MASTER PLAN 1988
FOR THE
CITY OF DOVER, NEW HAMPSHIRE

UTILITIES AND COMMUNITY FACILITIES

Adopted by the
Dover Planning Board
March 28, 1989

The Publication of this document represents the final two chapters of the City of Dover, New Hampshire Master Plan. Other chapters in print include: Housing, Land Use and Economic Development; Conservation and Recreation; and Transportation. The Master Plan was prepared by the Dover Planning Department under the auspices of the Planning Board. Assistance was received from private consultants, the Conservation Commission, the Historic District Commission, other City Departments, and numerous sounding boards comprised of local citizens and business professionals.

DOVER PLANNING BOARD MEMBERS:

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Historic Cover Photographs provided by Tom Hindle

RESOLUTION

RESOLUTION: TO ADOPT THE COMMUNITY FACILITIES AND UTILITIES CHAPTERS OF THE DOVER MASTER PLAN

WHEREAS: The Planning Board and Planning Department have written and completed in accordance with RSA 674:3, two Chapters of the Dover Master Plan entitled Community Facilities and Utilities; and

WHEREAS: A concerted effort was undertaken to include participation by the general public; and

WHEREAS: A formal public hearing on said Chapters, in accordance with RSA 675:6, was held before the Planning Board on March 14, 1989.

NOW THEREFORE, BE IT RESOLVED BY THE DOVER PLANNING BOARD THAT:

1. The Master Plan Chapters entitled Community Facilities and Utilities be adopted and certified in accordance with RSA 674:4; and

2. The Planning Board Chairman is authorized to sign and label as "adopted" the final reproduced documents of said Chapters; and

3. The Planning Department is authorized to develop an abbreviated summary of the said Chapters.

March 28, 1989
Date of Planning Board Action

Harold Preston
Planning Board Chairman

Motion to approve by: Otis Perry

Seconded by: Patricia Torr

Board members in favor: Otis Perry, Patricia Torr, Kevin Mone, Pete Bouchard, Richard Pak, Harold Preston, Mic Holbrook, Jo Eteiman

Board members opposed: Jim Caliendo

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Water and Sewer

CITY OF DOVER
UTILITY SECTION

The City of Dover, New Hampshire is located in Southeastern New Hampshire (Strafford County) and has a population of approximately 26,500 people. The City consists of 28.3 square miles of which 47 percent of the land area has been developed for residential use and 7 percent has been developed for non-residential uses. The remaining 46 percent of Dover's total land area is either vacant (25%), or in public (11%), agricultural (8%), or institutional (2%) use.

Approximately 85 percent of the developed residential area consists of single family dwelling units. Most of the multifamily development is located in and around the urban core with single family dwellings extending from the center of the City in decreasing numbers. The location of residential units occur primarily in and around areas which have accessibility to municipal water and sewer.

Commercial and office development is located in the downtown and Miracle Mile areas, while industrial growth is concentrated on the Littleworth Road and Knox Marsh Road corridors. These areas are also serviced by municipal water and sewer.

Much of the vacant land within Dover is not serviced by either municipal water or sewer. Some areas are serviced by City water but not sewer. This section of the Master Plan reviews the existing water and sewer systems in regard to their ability to meet present and future needs.

WATER

Prior to the creation of a municipal water system in the late 1800's, residents in the City received their water through three private aqueduct companies. The original system consisted of a two million gallon open storage reservoir on Garrison Hill, a pumping station at the south end of Willand Pond, and twenty-one miles of water mains. The system was fed by three sources of water: Kelly Springs; Hussey Springs; and, Willand Pond. The first filtration system was created in 1889 with the construction of slow sand filters at Lowell Avenue.

Rapid community growth caused a continual upgrade and expansion of the system. The following is a list of wells and their date of installation:

YEAR	WELL
1934	Layne Well No. 1*
1941	Smith Well No. 1*
1947	Barbadoes Well No. 3*
1954	Willand Pond Well*
1959	Cote Well*
1964	Smith Well No. 2*
1958	Ireland Well
1966	Cummings Well
1966	Griffin Well
1967	Smith Well No. 3
1969	Hughes Well
1972	Calderwood Well
1977	8" Test Well

* No longer in existence

Due to iron and manganese problems in many of the well water supplies the City expanded its treatment facility in 1956 with the construction of a one million gallon per day plant at Lowell Avenue.

The open storage reservoir on Garrison Hill was abandoned in 1969 with the completion of a new four million gallon prestressed concrete tank. The new tank raised the static pressure throughout the system about 10 pounds per square inch and provided additional storage capacity. The tank has a water depth of 31 feet and a diameter of 148 feet. The overflow elevation of the Garrison Hill storage reservoir is 305 feet above mean sea level.

EXISTING SYSTEM

The existing system consists of approximately 70 miles of water mains ranging from four to sixteen inches in diameter. The lines are generally comprised of unlined cast iron, cement lined ductile iron and cast iron, asbestos cement, and cement lined ductile iron.

This single pressure system is supplied entirely by groundwater sources. These groundwater sources consist of seven deep gravel-walled wells screened in glacial deposits. The wells feed the system from the north (Smith and Cummings Well) south (Ireland, Griffin, and Hughes Well), and west (8" Test Well and the Calderwood Well). The water from the Smith and Cummings wells is fed to the Lowell Avenue treatment plant prior to being fed into the reservoir and eventually into the system. The water from the remaining five wells are fed directly into the system. Pressures in the system range from a maximum of about 120 pounds per square inch at Dover Point to a minimum of 40 pounds per square inch at the north end of the system on Apachee and Pawnee Lanes. While the pressures are comparatively low in the northern section of

the City, they fall within the minimum industry standard of 20 pounds per square inch.

The following is a description of the existing wells. Refer to Appendix A for a more detailed breakdown.

Griffin Well - The Griffin well, developed in 1967, draws water from the Pudding Hill aquifer and is located north of Mast Road just over the City line in Madbury. Normally throttled to 500 gallons per minute the well has the ability to produce up to 600 gallons per minute for short periods of time. The well is artificially recharged with water drawn from the Bellamy River. In recent years the well has developed a slight iron and manganese problem. The well was developed as the result of findings from the Federal Government's exploration program for Pease Air Force Base. Given the large pumping capacity of the well a back-up energy supply has been installed in the event of power failures.

IRELAND WELL - This well was created in 1960 and similar to the Griffin well it draws its water from the Pudding Hill aquifer. It is also supplemented by being recharged with water taken from the Bellamy River. The well is located midway between Knox Marsh Road and Mast Road on the south side of the Bellamy River. The well has a long-term capacity of 600 gallons per minute but may pump up to 700 gallons per minute for short periods of time. The water quality is excellent and needs only an alkali additive for PH adjustment prior to being pumped into the distribution system. The original testing of the site for a well was completed by the Federal Government as a potential water source for Pease Air Force Base.

CALDERWOOD WELL - Developed in 1972, the Calderwood Well is in the northwest corner of the City off of Glen Hill Road near the Barrington line. The well draws water from the Hoppers Aquifer and has a long-term capacity of 500 gallons per minute. The well can produce 700 gallons per minute for short periods of time. The water quality is excellent needing only alkali addition prior to being pumped into the distribution system. In addition to the well being an important source of water for the City, it also provides added pressure to the system in the County Farm Road area.

8" TEST WELL - Located near the Calderwood well in the northwest area of the City, this well was established after preliminary tests indicated that additional water could be withdrawn from the Hoppers aquifer. The well was established in 1977 and proved to be a disappointment when it was determined that the well could only safely produce approximately 300 gallons per minute for 6 months a year without drawing down the water level in the aquifer.

SMITH & CUMMINGS WELLS - The Cummings Well was developed in 1958 and is located between Glennwood Avenue and the Sixth Street connector just off of Smith Well Road. The Smith Well is located 100 feet away and was developed in 1967. The two wells together produce a long-term yield of 535 gallons per minute. The contaminant Benzene becomes apparent in the water if the wells are pumped at a higher capacity. Therefore, the short term yield is not much higher than 535 gallons per minute. The wells draw upon the Willand Pond Aquifer and the water contains undesirable amounts of dissolved iron and manganese. The water is pumped to the Lowell Avenue treatment plant where it is treated and then introduced into the distribution system via the Garrison Hill Reservoir.

HUGHES WELL - The Hughes Well replaced the earlier Barbadoes Pond Well and is located north of Old Stage Road and south of Littleworth Road just inside the City line. Developed in 1969, the well soon developed levels of iron and manganese comparable to the well it had replaced. Because of the iron and manganese the well is used only during peak periods with a long-term and maximum yield of 300 gallons per minute for about 6 months a year.

All of the present wells require periodic cleaning and redevelopment. This process entails the retrieval of the pumping unit for cleaning and removal of iron and manganese incrustatios from the screen.

While the depth, yield, water quality and pumping equipment among the seven active wells may differ, the actual construction is very similar (24" diameter outer castings with 18" diameter gravel-walled well screens and inner castings). The Ireland, Griffin, Hughes, and Calderwood wells range in depth from 101 to 114 feet. The Smith and Cummings wells are both 75 feet in depth with the 8" Test Well being 97 feet in depth. Each well is equipped with a vertical-turbine pump, drawn by a vertical induction motor. The motors and other mechanical, electrical, and treatment equipment are installed in well houses instead of underground vaults. The City recently purchased a mobile emergency power generator which can be used at the Ireland, Calderwood and 8" Test Wells.

The long term well yield (safe yield) represents the amount of water which may be pumped from a well for an extended period of time without depleting the aquifer of its resources or introducing contaminants to the system. The longterm combined well yield of the seven existing wells is approximately 3,506,400 gallons per day.

The short-term yield (maximum yield), represents the maximum amount of water which may be pumped from a well for a brief period. Generally, when a well is being pumped at its maximum yield the water level in the Aquifer itself is slowly

being depleted. When two wells tapped into the same aquifer are pumped at maximum yield simultaneously, the water level is depleted at a much faster rate. The length of time at which a well may be pumped at maximum level depends on a number of factors including weather conditions and rate of recharge. The maximum yield for the existing system is 4,536,000 million gallons per day. Table I illustrates the prospective well capacities.

TABLE I

WELL CAPACITY (GPM)

	SAFE YIELD	MAX YIELD
SMITH & CUMMINGS	535	550
CALDERWOOD	500	700
IRELAND	600	700
GRIFFIN	500	600
HUGHES	300 GPM 6 MOS./YR	300 GPM 6 MOS./YR
8" TEST	300 GPM 6 MOS./YR	300 GPM 6 MOS./YR
TOTAL	3,506,400*	4,536,000

*The safe yield total assumes that the Hughes Well and the 8" Test Well are not pumped concurrently.

AVERAGE DAY DEMAND

The average daily demand represents the amount of water a community would consume in 24 hours if the daily consumption were averaged throughout a one year period. This demand on a distribution system changes through time as the result of population increases, waterlines being extended into new areas, changes in water use habits and even weather conditions. Trying to determine the reason behind a community's sudden change in water usage can often be difficult.

Between 1930 and 1940 the population of Dover increased from approximately 13,500 to 15,000 people. The water consumption remained relatively stable at about 700,000 gallons per day. This indicates that either the majority of the new residents settled outside of the existing service areas or that there was a loss of non-residential usage within the City.

The amount of water the City consumed on a daily basis almost doubled between 1950 and 1960, (1,100,000 gpd in 1950 2,000,000 gpd in 1960). The large increase was most likely a result of the extension of the distribution system into areas previously undeveloped to accommodate increased population as well as an increased standard of living leading to a larger use of appliances such as washing machines.

During the period between 1960 and 1980 the average daily use of water remain relatively stable (2,000,000 - 2,200,200 gpd). This stability was the result of slow population growth (19,000 in 1960 vs. 22,400 in 1980) and the loss of non-residential water usage.

Appendices B through I illustrate the average daily water production for each well by month and year between the period of 1981 through 1988. The appendices indicate an increase in the daily consumption of approximately 400,000 gallons (18%) between the years 1981 (2,234,651 gpd) and 1988 (2,651,958 gpd). During this same period, population increased by 18% (4,100 people), and non-residential growth added 1,000,000 square feet of floor space. The average daily water demand has grown in direct proportion to the residential and non-residential growth.

It should be noted that a slight decrease in the average daily demand of water in the later part of 1982 and into 1983 was the result of a sharp increase in water user fees which took place in April of 1982. The fees increased from .59 cents per 100 cubic feet of water to 1.00 dollar per 100 cubic feet.

MAXIMUM DAY DEMAND

The maximum amount of water entering a distribution system during the course of one day within a particular year is defined as the maximum day demand. The maximum day demand is generally a direct result of weather conditions which exist at the time of recording such as a hot dry period of weather resulting in an increased use of water. Domestic water users in residential areas increase their average daily water consumption by lawn sprinkling, car washing, swimming pool use, as well as increased use of any household water using devices. Table II illustrates the maximum day demand and its relation to the Average Day Demand for the years 1981 through 1988.

TABLE II
HISTORIC WATER DEMAND

	Average Day Demand Per Year	Maximum Day Demand Per Year
1981	2,234,651	2,815,300
1982	2,152,110	2,890,300
1983	2,196,878	2,971,100
1984	2,235,316	3,690,500
1985	2,590,534	3,714,500
1986	2,432,200	3,056,400
1987	2,517,599	3,397,700
1988	2,651,958	3,763,800

During the past eight years, the maximum day demand ranged from a high of 1.65 times the average daily use occurring in 1984, to a low of 1.26 times the average daily use which occurred in 1981 and again in 1986. In 1987 the maximum day demand of 3,397,700 gallons per day was 1.35 times the average demand of 2,517,599. In 1988 the maximum day demand was 3,763,800 gallons per day or 1.41 times the average. The average increase between the average day demand and the maximum day demands during the past eight years has been 38 percent.

EXISTING PROBLEM AREAS

Many of Dover's existing problems stem from the City's single pressure system and the overflow elevation of the Garrison Hill Storage Reservoir. This elevation of 305 feet above mean sea level is only slightly higher than many of the elevations of outlying areas. For example, the ground elevations in the northern section of the City range from 120 feet on County Farm Road near the Cochecho River to about 240 feet in Indian Village and 300 feet at the top of Long Hill.

These elevations cause a drop in water pressure and require larger water mains to provide adequate water for fire flows. Minimum fire flow standards are one of the many requirements used by Insurance Service Organization (I.S.O.) to establish an insurance rate for a city. The minimum ISO fire flow for a given area is established by the distance between structures as shown in the following table:

TABLE III
I.S.O. FIRE FLOW STANDARDS

DISTANCES BETWEEN STRUCTURES	MINIMUM FLOW
Less than 10'	1500 GPM
11' to 30'	1000 GPM
31' to 100'	750 GPM
100' and above	500 GPM

A residual pressure of 20 P.S.I (pounds per square inch) must be maintained while providing the needed flow. Maintaining a residual pressure of 20 P.S.I. insures that normal household functions can still be carried out during a fire. For the purposes of this study a fire flow of 1500 gallons per minute was established for the outlying areas in order to assure continued line capacity in the future. A minimum 1000 gallons per minute with a residual pressure of 20 P.S.I. was established in the Urban Core.

In the following areas a fire flow of 1500 gallons per minute cannot be withdrawn from the system while maintaining a residual pressure of 20 P.S.I.:

1. Fire flows on Tolend Road, County Farm Road, and Upper Sixth Street cause low pressures on Tolend and County Farm Roads.

2. Fire flows at Wentworth Terrace cause low pressures on Boston Harbor Road and Wentworth Terrace.

3. Fire flows in the Indian Village area create low pressures on Old Rochester Road and Indian Village area.

4. Fire flows on Westwood Circle cause pressure problems at Westwood Circle.

5. Fire flows in Country Club Estates create pressure problems in Country Club estates.

6. Fire flows in the Fourth Street and Snows Court area create pressure problems on Snows Court.

7. Fire flows in the Morningside Park area create pressure problems in that area.

The distribution system suffers from capacity problems as well as insufficient line size to carry the amount of water needed in an area. The following is a summary of capacity problems:

The water line on Lincoln Street is only 4 inches in diameter. A 12" line is needed for added capacity.

The main line Grove to Central on Fifth Street is only

4 inches in diameter. A new 8" line is needed for additional capacity.

The Henry Law Avenue line from Foster's to Nile Street consists of an old 6 inch line. A 12" line is needed for added capacity.

The 8" line on Sixth Street from Glenwood Avenue to County Farm Road is insufficient and needs a 12" line for added capacity.

FUTURE WATER DEMAND

The ability or inability to supply water to new development, both residential and non-residential, could be the single most limiting factor affecting the potential future growth of the City. In order to assess the future water demand for the City the projected residential and non-residential growth as outlined in the Land Use Section of the Master Plan was used. In this section of the plan, residential growth was projected based on new dwelling units and non-residential growth was projected on a basis of square footage. These projections were used in conjunction with a water usage multiplier based on each type of land use. The multipliers were derived from actual water usage data for each land use type in the City. Table IV illustrates the multipliers.*

TABLE IV

WATER DEMAND MULTIPLIERS

LAND USE	AVERAGE DAILY WATER USE (GAL)
Single Family Detached	159.6 per unit
Single Family Attached	104.62 per unit
Multi-family	112.72 per unit
Office	.078 per sq. ft.
Commercial/Retail	.0946 per sq. ft.
Industrial	.052 per sq. ft.

* Multipliers were taken from Table F - Impact Matrix of the Land Use Section

Appendix J outlines the projected demand for the years 1995, 2000, 2010, and 2020 based upon the projections set out in the Land Use Section.

Table V illustrates the projected water demand. The Projected Maximum Daily Consumption was derived by multiplying the projected average gallons per day by 1.38. This 1.38 ratio is based on the average increase between the daily water demand and maximum day demand during the past ight years. The projected water demand for the City of Dover is shown below.

TABLE V

PROJECTED WATER DEMAND

	Average Gallons Per Day	Maximum Daily Consumption
1995	3,237,951	4,468,372
2000	3,543,632	4,890,212
2010	4,155,599	5,734,727
2020	4,761,297	6,570,590

The figures indicate that the water needs of the City will increase from the current average of 2,651,958 gallons per day to 3,237,951 gallons per day by the year 1995. During this same period the maximum day demand will increase from 3,763,800 gallons per day to 4,469,372 gallons per day.

The projections illustrate the need for Dover to begin researching alternative water supply sources immediately. The existing maximum safe yield of 3,506,400 gallons daily and maximum yield of 4,563,000 will barely be adequate to supply the City through the year 1995. The current available resources are not adequate to meet the City's projected need for the year 2000 of 3,543,632 gallons of daily safe yield capacity and a potential maximum demand capacity of 4,890,212 gallons daily. Appendices K and L illustrate the past and projected population and water demand.

MAXIMUM MARKET POTENTIAL

The maximum amount of development which could occur if all of Dover's vacant land were developed in accordance with existing building densities is defined as the Maximum Market Potential. This maximum potential is important in helping the City determine its ultimate future water need.

As noted in the beginning of this chapter, 54% of the land area in Dover has been developed for either residential or non-residential use. The remaining 46% of the land consists primarily of undeveloped land. This is broken down into the number of acres of vacant land that exists in each zoning

district as illustrated in tables A through D of the Land Use Section of the Master Plan. The amount of land that is generally consumed for various development types is outlined in Table E of the Land Use Section. By multiplying the amount of available land by the density standards established in Table E the maximum market potential can be derived for total buildout of the City.

If all of the vacant land which is currently available was developed to its maximum market potential, the City of Dover would use an additional 2,273,042 gallons of water per day. The maximum amount of water that the City would need on an average daily basis would be approximately 4,925,000 gallons. The maximum daily demand would approach nearly 6,796,500 gallons of water per day.

The existing system can produce a daily safe yield of 3,506,400 gallons of water per day with a maximum day yield of 4,536,000 gallons. Therefore, the City would need to produce an additional 1,418,600 gallons per day to meet a Maximum Market Potential of 4,925,000 gpd. An additional 2,260,500 gpd will be needed to meet the maximum day demand. Given these projections, do the resources exist within the City to meet the potential demands?

Based on preliminary explorations by BCI Geonetics Inc., hydrologists retained by the City to research future water supplies, the findings appear to be positive. BCI identified eleven "favorable zones" which warrant detailed exploration. Of the eleven favorable zones, seven are targeted as bedrock aquifers while four are in sand and gravel deposits. The eleven areas are discussed in great detail and depicted on the Groundwater Protection map in the Water Resources section of the Master Plan. A listing of the sites along with the estimated potential annual recharge and area of recharge is provided in Table VI.

TABLE VI

FAVORABLE ZONE SITES AND POTENTIAL RECHARGE

SITE	PRIMARY WATER BEARING MATERIAL	ESTIMATED RECHARGE AREA (ACRES)	MINIMUM ANNUAL RECHARGE (MILLION GALLONS)
Bellamy & Barbadoes	Sand & Gravel	590	300 to 350
Tates Brook	Sand & Gravel	1737	849 to 990
Garrison Road	Sand & Gravel	221	108 to 126
Johnson Creek	Bedrock	1196	320 to 430
Blackwater Brook	Bedrock	1491	380 to 520
Reyners Brook	Bedrock	1308	340 to 450
Fresh Creek	Bedrock	1026	275 to 350
Drew Road	Bedrock	303	50 to 80
Horn Brook	Bedrock	500	100 to 140
Varney Brook	Bedrock	1180	150 to 300

BCI recommends immediate further exploration on six of the eleven favorable zones. The six include:

Bellamy Site
Barbadoes Site
Tates Brook
Johnson Creek
Blackwater Brook
Reyners Brook

In addition, BCI outlined a potential operation of an off-stream reservoir using water withdrawn from the Cochecho River that would have a safe yield of 2 to 2.4 million gallons per day. A third alternative could be the use of direct withdrawal and treatment of water from the Cochecho during periods of high river flow.

