EXETER, NEW HAMPSHIRE

REPORT ON

ALTERNATE SOURCES OF WATER SUPPLY

MARCH, 1968

WESTON & SAMPSON
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

WESTON & SAMPSON

CONSULTING ENGINEERS

10 HIGH STREET
BOSTON, MASS. 02110

TEL: AREA CODE 617
227-3506
227-3509

R. S. WESTON 1915-43
G. A. SAMPSON 1915-64

GEORGE G. BOGREN
ROBERT M. POPE

LEO F. PETERS

March 14, 1968

Board of Selectmen
Town of Exeter
10 Front Street
Exeter, New Hampshire 03833

Attention: Mr. Robert P. Barker, Town Manager

Gentlemen:

We are pleased to submit the following report covering our studies and recommendations concerning the various water supply alternatives for the Town of Exeter, as authorized on October 4, 1967.

Sincerely,

WESTON & SAMPSON

George G. Bogren

George G. Bogren, Partner

GGB:hw

THE STATE OF NEW HAMPSHIRE
GEORGE G. BOGREN No. 678
REGISTERED PROFESSIONAL ENGINEER

TABLE OF CONTENTS

TABLE OF CONTENTS CONTINUED

LIST OF TABLES

LIST OF FIGURES

STATEMENT OF THE PROBLEM TO BE INVESTIGATED

Exeter is presently dependent upon ground water to supply its municipal system, after using surface water for half a century. As the Town has grown in population and in service area, the existing ground water sources have become barely adequate in both quantity and quality. These sources provide no standby dependability and are both in daily use.

SCOPE OF THE INVESTIGATION

The agreed-to scope of investigation included consideration of the following subjects pertaining to the development of a supply improvement program for the Water Department of the Town of Exeter.

1. The development of estimates of future water supply requirements.
2. The adequacy of existing facilities to meet such requirements.
3. Comparisons of various water supply alternatives.
4. The sequence of development of additional water supplies.
5. A recommended construction program together with costs for supply, treatment and transmission facilities.

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The conclusions of the study are as follows:

C1. The estimated populations which Exeter should be prepared to serve are as follows:

YEAR	POPULATION
1970	9,000
1980	11,000
1990	13,000
2000	15,000

C2. In the future water consumption can be expected to increase at a more rapid rate than the population. Our studies indicate that per capita consumption can be expected to increase at an average rate of about 1.5 percent per year.

C3. The safe yield of water supply sources should be capable of meeting maximum one-day demand requirements. For design purposes these demands are estimated to be:

YEAR	MAXIMUM ONE-DAY DEMAND
1970	1,520,000 gallons
1980	2,110,000 gallons
1990	2,800,000 gallons
2000	3,600,000 gallons

C4. It is estimated that the safe yield of the two existing sources, Lary Lane and Stadium Well, will be inadequate within the next two years.

C5. The quality of the water from the Stadium Well is deteriorating, as the result of increasing iron and hydrogen sulfide content.

To meet the requirements indicated by these conclusions, the following recommendations are made:

R1. In order to meet the increasing water demands of Exeter it is recommended that the original surface supply, Water Works Pond, be put in use again and that its yield be augmented by the flow of the presently unused Skinner Springs Wells and Gilman Park Well. This requires the renovation and expansion of the existing water treatment plant; the equipping of Gilman Park Well; and the construction of about 8,300 linear feet of 12-inch diameter force main from the existing main between Stadium Well and Gilman Park Well to Water Works Pond.

R2. The quality of Stadium Well water is to be made acceptable by diverting it to Water Works Pond through the above noted force main and treating it in the treatment plant.

R3. A river intake and pumping station connected to the force main is recommended to supplement the augmented yield of Water Works Pond with Exeter River water when the river flow exceeds the requirements of Milliken Industrials, Inc. This would assure the Town of a full reservoir at the beginning of the high demand dry periods of the year by permitting it to pump into the reservoir during high river periods. This arrangement should be established by agreement with industry and sanction of the state agencies concerned. Each have expressed their appreciation of the reasonableness of this approach to Exeter's water problem.

The estimated total cost of the facilities recommended under R1, R2, and R3, considered to be Stage I of the solution to Exeter's water problem, is $607,200.

R4. It is anticipated that by the mid-1980's the safe yield of Stage I would be equalled by the demands of the Town and that provisions would have to be made by means of a dam to increase the safe yield of the Exeter River such that the Town could withdraw water in the dry months. The estimated current total cost of Stage II is $217,200. Participation by Federal or State agencies to reduce the actual cost to the Town should be considered.

EXISTING SUPPLY FACILITIES

SURFACE WATER

The Exeter Water Works was established in 1886 as a private water company. The source of supply was created by the construction of a dam to impound water from Dearborn Brook. The resulting reservoir is known as Water Works Pond. The dam was raised in 1897, 1909, and 1916. Water was pumped directly from a clearwell adjacent to the reservoir into the distribution system until the construction of a treatment plant in 1906.

The impounding reservoir has a capacity of 60,000,000 gallons with 18 inch flash boards, a water surface of 25 acres, a watershed of 1.6 square miles, and a safe yield during an extended drought of about 300,000 gallons per day. Since the flow line in the treatment plant is 9.5 ft. below the top of the spillway, about 57,000,000 gallons are available in storage when the pond is full. The treatment plant, which was used on an emergency basis as recently as 1962, consists of settling basins, two rapid sand filters, chemical feeding equipment, the original clearwell, and a washwater tank. Increasing water consumption and problems in tastes, odors, and algae brought about the abandonment of this plant. The plant by modern standards is considered inoperable. Only the settling basins and filters are salvageable structures. The equipment is obsolete and in a deteriorated condition.

GROUNDWATER

In 1929 water from the Skinner Springs dug wells was diverted to the clearwell of the treatment plant. The Springs are located about 3,000 feet northeast of the reservoir in the Town of Stratham. They consist of eight (8) supply wells, a collection well, and a 10-inch

gravity supply main. The safe yield of the Springs is about 125,000 gallons per day.

The growth in population necessitated additional water supplies, after World War II. In 1951 a 24-inch well was installed in Gilman Park. This well is 51 ft. deep, excluding the 5 ft. well screen. The safe yield of this well is estimated to be about 440,000 gallons per day. However, this well had to be abandoned in 1959 because of increasing iron content and taste and odor problems caused by hydrogen sulfide.

In 1958 an 18-inch by 24-inch gravel-wall well was drilled at Lary Lane, near the Exeter River. A seven (7) stage pump rated at 720,000 gallons per day at 245 feet with a 40 horsepower motor was installed, however, the safe yield of this well is estimated to be about 650,000 gallons per day. The well is 79 ft. deep, excluding the 15 ft. well screen. Analyses of water from this well indicate that it is low in color, turbidity, and iron and quite hard.

