FINAL
WATER SUPPLY ASSESSMENT
HOUSATONIC WATER SUPPLY
MANAGEMENT AREA

APRIL, 1987

HAVENS AND EMERSON, INC.
CONSULTING ENVIRONMENTAL ENGINEERS

IN ASSOCIATION WITH

GERAGHTY & MILLER, INC.
Ground-Water Consultants

KEYES
Architects/Engineers/Planners

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WATER SUPPLY ASSESSMENT

1.1 INTRODUCTION

1.1.1 The Coordinated Water System Planning Process

An Act Concerning a Connecticut Plan for Public Water Supply Coordination (Public Act 85-535) was passed by the Connecticut General Assembly in the 1985 legislative session. The act provides for a coordinated approach to long range water supply planning, addressing water quality and quantity issues from an areawide perspective.

The regional planning process is designed to bring together utility representatives and agency representatives in a Water Utility Coordinating Committee (WUCC) to discuss long range water supply issues and develop an areawide water supply plan. The plan will address future needs and concerns and should identify potential conflicts over future water supply sources, competition for future service areas, or areas of anticipated growth where public water supply is not available.

To facilitate the planning process, the state has been divided into seven areas for water supply planning (See Figure 1.1). Some of the criteria that were considered in developing the boundaries include: population density and distribution; existing sources of public water supply; service areas or franchise areas; interconnections between public systems; municipal and regional planning agency boundaries; natural drainage basins; topography and geology; and the similarity of water supply problems. The boundaries for these Public Water Supply Management Areas were adopted by the Commissioner of Health after considerable public comment, agency input and a series of public hearings.

