REPORT OF

CONSERVATION COMMISSION

TO THE

CHARLTON

UNION WATER DISTRICT

STATE OF NEW YORK
CONSERVATION COMMISSION
ALBANY
1914

STATE OF NEW YORK

CONSERVATION COMMISSION

GEORGE E. VAN KENNEN, *Chairman*
JAMES W. FLEMING
JOHN D. MOORE
Commissioners

ALBERT E. HOYT
Secretary

RICHARD W. SHERMAN
Chief Engineer

JEREMIAH F. CONNOR
Counsel

CONSERVATION COMMISSION REPORT TO CHARLTON UNION WATER DISTRICT.

ALBANY, N. Y., *June* 15, 1914.

Charlton Union Water District,

The Mayor of the City of Cohoes
The Mayor of the City of Watervliet
The President of the Village of Green Island
The Supervisor of the Town of Waterford

Ex Officio Trustees.

GENTLEMEN.— The Charlton Union Water District, having been formed and organized in compliance with the provisions of Article 9-A of the Conservation Law, being Chapter 233 of the Laws of 1913*, on the 23rd day of June, 1913, petitioned the Conservation Commission under the provisions of Section 531 of said law, a copy of which petition is attached hereto as Appendix B.

Acting upon said petition as a whole and the following paragraph thereof in particular, namely:

> "The petitioner hereby applies to the Conservation Commission to investigate the proposition of a supply of water to said Union Water District under the provisions of said law (Chapter 233 of the Laws of 1913), and to cause surveys, maps, plans and estimates to be made, and such further or other information as said Commission may deem advisable; and your petitioner will forever pray, etc."

the Conservation Commission did on the 8th day of July, 1913, adopt a resolution as follows:

> "WHEREAS, The cities of Cohoes and Watervliet, together with the Village of Green Island and the Town of Waterford under the provisions of Chapter 233 of the Laws of 1913, formed the Charlton Union Water District, and duly organized as such;

*Article 9-A, Conservation Law, Union Water Districts, will be found herewith as "Appendix A."

"And Whereas, Said Charlton Union Water District has petitioned the Conservation Commission under the provisions of Section 531 of the law aforesaid;

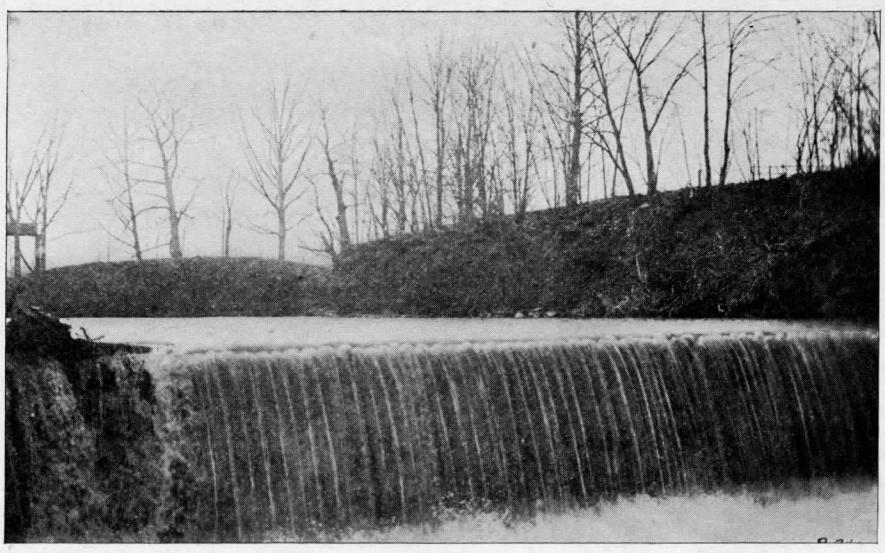
"And Whereas, The Counsel to this Commission did, on July 8th, examine said petition and all the papers accompanying it, and found such application to comply with the provisions of said law;

"And Whereas, This Commission by reason of a reconnaissance and investigations, and also examinations of the maps of the United States Geological Survey, and otherwise, has become familiar with the possibilities of supplying such Union Water District with water under the provisions of the said law by constructing a reservoir on the Alplaus Kill in Saratoga County and conducting the water therefrom to distributing reservoirs for the four municipalities in said district;

