

6. Howard Lake

Howard Lake is located within the city limits of Columbus, along the main stem of Rice Creek and downstream of Mud Lake. It has a surface area of 541 acres and its outlet consists of a 10-foot by 6-foot RC box culvert at 886.13 (NGVD 29) or 888.25 (NAVD 88). The ordinary high water level, as recorded by the Minnesota DNR, is 888.4 (NGVD 29). This lake was not addressed in the 1981 Lino Lakes FIS. The DNR Lake Finder website provides lake level data for a spotty period of record from 1987-2018 (see **Figure 6a**). Due to only one data point collected in 1987 and 2014, these years were eliminated.

The maximum annual series, consisting of 28 years, was plotted on probability paper. A polynomial line was fit to the data to determine the elevations for the various recurrence intervals (see **Figure 6b**). The maximum annual series are plotted on **Figure 6a**, and the estimated flood elevations are shown in **Table 6a**. The 100-year flood elevation was estimated using the polynomial equation. Insufficient lake level data and information on potential overflow elevations are available to provide a reliable estimate of the 500-year flood elevation.

Table 6a: Estimated Flood Elevations for Howard Lake

Return Period	Lake Level Data Source		
	1981 FIS	DNR (used in this study) (n = 28)	
	(NGVD 29)	(NGVD 29)	(NAVD 88)*
2	--	888.6	888.7
5	--	889.0	889.1
10	--	889.2	889.3
50	--	889.4	889.6
100	--	889.5	889.6
500	--	--	--

*0.12 feet is added to NGVD 29 datum to convert to NAVD 88 datum

An additional component of this study consists of creating a non-exceedance frequency graph based on all daily measurements available (see **Figure 6c**). For Howard Lake, the period record consists of the data found on the MnDNR Lake Finder website, which consists of 686 days of measurements, from 1987 to 2018 (see **Figure 6a**). The results are presented in **Table 6b**.

Table 6b: Daily Non-Exceedance Frequency of Lake Levels for Howard Lake

Non-Exceedance Frequency	Lake Level	
	(NGVD 1929)	(NAVD 1988)
2.5%	887.1	887.2
10%	887.3	887.5
25%	887.6	887.7
50%	887.9	888.1
75%	888.3	888.4
90%	888.6	888.7
99.5%	889.2	889.4

Howard Lake Levels (NGVD 1929)

◆ DNR LakeFinder ◆ Annual Max (DNR LakeFinder)