After the abandonment of Gilman Park Well in 1959, Lary Lane Well was the only dependable source of good quality. In 1963 a 24-inch by 36-inch gravel-wall well was installed between Exeter Stadium and the Exeter River. The seven (7) stage pump had a capacity of 865,000 gallons per day at 260 ft. and a 50 horsepower motor. This well which is 44 ft. deep, excluding the 15 ft. well screen, is located across the River and about 700 ft. from the Gilman Park Well. The test wells at this site originally indicated that the iron and manganese content in the water might present problems. Analyses of the water by the New Hampshire Water Supply and Pollution Control Commission during the

past year showed the iron content to range from 0.34 to 0.71 ppm. The recommended limit for iron is 0.30 ppm. In addition traces of hydrogen sulfide have been noted recently. If the iron content and taste and odor problems associated with hydrogen sulfide continue and increase, the Town will have to either discontinue the use of this Stadium Well or install expensive equipment to properly treat the water.

The flow from both the Lary Lane Well and the Stadium Well is metered and recorded at each well. A standby engine is connected by means of a right angle gear to the pump at Lary Lane Well.

WATER SUPPLY REQUIREMENTS

GENERAL

An evaluation of the requirements of a water supply system is based upon an estimate of future population to be served and trends in per capita consumption. The per capita consumption is composed of domestic, commercial, municipal, and industrial usage plus unaccounted for water divided by the population served.

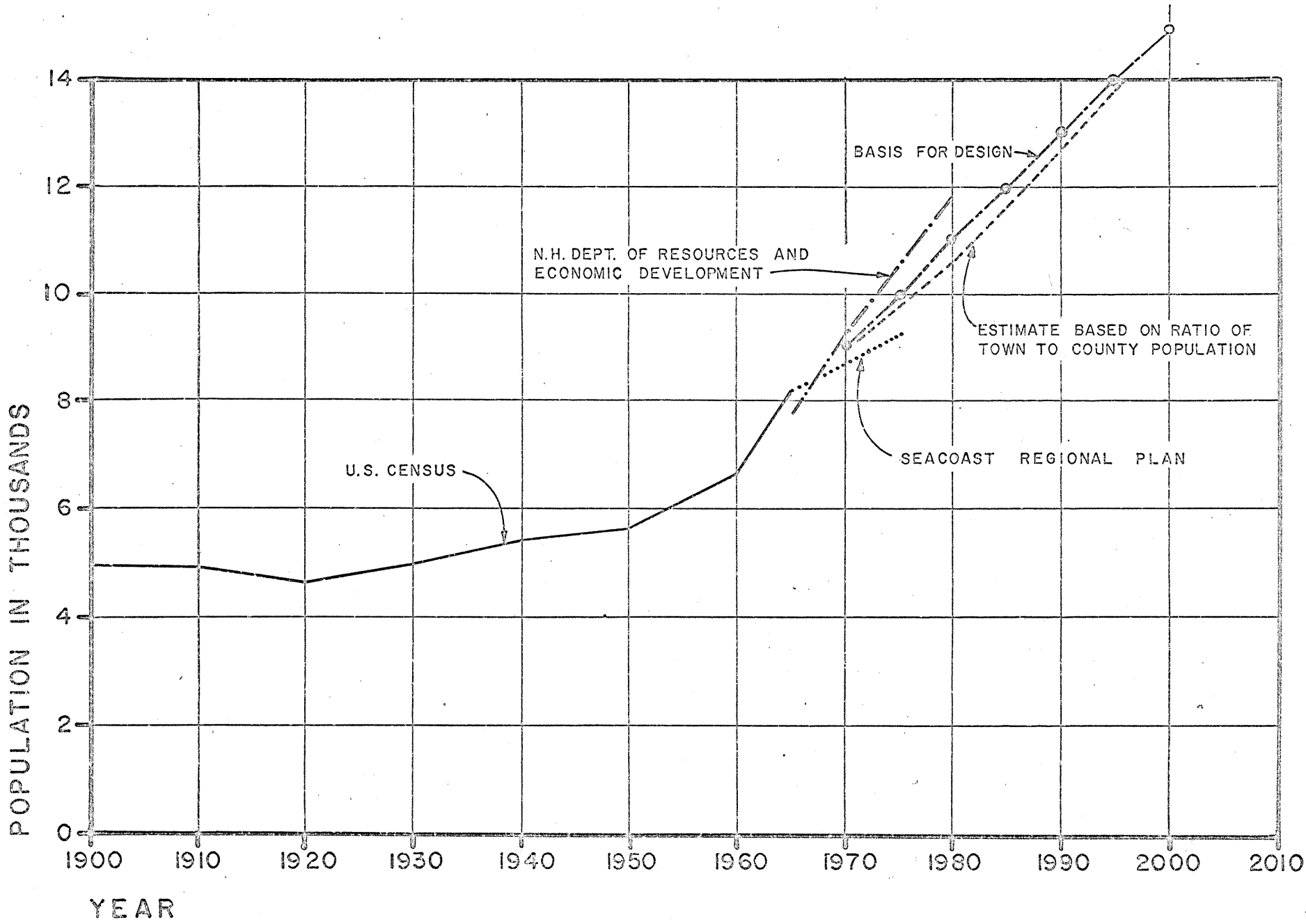
The water supply system must not only be capable of supplying the average daily consumption but also the maximum one-day demand. Peak hourly consumption is usually met from storage within the distribution system. This is true in Exeter with its two (2) 1,000,000 gallon capacity steel standpipes. The Epping Road standpipe was constructed in 1951, and the Hampton Road standpipe was completed in 1958.

POPULATION

Estimates of the future population of Exeter have been developed by others as follows:

1. New Hampshire Department of Resources and Economic Development.
2. Seacoast Regional Plan.

In addition the New Hampshire Department of Resources and Economic Development has also made a population projection for Rockingham County through the year 2000. Using this estimate and the ratio of Exeter's population to that of the County, a third estimate was developed for Exeter. The three projections are shown on Fig. No. 1.



POPULATION TRENDS, EXETER, N.H.

WESTON & SAMPSON

FIG. NO. 1

L-68.22

The following population estimates were used as our basis for design:

YEAR	DESIGN POPULATION
1965	8200
1970	9000
1975	10,000
1980	11,000
1985	12,000
1990	13,000
1995	14,000
2000	15,000

The above estimates have also been plotted on Fig. No. 1 and labeled "Basis for Design".

PER CAPITA USAGE

In order to determine the per capita usage, the total water consumption for a year is divided by the number of days in the year. This yields the average daily consumption. The per capita usage is the average daily consumption divided by the population served. The per capita consumption increased from 69 gallons per capita per day in 1960 to 78 gallons per capita per day in 1965. This represents an annual increase of 1.8 percent. However, in 1950 the per capita consumption was 71 gallons per day. Thus the annual increase over 15 years is less than 0.8 percent. The tendency in the United States has been for per capita consumption to increase each year. This can be attributed to the increasing use of air conditioners, automatic washing machines, swimming pools, lawn sprinkling, garbage disposals, and other water consuming appliances.

The rate of annual increase varies widely. Due to differences in total population served, dwellings served, uncertainty of population estimates, and varying industrial demands, reliable comparisons between water systems are difficult to obtain.

In estimating future per capita consumption, we feel that it would be prudent to apply a percentage increase of 1.5 percent (not compounded) from a base of 78 gallons per capita per day.

