need to be opened prior to flood stage. In order to overtop the Iowa River Spillway crest of 545.2 feet, the tailwater stage at LD 17 needs to exceed 18.5 feet. The gates of the outlet structure should be opened prior to a river stage (LD 17 tailwater) of 18.5 feet, as follows:

The gates of the outlet structure can be opened when the tailwater stage at LD17 reaches 17.5 feet and the Mississippi River is predicted to rise above a stage of 18.5 feet for longer than 24 hours. If the Mississippi River stage is between 15 feet and 17.5 feet (at LD17), and the Iowa River is less than 1 foot

below the crest of the Iowa River Spillway (at the spillway), and the nearest upstream Iowa River Gage at Oakville (US Hwy 99 Bridge) shows a significantly rising hydrograph, it is recommended that refuge managers and the Corps be in communication with one another. The goal of timing the gate opening of the outlet structure is to raise the interior water elevation to 540 feet or greater at the time of overtopping of the Iowa River Spillway; this is done to reduce scour at the spillway toes. For the same reason it is desirable for interior water levels to exceed 542.2 feet at the time of overtopping of the upstream most spillway (FWS) near Prairie Pocket. Plates I-12 to I-14 show details of expected interior water levels when the gated structure is used to help fill the interior.

When the river rises above flood stage, project managers should monitor the stage predictions at the tailwater of Lock and Dam 17. Official stage forecast information can be found on the following NWS site: http://www.crh.noaa.gov/ahps2/hydrograph.php?wfo=dvn&gage=nboi2&view=1,1,1,1,1,1,1,1

Other Lock and Dam 17 information at the Corps of Engineers site (www.rivergages.com):
http://www2.mvr.usace.army.mil/WaterControl/stationinfo2.cfm?sid=MI17&fid=NBOI2&dt=S

Iowa River at Oakville information at the Corps of Engineers site (www.rivergages.com):
http://rivergages.mvr.usace.army.mil/WaterControl/stationinfo2.cfm?sid=OKVI4&fid=OKVI4&dt=S