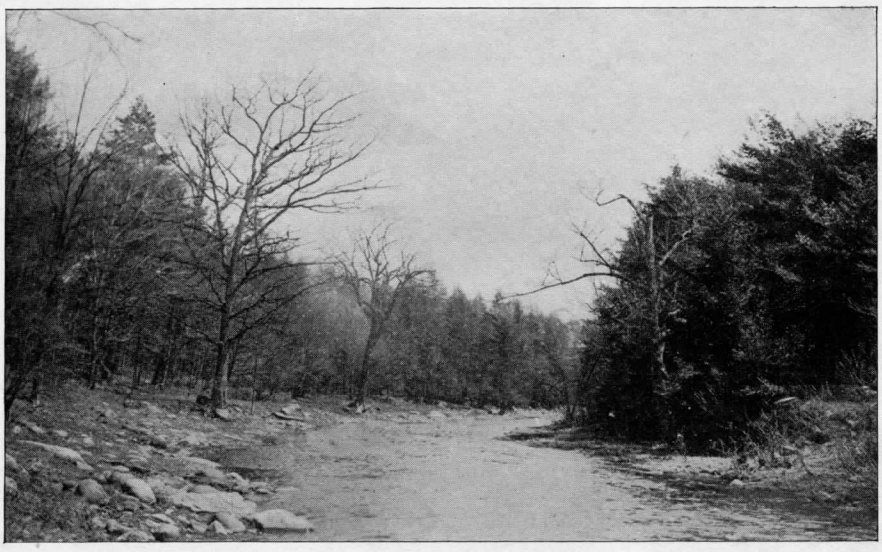
"And Whereas, This Commission appreciates the importance of the construction of a "Conservation Water Works" for the promotion of the health and prosperity of the municipalities in said Union Water District;

"Now, Therefore, Resolved that the Chief Engineer be and hereby is directed to immediately proceed to make such preliminary investigations, surveys, maps and plans as are set forth in the second paragraph of Section 531 of said law."

Acting under said resolution the Chief Engineer caused careful examinations and surveys to be made and designed a gravity water supply system with filtration in compliance with the Conservation Law, and made a report thereon to the Conservation Commission, which report is made a part of this report by the Conservation Commission to the Charlton Union Water District, and is as follows:

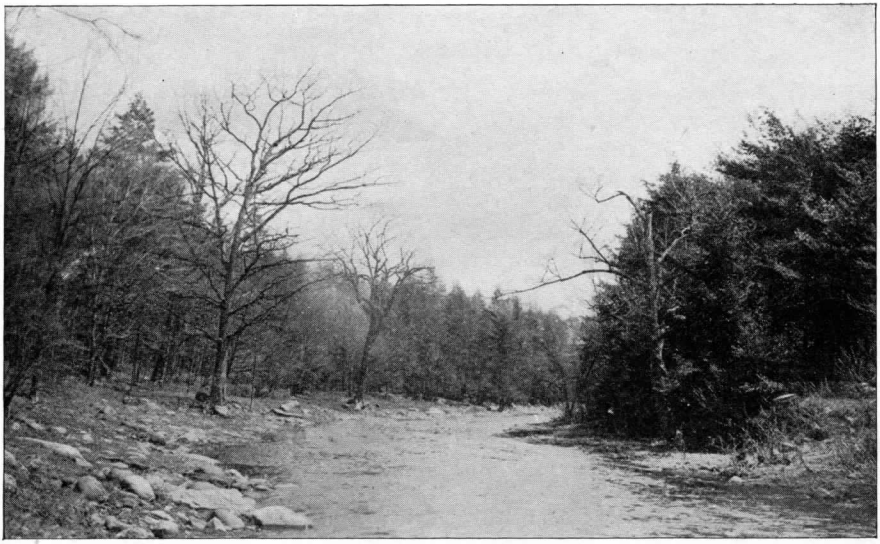


Alplaus Kill at High Mills Dam.