FUTURE WATER USAGE

The future average daily consumption was estimated by multiplying the estimated population by the projected per capita usage.

A water supply system must be capable of delivering the maximum one-day demand, since four or five maximum or near maximum days may occur consecutively. Thus, if the delivery rate to the system was less than the maximum day consumption, the water level in the two standpipes would be successively lower at the end of each day as the deficiency between the delivery rate and the demand was met from storage. It is good practice to avoid this situation since adequate storage is necessary to meet peak hourly water consumption which varies from 2 to 5 times the average daily rate, to meet fire flows, and to provide emergency storage when power failures occur.

The maximum one-day consumption of Exeter since 1960 as a percentage of average daily consumption is recorded in Table No. 1.

TABLE NO. 1
MAXIMUM ONE-DAY CONSUMPTION

YEAR	AVERAGE DAILY CONSUMPTION, MGD.*	MAXIMUM DAILY CONSUMPTION, MGD.	PERCENTAGE OF MAXIMUM TO AVERAGE
1960	0.500	0.850	170
1961	0.509	0.809	159
1962	0.503	0.944	188
1963	0.524	1.16	221
1964	0.587	1.006	172
1965	0.640	0.962	150
1966	0.662	1.143	173
1967	0.631	1.044	165

* MGD. = million gallons per day.

As shown in this table the ratio of maximum one-day consumption to average daily consumption has varied from 150 to 221 percent. In estimating future one day consumption we have used a ratio of 200 percent.

Experience has shown that highly industrialized densely populated communities experience a lower ratio of maximum to average consumption. Residential communities however, with a high percentage of single family dwellings on large lots have low population densities and a high ratio of maximum to average consumption.

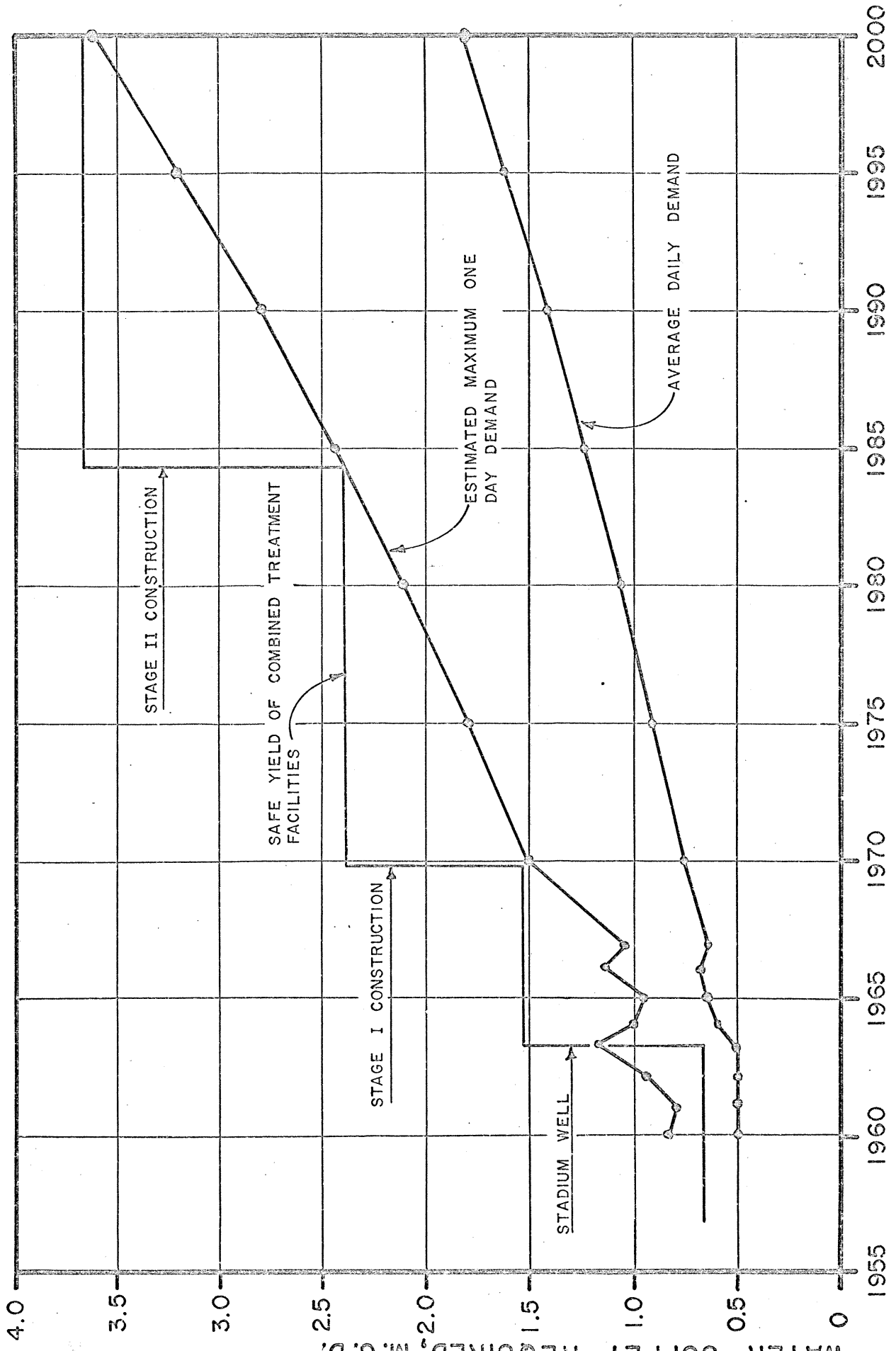
The past and future water usage is summarized in Table No. 2 below.

TABLE NO. 2
PAST AND FUTURE WATER USAGE

YEAR	POPULATION	GPCD	AVERAGE DAY IN MGD.	MAX. DAY FACTOR	MAX. DAY IN MGD.
1920	4604	71.5	0.33	1.3	0.43
1930	4872	59.	0.29	1.38	0.40
1940	5398	44.5	0.24	1.37	0.33
1950	5664	70.5	0.40	-	-
1960	7243	69	0.50	1.7	0.85
1965	8200	78	0.64	1.5	0.96
1970	9000	84	0.76	2.0	1.52
1975	10000	90	0.91	2.0	1.81
1980	11000	96	1.06	2.0	2.11
1985	12000	102	1.22	2.0	2.44
1990	13000	108	1.40	2.0	2.80
1995	14000	114	1.60	2.0	3.20
2000	15000	120	1.80	2.0	3.60

On Fig. No. 2 we have shown the anticipated average and maximum daily demands. The Town is now dependent upon two sources of supply, Lary Lane Well and Stadium Well. Even with Lary Lane Well and Stadium Well both producing at their present capacity, additional supply will be required to meet the estimated maximum one-day demand within two or three years from now. Continuous pumping from the Stadium Well will probably result in increasing taste and odor complaints. Therefore, it is recommended that additional sources be developed immediately.

FIG. NO. 2



FUTURE CAPACITY REQUIRED, EXETER, N. H.