Potential Contamination

While the existing water distribution system provides adequate supplies for the current need many potential contaminants threaten one or more of the wells. Contamination can occur from the disposal of solid and liquid waste materials, storage of petroleum products, leakage of septic systems, fertilizers, pesticides, and others.

The Smith and Cummings wells located near the Weeks Traffic Circle have at times shown levels of benzene contamination. This contamination may be coming from leaking underground storage tanks. There are five gas stations, two autobody shops and a salt storage shed within one mile of the wells.

The Griffin and Ireland wells located near the Madbury town line are situated near a number of possible contaminants.

Madbury Metals is a metal salvage operation located less than 900 feet from the Griffin Well. Gravel extraction sites exist nearby and on the opposite side of the Bellamy River exists Dover's Industrial Parks.

The Calderwood and "8-inch" wells in the northwest section of Dover are in close proximity to the Tolend Road Landfill. The landfill is no longer used by the City and is on the E.P.A. Superfund List undergoing remedial investigation. The Turnkey Landfill located just over the northern border of the City in Rochester is also very close. Studies have shown that the landfill should have no impact on the wells, however due to the proximity constant monitoring should take place. Gravel operations exist to the north of the wells in Rochester including a plant which produces asphalt on site using petroleum based products.

Located near Barbadoes Pond off of the Old Stage Road is the Hughes Well. A major sand and gravel operation exists in Madbury which poses a potential threat to the water source.

Appendix M contains the potential contaminant threats within Dover and surrounding communities. A more detailed description of potential threats as well as a Contaminant Threats Analysis Map prepared by BCI which indicates, the location of the threats in Appendix M is available in the Water Resources Section of the Master Plan.

Recommendations

The following recommendations are being made to alleviate the Fire Flow problems in the rural areas of the City.

1. The resultant low water pressure on Tolend Road and County Farm Road caused by Fire Flows in the Tolend Road, County Farm Road, and Upper Sixth Street areas can be solved by:

   - Constructing approximately 13,000 linear feet of new 12" main down Long Hill Road from Sixth Street to Route 16B. The approximate cost would be $975,000. This 12" main will also be required should the City place a storage facility on Long Hill Road in order to raise water pressure in the area.

   - Replacing an existing eight inch line down Sixth Street from Glenwood area to County Farm Road with a new 12" main. The line would be 4800 linear feet in length and cost approximately $360,000.

2. Low water pressure on Boston Harbor Road and Wentworth Terrace caused when fire flows occur on Wentworth Terrace can be alleviated by:

- Constructing 4800 linear feet of new 12" main from Spur Road to Leighton Way. The approximate cost would be $360,000.

3. Inadequate water pressure levels on Old Rochester Road the Indian Village area which exist when fire flows occur in Indian Village can be solved by:

   - Constructing a new 12" main from Longhill Road up Old Rochester Road to Apache, looped through the Indian Village back to Longhill Road (6000 linear feet). The approximate cost would be $450,000.

   - Creating a 13,000 linear foot 12" main connecting Sixth Street up Longhill Road to Old Rochester Road. This main would cost approximately $975,000.

   - Laying a new 12" main up Old Rochester Road from the Weeks Traffic Circle to Longhill Road. The line would be 5000 linear feet and cost approximately $375,000.

4. The pressure problems on Westwoood Circle which occur when there is a fire flow in the area can be alleviated by:

   - Establishing a new 12" main up Littleworth Road from Crosby Road to Westwood Circle (2100 linear feet). the approximate cost would be $157,500.

5. Inadequate water pressure in the Country club Estates area which occurs when fire flows exists can be solved by:

   - Developing a new 12" main up Gulf Road into Country Club estates. The line would be 3000 linear feet in length and cost approximately $225,000.

6. The pressure problems on Snows Court caused by a fire flows in the Snows Court, Fourth Street area can be corrected by:

   - Establishing a new 12" main (4200 lineal feet) up Washington from Whittier Street and up Fourth Street from Washington to Grove Street. The projected cost is $315,000. The resulting line will also solve a high head loss problem on Washington Street.

7. Resulting pressure problems in the Morningside area caused by fire flows can be solved by:

   - Constructing a new 10" main up Spruce Lane from Mast Road to Garrison Road, then up Garrison Road to Tideview. The line would be 1,000 linear feet and

cost approximately $682,500.

8. Additional research and cost-benefit analysis needs to take place to establish a solution for the general low water pressure in the northern area of the City. Possible solutions may be a water storage tank on Longhill or a pressure booster station somewhere on the northend. Larger water lines increase capacity but do little in regard to increasing water pressure.

In order to alleviate existing capacity problems the following recommendations are being made:

1. The existing 4" water line on Lincoln Street needs to be replaced by a 8" main for added capacity.

2. The existing 6" line on Henry Law Avenue from Fosters to Nile Street should be upgraded to 12" for added capacity.

3. The 8" line on Sixth Street from Glenwood Avenue to County Farm Road should be upgraded to a 12" line for added capacity.

4. A new 8" main from Grove to Central Avenue on 5th Street is needed to add water capacity to the area.

5. It is recommended that a small water treatment plant be constructed for the purpose of removing iron and manganese from the Griffin Well water.

In order for the City to maintain an adequate water supply the following recommendations are being made:

1. The City immediately proceed with its plans to artificially recharge the Hoppers Aquifer.

2. The 8" test well should be upgraded to a regular well in conjunction with the recharge of the Hoppers Aquifer.

3. Pursuant to the BCI recommendations, research of potential new well sites should take place immediately.

4. New wells should be created as soon as possible to meet the growth demands of the City and provide protection from the possible contamination of an existing well(s). Given the projected water need, it is recommended that new water sources totaling 1,000,000 gpd be developed by the year 1995.

5. Areas with confirmed water producing potential should be acquired for City use.

6. In conjunction with the development of additional water sources it is recommended that the City pursue potential conservation options including one or more of the following:

   - Undertaking an education campaign aimed at volunteer conservation;

   - Revising building codes, site review, subdivision, and plumbing regulations in order to design and establish conservation standards in regard to maximum water usage for new construction;

   - Creation of an emergency conservation ordinance which may be implemented during periods of severe drought. Such an ordinance would limit car washing, watering of lawns, and other non-essential water uses.

SEWER

There are approximately 100 miles of sewer lines existing in the City of Dover. The lines vary in size from eight inches to 30 inches in diameter and service approximately 85% of the City's residents. The lines generally consist of clay, concrete, cement asbestos, and more recently P.V.C.

HISTORY

The first sewers in the City of Dover were constructed in the 1840's and consisted of wood. Gradual expansion of this "wooden" system took place until the late 1860's when the construction of the first brick sewer began on Court Street. By 1870 brick sewers on Washington Street and Central Avenue were started and by 1874 the first cement pipe was layed into the ground.

As was the case in many New England communities, small brooks were often enclosed by stone culverts and used as convenient sewer lines. Others, such as Berry Brook, were simply left as open sewers. Outlet pipes took the shortest route to the nearest river and many lines were laid over private property without proper easements.

Use of the sewers for the conveyance of storm water began around 1880. Within five years the capacity of the system was insufficient and emergency relief sewers had to be constructed to reduce the load in many areas. Lacking any sewer master plan, the City continued to be plagued by problems such as no standardization of manholes and flooding of streets from inadequate catch basins.

The City continued to allow the connection of drainage lines to the Municipal Sewer System as recent as the mid 1960's. This policy haunts the City even today in the form of large amount of infiltration into the sewerage treatment system during periods of wet weather.

Industrial wastes received little or no treatment prior to being dumped directly into the river. In the middle 1950's, United Tanners pumped more than 300,000 gallons per day from the Cochecho River for use in processing, washing down, and rinsing in the tannery. After partial treatment in the tannery, using settling and screening, all of the water was discharged into the lower Washington Street sewer which emptied into the Cochecho River below the dam.

Several shoe and leather companies dumped waste containing dyes, oils, solvents, and various chemicals into the system. Industries producing insecticides, meat by-products, plastic, and paper products also contributed toxic material to the system.

Dover's primary treatment plant was constructed in the late 1950's and began operation in March of 1960. Located at the end of River Street, the plant was designed to handle the sewage flow from the south side of the Cochecho River as well as the Tannery that was located on Green Street. At its inception, the domestic sewage flow into the treatment plant was 0.3 million gallons per day while the flow from the tannery was 0.1 million gallons per day. Although the domestic flow was three times greater than the tannery, the tannery generated 90% of the solids.

In 1969 the plant underwent an expansion process in order to handle sewage from areas further north of the Cochecho River. Between 1975 and 1980 the Cochecho Separation Project connected the entire sewer system north of the Cochecho River to the plant. During this same period the South Side Sewer Project expanded the system to the Dover Point area.

EXISTING SYSTEM

The City's original sewage treatment plant is still in operation today. The facility is a primary treatment plant providing grit removal, primary sedimentation, and gaseous chlorination of wastewater flow. The separated sludge flow is gravity thickened, chemically conditioned, and dewatered through the use of a belt filter press. The resulting sludge is then deposited at a sanitary landfill.

The sewage flows into the plant by means of a gravity fed system. Areas of the City which can not be serviced with a gravity system have pumping stations. The pumping stations are listed with their prospective capacities in Table VII.

TABLE VII
PUMPING STATIONS

STATION	CAPACITY	LOCATION
Varney Brook	5000 GPM	Cushing Road
Charles Street	4400 GPM	Charles Street
Piscataqua	1000 GPM	Wentworth Terrace
Mill Street	485 GPM	Mill Street
Mast Road	480 GPM	Intersection of Mast Rd./Spruce Ln.
Cochecho	300 GPM	Cochecho Street
Boston Harbor	243 GPM	Boston Harbor Rd.
Cranbrook	200 GPM	Cranbrook Lane
Strafford	200 GPM	Rt. 16 near Strafford Farms
Crosby Road	200 GPM	Crosby Road Industrial Park
Spruce Drive	200 GPM	Spruce Drive
Mount Pleasant	100 GPM	Intersection of Back Rd/Henry Law
Leighton	60 GPM	Leighton Way
Brickyard	N/A	Brickyard Estates

Four raw sewage pumps with a combined capacity of 5450 gallons per minute are used in the treatment plant for processing. The plant can treat an average flow of 3.2 million gallons per day and may treat a peak up to 7.7 million gallons per day at a much lower efficiency rate for very limited periods of time. Flows larger than 7.7 million gallons per day are bypassed directly into the Cochecho River.

EXISTING FLOW RATES

Because of Dover's past history of allowing a combined drainage/sewer system significant infiltration and inflow exists today. In their 1986 report on a design for the new treatment plant, Camp Dresser and McKee stated that the plant experiences and inflow of 5.2 mgd as the result of a 2 inch rain storm. Instantaneous peak flows exceeding 10 mgd occur on many occasions during periods of heavy rain. These inflow rates are 53% greater that standard established by the Merrimack Curve. (Industry Standard)

Average daily flow to the treatment plant during the years 1983 to 1984 was 2.40 million gallons per day. During the driest months of 1983 and 1984, when infiltration was lowest, the average daily flow was 1.75 mgd and 1.53, respectively. The average daily flow to the plant during 1987 was 2.61 million gallons per day. Flows through October of 1988 have averaged slightly less at 2.58 mgd. Expansion of the system as well as an 18% increase in population since 1980 has caused a 45% increase in sewage flow during this period. Appendix N details the average daily flows and maximum day flows from 1980 to November of 1988.

EXISTING PROBLEM AREAS

Existing problems can be broken into two categories: maintenance, and capacity.

MAINTENANCE PROBLEMS

The existing sewer system has a number of areas in need of maintenance. Typical maintenance problems include: separation of drainage lines; blockage of lines; roots growing into the system; and old age. Table VIII outlines a list of maintenance problems.

TABLE VIII
MAINTENANCE PROBLEMS

	LOCATION	PROBLEM
1.	Belknap and St. Thomas	Separation of Drain
2.	Horne St. from Hough to Ash	Deteriorated Line
3.	Most lines in Morningside Park area	Deteriorated lines, High infiltration
4.	Durham Road	Blockage
5.	Applevale area	Deteriorated lines
6.	Stark Ave. near Elliot Cir.	Deterioration
7.	Glennwood Ave.	Line not to City Specs
8.	Nelson St. from Locust to Atkinson	Deterioration
9.	Whittier St. from Glenwood to Sixth St.	Roots in line
10.	Richmond St.	Roots in line
11.	Henry Law Ave. from Niles to Tennison	Deterioration
12.	Hanson St.	New line & separate drainage
13.	Central Ave. from City Hall to Dover Catholic	New line & separate drainage.
14.	Hill St.	Deterioration
15.	Page Ave.	Deterioration
16.	Hull Ave.	Roots in line
17.	Hancock St.	Deterioration
18.	Cocheco St.	Deterioration
19.	Mill St.	Deterioration
20.	Smith Rd.	Roots in line
21.	Bellamy Rd. & Cataract Rd.	Deterioration

22. Industrial Park Dr.	Infiltration
23. Rose St.	Roots in line
24. Ham St from Park to Central (St. Charles parking lot)	Deterioration
25. Prospect St.	Separate Drainage
26. Strafford Rd.	Separate Drainage
27. Old Rochester Rd.	Separate Drainage
28. Third & Chestnut	Separate Drainage
29. Baker St. & New York	Clean line (grease)
30. Pearl St. to Broadway	Clean line (grit)
31. Central Ave. from Reservoir to Ash	Deterioration

In addition to the above, a number of manholes need servicing. These are listed in Appendix O.

EXISTING CAPACITY PROBLEMS

Capacity problems are caused by either inadequate size or too shallow a slope of any given line. Table IX outlines the existing capacity problems which are also illustrated on Map A.

TABLE IX
CAPACITY PROBLEMS

	LOCATION	PROBLEM
1.	Corner of Portland Ave. & Rogers St.	Inadequate Slope
2.	Portland St. across to River St.	Inadequate Slope
3.	Boston and Maine bridge over the Cochecho River	Inadequate Slope
4.	Waldron St. along the river	Inadequate Slope
5.	Henry Law Ave. from Washington to River St.	Inadequate Slope and size
6.	River St. near plant	Inadequate capacity but will be discontinued
7.	River St. near Henry Law Ave.	Inadequate slope
8.	Horne St. from Roosevelt Ave. to Ash St.	8" line inadequate
9.	Corner of Plaza Dr. and Whittier	Inadequate slope and size
10.	Line along corner of Sixth St. and Whittier	8" line inadequate
11.	Sixth St. near Horne St.	8" line inadequate
12.	Maple St. from Ash to Hough St.	Inadequate slope
13.	Broadway from Hill to Ham St.	8" line inadequate poor slope
14.	Corner of Snows Ct. and Fourth St.	Inadequate Slope

In addition to the above list the capacity of the existing treatment plant creates problems during periods of inclimate weather. Infiltration causing flows above 7.7 mgd results in sewage being diverted to the Cochecho River. This situation will be alleviated with the development of the new Sewage Treatment Plant.

SECONDARY TREATMENT PLANT

In accordance with the United States Environmental Protection Agency, the City has developed plans for a new Secondary

Treatment Facility. This new facility will replace the existing plant and will be located at the Huckleberry Hill site off Middle Road. It is anticipated that construction will begin in 1989 with the facility in operation by 1992.

Sewage will be collected at River Street from the existing interceptors and pumped the 19,400 feet to the Huckleberry Hill site. The pump station will contain four 3,300 gpm pumps with 300 HP motors, screening and grit removal facilities. A 36 inch force main will be placed between the River Street pump station and Huckleberry Hill along Back Road and Middle Road.

The average daily flow capacity of the new plant will be 4.7 mgd with a maximum 24 hour flow of 13.8 mgd and a peak hour flow of 16.8 mgd. The plant was designed to meet sewage flows through the year 2005 based on population projections from the Office of State Planning. Population for the year 2005 was estimated to be 31,300 and it was assumed that 90% of the City would be serviced by the system. The design of the plant, as well as the size of the parcel on which it will be constructed (36 acres), allow for a 33% increase in future capacity.

The Dover Planning Department projects a higher rate of growth than the Office of State Planning. Based on recent growth as well as projected market conditions the Planning Department estimates that Dover's population will reach 32,425 by the year 1995. Given this projection, will the capacity of the new Wastewater Treatment Facility be adequate?

PROJECTED SEWER DEMAND

Housing projections from the Dover Planning Department estimate the construction of 2350 new housing units between 1988 and 1995. Of these units, 846 will be single family homes, 600 will be condominiums, and 904 will be apartments. In projecting future sewer use, the State of New Hampshire Water Supply and Pollution Control formula was used to determine domestic flows. The Impact Matrix Multiplyers from Table F of the Land Use Section were used for the non-residential units.

Residential: Q= (75 gal/day)(#people/house)

4 people/house
3 people/apartment

Non-residential: Office .078
Commercial .0946
Industrial .052 per square foot

The projected average daily wastewater flow for the year 1995 will be 3.4 million gallons per day with a maximum 24 hour flow of 14.3 million gallons per day. Based on historical data, infiltration of drainage causes an average increase of .3 million gallons per day of wastewater during the spring months (Feb., March, April, and May). Therefore, the average daily wastewater flow during periods of higher infiltration will be 3.7 million gallons per day with a peak of 15.2 million gallons per day.

Based on these findings the City of Dover will have adequate wastewater treatment capacity well past the year 1995 and into the year 2000. It should be noted that while the Environmental Protection Agency used the Office of State Planning's slower growth projections they also estimated an extremely high per capita/per day water usage (167 gpcd). In comparison the existing per capita water usage on an average daily basis is 98 gpcd.

In order to assure that the City provides adequately sized sewer lines for a continually growing population, it is important to project potential growth years in advance. The following projection was conducted for the year 2020.

Housing projections from the Dover Planning Department indicate that there will be 3462 new single family detached houses built in the City between 1987 and 2020. They also predict that there will be 6201 rental/condominium units constructed during this same period. In order to assure proper planning for future line sizes the maximum market potential was used for non-residential growth.

The projected average daily sewerage flow for the year 2020 was 6.5 million gallons per day with a peak hour flow of 26.6 million gallons per day. Based on the future potential expansion of the wastewater treatment facility to an average 6.3 million gallons per day (33%), it can be said that wastewater capacity will be available far into the future.

In the projections for 1995 and the year 2020 it was assumed that 100% of the City was being serviced by the sewer system. In addition, a peak factor of 4.1 was used to determine peak flow (53% greater than Merimack Curve). This peak factor was established based on historical trends.

Using the projections outlined for the year 2020 the following areas become a problem. These areas are listed in Table X and illustrated on Map B.

TABLE X
PROJECTED PROBLEM AREAS

	LOCATION	PROBLEM
1.	Portland Ave. from Atlantic to Rogers St.	8" line inadequate
2.	Atlantic Ave.	8" line inadequate
3.	Rogers St.	8" line inadequate
4.	Cocheco St.	10" line inadequate
5.	Cocheco St. pump station	Over Capacity
6.	Court St. at Niles	Inadequate line
7.	River St. at entrance	Inadequate line
8.	Spruce Lane	Combination of slope and size
9.	Varney Brook pump station	Not large enough
10.	Locust Street	Inadequate slope
11.	Sixth St. behind "East Coast Autocraft"	Inadequate slope
12.	Along Cocheco River from "East Coast Autocraft" to downtown	Inadequate slope
13.	Lowell Ave. near pond	Inadequate slope
14.	Maple St. between Ash and Hough St.	Inadequate slope
15.	Mill St. at entrance	18" line inadequate
16.	Charles St. Pump Station	Over capacity
17.	Crosby Rd. following Knox Marsh Rd.	Inadequate slope and size
18.	Crosby Rd. Pump Station	Over capacity
19.	G.E. Line	12" line inadequate
20.	Fourth St. where G.E. ties in	Inadequate slope and size
21.	Toftree and Dover Point	8" line inadequate

22.	Cross County line between Middle and Dover Point	Inadequate slope
23.	Morningside Dr.	Inadequate slope, size and infiltration
24.	Cochecho River between First St. and Waldron Ct.	Inadequate slope

RECOMMENDATIONS

An ambitious program needs to be established in order to upgrade the existing system. It is recommended that a detailed study be completed in regard to upgrading existing capacity problems including cost estimates and implementation recommendations. Many of the capacity problems are interrelated and need to be addressed comprehensively. Detailed engineering will be needed for many of the problems.

The Public Works Department has begun an aggressive campaign to repair many of the existing maintenance problems. Given the number of problems, it appears to be an overwhelming task given the size of the department.

Specific recommendations include:

1. The sewer lines on Central Avenue from Reservoir Street to Ash Street has deteriorated and become a problem. The existing 8" line should be replaced by a 15" line ($100,000).

2. The existing line on Henry Law Avenue from Niles Street to Tennison Avenue should be upgraded and replaced ($240,000).

3. The line on Whittier Street from Glenwood to Dowaliby Court should be replaced ($90,000).

4. The sewer line on Horne Street from Hough to Ash should be replaced ($114,000).

5. The Fourth Street line should be reconstructed in order to alleviate existing problems an din anticipation of future growth in the Industrial Zones ($1,000,000).

6. An aggressive expansion of the sewer line into the northern area of town for future residential and non-residential growth should be started ($2,000,000 to $3,000,000).

7. The G. E. sewer line should be upgraded and expanded

to provide the necessary infrastructure support for future industrial expansion ($1,000,000).