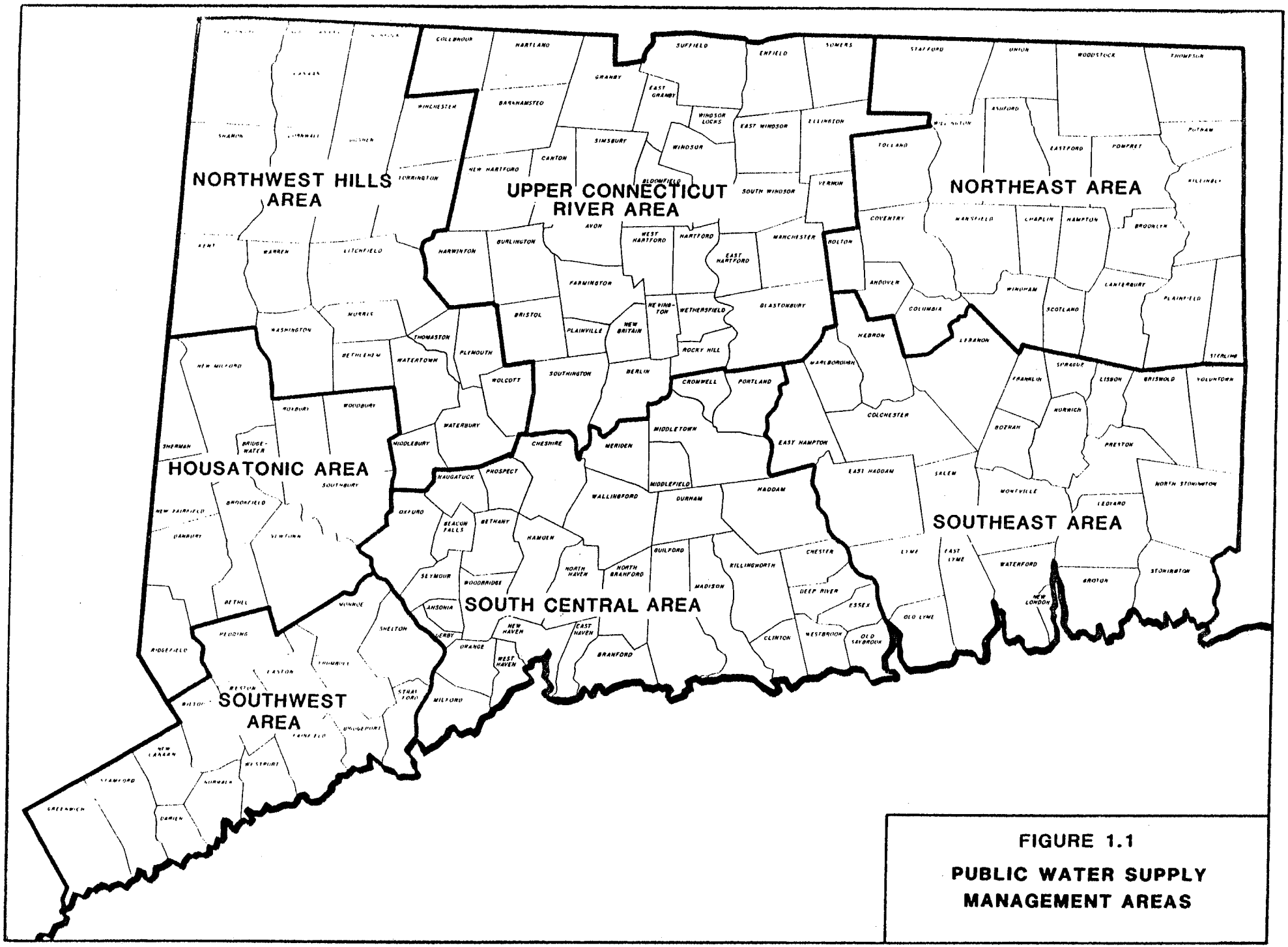


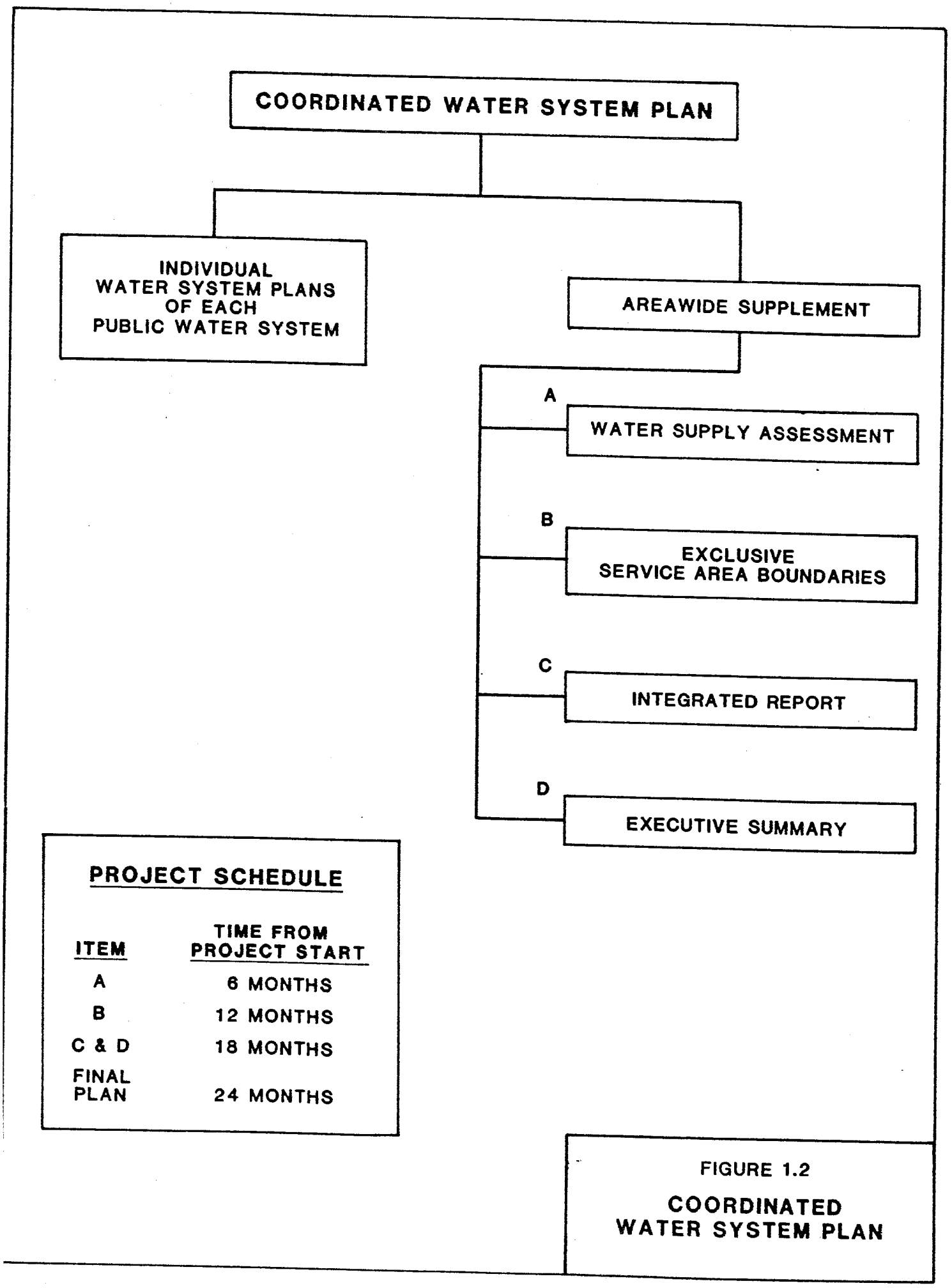
FIGURE 1.1

PUBLIC WATER SUPPLY MANAGEMENT AREAS

To devote the necessary resources and funding to each area, it was necessary that priorities be established and the planning process begun in the areas accordingly. The Housatonic area was selected as the first priority of the seven areas for initiation of the water supply planning process. This area was selected as first because of its continued population growth and the proliferation of small water systems. The Upper Connecticut River area has been selected as the second priority and the South Central area as the third priority. The Commissioner of Health Services convened the Housatonic Water Utility Coordinating Committee on June 11, 1986. The WUCC is comprised of representatives from public water systems and regional planning agency representatives within the area. The WUCC has two years to prepare a coordinated, areawide water supply plan.

As shown in Figure 1.2, the Coordinated Water System Plan for each Public Water Supply Management Area incorporates the individual water system plans from each utility with greater than 1000 users within the management area and the Areawide Supplement prepared under the auspices of the WUCC. The Areawide Supplement consists of four key components. The Water Supply Assessment represents the first of these components and constitutes the area's problem statement, constructed from the best available information at the time of writing, on which the remainder of the planning process is built. Its purpose is to evaluate water supply conditions and to identify areawide water system issues, concerns and needs.

