

10. Peltier Lake

Peltier Lake is a 483 acre lake located in both the City of Lino Lakes and the City of Centerville. Rice Creek and Hardwood Creek enter from the north, and Clearwater Creek enters from the east. The ordinary high water level, as recorded by the Minnesota DNR is 884.7 (NGVD 29). Lake levels are controlled by a 137.5-foot long dam at 884.61 (NGVD 29) which discharges to Rice Creek. Peltier Lake also shares a 48-inch equalizing culvert under Main Street with Centerville Lake at elevation 876.01 NGVD 29 or 876.16 NAVD 88.

In the 1981 FIS, records from 1945 to 1979, obtained from the St. Paul Water Utility, were used to determine the exceedance probability of each of the annual high water elevations. The measured data is no longer available, but the selected annual maximums are provided in the 1981 report. The Saint Paul Regional Water Services has provided more recent lake level data shown in **Figure 10a1**. Data received from the City in 2009 contains data from 1997 to 2003. Data received from the City in 2010 contains data from 1994 to 1997. The overlapping data between the two data series are mostly identical, or within 0.05 feet (with the exception of 4/4/1997 which is off by 0.48 feet). When overlapping data is not identical, the data received in 2010 was adopted for this study.

The DNR Lake Finder website provided lake level data for a spotty period of record from 1951-2021. The City adds 694.1 feet to convert from the City datum to NGVD 1929. The DNR used 693.7 feet. In order to compare the data, and assuming the City datum conversion is correct, 693.7 feet was subtracted from the DNR data, and 694.1 was added back in. On 345 days, lake level data is available from both sources. The difference between the DNR data and the City of St. Paul data varies from 0.25 feet to 2.3 feet (after datum conversion). For these overlapping 345 data points, the City's data was adopted for this study (see **Figure 10a2**).

The year 1959 was excluded from this study because the maximum annual lake level is 4 to 5 feet below all of the other annual maximum lake levels, although the annual precipitation was 26.88 inches at the Twin City Metropolitan Airport, which is very close to the long term average of 27.59 inches.¹ It is assumed that the low lake levels in 1959 are due to St. Paul Water Utility management.

From 1951 to 1979, annual maximums are available from both the 1981 FIS and the DNR. For this time period, this study adopts the DNR maximum annual lake level measurements, 70% of which are exactly 0.09 above the 1981 FIS values (the other 30% varying by 0.2 to 0.6 feet).

The maximum annual series, shown in **Figure 10a2**, consisting of 58 data points, was plotted on probability paper, and a polynomial line was fit to determine the elevations for the various recurrence intervals (see **Figure 10b**). The estimated flood elevations are shown in **Table 10a**. The 100-year flood

¹ <http://climate.umn.edu/text/historical/msppre.txt>

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.

Both the maximum annual series used in the 1981 FIS analysis and the combined data are plotted on **Figure 10b**. The difference in results shown in **Table 10a** are the result of both a different maximum annual series (length of data set) and the fact that in the 1981 study, a straight line was fitted through the points, as opposed to the graphically fitted line in this study.

An additional component of this study consists of creating a non-exceedance frequency graph based on all daily measurements available (see **Figure 10c**). For Peltier Lake, a combined data set was used, consisting of lake level measurements from the DNR and the City of St. Paul, with the City of St. Paul data adopted for the overlapping period of record. The total period of record consists of 10,417 days of measurements, from 1951 to 2011 (see **Figure 10a2**). The results are presented in **Table 10b**.