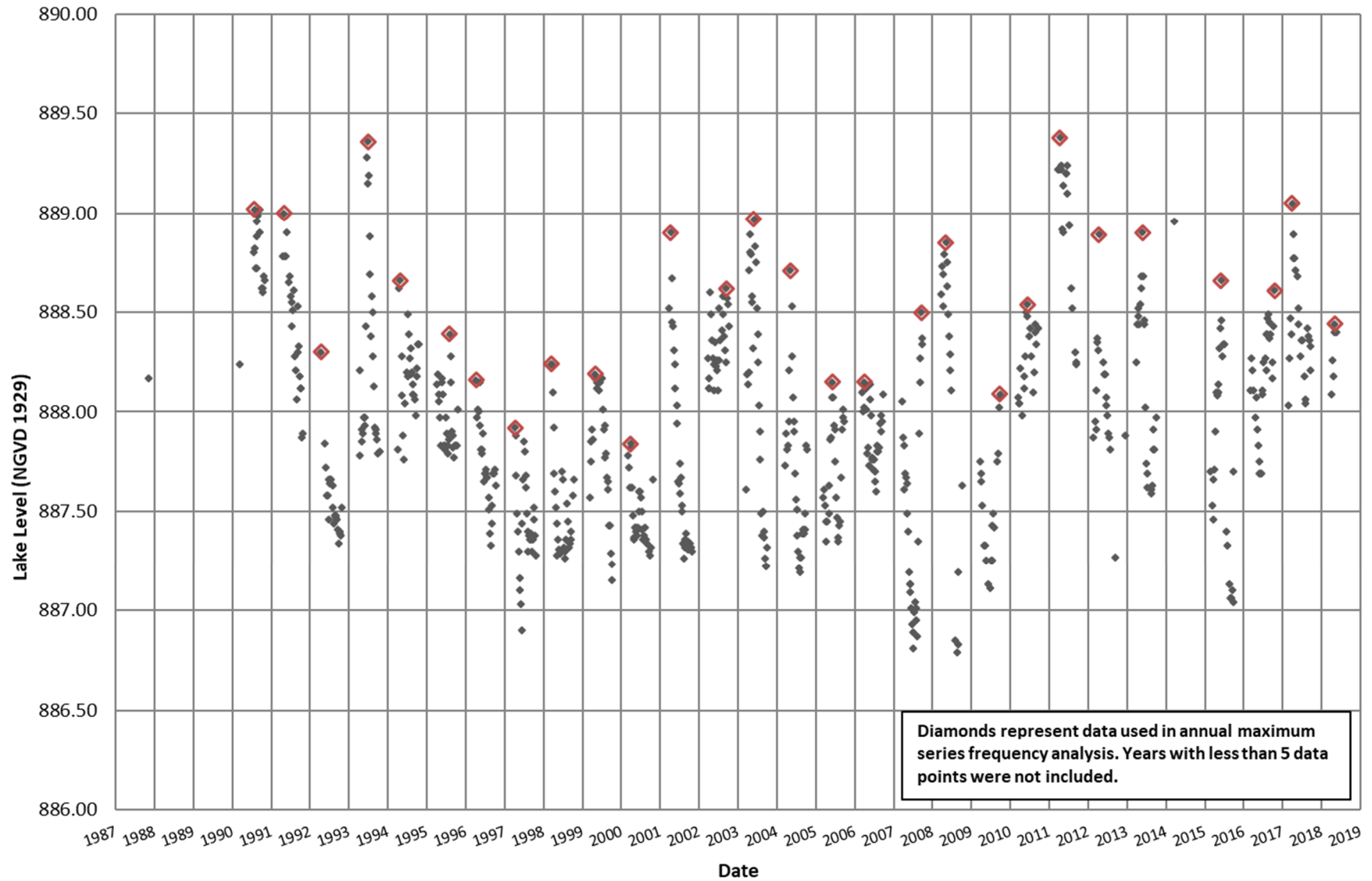
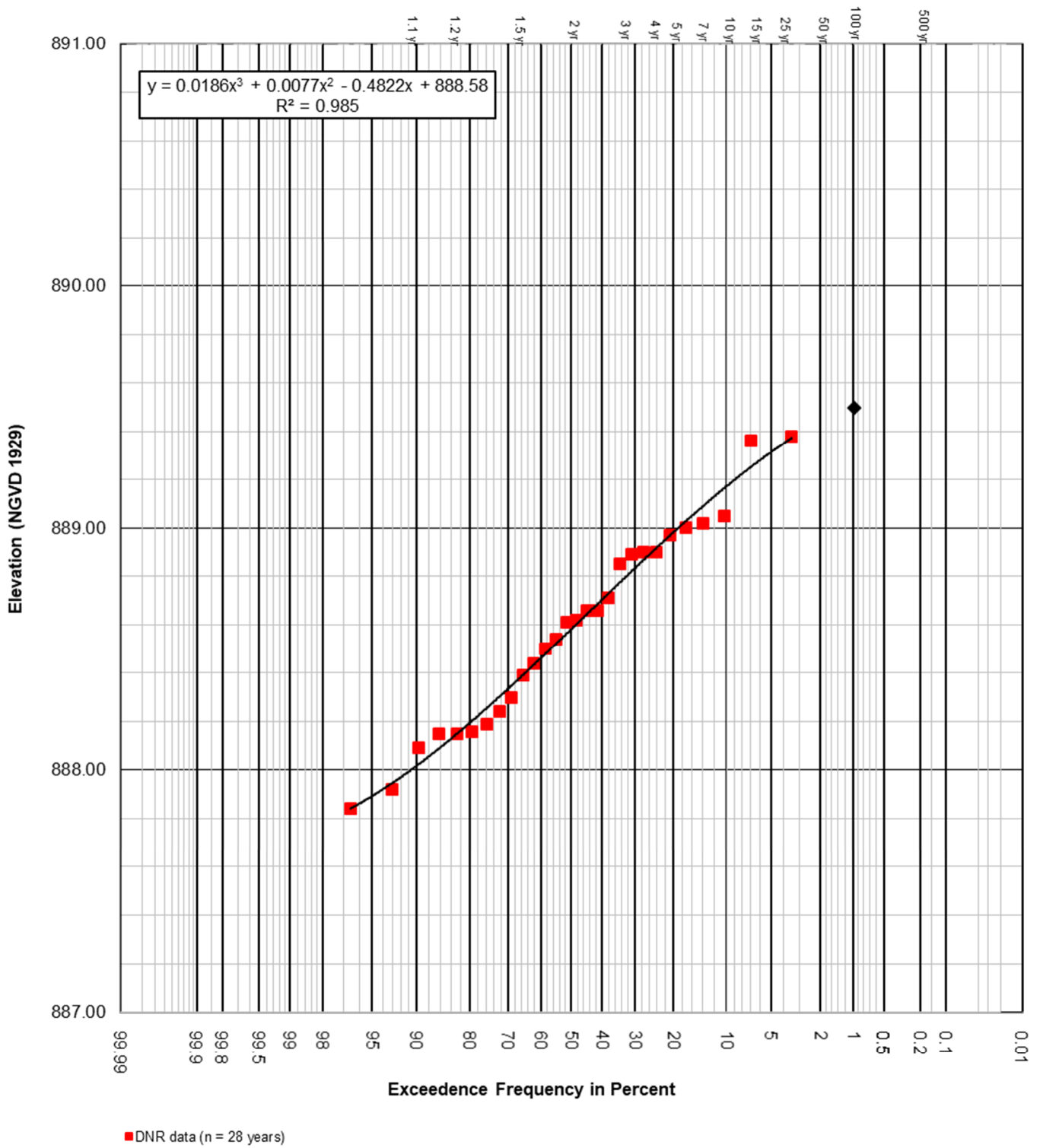


