



CITY OF CAMBRIDGE
INTEROFFICE CORRESPONDENCE

To : James L. Sullivan
City Manager

Date : April 29, 1977

From : Conrad C. Fagone *CCF*

Reference

Subject

The enclosed report transmitted herewith is a result of the City Council Meeting of Monday, April 25, 1977. This report was requested by the City Council as a result of problems raised in the Council, of the inadequate maintenance of the Water System.

At that time, I reminded the Council that part of the reason for the inadequate maintenance was that insufficient funds have been appropriated over the years.

Given the time frame since last Monday night, this report is only an effort to describe and recommend conditions and improvements. I would be pleased to meet with the City Council, and yourself, at any-time to further pursue this.

April 28, 1977

The following report is an effort to provide you with a history of the capital improvement program carried out by the Cambridge Water Department and recommendations for future programs of this nature. From 1965 through 1970 the Water Department received an average of approximately \$230,000 a year for capital improvements. During this period, the Department recommended expenditures of \$200,000 per year for 1965 and 1966 and \$250,000 from 1967 through 1970. The actual expenditures are contained on the attached sheet. The nature of the work performed during this period was primarily cleaning and lining of water mains and repairs and improvements to the filtration plant.

In 1970 Camp, Dresser & McKee prepared an extensive report detailing the needed improvements to the Cambridge water system and set down a list of recommendations based on priorities which they had set for the projects.¹ During this period the Water Department spent an average of \$435,000 a year.

CDM recommended an annual cost of \$750,000 to maintain a pay as you go basis for various projects to include improvements to Payson Park Reservoir and the treatment plant, distribution system improvements, cleaning and cement lining water mains, conversion to an eight inch grid system eliminating dead ends, and repair work to the Hobbs Brook and Stony Brook dams. The repairs to the dams indicate a history of neglect to the reservoir properties. In addition to improvements which are very much needed to the dams, spill ways, and rip rap of these reservoirs, the gate houses and caretakers' houses at the reservoirs are all in need of substantial general repairs.

The only repairs of any substantial betterment to these properties has been the aluminum siding to the house at Stony Brook Reservoir. The structure at Hobbs Brook Reservoir is in very poor condition.

At this time it was stated in this report, "Although this represents a tripling of the present capital improvement program, we believe that the program is necessary if Cambridge is to have excellent water".² Of the total spent for capital improvements since 1970, the following is a listing of money spent in each area:

Hydrant Replacement Program	\$213,750.00
Cleaning & Cement Lining Water Mains	\$828,000.00
New Water Main Construction	\$1,050,000.00
Improvements to the Filter Plant & Pumping Station	\$440,000.00
Reservoir Improvements	\$18,800.00

In 1971, the City Council increased the water rate from twenty to twenty six cents and again in 1976 the City Council raised the water rate to thirty six cents. With the increased costs in salaries, power, payments to the Retirement System, employees' benefits, and cost of materials, the thirty six cent water rate only allowed \$100,000 for capital improvement programs in fiscal year 1977 and the City Manager is recommending \$255,000 in fiscal year 1978. Based on the fact that the average expenditure for capital improvement in the Department from 1971 through 1974 was \$500,000 and compounded by the fact that \$500,000 worth of construction in 1965 would currently cost \$1,160,000 (see attached CDM report), clearly indicates that the capital improvement program of the Water Department has suffered due to an inadequate water rate. The majority of costs

to the Department are fixed, therefore, capital improvement is the only area which could be cut back as the water rate became inadequate to fund the needs of the Department.

Fiscal year 1978's token expenditure of \$255,000 for capital improvements will allow us to do only work in the pumping station, at the dams at Hobbs Brook and Stony Brook, a small portion of the work at the filter plant, and to develop a study for the alternatives to covering Payson Park. There will be no funds available to clean and cement line water mains, to install new water mains, or to make any improvements at Fresh Pond.

It is the recommendation of the Water Board to provide sufficient funds to complement the \$255,000 with an additional \$150,000 for cleaning and cement lining and \$150,000 for new water mains. This would bring the total capital improvement program for fiscal year 1978 to \$555,000. Any increases in the water rate should allow for increases in the capital improvement program over the next five years to bring the program up to an annual cost of \$750,000 a year. This cost would fall in line with what CDM recommended to the City in its 1970 report. Keeping in mind what has happened to the cost of materials and construction, I feel that the \$750,000 annually is a minimum of what should be done to constantly improve and maintain our water system. The term capital improvement really does not apply because the nature of this work is more in line with maintainence necessary to keep the system modern.

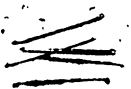
In 1976 the City's budget division compiled figures and made a recommendation to the City Manager to support the Water Board's request for an increase in the water rate. Based on

the history of expenditures and income for the Water Department, it would take approximately ten cents more to produce sufficient revenue to fund a capital improvement program as recommended. A lesson which has been learned since the last two water increases, is that it is extremely difficult to set a water rate which will enable the Department to function and fund a capital improvement program over this period. Therefore, it is my recommendation that the City Council adopt a policy whereby the water rate is adapted annually based on the adapted Water Department budget. In this way, the water consumers would no longer be assessed with thirty percent increases in water rates; but rather only have to absorb small incremental increases if the budget exceeds the water rate at a given time.