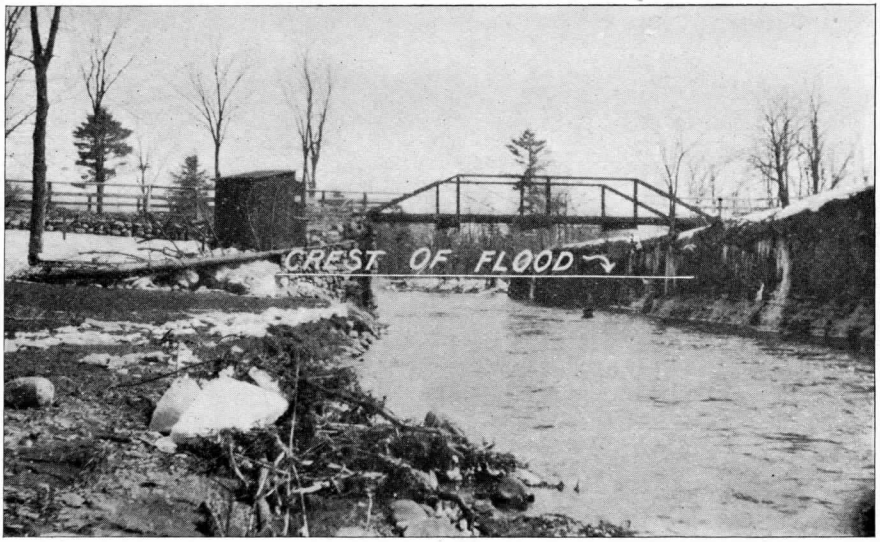


Alplaus Kill, Looking Down-Stream from Dam Site.

Alplaus Kill at High Mills Dam.



Alplaus Kill, Looking Down-Stream from Dam Site.



Alplaus Kill near Charlton Looking Down-Stream. White Line indicates Maximum Gage Height for March 28, 1914. Corresponding Flow, 591.4 Mil. Gal. Per Day.

Alplaus Kill — ¼ Mile above Dam Site. Buildings on right will be submerged by Proposed Reservoir.

CHIEF ENGINEER'S REPORT ON SURVEYS, INVESTIGATIONS AND DESIGN FOR CONSERVATION WATER WORKS FOR CHARLTON UNION WATER DISTRICT.

JUNE 8, 1914.

To the Honorable Conservation Commission:

GENTLEMEN.— Acting under a resolution adopted by the Commission on the 8th day of July, 1913, based upon a petition made by the Charlton Union Water District to the Conservation Commission, under the provisions of Article 9-A of the Conservation Law, and particularly under the last paragraph of said resolution, which paragraph reads as follows:

> "RESOLVED, That the Chief Engineer be and hereby is directed to immediately proceed to make such preliminary investigations, surveys, maps and plans as are set forth in the second paragraph of Section 531 of said law."

your Chief Engineer reports as follows:

SURVEYS, INVESTIGATIONS AND DESIGNS.

Careful surveys, investigations and designs have been made for a gravity water works with filtration system, with the Alplaus Kill as a source of supply.

Promptly following the adoption of the aforesaid resolution Assistant Civil Engineer F. D. Porter and surveying party were put into the field and a temporary local office opened at Charlton. The work has proceeded from that time to date as funds were available.

WATER SUPPLY NEEDS OF THE CHARLTON UNION WATER DISTRICT.

The population of the municipalities in the Charlton Union Water District is set forth in the petition of the trustees thereof to the Conservation Commission as follows:

City of Cohoes	24,709
City of Watervliet	15,074
Town of Waterford	6,128
Village of Green Island	4,737
Total	50,648

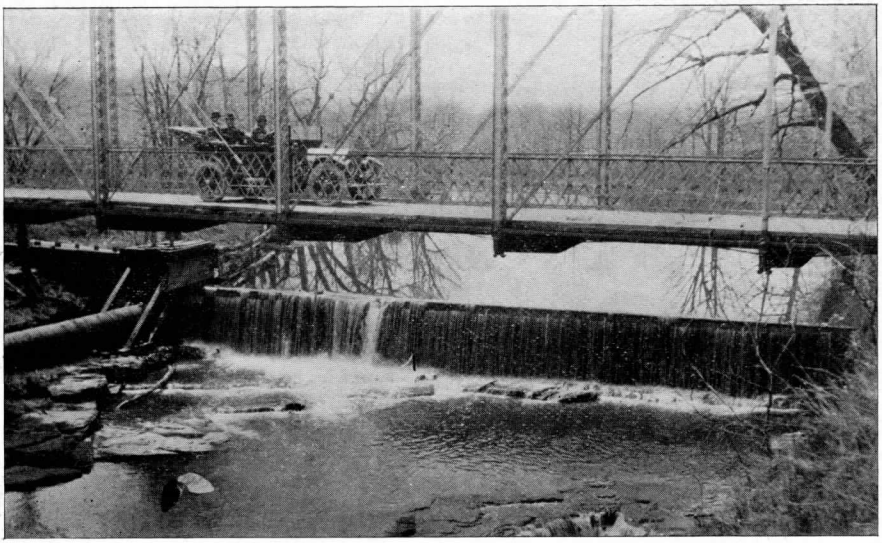
In the petition it is estimated that the population ten years hence will be:

