

Shawinigan Water and Power Company, Limited, at the foot of Les Gres Falls were liable to be affected by backwater. It caused the writer to give special care to the question.

Two formulæ were used, the first from a French author named Poirée, superintendent of public works in France, and the second from the well-known American author, Mead.

The illustration at the foot of this page shows the backwater above the Laurentide Dam in 1917; two cross-sections measured for the use of formulæ and the type of dam at Grand'Mère.

Five and a half miles from Grand'Mère, there was previously a fall of some 8 feet. At 7.25 miles is Pointe Madeleine, where a gauge exists and a cross-section of the river was surveyed; also on the seventeenth mile at Mekinac.

On the twenty-fifth mile, at Rapide Manigance, is another gauge fixed with the purpose of observing the river in its free course before entering the pondage. These gauges have been cut in the solid rock of the cliff existing at the above-mentioned sites.

The different zeros of the gauges are referred to the two known datums which may be summarized as follows:

	Laurentide datum elevation	C.E.C. elevation.
Grand'Mère	0.00	174.28
Pointe Madeleine	133.30	307.58
Mekinac	144.24	318.62
Rapide Manigance	159.26	333.64

With these datums accepted, observations have been conducted at those three places during a complete period of the year 1917 and the accompanying table shows the conditions for each month, i.e., the highest and lowest water stage.

These are with a fair degree of accuracy the existing conditions of the water surface, and the small variances in the fluctuations are attributed to the influence of wind on the water surface. The water level observations taken on June 14th, 1917, were chosen on account of the

conditions existing at that stage of the river from the dam to the foot of Rapide Manigance. The company maintains the water at level 155 at the dam site, while on April 25th, the date of the maximum annual discharge, the level was lowered to elevation 152.50.

From this experience it may be deduced that the existing backwater above the Grand'Mère Dam varies from 1.0 foot to 2.5 feet, according to the wind and discharge influences encountered on the river.

As stated above, the first formula used was Poirée's:

$$D = H + h - ix + \frac{(ix)^2}{4h}$$

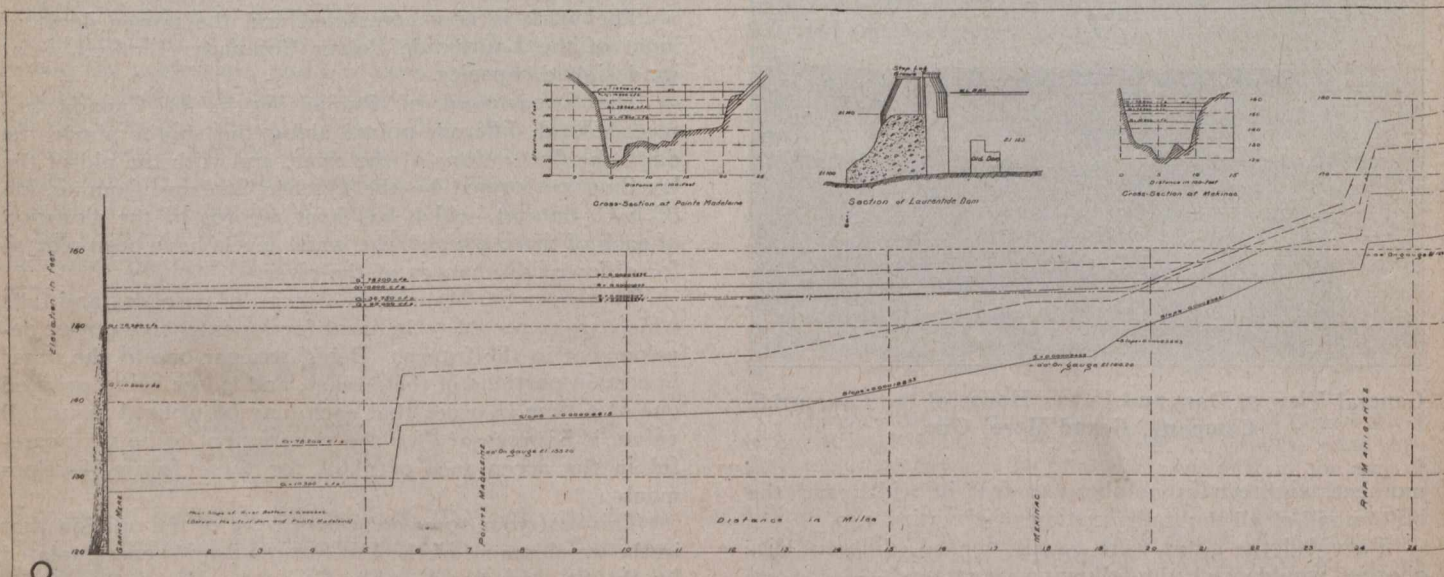
D being the depth of water attained after raising the surface level, at a certain section of the river distant *x* from the dam.

h is the natural height of the water below the dam.
H is the raised height of the surface by the erection of the dam.
i the slope.
x the distance between the sites considered.

The value of *i* is determined by taking the mean depth across the section, and great care must be taken to determine the slope, as at certain sections there may be a sudden depression of the river bottom and the additional depth modifies the slope.

The water level being raised 23.1 feet corresponding to *H* and the depth below the crest of the dam being 26.9 corresponding to *h*, *i* = 0.0005491, *x* = 38,280 feet, then we obtain

Date	Grand'Mère		Pointe Madeleine		Mekinac		Rap. Manigance		Remarks
	Elevation	Gauge	Elevation	Gauge	Elevation	Gauge	Elevation	Gauge	
April 29	153.25	20.4	153.6	10.00	154.24	5.00	164.26	Low	
April 25	152.50	19.9	153.1	10.25	154.49	14.00	173.26	High	
May 1	153.20	20.6	153.8	10.00	154.24	6.00	165.26	Low	
May 14	153.90	21.8	155.0	12.00	156.24	10.50	169.76	High	
June 3	154.00	21.7	154.9	11.25	155.49	5.60	164.86	Low	
June 14	155.40	23.2	156.4	13.20	157.64	11.00	170.26	High	
July 30	153.70	21.2	154.4	9.66	153.90	3.75	163.01	Low	
July 4	154.10	22.0	155.2	12.10	156.34	8.00	167.26	High	
August 28	155.30	22.1	155.3	11.30	155.54	3.32	162.58	Low	
August 4	154.50	21.7	154.9	11.50	155.74	4.60	163.86	High	
September 22 ..	154.90	22.0	155.2	11.20	155.44	1.32	160.58	Low	
September 1 ...	154.20	21.6	154.8	11.40	155.64	3.32	162.58	High	
October 1	154.90	21.7	154.9	11.00	155.24	1.40	160.66	Low	
October 31	154.00	22.2	155.4	12.00	156.24	5.20	164.46	High	



River St. Maurice, Backwater Above the Dam from Grand'Mere to Mekinac