1965-1976

	<u>TOTAL REVISED EXPENDITURES</u>	<u>ACTUAL CAPITAL IMPROVEMENT EXPENDITURES</u>
1965	\$1,190,409.35	\$126,046.80
1966	1,373,272.17	182,345.10
1967	1,551,432.34	100,059.09
1968	1,482,288.91	377,834.29
1969	1,410,296.57	232,142.22
1970	1,776,746.10	356,257.74
1971	1,966,943.38	450,000.00
1972	2,210,050.86	371,500.00
1973-74	3,444,134.75	756,100.00*
1974-75	2,528,903.38	415,600.00
1975-76	2,570,925.00	400,200.00
1976-77	2,648,840.00	100,000.00
1977-78	2,747,985.00	255,000.00

* Eighteen month budget period



CAMP DRESSER & McKEE

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CABLE: CAMDRES

9 February 1976

Mr. William H. McGinness
General Superintendent
Cambridge Water Department
250 Fresh Pond Parkway
Cambridge, MA 02138

Dear Mr. McGinness:

Pursuant to your request, I have researched some data which will give an indication of what has happened to construction costs during the past 10 years. For illustration purposes, I have used the Engineering News Record Index, which indicates increases in construction costs from year to year. The following numbers were developed:

<u>Date</u>	<u>ENR Index</u>
December 1965	938
December 1970	1445
December 1975	2297

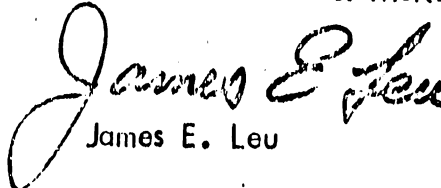
These numbers indicate that \$500,000 worth of construction in 1965 would now cost \$1,160,000, or conversely, \$500,000 today is buying only \$215,000 worth of construction using 1965 as a base.

While the ENR Index applies to construction in general, the type of work undertaken annually in the Water Department's CIP more or less follows the same trend.

If you should require any additional data or have any questions on the above, please do not hesitate to contact me.

Very truly yours,

CAMP DRESSER & McKEE Inc.,


James E. Leu

JEL/pas

CAMP, DRESSER & MCKEE

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ADMINISTRATIVE MANAGER
ROBERT E. JEWETT

July 16, 1970

Cambridge Water Board
250 Fresh Pond Parkway
Cambridge, Massachusetts

Report on Needed Improvements to the Cambridge Water System CDM 139-42

In accordance with our contract dated December 19, 1968 we have studied the Cambridge water system and have developed a program for capital improvements which should be made with particular attention to the next 20 years. The report transmitted herewith includes the results of our studies and investigations. These are summarized below.

The Cambridge Water System

The Cambridge water system dates from 1856 when Fresh Pond was used as a source of supply. In 1887, a storage reservoir was built near the mouth of Stony Brook in Waltham and Weston, and a transmission line laid from the reservoir to Fresh Pond. In 1897, a larger reservoir was built on Hobbs Brook, a tributary of Stony Brook in Waltham, Lincoln and Lexington. These supplies have been adequate to serve the City's needs until recently. In 1950, three connections were made to the Metropolitan District Commission water system at Cambridge Common, Norfolk Street and Porter Square. These connections have made it possible for Cambridge to utilize its own water resources more fully by eliminating the need to maintain reserve storage against severe droughts. Thus, although the safe yield of the Cambridge supplies is only about 13 mgd it has been possible to use the average yield of about 22 mgd and to supplement with MDC water as demand requires.

An open reservoir of 43 million gallons capacity located at Payson Park in Belmont provides the only storage on the distribution system.

Cambridge Water Board -2-
July 16, 1970

A water filtration plant was built on the edge of Fresh Pond in 1922. This was expanded in 1932 and additional improvements have been made in a continuing program since 1950. The old steam pumping station was replaced by a new electric powered station in 1950.

The water distribution system includes some 165 miles of pipe ranging in size from 4-in to 42-in diameter. Most of the system is relatively old. In the past 45 years the mileage of pipe in the system increased by less than 20 percent. Like most New England waters Cambridge's water is rather corrosive to ferrous metals and most of the unlined cast iron and steel pipe is badly tuberculated and has limited hydraulic capacity. Since the early 1930's there has been an effort made to reduce this corrosiveness by adjusting the pH of the treated water but this, of course, cannot restore the hydraulic capacity of the old unlined pipes.

Since 1950, a continuing program of cleaning and cement lining the pipes in place has been carried on and almost all of the pipes 16-in and larger have now been lined. This has restored the hydraulic capacity of these large mains. However, some 85 percent of the system still is unlined pipe smaller than 16-in. All of this should be cleaned and lined, or replaced with cement-lined pipe.

Population and Water Consumption

The population of Cambridge has not changed markedly in the past 50 years. During this time the population has generally been between 110,000 and 120,000. With the ambitious urban redevelopment program now under way, the marked increase in high-rise apartment development and the shift in the nature of industrial activity in the city it is likely that population growth will be resumed.