8. The City should continue their support for the expedient construction of the new Wastewater Treatment Plant.

Section Two

COMMUNITY FACILITIES

Schools
Fire
Public Works and School Bus Facility

COMMUNITY FACILITIES

Community facilities play an important role in making a community a desirable place in which to live. The degree to which services are provided, and the manner of their development, greatly determine the quality, convenience and general character of a city.

This section of the Master Plan analyzes three areas of need which exist within the City in terms of facilities. These needs include an elementary school; an additional fire station; and the relocation of the public works garage and school bus facilities.

SCHOOLS

The City of Dover operates three elementary schools, a junior high school, and a senior high school. In recent years, enrollments have been decreasing on the junior high and high school levels, while increasing in the elementary schools. Table I (see page 2) illustrates the public school enrollments for the past 10 years.

The numbers indicate that enrollments in the elementary schools have increased 21 percent (250 students) in the last four years. During this same period attendance at the junior high school decreased 32 percent (177 students). A similar decrease has occurred on the high school level in recent years.

This increase in elementary school aged students is due primarily to the number of young families moving into the City. These families are moving to Dover as the result of a number of factors such as: relatively affordable housing, rapid job growth within the region; and Dover's location in relation to existing job markets.

Existing Conditions

The increase in elementary school children, as well as the increased space needs of providing special education, has put a burden on existing school facilities. The current enrollment of elementary school aged children in Dover is 1451 students. Given the existing facilities this enrollment is above Dover School Committee recommended guidelines of 1260 and close to exceeding the maximum State standards of 1465 students.

TABLE I
DOVER PUBLIC SCHOOL ENROLLMENT
1978-1988

Grade	Sept. 1978	Sept. 1979	Sept. 1980	Sept. 1981	Sept. 1982	Sept. 1983	Sept. 1984	Sept. 1985	Sept. 1986	Sept. 1987	Sept 1988
K				126							
1	270	240	250	195	201	236	225	256	253	318	29
2	327	248	217	239	173	172	203	197	221	226	265
3	298	312	255	208	226	185	175	216	202	214	21
4	286	292	306	249	199	213	175	177	219	199	205
5	292	296	291	320	240	209	205	175	167	215	20
6	278	266	291	276	311	231	193	206	176	176	21
7	312	287	277	283	270	306	241	194	214	177	182
8	301	325	286	270	287	281	301	234	210	207	18
SPEC. & TRANSITIONAL CLASSES ELEM. JR. & SR. HIGH LEVELS	49	54	49	40	40	46	48	58	58	63	
9	447	381	395	378	350	361	364	446	373	381	31
10	423	387	347	361	345	316	325	346	445	333	327
11	402	405	370	331	344	336	295	298	270	312	27
12	422	364	376	345	304	312	312	281	278	296	326
P.G. & PART-TIME STUDENTS	93	95	82	71	60	71	66	72	87	102	11
TOTAL ELEM.	1800	1708	1659	1634	1369	1276	1201	1258	1268	1385	1451
TOTAL JR. HIGH	613	612	563	563	570	595	556	444	439	397	379
TOTAL HIGH	1797	1632	1570	1495	1411	1404	1371	1454	1466	1437	1378
TOTAL	4200	3952	3792	3692	3350	3275	3128	3156	3173	3219	32

PREPARED BY THE DOVER SCHOOL DEPARTMENT

The Dover School Committee recommends:

1. 20 Students per class in first grade;

2. 25 students per class in grades two through six; and

3. Art and music rooms in each school.

The State allowable maximum is:

1. Every room used for its originally designated use;

2. 25 students per class in grades one and two;

3. 30 square feet per student, per room with 30 students maximum in grades three through six; and

4. A perfect distribution of students across grade level so that every room is used to its maximum.

The following is a brief synopsis on each elementary school.

Woodman Park School - is located near the Spaulding Turnpike and Silver Street area. The school has an enrollment of 506 students and has all twenty-five classrooms in use. Music lessons and "Odyssey of the mind" are being held in the back foyer and special reading classes take place in small areas previously used as storage space. The existing library space barely meets minimum State requirements.

Horne Street School - has an enrollment of 443 students and is located on Horne Street not far from Glenwood Avenue. All eighteen classrooms are being utilized. The library is a converted classroom that falls short of meeting State standards and computer labs are located in the foyer. The stage is being used for Occupational Therapy as well as storage. Instrumental music lessons are held in a locker room and Reading and Resource teachers share a small room off of the foyer.

The Garrison School - is located on Garrison Road and has an enrollment of 502 students. The school contains twenty-two classrooms all of which are being utilized. Music lessons take place in locker rooms and preschool classes share one room. The theater stage is used as a storage facility and is unable to be used for anything else.

In addition to the above, support space in all three schools such as conference rooms; specialist rooms (reading, speech, special needs); guidance offices; teacher work rooms, and administrative spaces are either absent or extremely over crowded.

ALTERNATIVES

Given the existing conditions, what are the alternatives for providing a more effective and efficient educational system?

Alternatives frequently considered by private consultants, school department officials, and committee reports include:

1. Move sixth graders to the Junior High - This move would be relatively low cost and would provide some space on the elementary grade level. However, the Junior High program would have to be dramatically curtailed, resulting in the loss of computer labs, art programs, and music lessons. Physical Education facilities are considered inadequate and there would be bus scheduling problems.

2. Remove Art and Music rooms in the elementary schools This move would result in a gain of three rooms and would be low cost. Three of the six art and music rooms already have been lost to expansion and the three additional rooms would only be a temporary benefit.

3. Modular Classrooms - Modular classrooms woud supply a quick short term solution, however, they are expensive, temporary and have poor handicap accessibility. They are not a practical long term solution as they have a limited life-span, and do not meet all of the spatial needs. Additionally, students must travel outside in order to reach the classrooms.

4. Rent additional space - Rental of additional school space would provide a relatively quick solution. While no detailed study of potential rental space has taken place, it is doubtful that an adequate location exists. Potential rental space must meet the same minimum State requirements for site size (5 acres plus one additional acre for every 100 pupils) and classroom size (900 square feet per class) as a new facility.

5. Accept larger classes - By having larger classes the school system would pick-up six to eight rooms. The cost would be relatively low and quickly implemented. On the negative side, larger classes would be an unsound educational process. Research has indicated that increased class sizes have a negative impact on students learning abilities. In addition, classroom sizes of more than 25 students make it very difficult to provide any individualization or one-on-one interaction. Marginal students may not be able to keep pace with

the rest of the class.

6. Double sessions - Double sessions would take little time to implement and avoids any building of structures and/or additions. The drawbacks would include safety problems with children walking after dark, cut-back in extracurricular activities, and loss of family time with working parents. There would also be increased costs for staff, utilities, building care, food, and transportation services.

7. Additions to Existing Buildings - Adding onto existing school facilities would be a relatively quick solution. There would not be the need to purchase additional land and the City would be eligible to receive State funding for construction costs. Conversely, major additions to Horne Street School and Garrison School would require extensive site work before building ($540,000 according to Lavallee/Bresinger, October, 1987 report). Adding on to Woodman Park school alone would increase enrollment to over 825 students and would not be conducive to a proper educational atmosphere. In addition, any expansion of existing buildings will require additional support facilities such as library, cafeteria, and physical education space.

8. New Elementary School - Construction of a new elementary school provides a long term solution as well as assuring adequate classroom space to meet future demand (see following projections). The new school could be located in an area that has large numbers of school children wihin walking distance thereby reducing busing costs. The City would be eligible to receive state aid to assist in the construction of the school. Conversely, construction of a new school will be a significant capital expenditure and will take 18 to 24 months to construct. There also will be an increase in the yearly school budget for administration and maintenance of the new facility.

Projections

According to projections made in the housing section of the Master Plan, the City will continue to grow at a rapid pace. This pace will include the construction of 106 single family homes, 75 condominium units, and 113 multi-family units per year. A study was completed by the Dover Planning Department in December of 1986 which determined the average number of school children per housing unit. Table II illustrates the results. By multiplying the number of projected housing units by the number of children per unit an accurate school

projection can be made.

TABLE II
SCHOOL CHILDREN PER HOUSEHOLD

Housing Type	Number of School Aged Children per household
Single Family Homes	.81
Condominiums	.13
Multifamily	.24

Table III shows projected increase in the school enrollments for the years 1995 and 2000, and has been developed using the methodology outlined on the previous page.

TABLE III
PROJECTED INCREASE IN NUMBERS
OF SCHOOL STUDENTS

	1988 - 1995		1995 - 2000		TOTALS 1988 - 2000	
	Number of Units	Number of Children	Number of Units	Number of Children	Number of Units	Children
Single Family	742	601	530	429	1272	1030
Condominiums	525	68	375	49	900	117
Multi-family	791	190	565	136	1356	326
TOTALS	2058	859	1470	614	3528	1473

The table indicates that there will be an additional 859 school students in Dover by the year 1995. Since approximately half will be elementary students, there will be 430 additional students within the City between grades 1 - 6 in 1995. Traditionally 13% of the City's elementary students attend private schools. Assuming this trend continues, the City of Dover will need to provide space for 375 of the 430 students. Should the City continue growing at its present rate through the year 2000, Dover will need to find space in elementary schools for 642 more students than it presently supports.

These projections are based on past trends as well as projected market conditions. The projected yearly increase of approximately 294 units is meant to be taken as an average. The City may actually grow faster than 294 units per year for a brief period of time, slowing down to a lesser rate but still reaching the total number of projected units for 1995 and beyond.

The projections also assume that the distribution between elementary school students and students between grades 8 through 12 will remain at 50%, and that 13% of the total elementary students in Dover will continue to attend private schools.

Strafford Regional Planning Commission prepared population estimates in May of 1988 and published the results in a report entitled Demographic Profiles for the Strafford Planning Region of New Hampshire. The commission used a Cohort-Componant analysis which projects population over time based on changes in births, deaths, and migration. The projections are broken down into five year age cohorts such as 0-4, 5-9, etc. By extrapolating the elementary school ages from the cohorts it is possible to project the number of future school children.

The projections indicate that there will be 476 additional elementary aged students in Dover by the year 1995. Assuming 13% will attend private schools, the City will need to provide space for 415 students between the grades 1-6. This figure is comparable to the Planning Department projection of 375 students.

The projections by Strafford Regional Planning further indicate that there will be an increase of approximately 178 students on the Junior High level, and 72 students on the High School level. Space in the Junior High School and the Senior High School is adequate to accommodate these projected number of students. The Junior High can accommodate approximately 600 students, (379 currently attend) and the High School can accommodate approximately 1700 students (1378 currently attend).

Both the Planning Department and Strafford Regional Planning Commission relied on historical and projected Building Permit Data to assist in the population estimates. Building activity has slowed in the past year (1988). In terms of actual building permit data, the City issued permits for a total of 680 units in 1987. This number dropped to 311 units in 1988. Although the building permits decreased by more than 50% over the previous year, the total number of units (311), was more than the projected annual increase of 294 units. The distribution of the permits however, were different from the projection.

There were 58 single family dwelling units, 161 condominium and 92 apartment units issued building permits in 1988. Compared to the projected increase of 106 single family, 75 condominium, and 113 apartment units per year. Therefore, while the actual number of total units is close to the projections, the growth of single family dwelling units is happening at a much slower rate. Since single family dwelling units produce more school children than condominiums and apartments it can be said that

the school projections may be less than expected if the past year is an indication of future growth. Conversely, current proposals before the Planning Board indicate a trend to single family detached and duplex development. Should single family and duplex development increase, school enrollment may grow faster than expected.

It should be noted that the region is currently experiencing a slowdown in the housing market. It is difficult to predict if this is a temporary or long-term trend. Outside factors such as the potential closing of Pease Air Force Base may influence the projections.

Given the existing school capacities, the existing enrollment, projected increases in the enrollment, and the various expansion alternatives, it is recommended that the City pursue identification of school sites and construct a new facility.

The following is an analysis of potential school sites.

SITE SELECTION METHODOLOGY

The Planning Department began the process by reviewing the minimum state requirements for elementary schools. In addition, past reports completed by the Joint Educational Needs Committee and Lavellee/Brensinger Professional Association (1987) were relied upon heavily to determine the needs of a new elementary school. Numerous meetings were held with the Joint Building Committee and the School Administration. Using the information provided, it was determined that any potential school site should have a minimum of 10 acres, have on site municipal water and sewer, and be located in an area which would be within walking distance of a large number of students. Given the location of existing schools, as well as the areas of projected growth, it was determined to concentrate on parcels in the western and eastern sections of the City.

With information provided by the School Department, a map was devised which identified the location of the current elementary school children. The map also illustrated the projected number and location of elementary school children based on future population estimates and where they are likely to live.

The next step in the process entailed identifying City and privately owned parcels which would meet with the minimum state standards as well as locally identified needs. Numerous factors were considered in determining the importance of the individual parcels. The factors considered included:

Soils Data - Soils data was provided by the U.S.D.A.

Soil Conservation Service;

Water and sewer availability - Water and sewer availability was identified by using City water and sewer maps;

Road frontage - Road Frontage was identified by using City Tax Maps;

Number of children within one mile - The number of children within one mile of a given site was determined by using a precision map measuring wheel on an official street map. Aerial photography maps were used to verify distances.

Site Analysis

Most of the initially identified parcels of land did not provide solid opportunities for the location of an elementary school. Of the fourteen parcels of City-owned land (see Appendix P), only two have limited potential in meeting the City's needs. The first parcel, Map M, Lot 84-I on Dover Point Road (diagonally across from Tuttles) provides adequate acreage, water, sewer and frontage. However, the soil is very poorly drained, the topography is poor, and only about 50 children would be able to walk to the site. Transportation costs would be very high. In addition, the site is considered a conservation area.

The second City owned parcel with limited potential is located on Long Hill Road, Map D, Lot 10A (Longhill Memorial Park). The location has adequate acreage and water and sewer exists nearby but the site is again limited as to the number of children who could walk to the school. Other City parcels were either too small, located too far from existing and projected population areas, or were situated too closely to an existing elementary school.

Twenty-seven privately owned parcels were initially identified as potential sites in the eastern and western sections of the City, (Appendices Q & R). In the eastern area the sites with the highest potential were located on upper Henry Law Avenue and Middle Road. As illustrated in Appendix Q the parcels have access to city water and sewer, proper road frontage and soil conditions, and are within walking distance of a large number of school children.

As listed in Appendix R, the parcels identified in the western area of the City generally are not as well suited for a school site. In many instances municipal sewer was not available and soil conditions would make septic systems difficult. In addition, the number of children within walking distances of most sites is limited.

Owners of the preliminary sites received an introductory letter and a follow-up phone call to discuss their immediate plans for their property and their willingness to sell in the future. The response of the landowners in regard to their interest in selling their property is outlined in Appendix S. Those expressing interest in the discussion of the sale of their property included: Peter Rousseau, Map K, Lot 1; Andrea Ross, Map K, Lot 11; Harold Preston, Map K, Lot 6; Bonye McGeary Map B, Lot 6; Albert Drew, Map E, Lot 47; Charles Watson, Map C, Lot 46, Free Trade, Map K, Lots 49 and 18; and C.L.D. Investment Corporation, Map B, Lots 21 and 4.

Based on the preliminary analysis, responses from the phone contacts and direction provided by the Joint Building Committee the following lots were chosen for final review:

Peter Rousseau, Map K, Lot 1
Free Trade, Map K, Lots 49 and 18
Harold Preston, Map K, Lot 6
Andrea Ross, Map K, Lot 11
C.L.D. Investment Corporation, Map K. Lot 2

The C.L.D. parcel was not originally reviewed as preliminary plans called for a conventional grid subdivision on the site. The owner has since expressed interest in an alternative design subdivision with open space which may provide a possible opportunity for a school site. Therefore, the parcel was included in the final review. Appendix T illustrates the location of the parcels.

Peter Rousseau, Map K, Lot 1.

The Rousseau parcel is located on both sides of McKone Lane and fronts on Henry Law Avenue. The parcel is currently being used as a farm and has existed as such for many years. There are two potential sites for a school. The first site exists on the northern side of McKone Lane. The second site is located between McKone Lane and Back Road. Either site is within a one mile walking distance of 140-160 existing elementary school children.

Soils on the first site north of McKone Lane consist of a mixture of Hollis-Charlton very rocky fine sandy loam of varying slopes. This soil creates limitations for buildings without basements would be moderate. The shallow bedrock (20 inches or less) makes foundations difficult.

Soils on the second site between McKone Lane and Back Road consist of Hollis-Charlton fine sandy loam, and Windsor loamy sand, which have slight building limitations. However, there are some Scantic silt loams which are wet and may create building problems depending on the placement of the structure.

Both parcels have slopes of between 3 and 8 percent and 8 to 15 percent. Water pressure and supply are adequate. Sewer lines can be gravity fed to the Mt. Pleasant pumping station with adequate existing capacity.

Free Trade, Map K, Lot 49 and 18.

The Free Trade parcel is located on Middle Road near the new subdivision of Briarwood Estates. There is an existing Alternate Design Subdivision proposal for the parcel consisting of 44 parcels. In the area of the potential site there exists 7.5 acres of open space. It is being proposed that six to eight lots be purchased adjacent to the open space to create a buildable site of approximately 13 acres. The parcel is in an excellent location and would be within a one mile walking distance of approximately 150-160 children.

Soils on the site consist of Windsor loamy fine sand with clay subsoil, Hinckley loamy sand and Hollis-Charlton fine sandy loam. The building limitations are slight except for the areas near Middle Road which tend to consist of Scantic silt loam. The topography consists of between 8 to 10 percent slopes.

Water pressure and supply are adequate. In terms of sewage disposal, there is sufficient capacity and the school could tie directly into the gravity fed sewer system of the subdivision provided that it is approved. Should the subdivision not be approved, the school could tie directly into the gravity line on land owned by Harold Preston.

In regard to drainage on this particular site, the developer is proposing two drainage ponds to hold and slowly release the expected water runoff. Adding a 40,000 to 50,000 square foot school site with parking will obviously add drainage. Either drainage pond B as indicated on the plan prepared for Adams Estates can be enlarged, or the slope of the drainage pipe from the pond can be adjusted to control the flow rate accordingly. A third solution could be the creation of an additional drainage pond serving the school site.

Harold Preston, Map K, Lot 6.

The Preston parcel is located immediately adjacent to the Free Trade Parcel. The lot is currently vacant although a number of vehicles are stored there. Approximately 120-140 elementary school children are located within one mile of the site.

The soils consist of Buxton silt loam, Windsor loamy sand, Windsor loamy fine sand with a clay subsoil, and Hinckley loamy sand. These soils generally cause only slight limitations for development. Caution should be taken for

potential frost action in the Buxton soils and the Windsor with clay subsoils. Slopes on the site are very low averaging between 3 and 8 percent.

Water pressure and capacity are adequate. The sewer can flow by gravity into the existing sewer line on the parcel.

Andrea Ross, Map K, Lot 11.

The Ross property is located near the beginning of Back Road. The rear of the property was recently subdivided and developed by Clipper Home Affiliates. The remaining parcel consists of approximately 11 acres and supports a single family dwelling. The parcel is in an excellent location for approximately 150 elementary children to walk to the site.

The lot contains a Hollis-Charlton fine sandy loam near the road which generally provides slight limitations to the development of the site. Windsor loamy fine sand with a clay subsoil is also on the parcel so care should be taken to prevent damage from frost action. Scantic and Biddeford soils exist near the rear of the lot. The school would have to be located where the existing house is situated near the road. The parcel slopes 8 to 15 percent in the rear.

The site has adequate water supply as well as sufficient pressure. If the school is placed where the existing house now stands the sewer can flow by gravity to the Mt. Pleasant pump station. If the school is placed down grade closer to the wetlands, the sewage will have to be pumped to either the gravity line leading to the Mt. Pleasant pumping station or to the gravity line on Court Street. There is adequate sewer line capacity for either scenario.

One final note, Ms. Ross indicated that she would not want to sell her house with the rest of the property. This restricts the location of the school on this lot and effectively eliminating the site from further consideration.

C.L.D. Investments, Map K, Lot 2.

This parcel is located on upper Henry Law Avenue across from Tennyson Avenue and Penny Lane. The project will consist of an Alternative Design Subdivision but has yet to be proposed. The City therefore, will have an opportunity to obtain some open space should it be determined to be useful. The number of elementary school children located one mile from the site is approximately 100.

There are a number of soil types located on the parcel. A Buxton silt loam and a Hollis-Charlton fine sandy loam are apparent and pose slight limitations on development. However, a Charlton very stoney and Charlton fine sandy loam exists which provide moderate to severe limitations based on

15 to 25 percent slopes and stoney surfaces. A Windsor loamy fine sand with clay subsoils also exist with slight limitations for development but possible frost action. The terrain generally is inconsistent and varies from 3 to 8 percent slopes to 8 to 15 percent to 15 to 25 percent slopes.

Water pressure and capacity is not a concern for the area. Wastewater disposal may be able to flow by gravity to the sewer on Henry Law Avenue if the school is located in a high area near the road. If the school is located closer to the Cochecho River, then a small pump station will be required to pump the sewage to Henry Law Avenue. In either case there is adequate sewer capacity in the Henry Law Avenue line to handle the additional load.

Additional Considerations

Additional considerations which will need to be addressed for all sites include the widening of Henry Law Avenue, Middle Road and parts of Court Street to accommodate additional traffic, and the need for sidewalks.

Appendix U, with corresponding attached map, illustrates the areas that will need sidewalks and estimates the cost of individual sections. As shown, the average cost per linear foot of sidewalk will be $21.00.

Sidewalks will be needed for Court Street, most of Henry Law Avenue, sections of Middle Road and numerous connector roads. It is recommended that cost estimates for needed sidewalks and road improvements be included in any final cost figures for an elementary school.