The second component consists of the delineation of Exclusive Service Area Boundaries. During this phase of the process, each utility (WUCC member) within the management areas has the opportunity to define the area that it is committed to serving in the future. The following factors are to be used in establishing exclusive service area boundaries:



PROJECT SCHEDULE

ITEM	TIME FROM PROJECT START
A	6 MONTHS
B	12 MONTHS
C & D	18 MONTHS
FINAL PLAN	24 MONTHS

FIGURE 1.2

COORDINATED WATER SYSTEM PLAN

- existing water service area
- land use plans, zoning regulations and growth trends
- physical limitations to water service
- political boundaries
- water company rights as established by statute, special act or administrative decisions
- system hydraulics, including potential elevations and pressure zones
- ability of a water system to provide a pure and adequate supply of water now and in the future

The third component is the Integrated Report which is designed to provide an overview of the individual public water systems within the management area; to address the areawide water supply issues, concerns and needs identified in the Water Supply Assessment; and to promote cooperation among public water systems. This report by law must address at least the following:

- population, consumption and safe yield projections
- compatibility with land use plans
- alternative water resources for future supply needs
- interconnection between public water supply systems
- joint management or ownership of facilities
- satellite management program
- minimum design standards
- financial data related to regionally significant projects
- other uses of water resources

The fourth and final component is the Executive Summary which is designed to serve as an abbreviated overview of the Coordinated Water System Plan for the management area. It is intended to summarize the major elements of the plan.