Most studies that have been made over the past 40 years tended to overestimate population growth and to underestimate increases in water consumption. Average consumption is now about 22 mgd or a per capita consumption of about 200 gal per day. This is expected to continue to increase and we have projected an increase to 26.8 mgd by 1990. This means a steady increase in the use of MDC water unless additional water resources are developed.

The cost of MDC water is bound to increase substantially as time goes on and further developments are needed to keep pace with the constantly rising demand.

Supplemental Water Supply Sources

A number of supplemental sources of supply have been investigated in the past but most of these have been preempted. The remaining supplies within reasonable distances of Cambridge are from groundwater in Waltham and from either the Charles or Sudbury Rivers by pumping during suitably high flow periods into Hobbs Brook Reservoir.

Cambridge Water Board -3-
July 16, 1970

In 1956, upon entering the MDC, Waltham abandoned the use of two wells which had until then provided its water supply of some 6 mgd. If these wells can be obtained and rehabilitated they would provide the least expensive source of supplemental supply for Cambridge. Both wells are only a short distance from the transmission lines leading from Stony Brook Reservoir to Fresh Pond.

The diversions from the Sudbury or Charles Rivers would also provide usable additional water, but their cost would be considerably higher than that of the groundwater.

Distribution System Improvements

The major lines of the distribution system are quite adequate, but some strengthening of the system is needed. Urban redevelopment will undoubtedly require additional changes beyond those that can now be foreseen clearly. The cleaning and lining program which has been carried on needs to be continued to complete the cleaning and lining of 8, 10 and 12-in diameter mains. Rather than clean and line pipes smaller than 8-in, it is recommended that these lines be replaced with 8-in cement-lined pipe as circumstances permit. The program of replacement of obsolete and inadequate fire hydrants should be completed.

A major project which should be carried out soon is the covering of Payson Park Reservoir. This open reservoir is the cause of bacteriological quality problems annually.

Water Treatment Plant Improvements

If additional sources of water are developed some expansion of chemical feed facilities and flocculation and sedimentation capacity will be required. Low lift pumps from Fresh Pond need replacement and should have increased capacity. The wash water pumps need to be replaced. The present filters are adequate for anticipated future requirements.

Capital Improvement Program

With the exception of the covering of Payson Park Reservoir and the modification and expansion of treatment facilities the recommended program can be carried out on a pay-as-you-go basis. The two larger projects covering Payson Park Reservoir and the modification and expansion of the treatment facilities will cost some \$3,367,000 and should be financed with bonds.

Cambridge Water Board
July 16, 1970

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The annual cost of the recommended program is as follows:

1. Interest and Principal payment for covering Payson Park Reservoir and treatment plant modification expansion	\$300,000
2. Distribution system improvements	250,000
3. Cleaning and cement lining water mains	100,000
4. Other work, including repairs to Hobbs Brook and Stony Brook Dams, rehabilitation of the Waltham wells and gradual conversion to an 8-in grid	100,000
	<u>\$750,000</u>

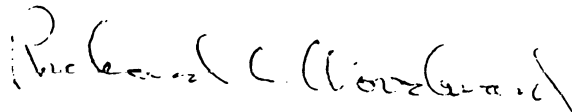
Although this represents a tripling of the present capital improvement budget, we believe that the program is necessary if Cambridge is to have excellent water.

Acknowledgments

We wish to acknowledge the assistance of the many Cambridge officials who assisted us in the preparation of this report, particularly those in the Planning Office, the Cambridge Redevelopment Authority, the City Engineer's Office and the Water Department. Special thanks must go to Mr. William H. McGinness, Water Superintendent.

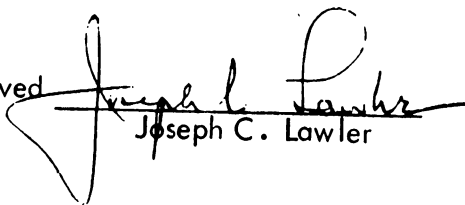
Very truly yours,

CAMP, DRESSER & McKEE



Richard L. Woodward

Approved



Joseph C. Lawler



CITY OF CAMBRIDGE

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Tel. 876-6800

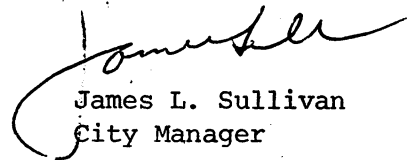
EXECUTIVE DEPARTMENT
JAMES L. SULLIVAN
City Manager

May 2, 1977

To the Honorable, the City Council:

As requested by the City Council, enclosed please find a report from Conrad C. Fagone, Acting Superintendent of the Cambridge Water Department, relative to the needs of the Water Department.

Very truly yours,



James L. Sullivan
City Manager

JLS/b

Agenda #2

S-249

Report from Conrad C. Fagone, as requested
by the City Council, re: needs of the Water
Department.

In City Council,

May 2, 1977

5/2/77

Referred to the
Ordinance Committee
For Hearing