Final Recommendations

Of the five parcels selected for final review, three stand out.

The Free Trade parcel - This site is the best location because 150 to 160 children could walk to the school including those from the Applevale neighborhood, Henry Law Avenue and Court Street areas. The site is particularly attractive because any future development on Middle Road would be well served by this location. The parcel is buildable and may be the least expensive to purchase and develop. Additional drainage analysis should be completed before any final decisions are made.

The Peter Rousseau parcel - This parcel, while not as well located as the Free Trade piece, is accessible by 140 - 160 children. Care should be taken in soils analysis and the placement of the building due to existing slopes.

The Harold Preston parcel - The location of this parcel is

adequate. The number of children who may walk to the site begins to decrease to 120 - 140.

Negotiations for purchase options should begin on all three parcels. The acquired architect and an engineer should review all three parcels in greater detail for building limitations which may exist.

Finally, it is recommended that land or options be obtained in the northern area of town (upper Sixth Street, County Farm Road), for a potential future school site in that area as growth dictates. More analysis will be needed to determine the specific site.

FIRE FACILITY

There are two fire fighting facilities in the City of Dover: the Central Fire Station and the Southend Fire Station. These fire stations are responsible for covering the entire 28 square miles of the City.

The Central Fire Station is located on Broadway in the downtown area of the City. Built in the late 1890's, the three bay structure was designed to house three vehicles and a small number of firefighters. Today the station is crowded with six vehicles, an increasing number of firefighters, and administrative support staff. The six vehicles within the structure consist of three fire engines, one ladder truck, one ambulance, and one forestry brush vehicle.

The Southend Fire Station is located on Durham Road just south of the Back River Road intersection. Constructed in 1967, the two bay station houses six pieces of apparatus including: two fire engines, one ladder truck, one ambulance, a squad truck, and a small boat.

Both stations lack the required space to house the existing fire fighting apparatus. In addition, space constraints exist for firefighters and administrative personnel.

FIRE LOCATION STANDARDS

There are very few standards regarding the optimum number and placement of fire stations in a community. The National Fire Protection Association recommends that a first due engine company (first arrival apparatus), be located within two miles of a residential area, and one and one-half miles of a commercial area.

A Fire Suppression rating schedule created by the Insurance Services Office, determines insurance ratings for individual communities. This schedule outlines a credit system based on the placement of fire facilities within a community. For maximum credit in the schedule, all sections of a city should be within one and one-half miles of an adequately equipped engine company and two and one-half miles of an adequately equipped ladder, service, engine-ladder, or engine service company.

The distance between a fire facility and the area it is to service is important. Research has shown that a room fire can progress from ignition to flashover (simultaneous ignition of all contents) in six to nine minutes. A fire department's objective is to arrive at the scene prior to flashover. Achieving this objective is often difficult because response time is a complex variable that includes: detection and reporting of a fire; dispatch of the fire

units; turnout (time required to mount the apparatus and leave the station); travel time to the fire scene and; setup (interval required to deploy firefighters and equipment).

What happens before the fire department is notified is as important as what happens afterwards. Travel time is, however, a variable which can be controlled by a community by increasing the number of stations and by choosing to locate stations near high service demand areas.

By having a fire facility within one and one-half to two miles from a fire, apparatus may arrive on the scene within three minutes of leaving the station. This leaves three to six minutes for a fire to be discovered, apparatus dispatch, turnout and setup, prior to the occurrence of a flashover. It is therefore very important for a fire facility to be located within one and one-half to two miles (three minute travel time) from areas it is to serve.

EXISTING COVERAGE

There are approximately 10,469 housing units in the City today. Seventy-seven percent (8076) are located within a three minute travel area (1 1/2 to 2 miles) of one of the two existing fire stations. Table IV illustrates the number of the units outside of a three minute travel area by City tax map.

TABLE IV
EXISTING UNITS OUTSIDE THREE MINUTES RESPONSE ZONES

TAX MAP	NUMBER OF UNITS
A	244
B	86
C	55
D	207
E	104
F	75
G	45
H	108
I	226
J	75
K	8
L	420
M	240
N	16
38	168
39	112
40	204
TOTALS	2393

The areas of the City outside three minutes of one of the two existing fire stations are primarily rural. Of the 2393 units not within three minutes of the fire stations, 1300 are located north, and 1093 are located south of the existing three minute zones.

Between April of 1988 and November of 1988, there were 2117 calls for assistance to the Fire Department. Only 986 or 44% had fire apparatus on the scene within three minutes this is likely the result of existing traffic flow problems. The Central Fire Station location in the center of the heavily traveled Urban Core makes difficult a quick response to outlying areas.

PROJECTIONS

According to projections made in the Housing section of the Master Plan, there will be approximately 12,819 housing units located within the City in the year 1995. Should the new units be distributed throughout the City based on historic trends, there will be a total of 3032 housing units located outside the three minute travel zone of the existing fire facilities. Table V illustrates the breakdown by City tax map.

TABLE V

PROJECTED UNITS OUTSIDE THREE MINUTE RESPONSE ZONES

TAX MAP	PROJECTED NUMBER OF UNITS
A	297
B	132
C	122
D	220
E	132
F	103
G	51
H	175
I	295
J	101
K	13
L	510
M	360
N	26
38	170
39	121
40	204
TOTAL	3032

The above number represents 24% of the total 12,819 units that will be located in the City by 1995. It is important to note that the above number is an estimate based on historic trends. Given the fact that most of the vacant land in the City is located in the rural areas which are not currently within the three minute zones a much different scenario could take place. A much higher percentage of the City's housing units may be constructed outside of the three minute time zones.

RECOMMENDATIONS

The City of Dover is unique because it is divided by two rivers, the Bellamy and Cochecho, and the Spaulding Turnpike. The geographic location of these two rivers and the turnpike make it difficult to provide adequate fire protection to the City in a quick and efficient manner. In addition, existing traffic patterns in the downtown area often make it impossible for fire apparatus to travel the required distances in a three minute time period.

The two existing stations adequately cover the immediate urban core and the western area of the town including Knox Marsh Road, Durham Road, Back River Road, Mast Road, and most of Morningside Park. The sections of the City north and south of the existing coverage areas contain 23% of the remaining households in Dover and also contain most of the City's vacant land for future development. These areas are in need of a more efficient fire response system. Therefore, it is recommended that a third fire station be constructed immediately.

Criteria used in determining the best location of a third fire station include: number of households within a three minute response zone; proximity to high risk areas such as industrial zones and areas of low fire hydrant water pressure; proximity to turnpike access; and availability of one to two acres of land. Using these criteria it is recommended that a third fire station be located on Sixth Street, near the Sixth Street connector.

A new fire station located on Sixth Street would provide a three minute fire response to an additional 922 households in the northern section of the City. The placement of a fire station near the connector road would provide easy access on and off the Spaulding Turnpike for coverage anywhere in the City. The site would be located in the middle of the Executive and Technology Park and the new Business and Industrial Zones on Sixth Street. Additionally, the site would be within three minutes of the "Indian Village" area of the City which has exhibited low fire hydrant water pressure.

Potential parcels in the Sixth Street Connector area with

adequate size (one to two acres) to support a fire station include:

Map D, lot 17A, owned by Walter Ham

Map E, lot 22E, owned by Liberty Mutual Insurance Co.

Map E, lot 22D, owned by Liberty Mutual Insurance Co.

Map E, lot 22C, owned by Liberty Mutual Insurance Co.

Map E, lot 22E-1, owned by Liberty Mutual Insurance Co.

Three fire stations functioning properly would provide a three minute fire response to 86% of the existing households and 85% of the projected 1995 households in Dover. Appendix V illustrates the response areas of the three fire stations.

Additionally, it is recommended that a fourth fire station be located on the southern end of the City perhaps in the Dover Point area as growth occurs. Additional analysis will be needed in order to identify the best location for a south end fire station.

PUBLIC WORKS AND SCHOOL BUS FACILITIES

The existing Public Works Garage, School Bus Facility, and Wastewater Treatment Plant are located on a 36 acre parcel on the west side of the Cochecho River in the downtown area.

The parcel is unique in that it provides the opportunity for Dover to integrate the downtown area with new, water-oriented, mixed-use development. The site has deep water access and is conducive to the construction of a variety of uses including a marina.

Numerous studies have recommended that the City do everything possible to encourage revitalization efforts in the downtown area. The Land Use Section of the Master Plan recommends that the City take a progressive and proactive approach to the development of the parcels for optimized open space, recreation and water access, and private development.

The existing Wastewater Treatment Facility will be replaced in 1992 by a new secondary treatment plant located in south Dover. Any reuse of the waterfront land would be contingent upon the construction of a new bus facility and Public Works Garage on another site in the City. The costs for the construction of the new facilities may be offset by the income from the sale of the City's riverfront land.

EXISTING FACILITIES

The existing Public Works building has a floor area of approximately 27,500 square feet. The facility houses a maintenance shop, office space, parts and equipment storage and vehicle storage. In addition, salt, sand, and other materials frequently used by Public Works are stored in an adjacent open area.

The school bus maintenance building has approximately 6,000 square feet of floor area and is located next to the Public Works garage. The building provides office space and an area for the maintenance of vehicles. Buses are stored on the grounds immediately surrounding the facility.

BUILDING REQUIREMENTS

The 1984 Pacific Mills Master Plan prepared by Rist-Frost Associates, contained recommendations that any new Public Works facility contain 40,000 square feet. Approximately 19,200 square feet would be used for vehicle storage; 9,200 square feet for a maintenance shop; 4,800 square feet for parts and equipment storage; and 6,800 square feet for office space. Rist-Frost recommended that a new school bus maintenance facility contain 15,000 square feet of floor area. Vehicle storage would require 9,000 square feet. Approximately 4,200 square feet would be required for the

maintenance area and 1,800 square feet for office space.

In addition to the lot size requirements a number of other factors need to be addressed prior to the relocation of either of the facilities to a specific parcel. Both the Public Works Garage and the School Bus facility must be placed in an area of low population density due to periods of high activity and noise levels, yet should be centrally located to minimize travel expense and time. Potential pollution concerns must be addressed as both facilities require fuel storage and Public Works frequently stores large quantities of salt in the winter months. The site should have adequate security and screening for aesthetic purposes.

RECOMMENDATIONS

The most cost efficient solution would be to relocate the facilities to another City owned parcel. After the review of these parcels, only a few appear to have the potential for use as a future Public Works and School Bus facility.

Tax Map I, Lot 72, located on the corner of Back River Road and Garrison Road consists of approximately four acres and is the site of an old City gravel pit. Surrounded by an existing gravel pit and few residential structures, the site is centrally located yet would not be a visual or audible nuisance to the immediate neighborhood. The parcel is small however, and may not provide adequate space for needed storage. The site is also in an identified potential future well site area.

Tax Map C, Lot 19, located on Tolend Road opposite the Tolend Landfill consists of approximately eight acres of vacant land. The site is remote and provides ample space for expansion. The parcel is located in a Secondary Groundwater Protection Zone which would make any potential fuel storage questionable. The site is remotely located and would require extended travel time and costs.

Tax Map C, Lots 20 and 22, are located on Glen Hill Road and consisting of approximately forty-three acres. Both parcels are located in the Secondary Groundwater Protection Zone and may provide little opportunity for fuel storage. Because of the remote nature of these parcels they provide excellent potential for a Public Works garage and school bus repair center in terms of noise and storage, but become impractical because of extended travel, time and expenses.

Tax Map C, Lots 16 and 18, are located on Tolend Road and are the location of the City's previous landfill. Both parcels total fifty-three acres and once they are cleaned up provide an expansive area for both facilities. The sites are in the Secondary Groundwater Protection Zone but consist of poorly drained soils providing some potential fuel storage under

specifically engineered conditions. Again, travel distances may provide problems in regard to time and added fuel expense.

One other City owned parcel frequently considered as a potential site for the facilities is Tax Map H, Lot 58, located on Mast Road. The lot contains fifty-four acres and currently contains the Ireland Well as well as City gravel pits. The site is a good location in terms of travel time however, there are other factors which should require serious consideration prior to the location of any facility on the lot. The parcel is partially located within the Primary Groundwater Protection Zone. The balance of the lot is in the Secondary Groundwater Protection Zone and generally consists of well drained soils. The site is not conducive to fuel and salt storage.

Given the distant location of many of the potential City owned parcels another solution may be to purchase a privately owned parcel or a parcel owned by Strafford County. Tax Map I, Lot 71, is owned by Louise Sweatt and is an inactive gravel pit located on Garrison Road immediately adjacent to the City's parcel outlined earlier (Map I, Lot 72). The parcel consists of approximately eight acres of land and is centrally located with easy access to most of the City. The location of the parcel near Garrison School makes it a good location for bus storage. The parcel is particularly attractive as it can be serviced by City water and sewer.

Conversely, the Sweatt parcel is located in an area classified as a Secondary Groundwater Protection Zone and is considered a potential future well site. The area is scheduled to be tested for well water quality and quantity. If the area is conducive as a future source of City water it will be permanently protected and will not be available for a potential Public Works and School Bus facility. In addition, existing slopes on the site created as a result of gravel extraction will add additional costs for any site preparation. The slopes are extremely steep and pose a potential danger to children playing on or near the site.

Strafford County owns two parcels adjacent to the existing Strafford County Administration and Justice Building on County Farm Road. Tax Map B, Lot 2 and Map C, Lot 4, consist of large acreage with excellent soils and are located outside of any Groundwater Protection Zones. While travel distances would be a factor, the site provides ample storage space, is an area of low population density, yet has added security from adjoining uses. Purchase of non-City owned land may be financed by the sale of the existing Public Works and School Bus Facility or perhaps another parcel of City owned land.

Based on potential pollution and noise concerns, travel expense and time considerations, and cost efficiency. It is

recommended that the City conduct additional site specific analysis on three of the areas outlined above. They include:

Map I, Lots 71 and 72 - City owned parcel and Louise Sweatt parcel on Garrison Road.

Map B, Lot 2 and Map C, Lot 4 - Strafford County owned land near Strafford County Administrative Building.

Map C, Lots 16 and 18, Tolend Road landfill.

It is recommended that Map I, Lots 71 and 72, because of its centralized location be given the highest priority. An immediate study should take place to determine if the area is a potentially valuable water source. If the results are negative the area should be dismissed as a Secondary Groundwater Protection Zone, and the site should be reviewed in terms of the potential placement of the Public Works and School Bus Facilities.

APPENDIX

EXISTING WELL DATA
APPENDIX A

ITEM	CUMMINGS	SMITH	IRELAND	GRIFFIN	HUGHES	CALDERWOOD	8" TEST
Aquifer	Willand Pond	Willand Pond	Pudding Hill	Pudding Hill	Barbadoes Pond	The Hoppers	Huckleberry Hill
Year Constructed	1966	1967	1964	1966	1969	1972	1977
Constructed By:	Chapman	Chapman	Chapman	Chapman	Chapman	Chapman	Chapman
Casing Diameter	24" x 18"	24" x 18"	24" x 18"	24" x 18"	24" x 18"	24" x 18"	8"
Gravel Packed	yes	yes	yes	yes	yes	yes	yes
Pump Capacity gal. per min. (1)	500 gpm	500 gpm	700 gpm	600 gpm	600 gpm	700 gpm	300 gpm
Well Capacity After & Before Cleaning, gpm	500 gpm @ 7.5' DD --- 500 gpm @ 22' DD	Not Applicable --- Not Applicable	500 gpm @ 22.7' DD --- 375 gpm @ 25' DD	490 gpm --- 350 gpm	660 gpm @ 32.3' DD --- 300 gpm @ 32.3 DD	650 gpm @ 13' DD --- 400 gpm @ 32.2' DD	Data Unavailable --- Data Unavailable
Yield of Aquifer	gpm: 5400 --- mgd: 7.75	5400 --- 7.75	560 --- 0.8	560 --- 0.8	625 --- 0.9	560 --- 0.8	Not Computed --- Not Computed
Pump, hp	25	25	75	60	75	60	25
Depth of Well	75'	75'	101-6"	114'	107'	105'	97'
Screen Length & Diameter	15'-18"	20' screen screen diam. data unavail.)	20'-18"	30'-18"	20'-18"	15'-18"	20'
Depth to Casing WL When Pumping	52' to 65'	Not Applicable	66.5 @470gpm (27' drawdown)	78' (11.5' DD)	32'-6" @300 gpm About 80'	66.5' @ 520 gpm	
Pump Intake Depth	63' Airline 65' Intake	63' Airline 65' Intake	78'-6" (3' above screen)	85' (1' below top of screen)	81'-6.5"	81' (3.5' above screen)	Data Unavailable
Status	Alternated w/ Smith	Alternated w/ Cummings	Operated Continuously	Operated all of the time	Standby Well	Operated Continuously	6 mos.

APPENDIX B

AVERAGE GALLONS OF WATER
PRODUCED PER DAY

1981	CUMMINGS	HUGHES	IRELAND	CALDERWOOD	GRIFFIN	TOTAL
JAN.	601768	431181	426648	543845	422158	2,425,600
FEB.	594486	363200	316925	652089	411479	2,338,179
MARCH	591190	111700	492797	673671	388545	2,257,903
APRIL	600500	424377	253737	481032	440723	2,200,369
MAY	439435	408787	381119	629000	440255	2,298,596
JUNE	646053	167217	413650	771913	308530	2,307,363
JULY	658503	416194	404106	763006	7668	2,249,477
AUGUST	648810	240977	330684	721526	190048	2,132,045
SEPT.	647063	0	294320	717127	402803	2,061,313
OCT.	642268	0	345303	847077	408458	2,243,106
NOV.	636237	0	406670	788543	351763	2,183,213
DEC.	630374	81877	456855	810110	139429	2,118,645
AVG./YR	611391	220459	376901	699912	325988	2,234,651

DATA SOURCE: City of Dover Water Department

APPENDIX C

AVERAGE GALLONS OF WATER
PRODUCED PER DAY

1982	CALDERWOOD	CUMMINGS	GRIFFIN	HUGHES	IRELAND	TOTAL
JAN.	787997	630348	217410	141468	477319	2,254,542
FEB.	662143	624293	424214	27846	490250	2,228,746
MARCH	663977	620861	411406	0	486816	2,183,060
APRIL	731313	327263	380847	201640	497487	2,138,550
MAY	869513	0	413252	436490	538300	2,257,555
JUNE	774013	0	426513	443360	529593	2,173,479
JULY	737234	326510	391481	396329	486497	2,338,051
AUG.	625919	633997	410610	396429	33635	2,100,590
SEPT.	625387	646707	424577	382063	0	2,078,734
OCT.	553719	640771	416432	404161	0	2,015,083
NOV.	626320	363273	422773	293433	251787	1,957,586
DEC.	582165	638387	21387	414381	443019	2,099,339
AVG./YR	686642	454367	363409	294800	352892	**2,152,110**

DATA SOURCE: City of Dover Water Department

APPENDIX D

AVERAGE GALLONS OF WATER
PRODUCED PER DAY

1983	8" TEST	CALDERWOOD	SMITH & CUMMINGS	GRIFFIN	HUGHES	IRELAND	TOTAL
JAN.		600594	634181	0	431129	477319	2,143,223
FEB.		631221	630682	0	431532	490250	2,183,685
MARCH		637406	630016	0	424919	486816	2,179,157
APRIL	0	647203	564628	303083	255813	497487	2,268,214
MAY	458484	582861	0	543758	84861	538300	2,208,264
JUNE	50023	557780	0	483027	177453	529593	1,797,876
JULY	511774	518952	0	545723	269229	486512	2,332,190
AUG.	494484	523629	384474	502458	270368	33635	2,209,048
SEPT.	424800	498043	799530	263800	165343	0	2,151,516
OCT.	256226	481487	805126	208523	311445	0	2,062,807
NOV.	28467	498300	786147	546543	346553	251787	2,457,797
DEC.	231484	395016	760690	526335	12213	443019	2,368,757
AVG./YR	204645	547708	499623	326938	265071	352893	**2,196,878**

DATA SOURCE: City of Dover Water Department

APPENDIX E

AVERAGE GALLONS OF WATER
PRODUCED PER DAY

1984	8" TEST	CALDERWOOD	SMITHWELL	CUMMINGS	GRIFFIN	HUGHES	IRELAND	TOTAL
JAN.	0	876752	0	809274	184639	0	456539	2,327,204
FEB.	0	836845	0	621710	0	0	760200	2,218,755
MARCH	0	851158	0	559032	342068	0	352494	2,104,752
APRIL	0	866977	569147	0	670127	85930	0	2,192,181
MAY	148871	797684	610726	0	611452	0	545123	2,713,856
JUNE	306500	732387	573967	0	596090	0	402443	2,611,387
JULY	262419	737561	29281	0	565729	0	622371	2,217,361
AUG.	189613	745061	182610	0	682039	0	490281	2,289,604
SEPT.	151400	745457	410040	0	614837	0	278637	2,200,371
OCT.	268355	674094	365358	0	571181	133384	0	2,012,372
NOV.	101400	777347	0	0	603213	437773	0	1,919,733
DEC.	94000	801400	0	0	640181	480639	0	2,016,220
AVG/YR	126880	786894	228427	165835	506796	94810	325674	2,235,316