City of Cohoes	26,000
City of Watervliet	20,000
Town of Waterford	7,000
Village of Green Island	5,000
Total	58,000

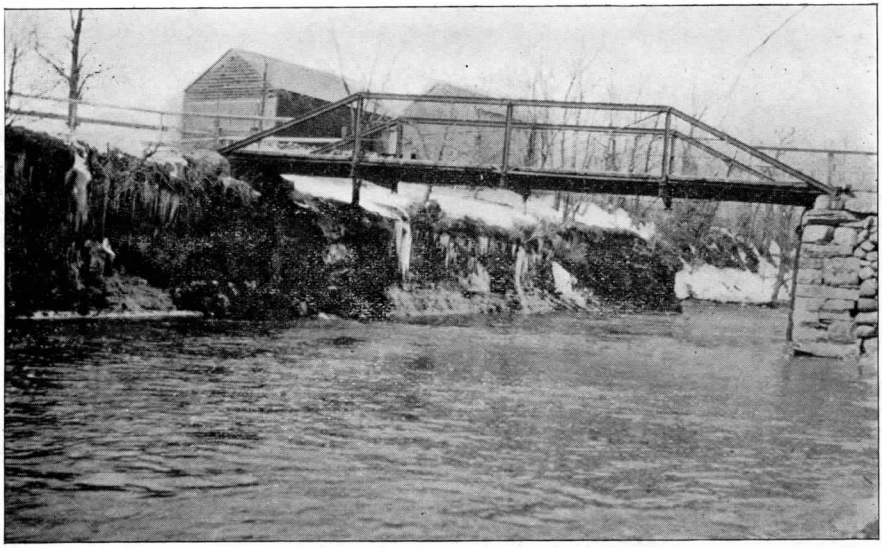
In designing a water works system it is customary and proper to anticipate a greater population at some future period, such as ten or twenty years hence, and give some heed to possible additional sources of supply for a much greater population at more remote periods in the future. From a financial standpoint it is not ordinarily advisable to make provision at the time of the original construction for an increased population at a period more than twenty years hence, for the reason that the compound interest on the cost of excessive construction would equal the cost of construction in about twenty years. Thus, by waiting to the end of twenty years, when the additional construction would be actually needed, a financial saving of about one-half would be effected in the cost of an additional supply needed only beyond that period of time. In considering the present population of 50,648 and the population estimated at ten years hence as 58,000 (as stated in the petition) a further assumption has been made that twenty years hence the population would be 75,000 and the works as designed are on that basis of population.

The petition of the trustees estimates the present daily consumption of water by the district to be:

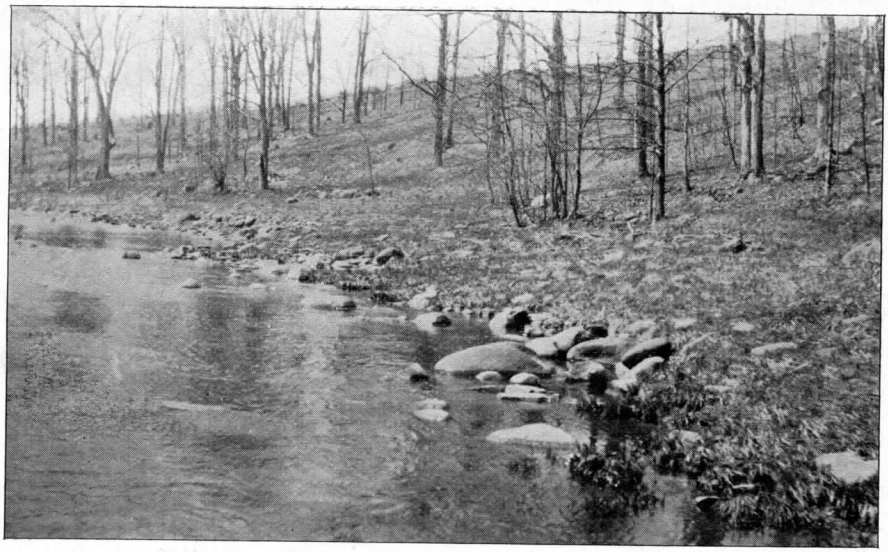
City of Cohoes	3,088,625 Gal.
City of Watervliet	1,884,250 "
Town of Waterford	766,000 "
Green Island	592,125 "
Total	6,331,000 "



Alplaus Kill at High Mills Dam.



Alplaus Kill near Charlton, looking up-stream. Photograph taken April 4, 1914
Measured Discharge, 103.4 Mil. Gal. Per Day.



Alplaus Kill View Up-Stream at Dam Site.

Alplaus Kill View Up-Stream at Dam Site.

The petition further estimates the per capita per diem consumption at 125 gallons. Records of the Cohoes Filter Plant indicate a per capita per diem consumption of about 300 gallons. The Watervliet Hydraulic Company claims to pump 170 gallons per capita per diem for Watervliet. Either these records are in error or there is a great leakage and waste of water in those two municipalities. The trustees of the Charlton Union Water District estimate 125 gallons per capita per diem, but ample provision has been made in the design for a much greater supply. Nevertheless, it is believed to be possible, by checking leakage and waste, and thus reducing the consumption to reasonable liberal necessity, that 125 gallons per capita per diem would suffice. In this connection, the following tabulation of the consumption of water in a considerable number of municipalities is of interest and importance:

Municipality	Population	Daily Consumption per Capita
Kingston, N. Y.	25,900	230
Albany, N. Y.	100,200	220
Chicago, Ill.	2,185,200	225
Erie, Pa	66,500	205
Bridgeport, Conn.	82,000	210
Philadelphia, Pa.	1,599,000	205
Auburn, N. Y.	34,600	185
Camden, N. J.	80,000	165
Pawtucket, R. I.	50,000	140
Lancaster, Pa.	45,000	140
Binghamton, N. Y.	48,400	140
Boston, Mass.	674,400	130
Perth Amboy, N. J.	40,000	125
Schenectady, N. Y.	72,800	125
Haverhill, Mass.	42,000	120
Harrisburg, Pa.	64,100	120
Pittsfield, Mass.	32,000	110
Bayonne, N. J.	55,500	110
Holyoke, Mass.	56,900	105
New York City	4,910,000	100
Yonkers, N. Y.	77,500	95

Municipality	Population	Daily Consumption per capita
Poughkeepsie, N. Y.	27,900	90
Syracuse, N. Y.	137,200	90
Jamestown, N. Y.	31,200	88
Salem, Mass.	43,600	90
Utica, N. Y.	74,400	85

(The above tabulation taken from Engineering News, Aug. 22, 1912.)

A supply of 100 gallons per capita per diem is enough for all the usual needs of a municipality. In some cases the use for steam boilers, laundries, some lines of manufacturing, etc., may make some greater quantity necessary.