WESTON & SAMPSON

L-68.24

DEVELOPMENT OF SOURCES OF SUPPLY

GENERAL

In 1961 the consulting engineering firm of Whitman and Howard, Inc. submitted to the Town of Exeter a report on a water supply for the Town from the Exeter River. This report recommended that a treatment plant designed for a normal flow of 2 million gallons per day be constructed on the Exeter River near Lary Lane Well. The construction cost of the treatment plant and a 12-inch discharge main was estimated at that time to be $327,000 including engineering. The report stated that the safe yield of the Exeter River is 3.5 million gallons per day.. It also mentioned the fact that the water rights to the Exeter River are controlled by the Exeter Manufacturing Company (now Milliken Industrials, Inc.) but did not mention the industrial river water requirements of the above mentioned firm.

In 1962 the consulting firm of Camp, Dresser and McKee submitted a report to the Exeter Manufacturing Company. This study estimated future mill river water requirements to be as high as 3.5 million gallons on a day of maximum daily use and averaging 2.4 million gallons per day over a week. It further pointed out that in the absence of stream gaging records for the River and based upon their observations flows considerably less than 2.5 million gallons per day can be expected during a very dry week. It was recommended that since the River will be barely adequate to meet the future needs of the mill, no agreement for its joint

use should be signed with the Town unless the safe yield of the River is increased by the construction of a new dam.

The immediate water requirements of the Town were alleviated in 1963 with the construction of the Stadium Well. The Town now had two sources in use with a combined yield of 1,515,000 gallons per day.

In that year Whitman and Howard, Inc. also submitted a report recommending the construction of a water supply reservoir and dam on the Exeter River. The proposed 140 ft. long dam would be located about one fourth mile upstream of the Pickpocket Dam and would reportedly increase the safe yield of the River to 6 million gallons per day, by raising the existing water level eight (8) feet and creating a reservoir about three (3) miles long with a capacity of about 300 million gallons. The River has a drainage area of about 103 square miles.

The various means of supplying Exeter with adequate water for the future, including these proposals regarding the Exeter River must be evaluated to arrive at a recommended plan of action.

ALTERNATE SOURCES

The alternate methods of supplying the Town of Exeter are listed in Table No. 3 below:

TABLE NO. 3 ALTERNATE SOURCES

ALTERNATE	SOURCE
A	2 MGD treatment plant on Exeter River and dam upstream of Pickpocket Dam.
B	Water from Bellamy Reservoir in Madbury via a force main and pumping station.
C	Water from the Lamprey River via a force main and pumping station.
D	Development of additional ground water sources.
E	Renovation and expansion of existing treatment plant combined with forced main and pumping station for the use of existing developed sources and the Exeter River.

The first alternate, that of the Whitman and Howard, Inc. reports of 1961 and 1963, which would provide the Town with 2 million gallons per day of water has a current (1968) project cost as estimated by Weston & Sampson of $863,400, including engineering and contingencies, as follows:

Dam	$181,000
2 MGD Treatment Plant	500,000
Discharge Main	38,500
Sub Total	$719,500
Engineering and Construction Contingencies	143,900
Total	$863,400

Because of the lack of physical data on the dam and discharge main these costs were established by updating the Whitman and Howard, Inc. estimates through the use of the Engineering News Record Construction and Building Cost Indexes for 1961, 1963 and January 1968. Because the filter plant estimate was considered low this was recalculated using current bids for plants of the type recommended. For year-round use of the Exeter River in this manner as the major source of water for the Town, without depriving industry of its water supply, the complete project including the dam would have to be constructed at once.

Alternates B and C were briefly discussed in the report on Metropolitan Water Supply for Seacoast Area by Camp, Dresser and McKee, consulting engineers, in 1960. Inasmuch as there are no other potential users of substantial quantities along the routes for either alternate, Exeter would have to pay the entire cost of supply and treatment and the required force main. The cost of either alternate would be prohibitive until a much larger demand is developed in the Exeter region.

The Town has made extensive explorations for ground water supplies. To date this search has yielded only three wells of 300 gallons per minute capacity or greater. One of three, Gilman Park Well had to be abandoned because of high iron, tastes, and odors. Analyses of the Stadium Well indicate that the iron, manganese, and odors are increasing to a point were treatment will be necessary in the immediate future. Only Lary Lane continues to provide water in quantity and of acceptable quality. Other test wells have been either insufficient in yield or have produced water which is high in nitrates. Test wells in the Drinkwater Road area were promising. However, the State Health Department recommended abandonment of this area because of the presence of nitrates. It is good practice not to construct wells where concentrations of iron in samples from test wells exceeds about 0.1 ppm. In view of the results of attempts to locate and utilize ground water supplies, it is not recommended that ground water should be considered as a future primary source of supply for Exeter.

Alternate E involves the reactivation of the original surface supply, supplemented first by previously abandoned and quality deficient supplies and then by water from the River; with reconstruction and expansion of the existing water treatment plant on Portsmouth Avenue. Although Gilman Park Well was abandoned, the yield of this well and that of the Stadium Well could be effectively utilized by pumping through a new force main to Water Works Pond. With storage in the reservoir and proper treatment at a renovated treatment plant, the water from both wells could be added to the yield of Skinner Springs and of the watershed of Water Works Pond. In the past, the turbidity of the reservoir water and occasional algae made treatment difficult with the original clarification facilities. However, with new flash mixing and flocculation

equipment, increased sedimentation time, and new chemical feed equipment, the water from the reservoir would not present any unusual treatment problems. The final product would be a completely acceptable water.

The first stage of this alternate would involve a renovated treatment plant, a new force main, a river intake pumping station and a new pump in the Gilman Park Well. The treatment plant would be increased in capacity to 2 million gallons per day. The safe yield of the presently developed sources to be treated at Water Works Pond would total 1.72 million gallons per day (Stadium - 0.86 MGD, Gilman Park - 0.44 MGD, Skinner Springs - 0.12 MGD, Water Works Pond - 0.30 MGD), with a proposed supplementary river pumping capacity of 2 MGD. The future extension of this alternate beyond Stage I would consist of providing more raw water and further expansion of the treatment plant.

RECOMMENDATION

We recommend Alternate E as the most economical plan and that best suited for the requirements of the Town, because it permits stage development and therefore stage expenditure of funds and because it makes full use of all sources of water. The 1.72 million gallons per day together with the yield of 0.65 million gallons per day from Lary Lane Well would give a total safe yield of 2.37 million gallons per day.

It is recommended that in Stage I the intake pumping station be constructed at the same time as the treatment plant renovation and the force main. This station would serve during an emergency, such as the loss of Lary Lane Well, and during times of high flows in the River. Industrial requirements could be guaranteed with the intake only being used in emer-

gencies or when the flow in the river was greater than that required by industry. The station could be used during periods of high flows to replenish the reservoir when drawn down. It would also ensure the reservoir of being full at the beginning of any drought.

Stage II will be required by the mid 1980's when it is estimated that the continuously increasing demand will reach the total safe yield provided by Stage I of 2.37 million gallons per day. At this time additional raw water will be necessary at Water Works Pond. It is recommended that this be provided by full time diversion of Exeter River water to the reservoir with the intake pumping station and force main.