Table 10a: Estimated Flood Elevations for Peltier Lake

Return Period	Lake Level Data Source		
	1981 FIS (n = 31)	DNR (used in this study) (n = 59)	
	(NGVD 29)	(NGVD 29)	(NAVD 88)*
2	--	885.5	885.7
5	--	885.8	886.0
10	886.1	886.1	886.2
50	886.5	886.8	887.0
100	886.65	887.3	887.5
500	887.0	--	--

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

Table 10b: Daily Non-Exceedance Frequency of Lake Levels for Peltier Lake

Non-Exceedance Frequency	Lake Level	
	(NGVD 1929)	(NAVD 1988)
2.5%	880.2	880.4
10%	883.0	883.1
25%	884.1	884.3
50%	884.8	885.0
75%	885.0	885.2
90%	885.2	885.4
99.5%	885.9	886.1

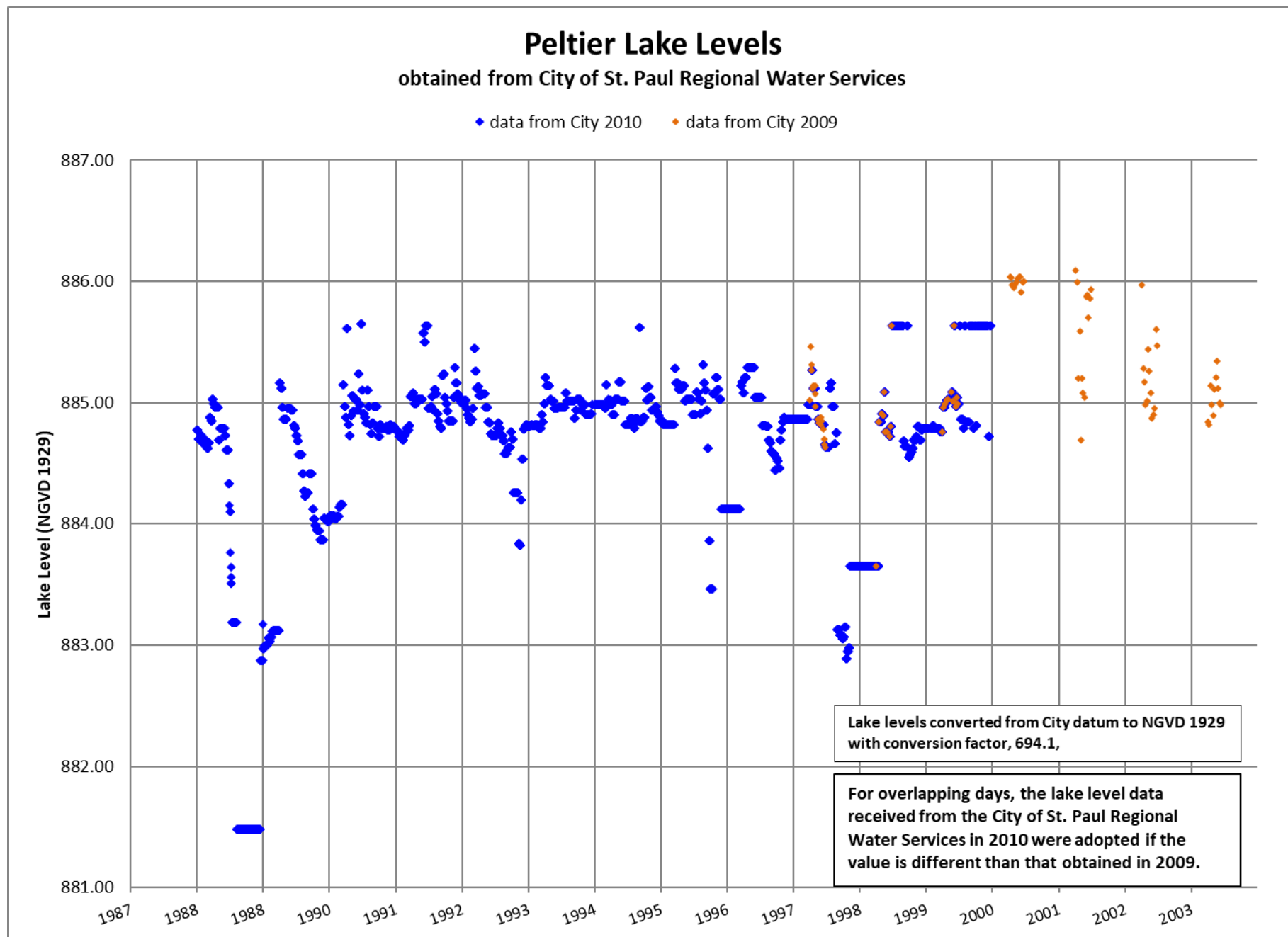


Figure 10a1

Peltier Lake Levels

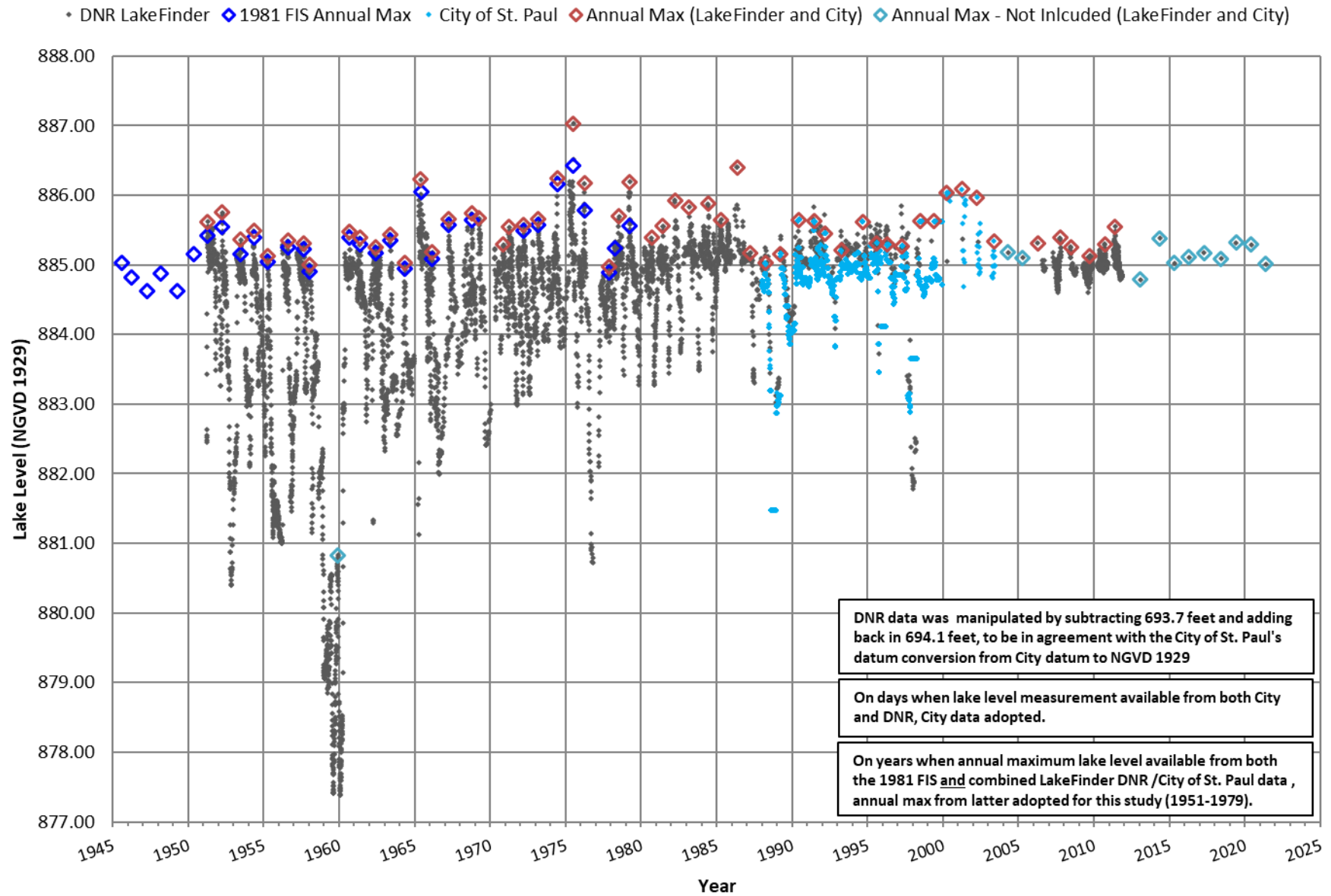
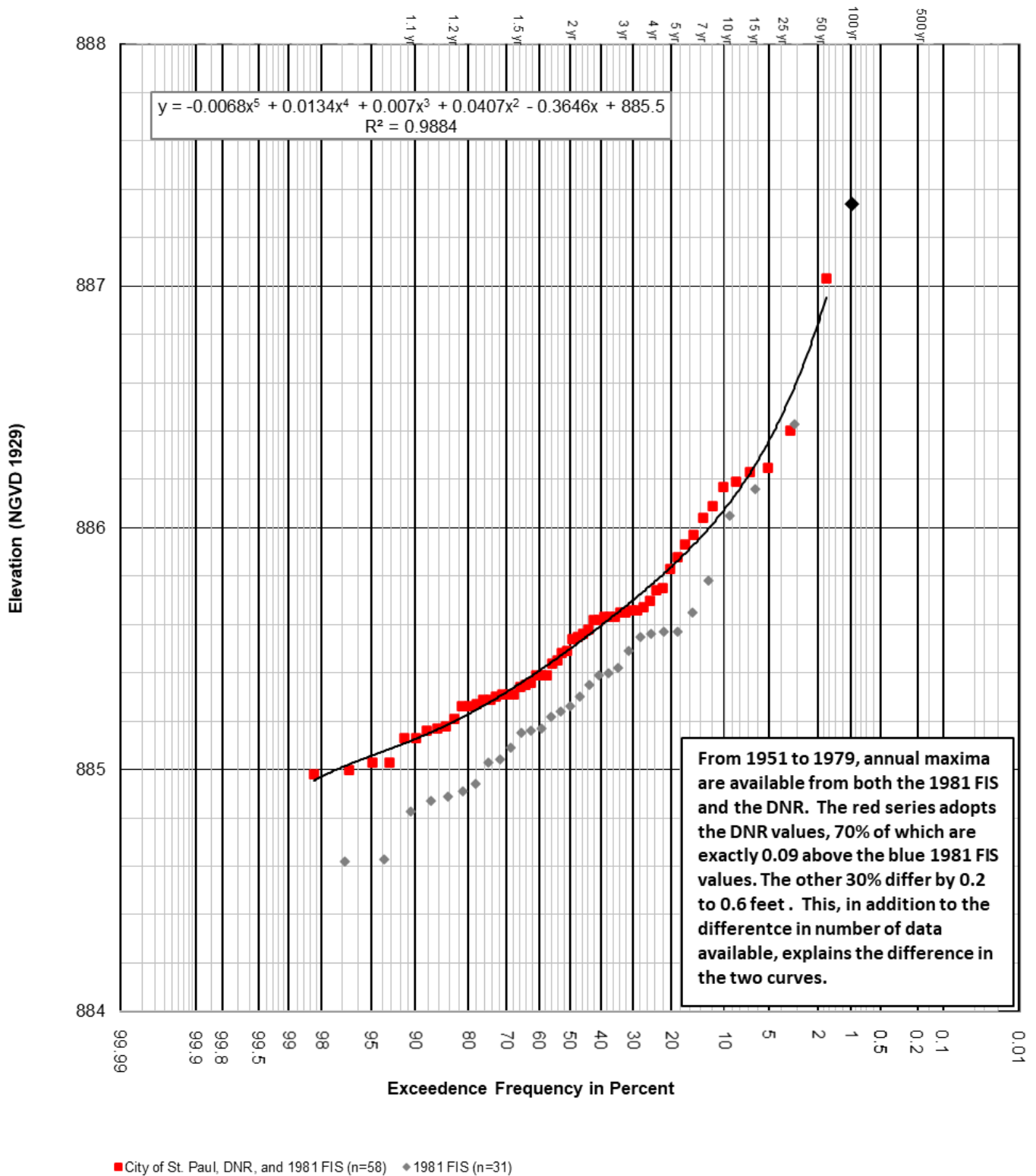


Figure 10a2

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



Outlet:

137.5-foot dam @ 884.63 (NGVD29), 884.78 (NAVD 88)

Figure 10b

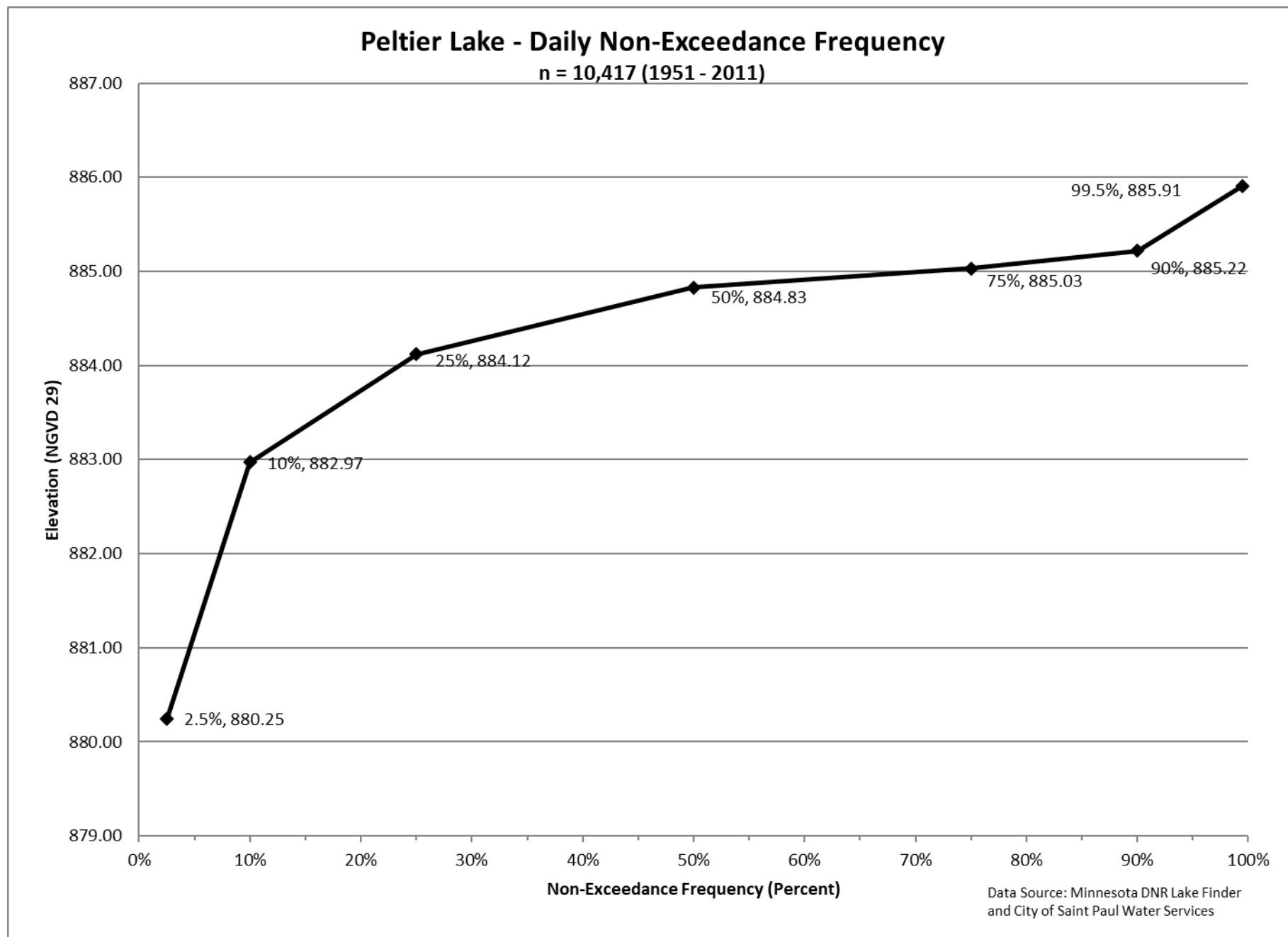


Figure 10c