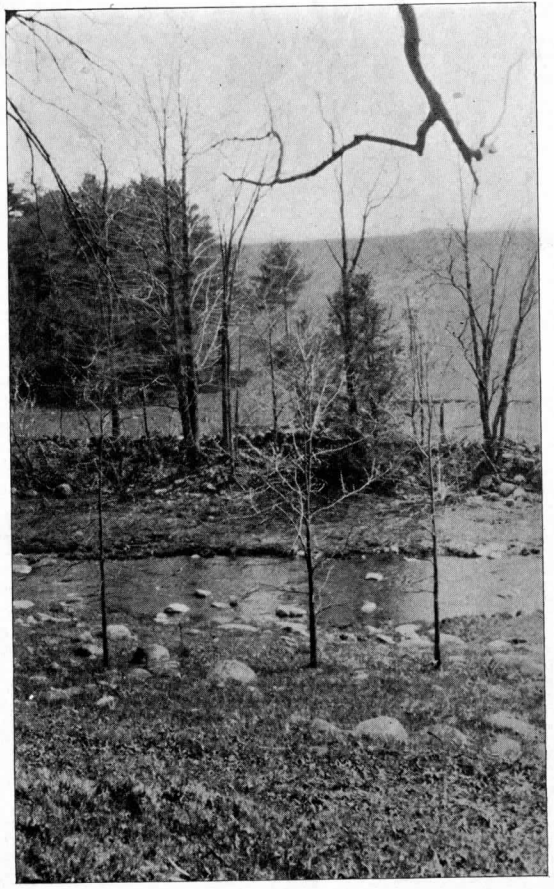
For the Charlton Union Water District provision has been made for 200 gallons per capita per diem for 75,000 inhabitants, amounting to fifteen million (15,000,000) gallons per day. This is on the basis of twice the rate of consumption that should take place under ordinary conditions, also on an increase of 50% in the population.

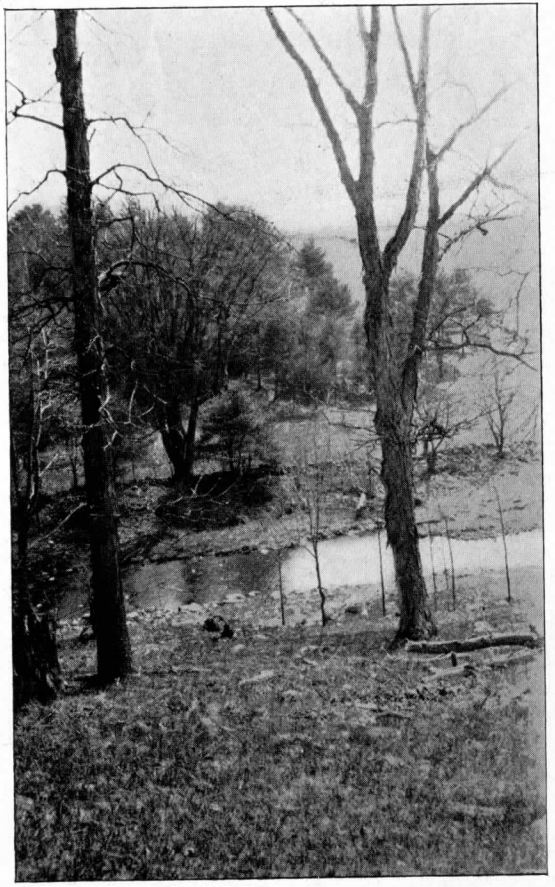
A water works system which will supply 200 gallons per capita per diem to 75,000 inhabitants, involves an investment in the original cost of the works as high as can be justified.

Source of Supply — Alplaus Kill.

The Alplaus Kill rises in the southwestern part of Saratoga county at an elevation of about 800 ft. above sea level, and flows in a southeasterly direction, entering the Mohawk river near Rexford Flats. Near Charlton the valley of the Alplaus Kill narrows sufficiently to afford a suitable and desirable dam site, while above this point the valley is broad and flat, thus affording a large basin for a storage reservoir. The drainage area or watershed above this point is approximately 25 square miles.

A stream gaging station was established August 12, 1913, by the Conservation Commission in co-operation with the Water Resources Branch of the United States Geological Survey at the highway bridge crossing Alplaus Kill about 3,000 ft. below the site of the proposed dam. This is a standard sharp crested weir with a "V" notch for low water flows. An automatic water stage register





Views across Aplaus Kill Valley at Dam Site.

with suitable shelter is located on the bank for recording the depths of water on the crest of the weir. Continuous records from August 12, 1913, to June 1, 1914, have thus been obtained, to which have been added the estimated flow from June 1st to August 12th, 1913, obtained by comparison with other similar watersheds. A detailed tabulation of these estimates and records will be found as "Appendix C" hereof. This table shows that the total flow for the year ending May 31, 1914, was six billion nine hundred seventy-four million five hundred thousand (6,974,500,000) gallons, or an average of over nineteen million (19,000,000) gallons per day, being an excess of four million (4,000,000) gallons per day over the estimated requirement of fifteen million (15,000,000) gallons per day. The measurements are accurate and reliable as made from August 12, 1913, to June 1, 1914, and may be safely depended upon for future years for the reason that the summer and fall of 1913 were remarkably dry, and there is no reason to believe that the flow of water in any future year will be any less than the measured and estimated quantity for the year ending with May, 1914.