1.1.2 Housatonic Public Water Supply Management Area

The Housatonic Public Water Supply Management Area consists of twelve communities (as shown in Figure 1.3) located in the western part of Connecticut adjacent to the New York State line. In all, these communities cover an area of about 400 square miles of galcially manicured topography. The area is typified by rolling hills and stream

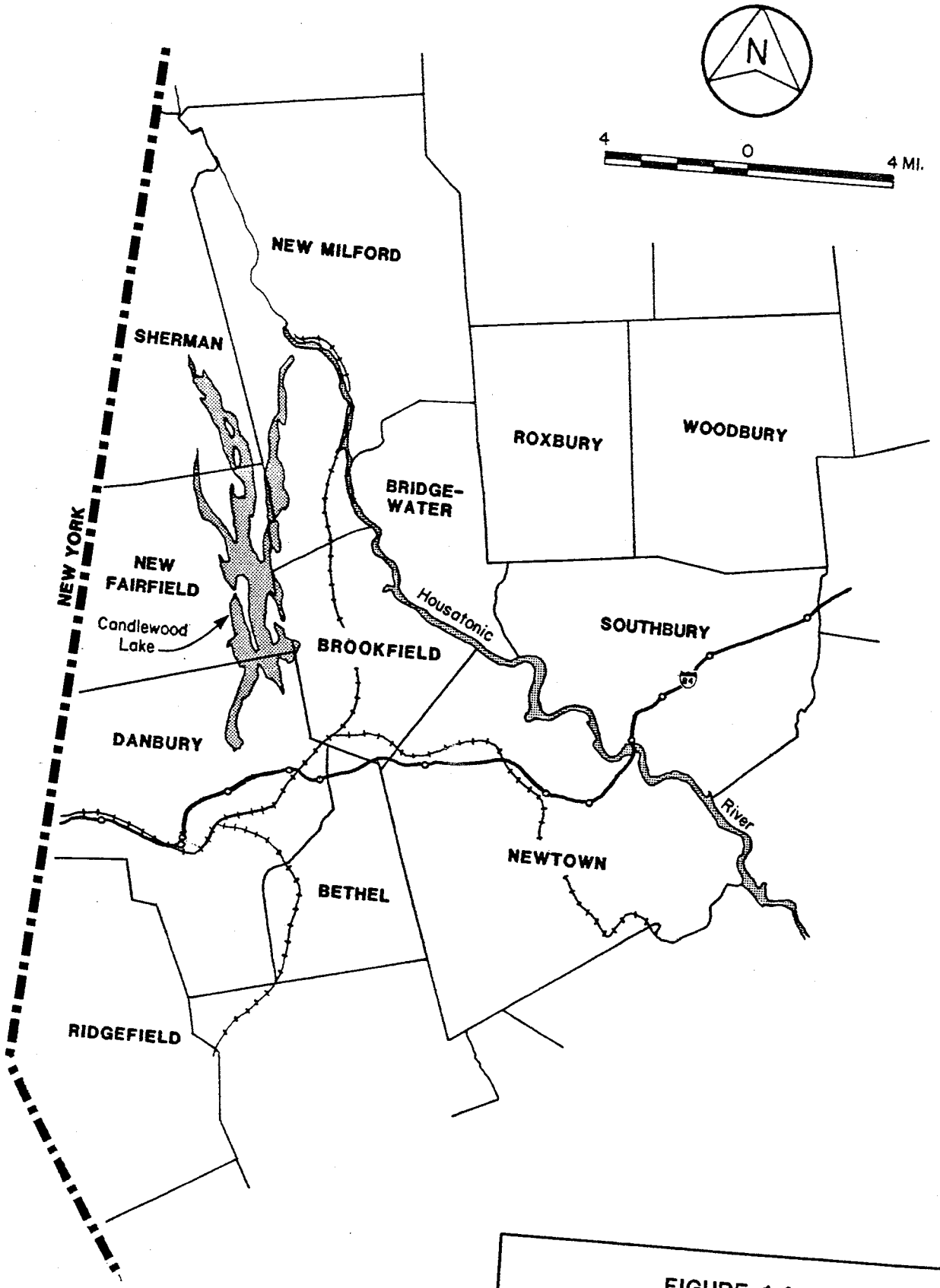


FIGURE 1.3

HOUSATONIC PUBLIC WATER SUPPLY
MANAGEMENT AREA

valleys and is transected by the Housatonic River. Candlewood Lake dominates the western portion of the study area.