If the future Milliken Industrials, Inc. river water requirements are as anticipated, the most permanent solution to the growing demand problem would be a new dam on the Exeter River similar to that described under Alternate A to develop the required safe yield of the river. This would be more than ample for any future needs that can be visualized at this time.

Postponing Stage II through increasing the safe yield of Water Works Pond by raising its dam during Stage I has been considered. While this would increase the yield by providing more storage, spillway modifications and a considerably longer dam would be required. The existing dam is a masonry-faced, earth fill, gravity type and because of space limitations most of the new portion of the dam would be in what is now the reservoir. The storage could be increased by about 50% by raising the existing dam 5 ft. This is not recommended, first because it would only postpone Stage II by a few years and second because its estimated cost, $120,000, is large in proportion to the benefits in comparison to the Exeter River

Dam. The creation of additional storage in Water Works Pond by excavation would be even more expensive, approximately $6,000 per million gallons of water volume or $180,000 for a 50% increase in volume at current prices.

The possibility of adding to the flow through the force main by finding a well or two in the vicinity of the Gilman Park and Stadium Wells, without regard for the quality of the water has been considered as a last resort in the event the Town's financial position prevented it from doing otherwise. It is felt, however, that there would be an eventual return to the river dam concept and that it should be considered at this time to be the most likely Stage II in comparing the various alternates.

Agreements as to the allocation of the Exeter River flow rights along with any necessary legislative action, plus efforts to have the dam and reservoir costs defrayed by Federal and State funds are preliminaries to Stage II. They should be initiated well in advance of the time that Stage II is needed.

The treatment plant as provided in Stage I would have an overload capacity of 3 million gallons per day and therefore would be adequate through the year 2000. The force main would also be adequate for Stage II.

CONSTRUCTION COSTS

GENERAL

The capital cost of Stage I of the project proposed in this report exclusive of land purchase, and based on prompt construction is estimated to be $607,200. The details of this figure are shown later in this chapter.

CONSTRUCTION COST TREND

An appropriate measure of changes in construction costs with time is the Construction Cost Index, published by the Engineering News Record (ENR). This index is based on weighted average costs of certain key materials and labor, and is related to a base figure of 100 for the year 1913. Our estimates of construction costs for this report have been prepared based upon a Construction Cost Index of 1110 which prevailed during the winter of 1967-1968 in the New England area.

The ENR Construction Index has increased at an average rate of about five percent per year for several years, and there is no indications at present that it will not continue to increase in the years ahead. Therefore, we urge that cognizance be taken of this trend, and that appropriate allowances be made therefore in the related funding. The estimate that follows should be reviewed in this light should delayed construction be considered, in order to be sure that those concerned will have a proper understanding of funding requirements.

The extent to which an allowance for increased costs should be made, cannot be accurately predicted at this time because it will be dependent upon the time when construction is to be undertaken and the cost index that prevails at that time. Our cost estimates may be adjusted at any given time by dividing

the then current index by 1110 and multiplying the cost estimates by the resulting factor.

COST ESTIMATE

Our estimate of costs is based on the premise that the construction work be done under contracts for which competitive bidding is obtained. The estimate for Stage I in Table No. 4 includes an allowance of 20 percent to cover construction contingencies such as repairs at Skinner Springs Wells, and engineering. It also includes demolition and removal as required at the filter plant. It does not include demolition of the old intake, washwater tank, or pump house.

TABLE NO. 4 STAGE I COST ESTIMATE

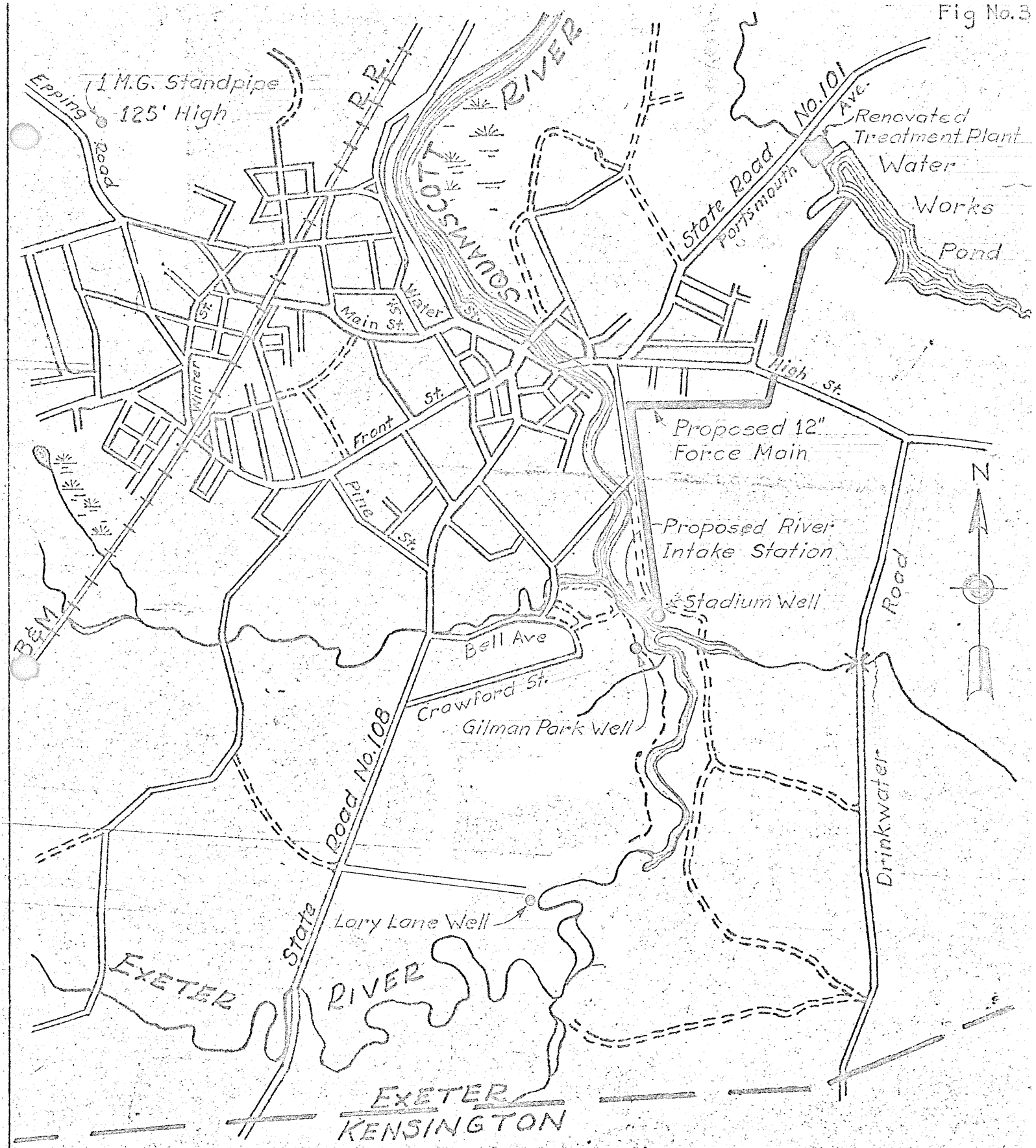
	Item	COST
1.	Expansion and renovation of existing water treatment plant to 2 MGD capacity	$375,000
2.	Force main (12-inch diameter, about 8,300 l.f.)	88,000
3.	Equipment changes at Stadium Well and new meter, pump, motor, and appurtenant equipment at Gilman Park	8,000
4.	Intake and Pumping Station on Exeter River	35,000
	Sub Total	$506,000
	Engineering and Construction Contigencies	101,200
	Total	$607,200

The proposed treatment plant would be a one-story masonry structure containing a chlorination room, chemical feeder room, office and laboratory space, toilet, and a pump room in the basement. New rapid mixing, flocculation basins and additional settling basins are also provided. The proposed facilities and the recommended force main are shown on Fig. Nos. 3 and 4.