The monthly Weather Review of the United States Weather Bureau for August, 1913, on page 1133, referring to the drought in the State of New York for that year, reads as follows:

> "Considering the extent of territory affected as well as the reduction in the yield of staple crops and pastures and the lowering of the water supply, it is believed that this summer's drought has been the most serious experienced in the State for at least 40 years.
>
> "The drought of 1913 was remarkable both in its duration and in the time of its occurrence, covering nearly three months and extending well over the maturing period of important crops. It began to retard the growth of vegetation quite generally by the second week in June and, in spite of occasional rains, became almost gradually worse until the 22nd or 23rd of August, when heavy rains brought decided relief in most parts of the State. In some sections, however, the drought remained unbroken until in September — so late that no amount of rainfall could bring the stunted crops to maturity.

> "In many sections of the State pastures failed completely and cattle and horses had to be fed full winter rations for several weeks. Almost the entire State suffered some loss in pastures and more or less reduction in the yield of staple crops, particularly of those that matured in the latter part of the season such as corn, buckwheat, pears, apples, peaches, and fall potatoes. In many localities one or more crops were reported as being practically failures. In some of the central and eastern counties the water supply was so reduced that it became difficult to secure enough for the most urgent needs in cities and villages, the use of water for sprinkling lawns and flushing streets having been discontinued, while farmers in many places were obliged to haul water from a distance, as most wells, springs, and creeks were dry. A number of correspondents report that wells and streams became dry that were never before known to fail."

A map published in connection with the weather report quoted shows that the four areas of least rainfall in New York State in the summer of 1913, included the greater part of Hamilton, Warren, Fulton and Saratoga counties; also the watershed of the proposed Charlton reservoir.

Having determined the minimum annual run-off which can be depended upon in any given twelve months' period at a certain point, and having found that it is equal to or in excess of the total requirements of the municipalities to be supplied, it is then necessary to determine how much of the water must be impounded or stored in a reservoir in order to equalize and regulate the flow to the uniform daily quantity required for consumption.

After exhaustive calculations it has been determined that the reservoir near Charlton should have a storage capacity of three billion (3,000,000,000) gallons, and it has been so designed. It is also necessary to determine an annual date when the reservoir will be full. This would occur almost without exception in the spring of the year, and usually in the month of May. At least the greater part, or possibly all of the surplus water would pass over the waste weir of the reservoir in the latter part of the spring floods.