DATA SOURCE: City of Dover Water Department

APPENDIX F

AVERAGE GALLONS OF WATER
PRODUCED PER DAY

1985	8" TEST	CALDERWOOD	SMITH & CUMMINGS	GRIFFIN	HUGHES	IRELAND	TOTAL
JAN.	100677	754106	0	643415	248981	472728	2,219,907
FEB.	0	737471	0	669232	0	983900	2,390,603
MARCH	0	751197	0	645184	0	988884	2,385,265
APRIL	0	754283	0	666723	0	1102580	2,523,586
MAY	153065	740148	469839	189555	0	1065661	2,618,268
JUNE	97133	746930	656650	0	0	1038510	2,539,223
JULY	140387	740735	919503	426039	0	1018135	3,244,799
AUG.	23871	759729	711616	634961	0	747471	2,877,648
SEPT.	45667	726463	668110	279107	25390	813053	2,557,790
OCT.	0	739881	703929	31777	219219	945771	2,640,577
NOV.	0	737007	699508	0	209678	992710	2,638,903
DEC.	0	743448	731165	0	0	975226	2,449,839
AVG./YR.	46733	744283	463360	348833	58606	928719	**2,590,534**

DATA SOURCE: City of Dover Water Department

APPENDIX G

AVERAGE GALLONS OF WATER
PRODUCED PER DAY

1986	8" TEST	SMITH & CUMMINGS	GRIFFIN	HUGHES	IRELAND	CALDERWOOD	TOTAL
JAN.	0	710739	0	142090	781974	63247	1,698,050
FEB.	0	468507	225925	399236	721350	643286	2,458,304
MARCH	32645	0	600135	70732	786464	657500	2,147,476
APRIL	233367	0	599600	236300	841940	658277	2,569,484
MAY	309484	0	572816	108382	831123	621639	2,443,444
JUNE	266940	0	551527	58960	965940	660640	2,504,007
JULY	134394	0	525794	233055	952881	684693	2,530,817
AUG.	90216	0	474632	317927	942474	693216	2,518,465
SEPT.	128280	660663	124233	0	936067	675643	2,524,886
OCT.	157676	713742	199416	0	940516	694403	2,705,753
NOV.	48397	709403	346717	0	804603	669913	2,579,033
DEC.	31355	700945	495471	0	685168	604499	2,517,438
AVG./YR	119,396	330,333	393,022	130,557	849,208	610,580	2,433,096

DATA SOURCE: City of Dover Water Department

APPENDIX H

AVERAGE GALLONS OF WATER
PRODUCED PER DAY

1987	8" TEST	SMITH & CUMMINGS	GRIFFIN	HUGHES	IRELAND	CALDERWOOD	TOTAL
JAN.	43103	60237	508310	0	767703	596558	1,975,911
FEB.	0	682558	498461	0	811564	622846	2,615,429
MARCH	45968	687855	510877	0	851048	607048	2,702,796
APRIL	5775	138383	464113	365753	873830	662433	2,510,287
MAY	262087	447142	83258	456584	840743	597163	2,686,977
JUNE	345907	707080	0	152810	796420	568060	2,570,277
JULY	245238	617587	0	164397	723087	534845	2,285,154
AUG.	240977	678513	0	352523	865265	653661	2,790,939
SEPT.	91700	637407	0	303110	648060	577627	2,257,904
OCT.	66793	756155	0	344742	777265	687042	2,631,997
NOV.	82637	690853	0	403310	737090	669680	2,583,570
DEC.	123481	749997	132152	222203	702683	669429	2,599,945
AVG./YR	129472	571147	183098	230453	782896	620533	2,517,599

DATA SOURCE: City of Dover Water Department

APPENDIX I

AVERAGE GALLONS OF WATER
PRODUCED PER DAY

1988	8" TEST	SMITH & CUMMINGS	GRIFFIN	HUGHES	IRELAND	CALDERWOOD	TOTAL
JAN.	154087	745110	13345	197716	733671	680226	2,524,155
FEB.	0	0	0	431579	682379	711952	1,825,910
MARCH	205461	723700	107890	268710	708984	660381	2,675,126
APRIL	203163	448433	153107	182583	717390	658597	2,363,273
MAY	15000	744135	707835	0	721448	691481	2,879,899
JUNE	127863	772397	765380	71640	791627	702950	3,231,857
JULY	153497	770384	830961	76590	684497	680181	3,196,110
AUG.	163065	766797	661242	0	680313	718284	2,989,701
SEPT.	99497	573733	643250	0	675767	706673	2,698,920
OCT.	151764	443841	699803	0	729867	677332	2,702,607
NOV.	115620	535810	624650	0	579326	674606	2,530,012
DEC.	275083	0	564677	0	710387	655777	2,205,924
AVG./YR	138675	543695	481012	102401	701305	684870	2,651,958

DATA SOURCE: City of Dover Water Department

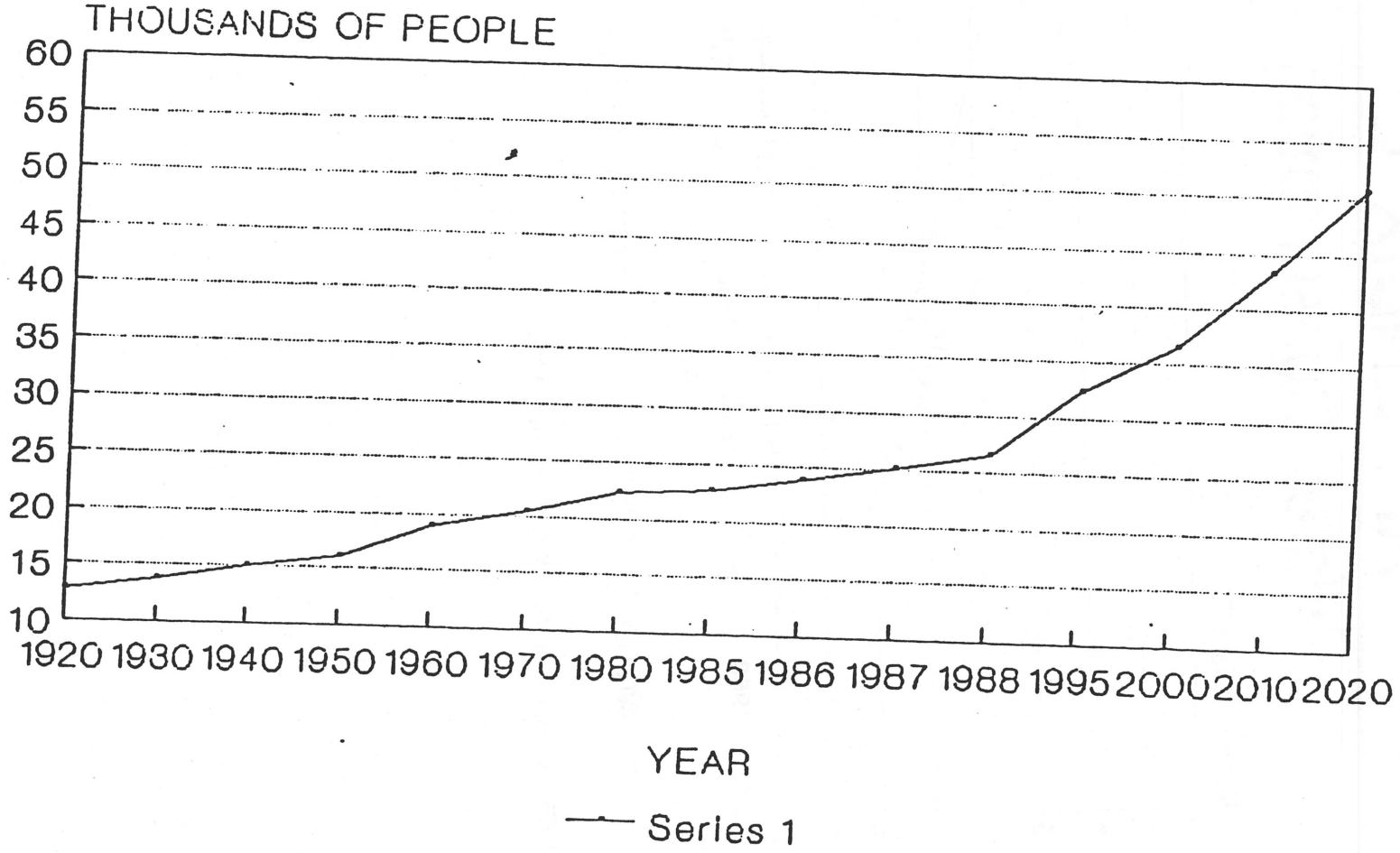
APPENDIX J

ADDITIONAL WATER DEMAND FOR THE CITY OF DOVER

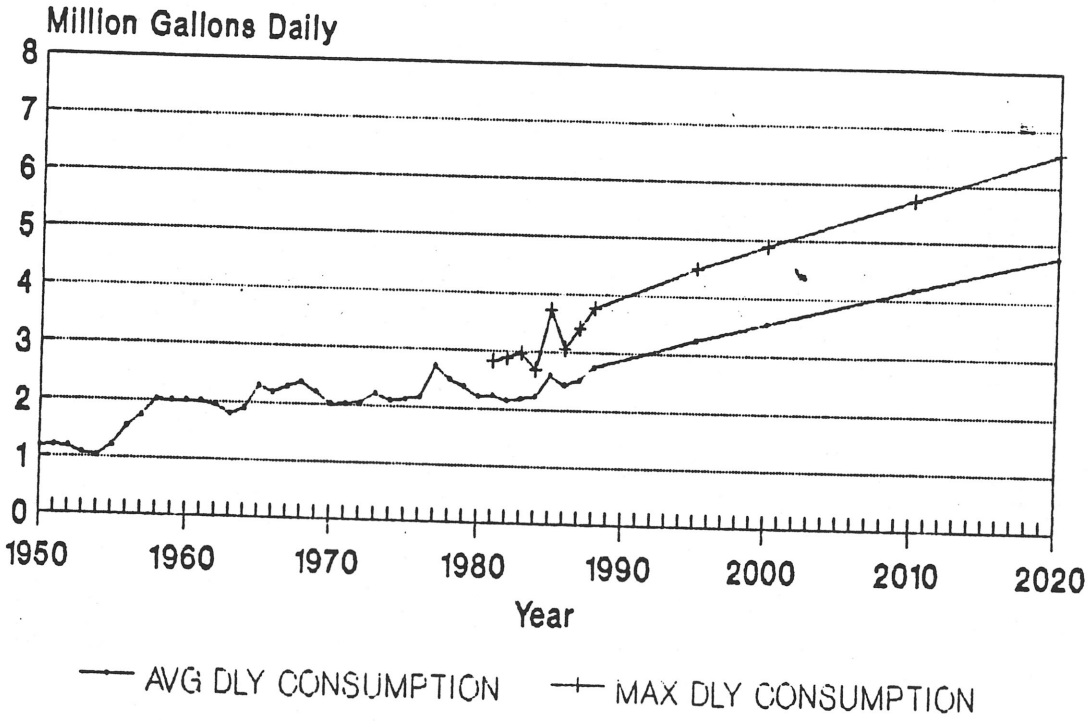
	1995		2000		2010		2020	
	ADDITIONAL HOUSING UNITS	ADDITIONAL WATER DEMAND(GPD)	ADDITIONAL HOUSING UNITS	ADDITIONAL WATER DEMAND(GPD)	ADDITIONAL HOUSING UNITS	ADDITIONAL WATER DEMAND(GPD)	ADDITIONAL HOUSING UNITS	ADDITIONAL WATER DEMAND(GPD)
RESIDENTIAL								
SF DETACHED	846	135,022	521	83,152	1052	167,899	1043	166,463
SF ATTACHED	600	62,772	375	39,233	750	78,465	751	78,570
MULTIFAMILY	904	101,899	565	63,687	1127	127,035	1129	127,261
TOTAL	**2350**	**299,693**	**1461**	**186,072**	**2929**	**373,399**	**2923**	**372,294**
	ADDITIONAL SQUARE FEET	ADDITIONAL WATER DEMAND	ADDITIONAL SQUARE FEET	ADDITIONAL WATER DEMAND	ADDITIONAL SQUARE FEET	ADDITIONAL WATER DEMAND	ADDITIONAL SQUARE FEET	ADDITIONAL WATER DEMAND
NON-RESIDENTIAL								
OFFICE	1,383,806	107,937	850,697	66,354	1,678,180	130,898	1,681,784	131,179
COMM/RETAIL	356,655	33,740	197,437	18,678	418,142	39,556	404,662	38,281
INDUSTRIAL	1,034,780	53,809	664,937	34,577	1,309,888	68,114	1,229,658	63,942
TOTAL	**2,775,241**	**195,486**	**1,713,071**	**119,609**	**3,406,210**	**238,568**	**3,316,104**	**233,402**
GRAND TOTAL		**495,179**		**305,681**		**611,967**		**605,698**

APPENDIX K

CITY OF DOVER
POPULATION PROJECTIONS



APPENDIX L
Water Consumption



SOURCE: CITY OF DOVER WATER DEPARTMENT

APPENDIX M

CONTAMINANT THREATS ANALYSIS

DOVER, NEW HAMPSHIRE

BCI SITE #	NAME/OWNER	ADDRESS	DESCRIPTION
1	ROCHESTER SEWAGE TREATMENT PLANT	PICKERING ROAD	WWTP
2	PROPOSED LANDFILL (BARRINGTON)	TOLEND ROAD	LANDFILL
3	MIDWAY ASPHALT PLANT #5	ROCHESTER NECK ROAD	INDUSTRY
4	BROX PAVING MATERIALS	ROCHESTER NECK ROAD	SAND & GRAVEL
5	PUMPKIN HOLLOW MOBILE PARK	ROCHESTER NECK ROAD	HOUSING DEVELOPMENT
6	DOVER LANDFILL	TOLEND ROAD	DUMP/LANDFILL
7	STRAFFORD COUNTY HOME	COUNTY FARM ROAD	SURFACE IMPOUNDMENT
8	STRAFFORD COUNTY HOME	WATSON/CNTY FARM RD	PETRO CHEMICAL STORAGE
9	GASSES SUNOCO	OLD ROCHESTER/DOVER	SLUDGE DISPOSAL
10	NH DEPT TRANSPORTATION	WEEK TRAFFIC CIRCLE	GAS STATION
11	OLD COLONY FUEL STOP	WEEK TRAFFIC CIRCLE	HIGHWAY SHED
12	SUNOCO	CENTRAL AVENUE	GAS STATION
13	BP GAS	CENTRAL AVENUE	GAS STATION
14	CROSBY ROAD INDUSTRIAL PARK	INDUSTRIAL PARK ROAD	INDUSTRIAL PARK
15	INDUSTRIAL PARK	PORTLAND AVE/RTE 4	INDUSTRIAL PARK
16		PROGRESS DRIVE	DUMP
17	INDUSTRIAL PARK	LOCUST AVENUE	INDUSTRIAL PARK
18	MOORE BUSINESS MACHINES	STARK AVENUE/108	INDUSTRY
19	CITGO & SUNOCO	MIDDLE ROAD	GAS STATION
20		DOVER NECK/BACK RD	AGRICULTURE
21	BRICKYARD ESTATES	DOVER POINT ROAD	HOUSING DEVELOPMENT
22	BILL DUBE AUTO	MAST ROAD	AUTO SALES
23	CHADWICK'S NURSERY		GREENHOUSE
24	DOVER SAND & GRAVEL	MAST ROAD	NURSERY
			SAND & GRAVEL
25	MADBURY METALS	PUDDING HILL ROAD	CONCRETE PRODUCTS
			METAL SALVAGE
26	MADBURY LANDFILL	PUDDING HILL	LANDFILL
27	JENSEN'S FARMWOOD VILLAGE	DURHAM RD/SPRUCE LN	TRAILER PARK
28	SEABORNE HOSPITAL	GARRISON ROAD	HOSPITAL
29	NH HIGHWAY DEPARTMENT	DOVER PT/SPLD TPK	HIGHWAY SHED
30	TUTTLES RED BARN	DOVER PT/SPLD TPK	AGRICULTURE
31	CALCUTT LANDFILL	DOVER NECK ROAD	LANDFILL
32	ST THOMAS AQUINAS H.S.	DOVER POINT ROAD	FUEL STORAGE
33	THE LANDING	HUCKLEBERRY HILL	HOUSING DEVELOPMENT
34	ELLIOTT & WILLIAMS ROSES	DOVER POINT ROAD	GREENHOUSES
35	DAVID DUPONT EXXON]	SILVER STREET	GAS STATION
36	TEXACO GAS	SILVER STREET	GAS STATION
37	KARKOS GULF GAS	SILVER/STARK AVENUE	GAS STATION
38	MOBILE GAS	SILVER/COURT STREET	GAS STATION
39	GETTY GAS	CENTRAL AVENUE	GAS STATION
40	CITY DOVER MAINTENANCE	UPPER NARROWS	GAS/SALT STORAGE DUMP
			SEWAGE TREATMENT PLANT

BCI SITE #	NAME/OWNER	ADDRESS	DESCRIPTION
41	BAYHEAD/CLARESTAT	WASHINGTON/MAIN	INDUSTRY
42	PUBLIC SERVICE CO. NH SUBSTATION	COCHECO STREET	ELECTRIC INDUSTRY
43	COCHECO COUNTRY CLUB	GULF ROAD	AGRICULTURAL CONCERNS
44	NATIONAL GUARD ARMORY	OAK STREET	PETROCHEMICAL STORAGE
45	LORD & KEENAN INC.	BROADWAY	INDUSTRY
46	HARRIS GRAPHICS	BROADWAY	PETROCHEMICAL STORAGE
47	D.F. RICHARD, INC.	CENTRAL AVENUE	INDUSTRY
48	FRANKLIN ELECTROPLATING	HAM/PARK STREET	WAREHOUSE
49	ROBBIN'S AUTO PARTS	MAPLE STREET	INDUSTRY
50	PROSPER & SHENVENEU & SON, INC.	CENTRAL AVENUE	HOSPITAL
51	WENTWORTH DOUGLSA HOSPITAL	CENTRAL AVENUE	SHOPPING MALL
52		CENTRAL AVENUE	GAS
53	TIBERO AUTO BODY	CENTRAL AVENUE	DRY CLEANERS
54	CLEARY CLEANERS	RTE 9 SOMERSWORTH	GAS STATION
55	CITGO	RTE 9 SOMERSWORTH	SHOPPING MALL
56	TRI CITY PLAZA	RTE 9 SOMERSWORTH	FUEL STORAGE
57	NE TELEPHONE CO.	RTE 9 SOMERSWORTH	GAS STATION
58	GETTY GAS	RTE 9 SOMERSWORTH	AUTO SERVICE STATION
59	SPEE-DEE OIL CHANGE/LUBE	CENTRAL AVE, DOVER	GAS STATION
60	GETTY GAS	STARK AVENUE	DRY CLEANERS
61	CLEARY CLEANERS	SPRUCE/GASSIRON	OLD DUMP
62	CITY DOVER	LITTLEWORTH ROAD	GAS STATION
63	TEXACO GAS	DOVER POINT	PROPOSED WWTP
64	CITY DOVER	COCHECO STREET	COAL/GASIFICATION PLANT
65	ELECTRIC COMPANY	CENTRAL AVENUE	GAS STATION
66	OLD COLONY #6927	CENTRAL AVENUE	GAS STATION
67	BILL'S TEXACO	5 DOVER POINT ROAD	AUTO DEALER AUTO BODY SHOP
68	BYRNE'S CHEVROLET	CENTRAL AVENUE	GASOLINE STORAGE
69	COLONY AUTO CO. & BODY WORKS	GROVE STREET	DIESEL FUEL STORAGE
70	B&M CORP. (DOVER CARPENTER SHOP)	OFF OAK STREET	PETROCHEMICAL STORAGE
71	B&M CORP. (DOVER FUEL FACILITY)	72 LITTLEWORTH ROAD	PETROCHEMICAL STORAGE
72	HANSCOM'S TRUCK STOP	OFF LITTLEWORTH ROAD	PETROCHEMICAL STORAGE
73	GENERAL ELECTRIC CO. (BUILDING T)	DOVER POINT ROAD	GASOLINE STORAGE
74	DOVER HIGH SCHOOL	622 CENTRAL AVENUE	PETROCHEMICAL STORAGE
75	BENN'S MARINA	69 FIFTH STREET	PETROCHEMICAL STORAGE
76	CENTRAL AVENUE MOVING CENTER	63 FOURTH STREET	PETROCHEMICAL STORAGE
77	A. LIPSON, INC.	38 DOVER POINT ROAD	AUTO DEALER
78	LORD & KEENAN, INC.	WOODMAN PARK	PETROCHEMICAL STORAGE
79	WILLIAM'S CADILLAC & OLDS, INC.		
80	WOODMAN PARK SCHOOL		