Although it is beyond the scope of this report to evaluate the condition of the existing 10-inch cast iron main in Portsmouth Avenue, it is quite likely that this unlined main which is about 80 years old will have to be replaced or cleaned and lined to restore capacity on Portsmouth Avenue. We estimate it would cost about $31,000 to replace this main between the treatment plant and Highland Street with a new 12-inch main.

The current cost of the recommended Stage II, based on the costs developed for Alternate A, page 17, is $217,200.

Fig No. 3



EXETER, NEW HAMPSHIRE

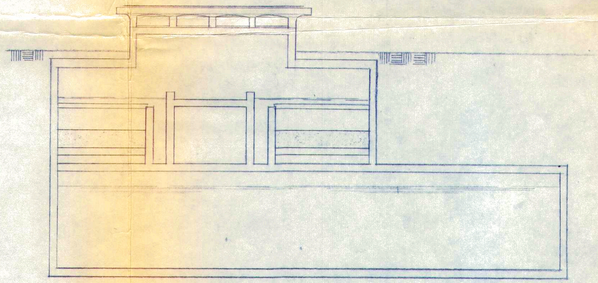
PROPOSED FORCE MAIN

Scale 1" = 1425' ±

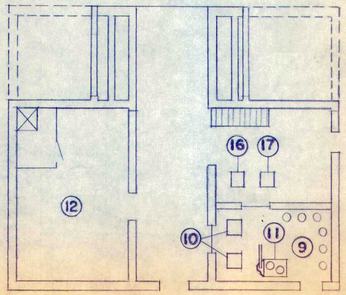
Weston & Sampson,
Consulting Engineers
Boston, Mass.

L
62.25
W

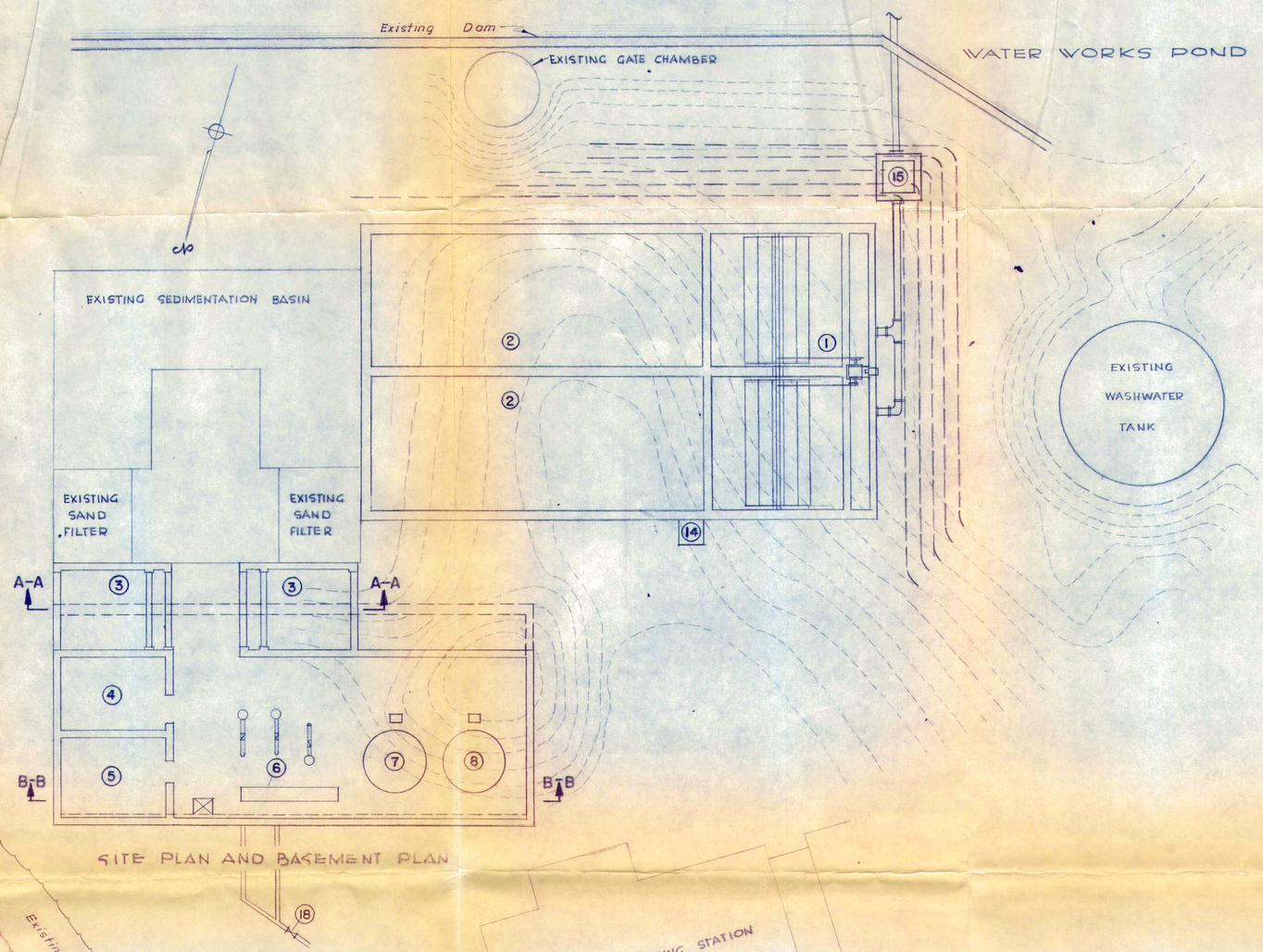
FIG. 4



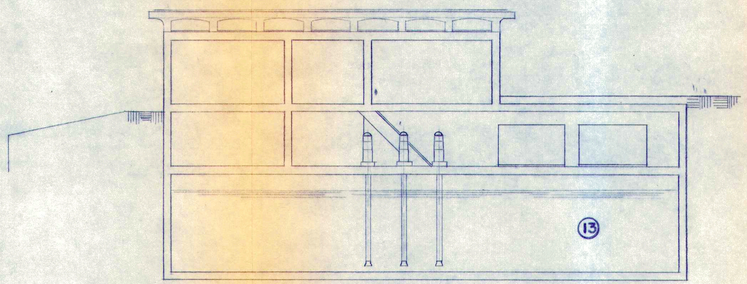
SECTION "A-A"



FIRST FLOOR PLAN



SITE PLAN AND BASEMENT PLAN



SECTION "B-B"

LEGEND

1. FLOCCULATOR DRIVE MECHANISM
2. SEDIMENTATION BASINS
3. RAPID SAND FILTERS
4. BOILER ROOM
5. STORAGE ROOM
6. MOTOR CONTROL CENTER, PUMPS
7. LIQUID ALUM STORAGE TANK
8. SODIUM HYDROXIDE STORAGE TANK
9. CHLORINE ROOM
10. CHLORINATORS
11. CHLORINE SCALES
12. OFFICE & LABORATORY
13. CLEARWELL
14. SLUDGE PUMP
15. RAPID MIX CHAMBER
16. CARBON FEEDER
17. SPARE FEEDER
18. FLOW METER

TOWN OF EXETER, N.H.