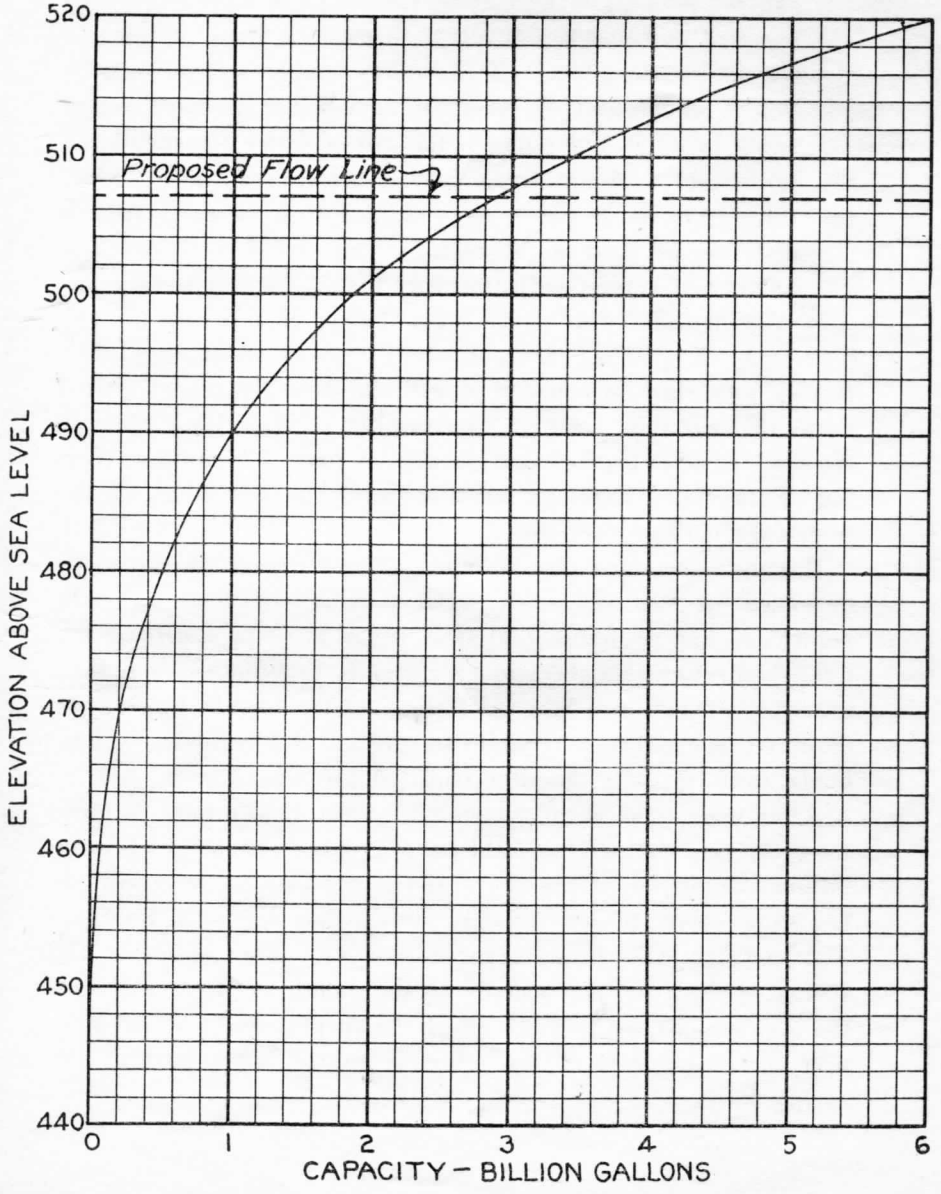
STATE OF NEW YORK
CONSERVATION COMMISSION
DIVISION OF INLAND WATERS

CHARLTON UNION WATER DISTRICT

CAPACITY CURVE

PROPOSED CHARLTON RESERVOIR

MARCH 1914 F. L. Porter ASST. ENGR
C. H. Sherman CHIEF ENGR.



In designing the works it is assumed that the reservoir would be full on the first day of June annually. Starting thus, with a full reservoir on the first day of June, we assume that fifteen million (15,000,000) gallons per day would be uniformly drawn therefrom to the first day of June in the following year, which would make a total draught of five billion four hundred seventy-five million (5,475,000,000) gallons.

The supply of water to the proposed reservoir, and the draught therefrom for consumption, are graphically shown on Plate I. The straight full line represents the uniform draught of fifteen million (15,000,000) gallons per day, as designed for the total requirements of the district at a period twenty years hence. The irregular line indicates the total quantity of water in the reservoir on any date.

This diagram shows that the reservoir would have been lowest on March 17th, when it would have contained one hundred million (100,000,000) gallons, or by the use of three foot flashboards the minimum remaining would have been six hundred and fifty million (650,000,000) gallons. This would make the lowest water at the dam 23 feet deep, or 43 feet deep if three foot flashboards were used. The capacity of the reservoir is graphically shown on Plate II. It also shows that the reservoir would have been full from April 10th to May 16th, 1914, and that one billion six hundred million (1,600,000,000) gallons surplus would have gone over the waste weir.

The foregoing proves that the quantity of water flowing in Alplaus Kill past Charlton, with the proposed reservoir of three billion (3,000,000,000) gallons storage, would certainly supply fifteen million (15,000,000) gallons per day through any year as dry as any known to have occurred in the past.

Quality of Water.

The head waters of Alplaus Kill are remarkably free from sources of pollution, the entire watershed above the proposed reservoir being devoted to agriculture or covered by wood lots. The estimated population of 800 is only 34 inhabitants per square mile of the watershed. While it is desirable that the ownership of a reservoir should include the entire watershed, the great cost