

## **Appendix E**

### **Historical Modifications to Floodway Inlet Rating Curve**

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The following text describes the modifications to the procedures in applying the Floodway Inlet Rating Curve.

In the early 1960's, the Province completed its detailed hydraulic backwater studies and finalized the "natural" water level relationship (or curves) for the Red River at the Floodway Inlet. At the time, the hydraulic backwater studies were based on data from the largest flood with detailed records, i.e., the 1950 flood. The 1965 relationship was documented in a 1970 Water Resources Branch report. The water level relationship, consisting of a number of rating curves that related flows on the Red River at Redwood Bridge, as well as flows on the Assiniboine River at the confluence with the Red River, to water levels at the Floodway Inlet had the structure. These relationships assumed that the Floodway channel, West Dyke and the primary dykes in Winnipeg had not been built.

Towards the end of the 1960's it was concluded by the Provincial engineers responsible for operating the floodway control structure that there had been a "shift to the right" in the Redwood rating curve (see Section 2.3.3) that is for the same stage a higher discharge was been observed. The assumption at the time was that the Red River had become more hydraulically efficient. To account for the "increased channel efficiency" the Provincial Government engineers responsible for the operation of the Red River Floodway began to apply a shift to the 1965 Floodway Inlet rating curves.

In 1984, the Province produced a new Program of Operation Manual (Manitoba Natural Resources, 1984). The new manual of operations came about as a result of recommendations made by the Manitoba Water Commission (1980) following the 1979 flood which recommended that the 1960's rating curve relationships used to calculate the "natural" water level for different combinations of Red River and Assiniboine River flows be converted into numerical formulae. This new Operation manual also described how the shift in the rating curve was to be applied as described on page 20 of the report, as follows:

*“Observations to date have indicated that indeed the rating curve of the Red River at James Avenue Pumping Station has shifted to the right indicating that the Red River is now more efficient than in 1950. Operation of the Inlet Control Structure has taken this shift into consideration by adjusting the computed*

*discharge to 1950 conditions before determining the natural water surface elevation at the Inlet. The adjustment is done as follows:*

- 1. Compute the natural flow of the Red River at James Avenue based on present conditions.*
- 2. Obtain the discharge based on 1950 conditions from Table 5.*
- 3. Compute the natural water surface elevation at the Inlet based on the discharge equivalent to 1950 conditions.*

The application of Steps 1 and 2 involves first determining a James Avenue stage (using the new rating curve) based on the computed natural flow, and then using this stage to do a table lookup of the old 1950's James Avenue rating curve to determine a flow. Since the new James Avenue rating curve has shifted to the right, the effect of these two steps is to come up with a flow that is lower. This new lower flow is then used to compute a stage at the Floodway Inlet (i.e., Step 3) using the 1965 rating curve relationship. By using the above procedure, the computed stage at the Floodway Inlet is lower than if the 1965 relationship was consulted directly (i.e., in Step 1).

While the Acres study arrived at a different rationale for the shift in the Redwood Bridge rating curve (which was later replaced by the James Avenue rating curve) the net effect is that both procedures result in shifting the Floodway Inlet Rating Curves and Table values to the right.

A comparison of the Province's two James Ave ratings curve in the 1984 Program of Operation report shows that there is a shift to the right for the new curve from about 30,000 cfs to about 120,000 cfs. Because a shift is being applied in this flow range it would be expected that the new Acres rating curve should have a fairly good match with the Provincial curve in this flow range, this is in fact the case as shown in Figure 4-11 main report.