PROPOSED FILTRATION PLANT EXPANSION

SCALE: 1" = 10'

MARCH, 1968

WESTON & SAMPSON
CONSULTING ENGINEERS
BOSTON, MASS.

23-36

B.L.M. 1881

ADDITIONAL INFORMATION ATTACHED TO REPORT

TOWN OF EXETER
10 FRONT ST.
NEW HAMPSHIRE 03833

TEL. 1-603-778-8535

WATER STUDY COMMITTEE

TOWN MANAGER

8 October 1968

Board of Selectmen
Exeter, New Hampshire

Gentlemen:

Herewith is a final report of the Water Study Committee meeting held October 3rd subject to your acceptance and/or any further work you may request of the Committee.

All members were present and after a long review of all aspects of the water rate structure a motion was made and seconded. A vote in favor of the motion was unanimous. The following water rate structure is recommended:

Minimum Charge	1,500 gals.	7.50	Per Quarter
Next	5,000 gals.	.08	Per 100 gals. each quarter
Next	10,000 gals.	.07	Per 100 gals. each quarter
Next	50,000 gals.	.06	Per 100 gals. each quarter
All Excess		.05	Per 100 gals. each quarter

Together with this report are several exhibits which will provide you with many details and facts which the Committee used as a basis for its recommendations.

Very truly yours,

Charles C. Knibbs

Charles C. Knibbs
Chairman

CCK/akg

R. S. WESTON 1915-48
G. A. SAMPSON 1915-64

GEORGE G. BOGREN
ROBERT M. POPE

LEO F. PETERS

WESTON & SAMPSON

CONSULTING ENGINEERS

10 HIGH STREET
BOSTON, MASS. 02110

READ AND HEED

TEL. AREA CODE	TO	READ	WRITE
TOWN MANAGER	508	✓	0867
1st SELECTMAN	✓		
2nd SELECTMAN	✓		
3rd SELECTMAN	✓		
TREASURER			
TOWN CLERK			
TAX Collector			
BOOKKEEPER		✓	
SEC.	File Hold		

May 14, 1968

5/17/68 C.C.K.

Water Study Review Committee
Town of Exeter
10 Front Street
Exeter, New Hampshire 03833

Gentlemen:

This is to record the substance of our meeting of May 8, 1968, as per your request.

1.) The estimated operating costs of the proposed filter plant is $30 per million gallons of water, exclusive of labor and fixed charges for the capital improvements. Allowing 3 men at $5,000 per year for two-shift operation would increase the unit cost at the 1970 average usage of 0.76 mgd to $84 per million gallons of water. By way of reference it is estimated that the current operation cost of the University of New Hampshire plant, a similar plant on similar water, based on previous records, is about $60 per million gallons. This allowed about $4,000 per year for labor. Again no fixed costs are included.

2.) We do not feel the removal of any mud that may be on the bottom of Water Works Pond would add significantly to the storage volume because of the normal high water content of mud in place. For example, a measurement of 3 feet of mud may be 80-95% water by volume. If cleaning involved removing 3 feet of mud from say 50% of the pond's 25 acres at a unit cost of 80¢ per cubic yard, the estimated cost would be about $48,500.

3.) Neither the water from the Gillman Park Well nor the Stadium Well is expected to require any treatment other than resulting from discharge to the Pond and passage through the filter plant.

4.) The Portsmouth Avenue 10-inch main can, it is felt, be cleaned and lined from the proposed plant to High Street for about $15,000. The cost of replacing it with a 12-inch main would be about $42,000. The replacement to Highland Street as noted in the report could be accomplished for $31,000 as stated.

5.) The proposed capacity of the river pumping station is 2.5 million gallons per day. It is anticipated that this amount of water could be taken without a dam on the river during the several wet months of the year. Emergency or "weekend" pumping appears feasible during the dry months. It should be noted that no credit has been taken for any of this water in predicting the time when Stage II (the dam) is required.

6.) Nitrates can not be economically removed from potable water.

7.) About 5% of the finished water, 38,000 gallons per day in 1970, will be used for wash water. This could be returned to the Pond after settling. Approximately $16,500 should be added to the Stage I cost of $607,200 for this feature.

8.) No extensive cleaning work is planned at the Skinner Springs Wells. Any that is required can be considered to be within the contingency figure allowed for Stage I.

9.) The estimated safe yield of the Gillman Park Well, is 0.44 mgd as shown on page 20 of the report.

10.) Water rates vary widely of course and should be based on the calculated cost of delivering water plus debt service. Two local rates follow:

Franklin, New Hampshire
Rate adopted the start of the second quarter 1961. (Still in affect 1968)
0 to 500 cubic feet $6.00 minimum quarterly charge
500 to 5,000 cubic feet @ 32¢ per hundred cubic feet
5,000 to 50,000 cubic feet @ 22¢ per hundred cubic feet
Over 50,000 cubic feet @ 12¢ per hundred cubic feet.
Minimum yearly charge for water service $24.00 per year.

Rochester, New Hampshire
Rates per six months

Cubic Feet	Per 100 Cubic Feet
First 1,000	Minimum of 5.00
Next 36,000	0.2175
Next 37,000	0.1875
Next 48,000	0.105
Next 122,000	0.1125
Next 244,000	0.075
Next 732,000	0.06
Excess	0.0375

Sincerely,

WESTON & SAMPSON

Robert M. Pope

Robert M. Pope, Partner

RMP:hw

1967 Pumping Costs.

462.	Superintendance	$ 523.92
64.	Pumping Station Labor	375.90
68	" " Sup + Exp.	2123.30
69	Purification " "	1070.47
71	Power Purchased.	7394.93
		$ 19388.52

Gallons Pumped 230.492.700

Cost per 100 gal. .00841

Total Expenses 1967 $ 129.561.25

Cost per 100 gal. .0633

TOWN OF EXETER
10 FRONT ST.
NEW HAMPSHIRE 03833

TEL. 1-603-778-8535

TOWN MANAGER

14 August 1968

Board of Selectmen
Exeter, New Hampshire

Gentlemen:

On April 16th a Committee was appointed to study and make recommendations to include three aspects of the present and future additions to the Exeter Water Department.