Figure 6a

Howard Lake Levels (NGVD 1929) Maximum Annual Series Frequency Curve (Weibull Plotting Positions)



Outlet:

10-ft x 6-ft Concrete Box Culvert @ 886.13 (NGVD 29), 888.25 (NAVD 88)

Figure 6b

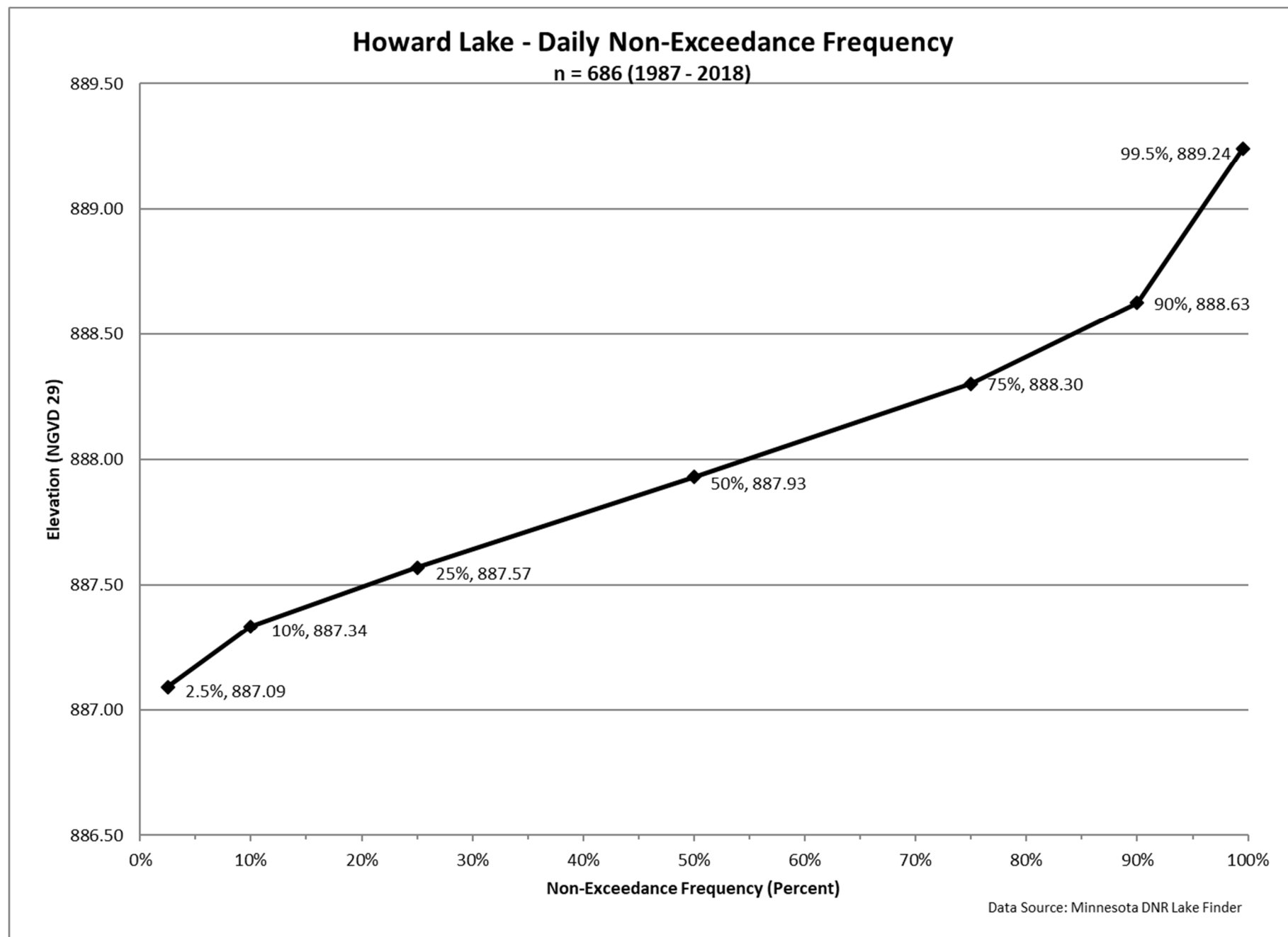


Figure 6c