APPENDIX H
SEWER USAGE

	1980		1981		1982		1983		1984		1985		1986		1987		1988	
	AVG. DAY	MAX DAY	AVG. DAY	MAX DAY	AVG. DAY	MAX DAY	AVG. DAY	MAX DAY	AVG. DAY	MAX DAY	AVG. DAY	MAX DAY	AVG. DAY	MAX DAY	AVG. DAY	MAX DAY	AVG. DAY	MAX DAY
JAN.	1.86	2.06	1.32	1.43	2.29	4.67	2.08	3.60	2.00	2.61	1.95	2.55	2.67	6.04	2.40	2.61	2.20	2.59
FEB.	1.74	1.95	2.26	5.00	2.02	3.62	2.26	4.00	3.30	5.97	2.08	3.47	2.43	4.23	2.25	2.47	2.72	5.05
MAR.	2.18	3.00	2.25	3.29	3.06	4.60	3.76	5.39	2.99	4.79	2.64	5.46	3.13	5.11	3.79	5.11	2.88	5.41
APR.	2.57	4.8	2.20	2.94	2.15	3.58	2.72	3.64	3.99	7.64	2.35	3.41	2.73	3.49	4.30	7.68	2.78	5.14
MAY	2.04	3.43	1.76	2.00	1.68	2.67	2.72	4.37	3.14	6.30	2.28	2.84	2.20	3.25	2.79	4.30	2.96	4.52
JUNE	1.61	1.99	1.70	2.19	2.78	8.19	2.21	3.57	2.94	5.51	2.07	2.82	2.57	3.65	2.31	2.67	2.38	2.80
JULY	1.54	2.07	1.85	2.74	1.73	2.52	1.53	1.97	2.00	4.51	1.99	2.58	2.32	2.96	2.22	3.14	2.57	4.82
AUG.	1.54	2.56	1.64	2.17	1.55	2.48	1.50	1.83	1.79	2.06	2.04	3.14	2.04	3.87	1.99	2.36	2.61	4.25
SEPT.	1.50	1.93	1.68	2.83	1.47	1.80	1.49	1.72	1.69	1.85	2.26	3.44	2.11	2.77	2.36	4.60	2.43	3.24
OCT.	1.57	3.02	1.92	3.14	1.50	2.22	1.58	2.89	1.76	2.78	2.29	3.21	2.2	3.05	2.22	3.45	2.25	4.02
NOV.	1.66	2.77	2.11	3.19	1.60	2.74	2.71	4.15	1.94	3.75	2.89	5.31	2.63	4.51	2.30	4.41		
DEC.	1.54	2.03	2.38	3.65	1.53	1.77	3.07	5.15	2.32	3.15	2.37	3.76	2.38	5.93	2.46	3.26		
	1.78	4.80	1.92	5.00	1.94	8.19	2.30	5.15	2.49	7.64	2.27	5.46	2.53	6.04	2.61	7.68	2.58	5.41

□ AVERAGE FOR YEAR

○ MAX. DAY FOR YEAR

APPENDIX O
SEWER REHABILITATION NEEDS

RIVER STREET AREA

Manholes that need to be raised

13, 14, 17, 24, 37, 38, 39, 114, 123, 125, 126, 127 must be located and raised

Manhole covers that need to be replaced

74 - new ring and cover
75 - new ring and cover (egg shaped)
47 - needs new ring (cracked)

Manholes that need invert work

65 - no shelf
49 - needs invert from Second Street
73 - fix invert brick missing

BROADWAY AREA

Manholes that need to be raised

7, 31, 40, 41, 63, 79, 80, 103

Manholes that need work

21 - needs invert from 145
145 - plug old drain line that enters manhole
103 - needs drop coming from Highridge Drive
100 - seal line that comes from drain manhole next to it
141 - fix four services that enter manhole

Manholes needed at end of lines

Rose Street
Forest Street
Florence Street - disconnect from drain line & add dead end
Locate manhole on Dover Street for line that enters 69
Loat line on Dover Street that enters 70

FOURTH STREET AREA

Manholes that need to be repaired

26, 42, 43, 66, 73, 81, 82, 96, 97, 104, 106

Manholes that need new rings and covers

35 & 36

ENTIRE AREA NEEDS TO BE CLEANED

Manholes that need work

39 - needs invert from line 100
68 & 69 root build-up
100 and 101 need invert and shelf work

Lines that need manholes

between MH 36 & 37
between MH 87 & 86 (find end of pipe entering manhole 87 and install manhole)
between MH 89 & 90
between MH 105 & 63 (will have to remove catch basin from sanitary line)

MORNINGSIDE AREA

Lines that need to be cleaned

between 8 & 3
line 37
line 127
line 130

Infiltration in manholes

63, 66, 67, 68, 69, 70, 71, 74, 75, 76, 78, 81, 84, 85, 86, 88, 90, 91, 92, 94, 99, 100, 101, 102, 103, 104, 117, 139, 141, 156

Root growth in manholes

23, 23, 27, 30, 55, 71, 73, 77, 82, 89, 129, 142, 155, 157

Other Manhole work needed

18 water plug boots
19 clean debris and fix invert
29 clean debris
38 clean debris
39 clean debris
70 invert work
71 no invert
72 invert work, cave-in near rim
77 invert work
78 invert work
84 invert work, reset ring & cover
87 replace ring & cover
92 replace ring & cover
100 silt build-up infiltration
102 invert plugged

123 debris in invert
126 debris in invert
128 replace ring & cover
132 flow running into force main
139 replace ring & cover - invert work
140 needs invert
141 invert work
143 needs invert
150 cover cracked
155 invert work

Manholes to be raised

26, 35, 56, 62, 66, 73, 86, 92, 93, 94, 98, 103, 104, 128, 129, 133, 139, 141, 157

Mains below minimum slope

Line #	Pipe Size	Slope
25	10"	.0027
26	8"	.00231
30	8"	.0030
37	8"	.0021
38	8"	.0029
54	8"	.0029
60	8"	.0036
61	8"	.0036
65	8"	.0025
66	8"	.0035
70	8"	.0034
77	8"	.0021
90	8"	.0039
99	8"	.0038
100	8"	.0029
112	8"	.0027
123	8"	.0039
137	8"	.0039
152	8"	.0036
153	8"	.0034
155	8"	.0032

Recommendations for the Morningside area

1. Lower sewer mains from Manhole 19 to Manhole 36
   a) to give adequate slope for lines 25 & 26
   b) to sewer all of McKenna Street
   c) to give adequate slope for lines 37 & 38
   d) to tie Linda Ave into Garrison to eliminate cross country easement
   e) to give adequate slope for lines 60 to 63

2. When replacing sewer mains from 63 to 70 install sewer in the road.

a) to eliminate cross country easement
b) to give adequate slope for line 70
c) to give adequate slope for lines 77 & 155

3. Lower line 43 t give adequate slope for line 54

4. Lower line 98 to get adequate slope for lines 99 & 100

5. Lower line 109 to give adequate slope for line 111

6. Storm drain system to allow foundation drains to be removed from the sanitary sewer

WHITTIER STREET AREA

Manholes that need to be raised

1, 2, 23, 37, 38, 40, 41, 42, 56, 60, 61

Manholes that need work

17 - Fix invert rags & debris hanging up
19 - Install 2-8" inside drops from line 20 & 23
21 - Break pipe out for access into lines
22 - Open invert for better access (dead end manhole)
24 - Install shelf
35 - Build better invert (3 lines enter manhole build up rags, slow moving)
39 - Check if contractor made invert for Force Main
51 - Cut pipe for better access
53 - Fix house service and install new shelf on one side
56 - Fix house services, rags building up line 60
64 - cut pipe for better access, install inside drop for #65
66 - Need invert and shelf (dead end)
69 - Fix house service and install new shelf

Manholes with roots and infiltration

4 - roots (removed 9/88)
6 - light infiltration
15 - moderate root growth
26 - light root growth
30 - light root growth

Lines that need to be TV'd

15 to 10
22 to 19
27 to 10

Line that enters 35 to locate 36
Line that enters 30 to locate 31

33 to 27
36 to 27

THE ENTIRE AREA NEEDS TO BE CLEANED

Lines with low slopes
Line 12 - .0039 this is where the separation stopped at MH 11. The tie in from manhole to caly line is high, plenty of room to lower this line.

Line 26 - .0036 and Line 28 - .0033 may have to start back at MH 19 and lower pipe to give adequate slope for these lines. Need to open MH 23 to obtain slopes for lines 23 & 24.

Line 50 - is 30 feet, slope .0023 has 3 houses on it.

Line 64 - .0005 - line 69 - .0017 slope may have to lower slope on line 58 to give adequate slope on lines 69 & 64.

COMMENTS

1. Extend line 58 so it is in the intersection of Glenwood and Whittier, add extra manhole on line 58 because:
   a) there is no line 59 at this time, run sewer to handle 5 or 6 houses.
   b) bring manhole 63 to the middle of Glenwood Ave. off Plaza Drive, and to tie line 60 into 63 to get sewer out of owners or sidewalk area. This will put sewers in roadway area.

2. Add manhole to line 57 (381 Feet)

APPENDIX P

CITY OWNED PARCELS

Map: M Lot: 84-1
Location: Dover Point Road

Size (acres): 22.91

Nearest Road(s): Dover Point Rd.
Frontage on (ft): 900 Distance to (Ft):
Access: Sight Distance (Ft):

Water Lines: 8 in. main on Dover Point
Sewer Lines: 8 in. line on Dover Point

Current Zoning: R-40
Current Property Uses: Easements
Former Property Uses:
Assessed Value: Land, Buildings:
Easements on Property: 1000' PS Co. easement; Gas easement

Topography (%): 0-3, 8-15
Soils: Buxton, Suffield
Soil Limitations: Moderate. High water table, May be shallow to bedrock, A corner of Very poorly drained land.
Groundwater Zone: Tertiary

Historical Potential (Cemetery?):
Aesthetics (Surveyor's Judgement):
Natural Resource Considerations:
Rail Frontage (?):

Abutting Zoning: R-40, R-20
Abutting Property Uses:

Other Considerations/Restrictions:

Map: 40 Lot: 17
Location: Rochester Road

Size (acres): 8.28

Nearest Road(s): Rochester Road
Frontage on (ft): 550 Distance to (Ft):
Access: Sight Distance (Ft):

Water Lines: 12 in. main on Rochester
Sewer Lines: 10 in. line on Rochester

Current Zoning: R-12
Current Property Uses: Pump House
Former Property Uses: Old Well Location
Assessed Value: $10,000 Land, Buildings: $8,300; $1,700
Easements on Property:

Topography (%): 0-3
Soils: Windsor loamy sand
Soil Limitations: OK for on-site sewerage

Groundwater Zone: Tertiary

Historical Potential (Cemetery?):
Aesthetics (Surveyor's Judgement):
Natural Resource Considerations: Surrounds much of Willand Pond.
Rail Frontage (?):

Abutting Zoning: Abutts Town line, R-12
Abutting Property Uses:

Other Considerations/Restrictions:

Map: 37 Lot: 40
Location: Lowell Avenue

Size (acres): 6.3

Nearest Road(s): Lowell Ave.
Frontage on (ft): 50 Distance to (Ft):
Access: also, ROW to Roosevelt Sight Distance (Ft):

Water Lines: 2 12in mains + 4in +8in mains go through parcel to tank
Sewer Lines: 10 inch line bisects, following Berry Brook

Current Zoning: R-12
Current Property Uses: Water Dept. Land -- Storage, Pump, Tank
Former Property Uses:
Assessed Value: $70,700 Land, Buildings: $9,500; $61,200
Easements on Property:

Topography (%): 3-8
Soils: Scantic, Buxton
Soil Limitations: Poor permiability, Very high water table, May be shallow t
bedrock. Poorly drained land.
Groundwater Zone: Secondary

Historical Potential (Cemetery?):
Aesthetics (Surveyor's Judgement):
Natural Resource Considerations: Bisected by Berry Brook
Rail Frontage (?):

Abutting Zoning: R-12
Abutting Property Uses:

Other Considerations/Restrictions:

Map: 34 Lot: 22
Location: Off Sixth Street

Size (acres): 8.1

Nearest Road(s): Sixth St.
Frontage on (ft): 0 Distance to (Ft): 600
Access: Dirt ROW Sight Distance (Ft):

Water Lines: 6 in. main on Sixth (600' to the NE)
Sewer Lines: 8 in. line on Sixth (600' to the NE)

Current Zoning: R-12
Current Property Uses: Vacant
Former Property Uses: Old Dump and Gravel Bank
Assessed Value: $8,100 Land, Buildings: $8,100; $0
Easements on Property:

Topography (%): 25-60
Soils: Windsor loamy sand
Soil Limitations: Slope is the only limitation.

Groundwater Zone: Tertiary

Historical Potential (Cemetery?):
Aesthetics (Surveyor's Judgement):
Natural Resource Considerations: 300' frontage on the Cochecho River.
Rail Frontage (?):

Abutting Zoning: R-12
Abutting Property Uses:

Other Considerations/Restrictions:

Map: 26 Lot: 2
Location: Portland Ave (NE of Hancock)

Size (acres): 39.3

Nearest Road(s): Portland, Oak, Forbes
Frontage on (ft): 2140,1000,1100 Distance to (Ft):
Access: Sight Distance (Ft):

Water Lines: 8 inch on Portland, 12 inch on Oak
Sewer Lines: 8 inch on Portland

Current Zoning: RM-10
Current Property Uses: Recreation area (arena, swimming, ball fields)
Former Property Uses:
Assessed Value: $933,700 Land, Buildings: $129,300; $804,400
Easements on Property:

Topography (%): 3-35 (Rolling)
Soils: Hollis-Charlton fine sandy loams, Made, Suffield silt loam
Soil Limitations: Moderate

Groundwater Zone: No

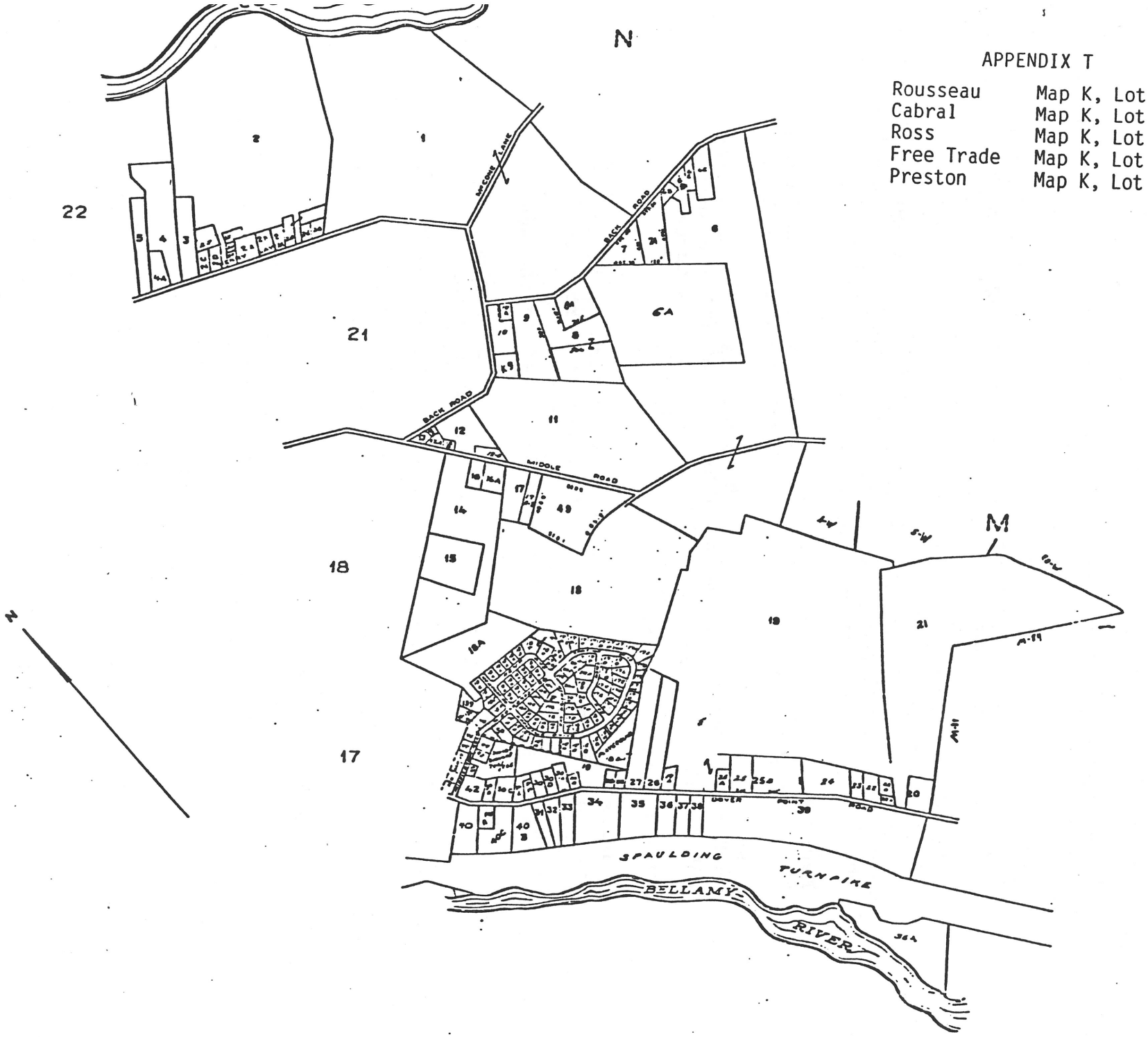
Historical Potential (Cemetery?):
Aesthetics (Surveyor's Judgement):
Natural Resource Considerations:
Rail Frontage (?): 1200' abutting on B&M RRtracks

Abutting Zoning: B-3, I-2
Abutting Property Uses:

Other Considerations/Restrictions:

APPENDIX T

Rousseau	Map K, Lot 1
Cabral	Map K, Lot 2
Ross	Map K, Lot 11
Free Trade	Map K, Lot 49 & 1
Preston	Map K, Lot 6



APPENDIX U

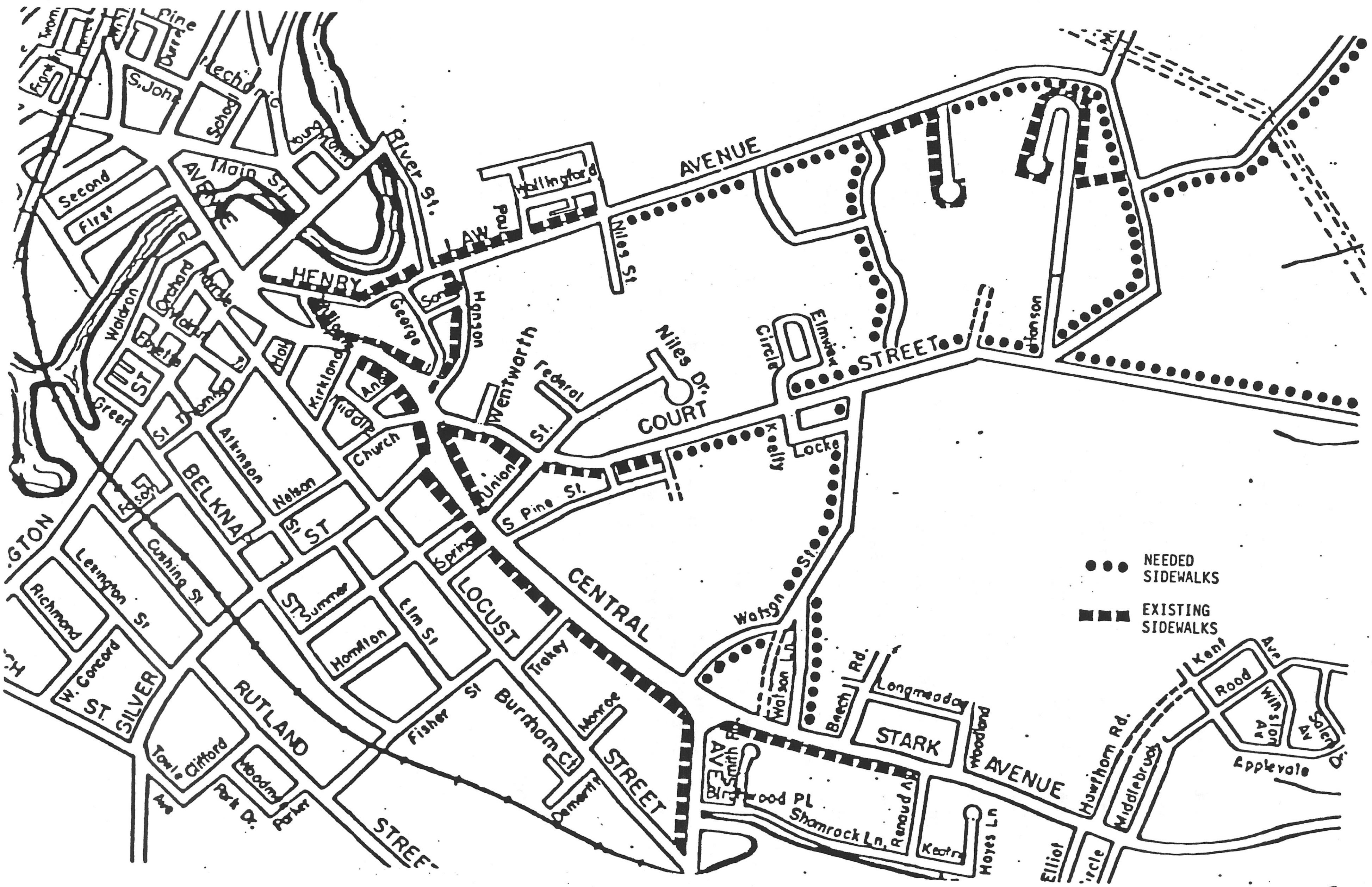
RECOMMENDED CITY SIDEWALKS

Sidewalk needed		Cost per Foot*
Court Street	2,300'	$ 48,300.00
Henry Law	3,475'	72,975.00
Back Road	10,050'	211,050.00
Tennyson	1,700'	35,700.00
Middle Road	6,800'	142,800.00
Watson Street	2,450'	51,450.00
Watson Lane	920'	19,320.00
Hawthorn	1,100'	23,100.00
	Total	$604,695.00

*Cost/LF of sidewalk:

Slope Curb	$11/ft	$11.00
Bit.Sidewalk	$15/sq. yd.	8.33
Bank Run Gravel	$ 9/cu. yd.	.83
Crush Gravel	$13/cu. yd.	.24
		$21.00/ft.