1. Alternate sources of Water Supply
2. Review Tapping Fee structure
3. Review Water RAte

Several meetings of the Committee were held. Very careful evaluations were made together with facts and figures of the Department and Town records.

On the above date at a meeting of the Committee, a motion was made and seconded that the March 1968 Report on alternate sources of water supply by Weston and Sampson be accepted subject to some reservations as follows:

1. ~~Renovation of present filters~~
2. Repairs to dam and spillway
3. Fee for sewers and contingencies.

The vote was unanimous in favor of the article, Item 1 on the agenda.

Further on the above date a motion was made and seconded that the tapping charge be increased from the present rate to $100.00. This fee is for water supply to the property line only and this shall be the extent of work done by the Department. All other work on the subscriber's property shall be the subscriber's responsibility and expense. The vote was unanimous in favor of this, Item 2 on the agenda.

The Committee on the above date was quite unable to make any recommendations with respect to water rate and we wish to report that further study is now under way.

Respectfully submitted,

Charles C. Knibbs, Chairman

CCK/akg

WATER STUDY COMMITTEE

Expense

	1965	1966	1967	1968
Total Labor	$ 22,216.48	$ 19,883.92	$ 23,000.00	$ 26,680.00
Social Security	1,170.52	1,145.80	2,211.52	3,000.00
Power Purchased	7,053.84	6,995.88	6,889.20	7,000.00
Bond	25,500.00	27,500.00	27,500.00	27,500.00
Interest	2,935.89	4,417.50	4,132.50	4,132.00
TOTAL	$ 58,876.73	$ 59,943.10	$ 63,773.22	$ 68,312.50
All Other	53,553.90	39,866.72	65,788.43	60,000.00
GRAND TOTAL	$112,430.63	$ 99,809.82	$129,561.65	$128,312.50

INCOME

				Estimate
Water Sales	$ 92,318.09	$ 91,247.60		$ 92,000.00
Hydrants	12,900.00	13,200.00		
	105,218.09	108,547.00		
All Other Income				
GRANT TOTAL	$116,788,45	$11,194.50	$ 87,230.40	$110,000.00
Deficit				

TOTAL COST OF NEW SYSTEM

1968 Cost	$128,312.50
Bond and Interest	66,500.00
Add Labor	30,000.00
Add Power	7,000.00
	$231,812.50

Water Treatment

$60.00 Per Million

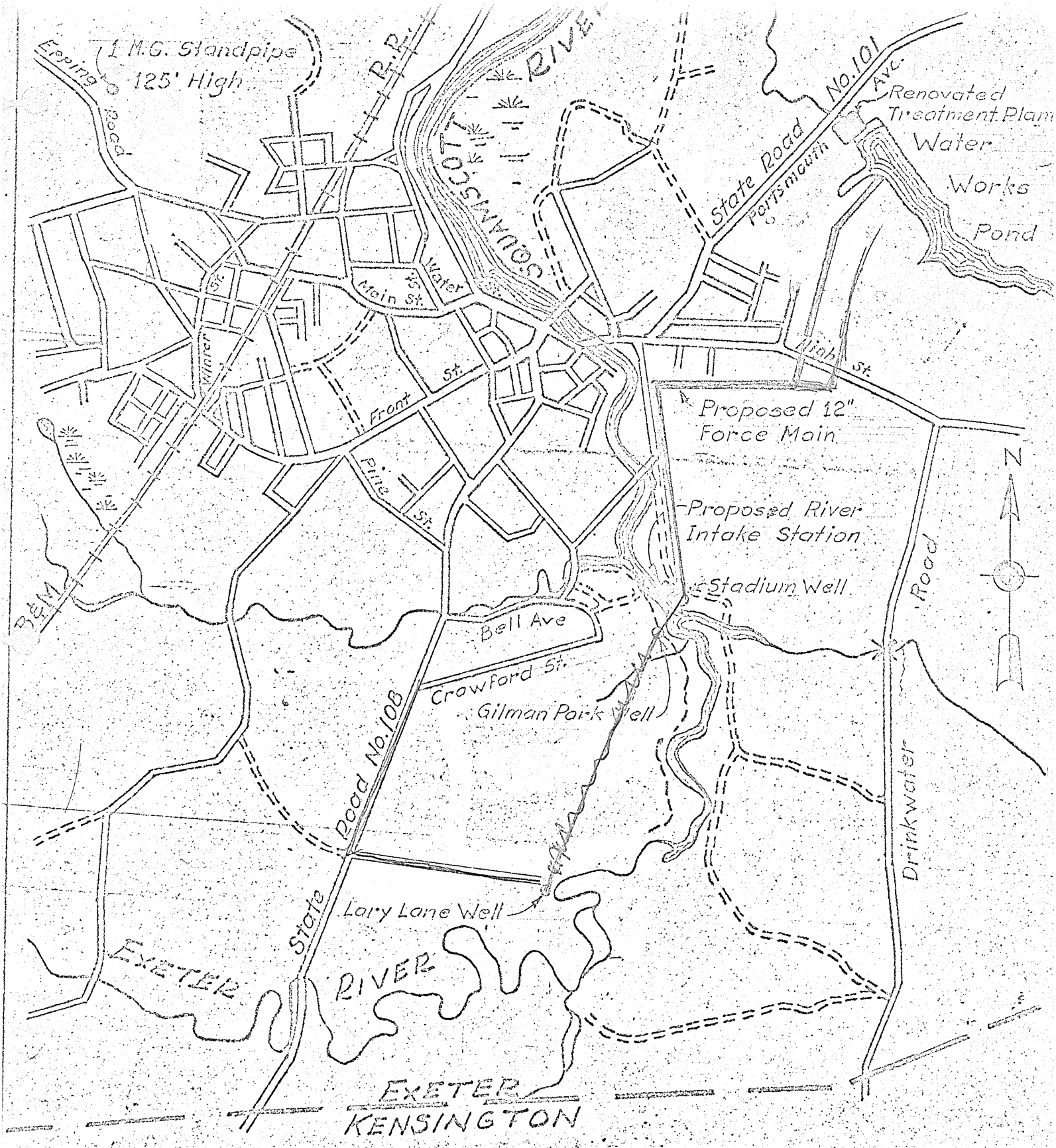
250 Million Gallsons	$15,000.00
Present Bond	18,000.00
	$33,000.00

$231,812.50	
33,000.00	
$264,812.50	

Tapping Charge to Property Line	$100.00
Increase Water Rate	33 1/3%

If and when new addition, it will take another increase of 33 1/3% to offset cost???

1968	Water Told	$ 90,000.00	
	Increase 1/3	30,000.00	
		120,000.00	
	New System Increase 1/3	40,000.00	
		$160,000.00	
	Other Department Income	25,000.00	
		$185,000.00	Total Income



EXETER, NEW HAMPSHIRE

PROPOSED FORCE MAIN

Scale 1" = 1425'

Weston & Sampson,
Consulting Engineers
Boston, Mass.

L
68.2E
W