Prepared by the Dover City Engineering Department


NEEDED SIDEWALKS
EXISTING SIDEWALKS
AVENUE
STREET
COURT
CENTRAL
LOCUST
STREET
STARK
AVENUE
RUTLAND
BELKNAP
HENRY
LAW
River St.
Main St.
Niles St.
Niles Dr.
Hollingford
Elmview
Circle
Hanson
Kelly
Locke
Watson St.
Watson Ln.
Wentworth
Federal
St.
Union
S Pine St.
Spring
Church
Middle
Kirkland
George
Atkinson
Nelson
Summer
Hamilton
Elm St
Trakey
Monroe
Burnham Ct.
Fisher St
Cushing St
Lexington St
Richmond
W. Concord
ST. SILVER
Towle
Clifford
Park Dr.
Parker
Second
First
Waldron
Orchard
Green
S. John
School
Beech Rd.
Longmeadow
Woodland
Hawthorn Rd.
Middlebrook
Elliot
Smith Rd.
Shamrock Ln.
Renaud Av
Keats
Hayes Ln
Kent Ave
Road
Winston Av
Salem Av
Applevale Dr.

Map: 26 Lot: 2
Location: Portland Ave (NE of Hancock)

Size (acres): 39.3

Nearest Road(s): Portland, Oak, Forbes
Frontage on (ft): 2140,1000,1100 Distance to (Ft):
Access: Sight Distance (Ft):

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Former Property Uses:
Assessed Value: $933,700 Land, Buildings: $129,300; $804,400
Easements on Property:

Topography (%): 3-35 (Rolling)
Soils: Hollis-Charlton fine sandy loams, Made, Suffield silt loam
Soil Limitations: Moderate

Groundwater Zone: No

Historical Potential (Cemetery?):
Aesthetics (Surveyor's Judgement):
Natural Resource Considerations:
Rail Frontage (?): 1200' abutting on B&M RRtracks

Abutting Zoning: B-3, I-2
Abutting Property Uses:

Other Considerations/Restrictions:

Map: 23 Lot: 15
Location: Henry Law Avenue

Size (acres): 6.52

Nearest Road(s): Henry Law Ave., Washington St., River St.
Frontage on (ft): 1132, 438, 306 Distance to (Ft):
Access: Sight Distance (Ft):

Water Lines: 6 in. main on Henry Law, 8 in. main on Washington
Sewer Lines: 18 +21 in. lines on Henry Law, 24 in. line on River

Current Zoning: RM-8
Current Property Uses: Henry Law Park
Former Property Uses:
Assessed Value: $498,600 Land, Buildings: $182,500; $316,100
Easements on Property:

Topography (%): 3-8
Soils: Buxton
Soil Limitations: Slight to moderate. Poor permiability, High water table be shallow to bedrock.
Groundwater Zone: No

Historical Potential (Cemetery?):
Aesthetics (Surveyor's Judgement):
Natural Resource Considerations: 1100' frontage on Cochecho River
Rail Frontage (?):

Abutting Zoning: UMUD, B-2, RM-10
Abutting Property Uses:

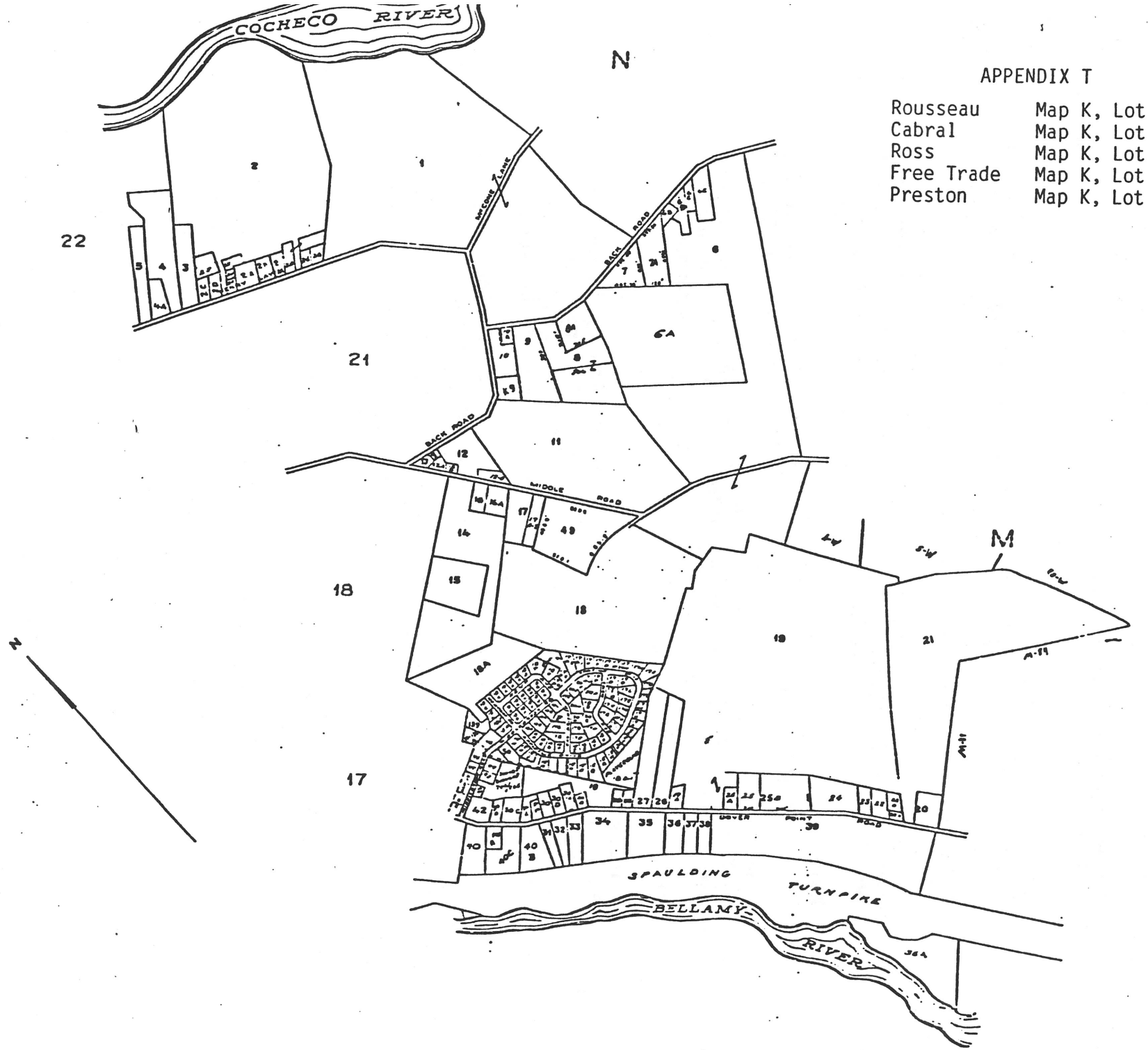
Other Considerations/Restrictions: It is a city park.

APPENDIX Q
SCHOOL SITE PARCELS (SOUTHSIDE)

Map/Lot	# Acres	Owners	Existing Use	Soils	Water	Sewer	Road Frontage	# Children Within one Mile	Restrictions
K-49+18	44	Free Trade	Vacant	Fair Some Poor	Yes	Yes	800 ft	150-160	
K-1(a)	30	Rousseau	Farm	Fair Some Poor	Yes	Yes	1300 ft	150-160	Slight Utility Line Problem
K-11	11	Ross	Single Family	Good	Yes	Yes	200	150	
K-6	68	Preston	Single Family	Fair Some Poor	Yes	Yes	1800 ft	140	
K-1(b)	50	Rousseau	Single Family/ Farm	Fair	Yes	Yes	600 ft	140	Possible Utility Line Problem
K-6A	25	Garrison City Broadcast	W.T.S.N.	Fair Some Poor	600'	600'	180 ft	120	Possible Utility Line Problem
N-18	24	Ayer	Single Family	Mixed Fair Poor & some Very Poor	900'	900'	300 ft	90	Slope Problems
N-19	31	Ayer	Vacant	Fair, Some Poor	900'	900'	500 ft	90	
N-20	32	McManus	Single Family	Fair	1500'	1500'	600 ft	60	
M-4	11	Eliot Rose	Fruit Trees	Fair, Some Poor	Yes	300'	500 ft	100	Utility Line Problems
M-3	47	Williams	Single Family	Fair, Some Poor	Yes	300'	1600 ft	110	
M-2	29	Hodgdon	Single Family	Fair, Some Poor	2500'	2500'	1200 ft	20	
M-100	69	Hunt	Single Family	Poor	Yes	2000'	1600 ft	10	
M-101	34	Williams	Single Family	Fair, Some Poor	3500'	3500'	1400 ft	10	Slope Problems

APPENDIX T

Rousseau	Map K, Lot 1
Cabral	Map K, Lot 2
Ross	Map K, Lot 11
Free Trade	Map K, Lot 49 & 18
Preston	Map K, Lot 6



APPENDIX U

RECOMMENDED CITY SIDEWALKS

Sidewalk needed		Cost per Foot*
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Henry Law	3,475'	72,975.00
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Watson Street	2,450'	51,450.00
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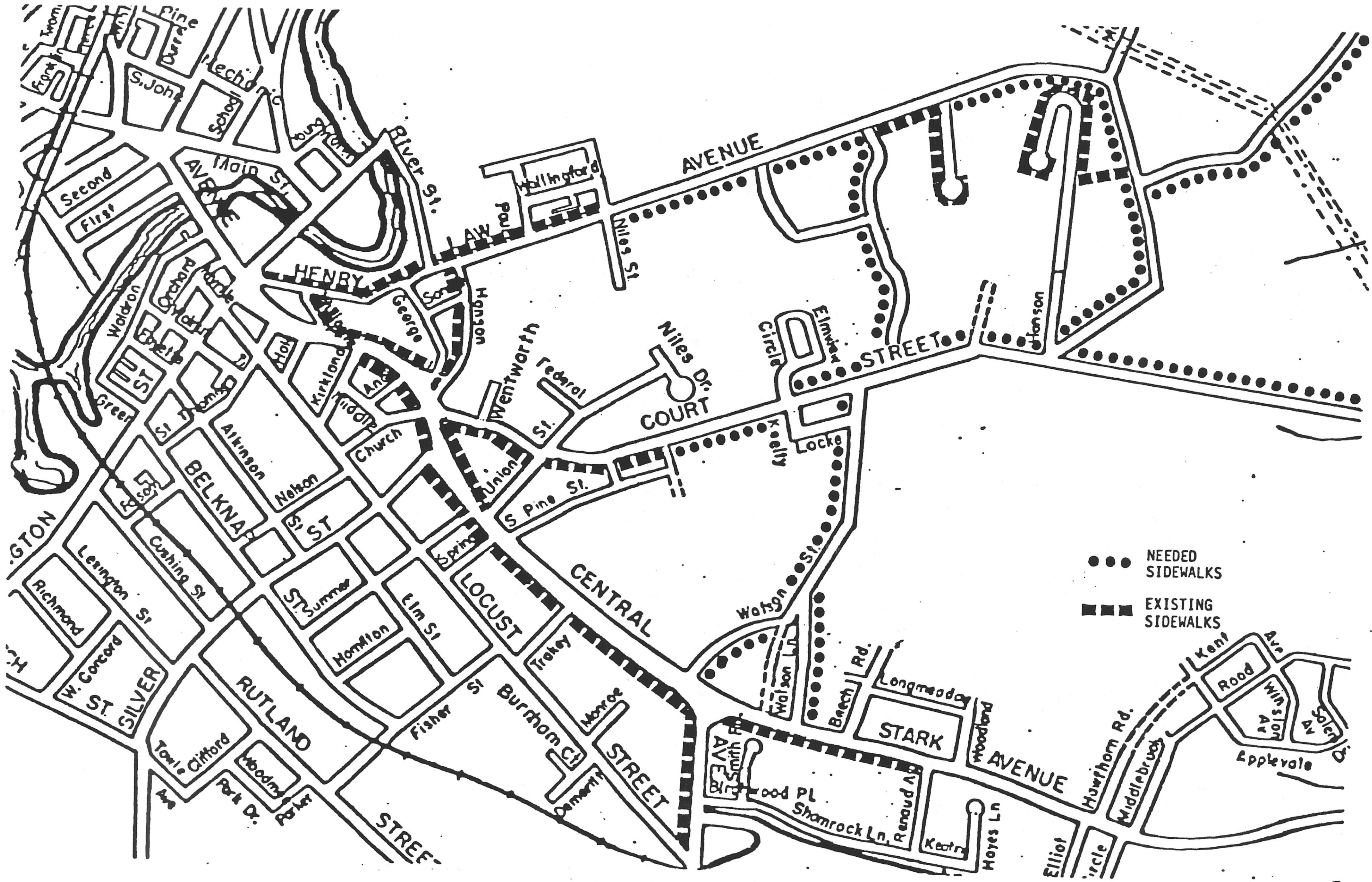
Hawthorn	1,100'	23,100.00
	Total	$604,695.00

*Cost/LF of sidewalk:

Slope Curb	$11/ft	$11.00
Bit.Sidewalk	$15/sq. yd.	8.33
Bank Run Gravel	$ 9/cu. yd.	.83
Crush Gravel	$13/cu. yd.	.24
		$21.00/ft.

Prepared by the Dover City Engineering Department


NEEDED SIDEWALKS
EXISTING SIDEWALKS
AVENUE
STREET
COURT
CENTRAL
LOCUST
BELKNAP
RUTLAND
STREET
SILVER ST
STARK
AVENUE
HENRY
River St.
Niles St.
Niles Dr.
Hollingford
Wentworth
Federal
Hanson
George
Elmview
Circle
Kelly
Locke
Union
S Pine St.
Watson St.
Watson Ln.
Beech Rd.
Longmeadow
Woodland
Hawthorn Rd.
Middlebrook
Kent Ave
Rood
Winston Av
Solen Av
Applevale
Elliot
Hoyes Ln
Renaud Av
Shamrock Ln.
Church
Spring
Elm St
Summer St.
Hamilton
Trakey
Monroe
Burnham Ct.
Fisher St
Atkinson
Nelson
Cushing St
Lexington St
Richmond
W. Concord
Towle
Clifford
Park Dr.
Waldron
Orchard
Second
First
Main St.
S. John
School
Pine
Green
Kirkland
Holt

Map: 26 Lot: 2
Location: Portland Ave (NE of Hancock)

Size (acres): 39.3

Nearest Road(s): Portland, Oak, Forbes
Frontage on (ft): 2140,1000,1100 Distance to (Ft):
Access: Sight Distance (Ft):

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Sewer Lines: 8 inch on Portland

Current Zoning: RM-10
Current Property Uses: Recreation area (arena, swimming, ball fields)
Former Property Uses:
Assessed Value: $933,700 Land, Buildings: $129,300; $804,400
Easements on Property:

Topography (%): 3-35 (Rolling)
Soils: Hollis-Charlton fine sandy loams, Made, Suffield silt loam
Soil Limitations: Moderate

Groundwater Zone: No

Historical Potential (Cemetery?):
Aesthetics (Surveyor's Judgement):
Natural Resource Considerations:
Rail Frontage (?): 1200' abutting on B&M RRtracks

Abutting Zoning: B-3, I-2
Abutting Property Uses:

Other Considerations/Restrictions:

Map: 23 Lot: 15
Location: Henry Law Avenue

Size (acres): 6.52

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Frontage on (ft): 1132, 438, 306 Distance to (Ft):
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Current Property Uses: Henry Law Park
Former Property Uses:
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Easements on Property:

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Soils: Buxton
Soil Limitations: Slight to moderate. Poor permiability, High water table be shallow to bedrock.
Groundwater Zone: No

Historical Potential (Cemetery?):
Aesthetics (Surveyor's Judgement):
Natural Resource Considerations: 1100' frontage on Cochecho River
Rail Frontage (?):

Abutting Zoning: UMUD, B-2, RM-10
Abutting Property Uses:

Other Considerations/Restrictions: It is a city park.

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SCHOOL SITE PARCELS (SOUTHSIDE)

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K-6	68	Preston	Single Family	Fair Some Poor	Yes	Yes	1800 ft	140	
K-1(b)	50	Rousseau	Single Family/ Farm	Fair	Yes	Yes	600 ft	140	Possible Utility Line Problem
K-6A	25	Garrison City Broadcast	W.T.S.N.	Fair Some Poor	600'	600'	180 ft	120	Possible Utility Line Problem
N-18	24	Ayer	Single Family	Mixed Fair Poor & some Very Poor	900'	900'	300 ft	90	Slope Problems
N-19	31	Ayer	Vacant	Fair, Some Poor	900'	900'	500 ft	90	
N-20	32	McManus	Single Family	Fair	1500'	1500'	600 ft	60	
M-4	11	Eliot Rose	Fruit Trees	Fair, Some Poor	Yes	300'	500 ft	100	Utility Line Problems
M-3	47	Williams	Single Family	Fair, Some Poor	Yes	300'	1600 ft	110	
M-2	29	Hodgdon	Single Family	Fair, Some Poor	2500'	2500'	1200 ft	20	
M-100	69	Hunt	Single Family	Poor	Yes	2000'	1600 ft	10	
M-101	34	Williams	Single Family	Fair, Some Poor	3500'	3500'	1400 ft	10	Slope Problems

APPENDIX R
SCHOOL SITE PARCELS (NORTHSIDE)

Map/Lot	# Acres	Owners	Existing Use	Soils	Water	Sewer	Road Frontage	# Children Within one Mile	Restrictions
E-67	15	Michael Barry	Vacant	L	Yes	Yes	250 ft	270	Bad Intersection
A-19	30	Wayne & Terry Picard	House	H	Yes	No	650 ft	60	
E-48B	32.4	Rich Gower	Vacant	L	Yes	No	200 ft	70	
A-53G	20-	Edmond Grady	Vacant	H	No	No	300 ft	60	
B-8	42	George Day	House	L	No	No	950 + 550	70	
B-6	28.5	Bonneye McGeary	House	L, VL	No	No	250 + 250	70	
A-45	21	Linda Rossetti Trust	House	H	No	No	100 ft	50	
A-45A	17	Bob Callan		H	No	No	400 ft	50	
B-21 4	128	Cabral		L	No	No		10 50	
E-32	25.9	Kevin Kelly	Farm & House	L	No	No	1200 ft	30	
E-47	34	Albert Drew	House	L	Yes	No	275 ft	10	
C-46	37	Charles Watson	Vacant	L	Yes	No	500 ft	20	
B-18	43	Chester Bolstridge	House	L	No	No	250 ft	30	

APPENDIX S

LANDOWNER RESPONSE

The following responses are the result of phone interviews conducted between August 8, 1988 and August 15, 1988, by the Dover Planning Department. The landowners interviewed were selected based on preliminary research into the suitability of their parcel for the construction of a new elementary school. The landowners were asked to respond to three questions:

1. Do you have any short or long term plans for your parcel?

2. Do you have any concern in regard to a school being located in your neighborhood?

3. Would you be interested in discussing the possible donation and/or purchase price of your parcel with the city?

The following is a brief synopsis of the response.

Free trade, Map K, Lots 49 and 18 - Free Trade has plans to subdivide the lot using an alternative design subdivision. The size and location of the open space is not conducive to an elementary school. There is the possibility of the City purchasing 5-8 lots in order to provide the needed 10-15 acres for the school site. The developers are concerned with a school being located near their development as they have plans to build $200,000 - $250,000 homes and they feel that the value of the homes may be affected.

Peter Rousseau, Map K, Lot 1 - Mr. Rousseau currently plants crops on both sections of his land and plans to continue in the foreseeable future. He indicated that he would be willing to talk to the city concerning the sale of 10-15 acres but would want the City to make the first offer. Mr. Rousseau has no problem with a school being located in the neighborhood.

Andrea Ross, Map K, Lot 11 - Ms. Ross just recently subdivided a large parcel of her land for Clipper Homes. She still has 11 acres and would be willing to sell except that she thought a portion of that is poorly drained. She has no problem with a school being located in the area.

Harold Preston, Map K, Lot 6 - Mr. Preston indicated that he recently sold an option on the parcel. However, that would not preclude any possible future sale. He would sell the 18 acre parcel for $500,000.00. Mr. Preston would not object to a school located on the parcel.

Garrison City Broadcast, Map K, Lot 6A - W.T.S.N. needs the entire 25 acres as they have radial underground copper receiving wires which run under most of the parcel. They have no objections to a school being located in the area.

Daniel Ayer, Map N, Lots 18 and 19 - Mr. Ayer stated that he had no particular plans for his parcel. He felt that his site would not be the best suited but would talk to the City about a possible sale. Mr. Ayer has no objections to a school being located in the area.

Anthony McManus, Map N, Lot 20 - Mr. McManus has short term plans to subdivide his property. He will have ten acres available with road frontage but it will be divided by a road. He would have no problems with a school locating nearby.

Eliot Rose, Craig Williams, Barry Williams, Map M, Lots 3, 4 and 10 - Mr. Williams stated that neither he nor the family company would be interested in selling any parcel of land. They wish to maintain the land for their existing business. Mr. Williams has no problems with a school being located in the area.

Melville Hodgdon, Map M, Lot 2 - Mr. Melville is saving the land for his children and would not be interested in selling his land. He is also very much against the idea of a school being located in the immediate area due to traffic concerns.

William Hunt, Map M, Lot 100 - Mr. Hunt is not interested in selling any land to the City. He would not like to see a school in the area. Even if the road were to be upgraded they would not like to see the area lose its rural character.

Michael Barry, Map E, Lot 67 - Mr. Barry is not interested in talking to the City.

Wayne Picard, Map A, Lot 19 - Has not returned calls.

Richard E. Gower, Map E, Lot 48B - Has an unlisted phone number. A letter has been sent to Mr. Gower.

Edmond Grady, Map A, Lot 53G - It not interested in selling any land to the City.

George Day, Map B, Lot 8 - Mr. Day stated that he has recently sold some of the land and feels that any land he has left is unsuitable for building. He felt that it was an unsuitable site for a school.

Boneye McGeary, Map B, Lot 6 - Would be very interested in selling her land. The price for the total parcel is $495,000, ten to fifteen acres may be sold for approximately

$150,000.

Linda Rossetti Trust, Map A, Lot 45 - Have not returned phone calls.

Bob Callan, Map A, Lot 45A - Mr. Callan indicated that he had just entered into a purchase and sales agreement with the Assembly of God Church.

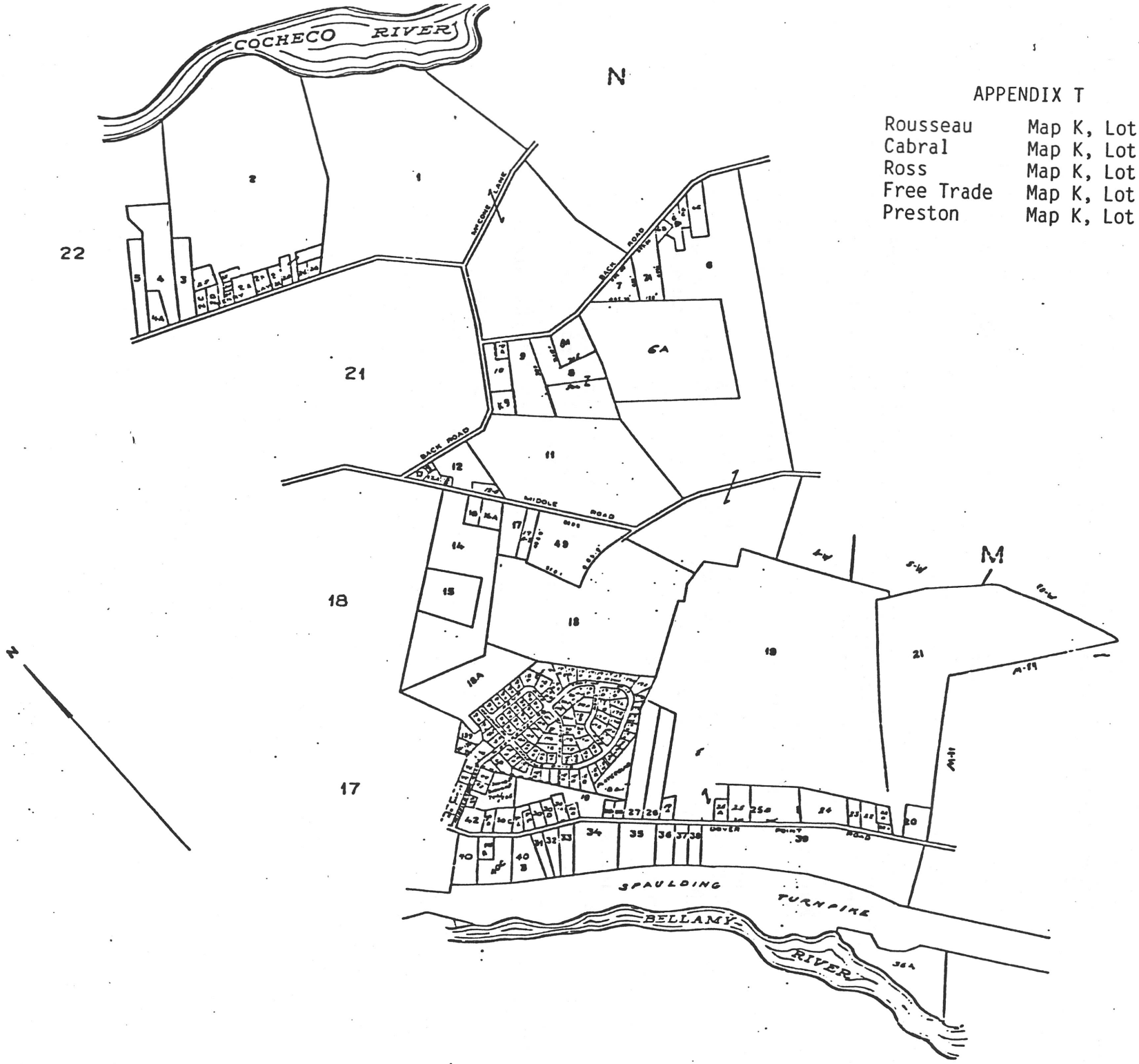
Richard Cabral, Map B, Lots 21 and 4 - Representatives of Mr. Cabral have contacted the Planning Department concerning the development of the lots. They are interested in a possible A.D.S. subdivision and have no problem with the City obtaining some of the open space.

Kevin Kelly, Map E, Lot 32 - Mr. Kelly is entering into a purchase and sales agreement this week to sell the land.

Albert Drew, Map E, Lot 47 - Mr. Drew has his land on the market for $400,000. He would prefer to sell the entire parcel but would discuss subdivision. He has turned down an offer for $329,000. Mr. Drew has no problem with a school locating in the area.

Charles Watson, Map C, Lot 46 - Mr. Watson is interested in selling his land. He wishes to sell the parcel in its entirety and would like tot City to make an offer. Mr. Watson would like to see a school located in the area.

Chester Bolstridge, Map B, Lot 18 - Mr. Bolstridge indicated that he recently sold the land to Dover Development.



APPENDIX T

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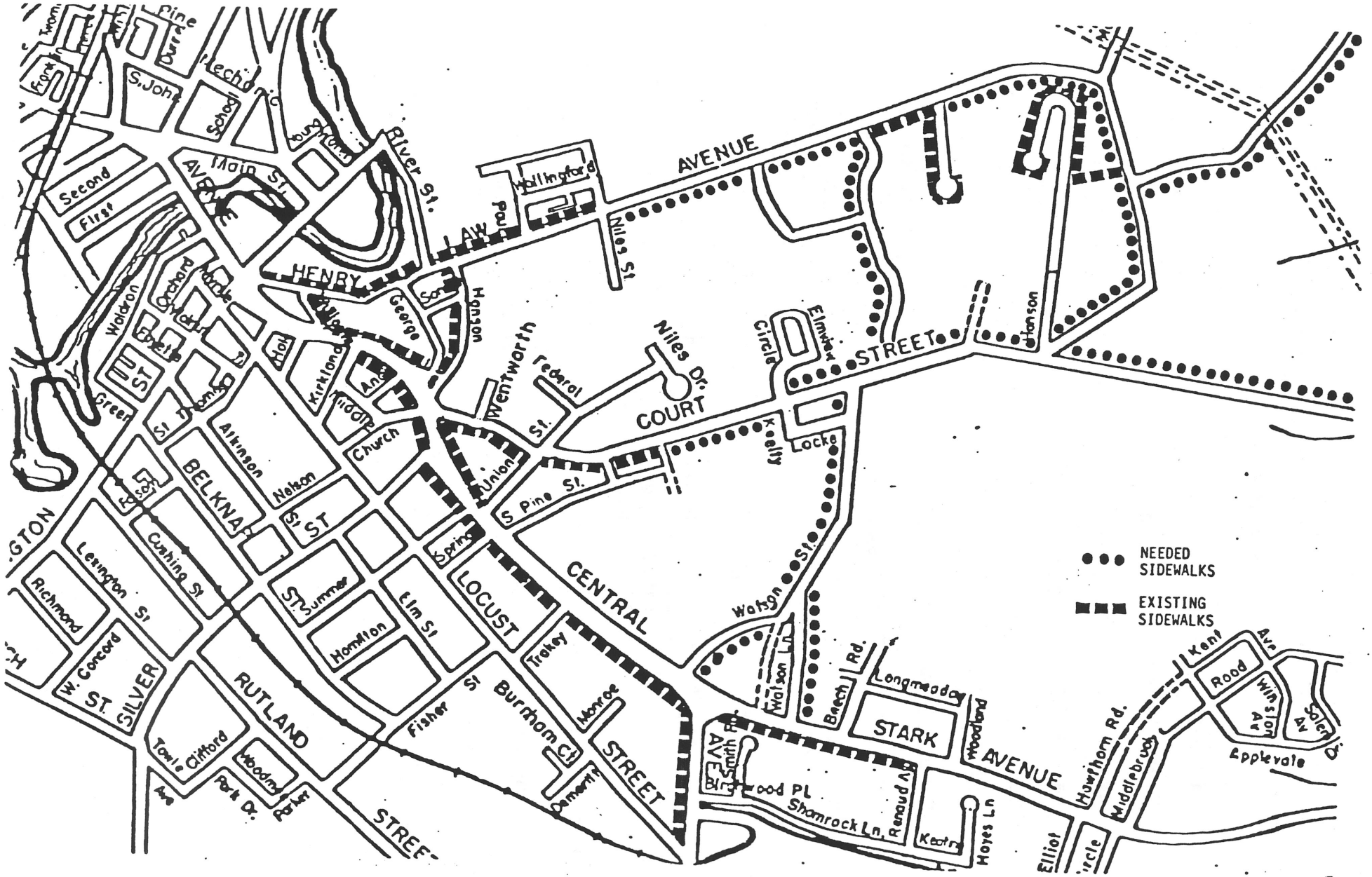
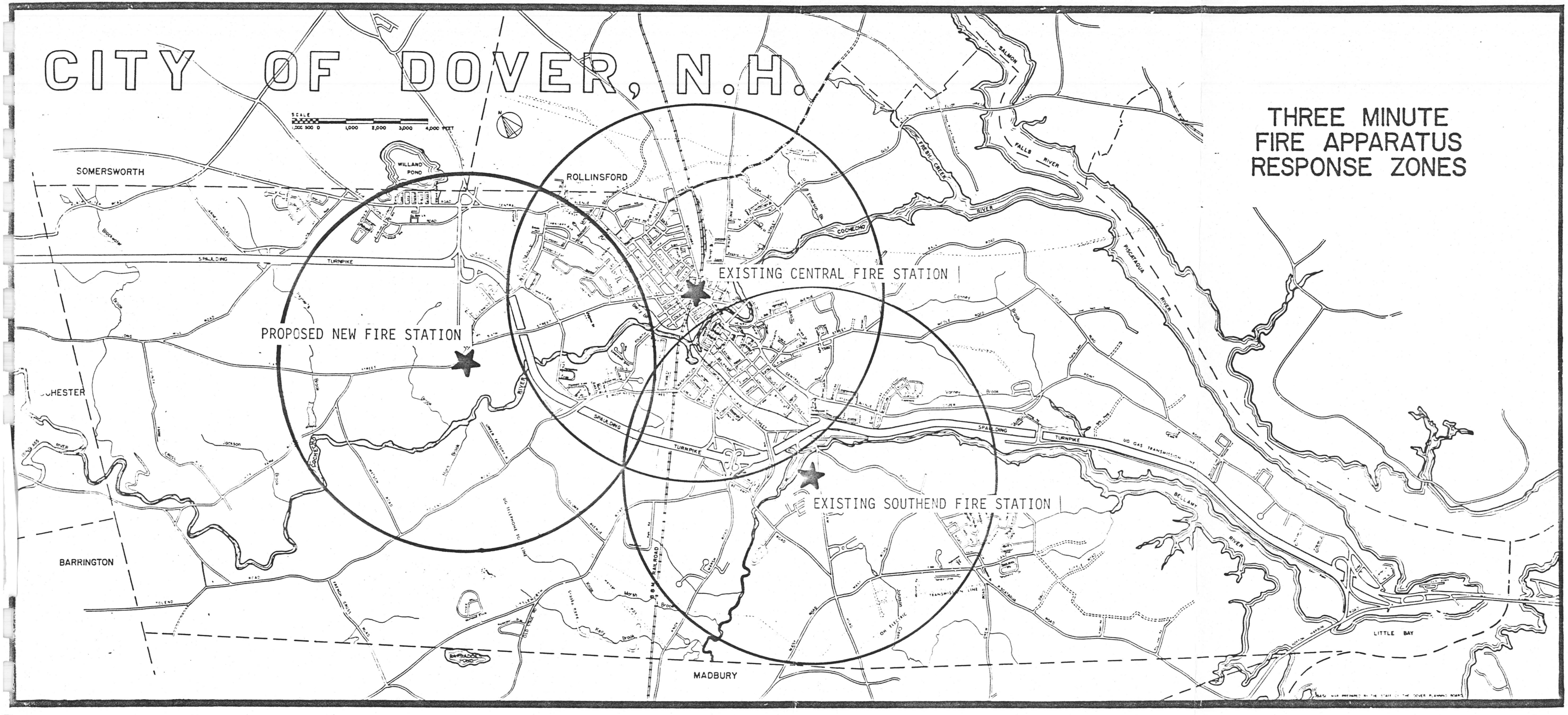
		$21.00/ft.

Prepared by the Dover City Engineering Department


NEEDED SIDEWALKS
EXISTING SIDEWALKS
AVENUE
STREET
COURT
CENTRAL
STARK
AVENUE
HENRY
LOCUST
RUTLAND
STREET
BELKNAP
River St.
Main St.
Second
First
Pine
S. John
School
Hallingford
Paul
Niles St.
Hanson
George
Wentworth
Federal
Niles Dr.
Circle
Elmhurst
Hanson
Kirkland
Church
Union
Atkinson
Nelson
Waldron
Orchard
Green
Thomas
Spring
Summer
Elm St
Hamlon
Trakey
Monroe
Fisher St
Burnham Ct
Somerset
Lexington St
Cushing St
Richmond
W. Concord
SILVER ST
Towle
Clifford
Ave
Woodman
Park
Park Dr.
Kelly
Locke
S. Pine St.
Watson St.
Watson Ln.
Beech Rd.
Longmeadow
Ridgeway
Hawthorn Rd.
Middlebrush
Kent
Road
Ave
Winston Av
Av
Applevale
Dr.
Smith
Birch
Wood Pl
Shamrock Ln.
Renaud Av
Keeler
Hayes Ln
Elliot
Circle

CITY OF DOVER, N.H.

THREE MINUTE FIRE APPARATUS RESPONSE ZONES

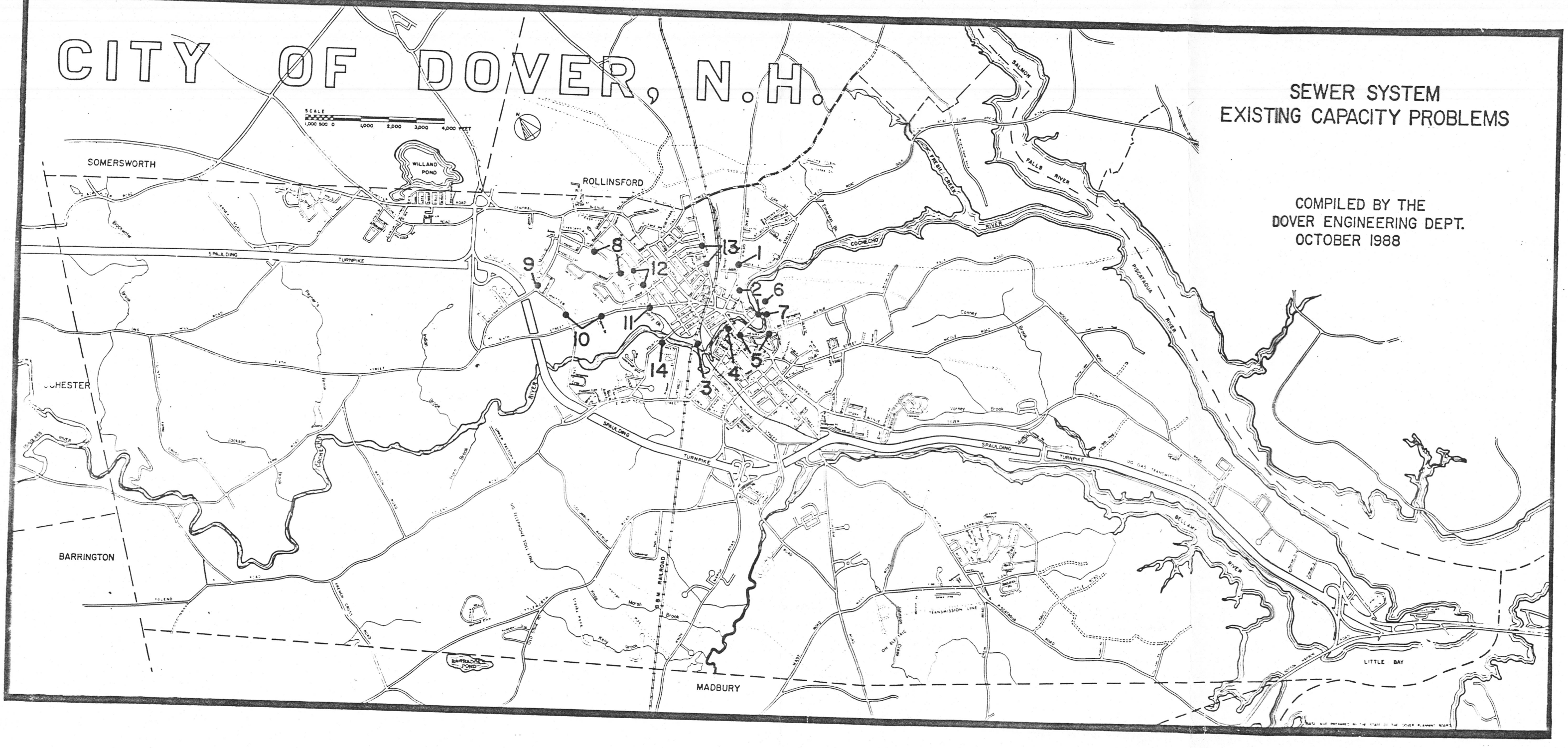


MAPS

CITY OF DOVER, N.H.

SEWER SYSTEM
EXISTING CAPACITY PROBLEMS

COMPILED BY THE
DOVER ENGINEERING DEPT.
OCTOBER 1988

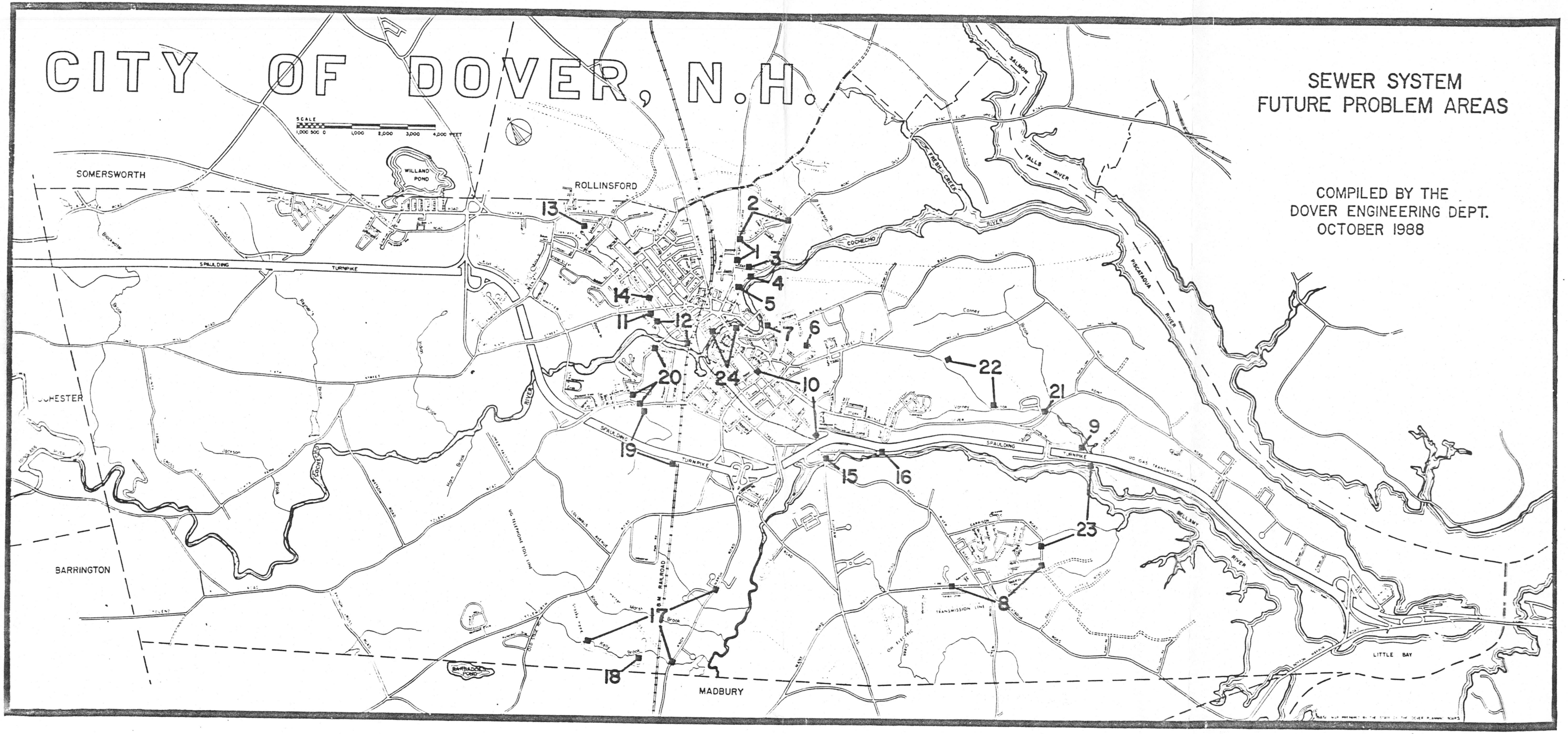


MAP A

CITY OF DOVER, N.H.

SEWER SYSTEM
FUTURE PROBLEM AREAS

COMPILED BY THE
DOVER ENGINEERING DEPT.
OCTOBER 1988



MAP B