A relatively thin veneer of unconsolidated sediment overlies the bedrock in the region. Indicative of their glacial origin, the unconsolidated sediments are quite variable, but, in general, glacial till (compact unsorted material) covers most of the hills, slopes and upland areas while stratified drift deposits (predominately sand and gravel with intermittent silt and clay layers) are generally found along stream valleys and the lowland areas. The stratified drift aquifers represent potential significant groundwater sources with well yields in the 50 to 2,000 gallon per minute (gpm) range. Till is typified by very low well yields due to its low hydraulic conductivity. The fractured bedrock formations, which are relatively close to the ground surface, also have fairly low yields (generally less than 100 gpm and typically less than 10 gpm), but, due to their areal extent, represent an important regional groundwater source for individual homes and small commercial or institutional establishments.

The average annual precipitation for the Housatonic area is approximately 46 inches[1] of which between 30 to 50 percent is returned to the atmosphere via evaporation and transpiration from plant life. The remainder runs off into the area's streams or infiltrates into the ground to recharge the groundwater. Water captured in surface impoundments constitutes a significant existing and future water supply source.

Information published by the Connecticut Department of Environmental Protection (DEP)[2] indicates that about 50 to 60 percent of the Housatonic area's populace (estimated at about 187,000 in 1981) is served by public/private water utilities, with the remainder deriving their supply from individual groundwater wells. In all, 111 water utilities are located in or have watershed area in the Housatonic Study Area and, of these, only 19 have a customer base of more than 1000

individuals. The remainder of the utilities range from fairly loosely organized clusters of homes deriving their water from a common well to more formally structured organizations serving a few hundred users. More than half of the utilities are located in the five towns surrounding Candlewood Lake, some of which have highly variable seasonal demands.

The twelve town Housatonic Public Water Supply Management Area is the fastest growing area in Connecticut. Based upon the Connecticut Office of Policy and Management (OPM)[3] population projections for water supply planning, the population of the management area is projected to increase by 47 percent from 1980 to the year 2030. This growth has been stimulated by the relatively rural nature of the area as a whole (as compared to nearby urban centers) and its proximity to economically strong, major metropolitan areas in southern Connecticut and New York. An analysis conducted by the Housatonic Valley Council of Elected Officials (HVCEO)[4] indicated that, based on 1978 data, nearly 30 percent of the region had been developed. Of the remaining 70 percent about half was considered to be unsuitable for development or otherwise reserved, and the remainder was available to absorb growth. Along with these growth pressures comes the need for both water and sewer services. The potable water supply issue is further exacerbated by the impact of various pollutants which have contaminated both ground and surface water resources throughout the area. The above-noted relatively rural nature of various communities within the Housatonic area has led to, either by design or necessity, the large number of small water utilities, many of which rely on a single-source groundwater supply.

1.1.3 Information Sources

Given the lack of individual utility water supply plans, the information used to develop the Water Supply Assessment had to be derived from a variety of other sources. Where possible, information

provided in the WUCC questionnaires was relied upon heavily (a sample WUCC questionnaire is included in Appendix B). This document was specifically designed to gather the information that was relevant to this project, e.g., population served data, supply source(s), water usage, supply safe yield, system problems, and other pertinent information. It also represents the most up-to-date and presumably most accurate information source.

However, the HVCEO's Regional Planning Bulletin[5] entitled "New Directions for Water Supply Planning" proved to be an invaluable resource, since it focused directly on the issue at hand and was prepared under the review of the respective communities in the Housatonic Valley Region's planning area. Other particularly valuable sources of information included a questionnaire completed by the Department of Health Services (DOHS) staff as part of their inspection program for utilities with fewer than 1000 customers, DOHS files (inspection reports), and DEP's Water Use Information System. Various utility representatives were also extremely helpful in clarifying information and providing local perspective.

1.1.4 Structure of the Water Supply Assessment

The remainder of the Water Supply Assessment is structured to respond to the five criteria that at a minimum (per the regulations) must be addressed as part of this assessment. Also, in accordance with the desires of the WUCC, a sixth item has been added. The six pertinent criteria are as follows:

- Description of the existing water supply systems (Section 1.2 and Appendix A).
- Availability and adequacy of future sources (Section 1.3).
- Existing service area boundaries (Section 1.4).
- Land use and population trends (Section 1.5).
- Status of water system planning, land use planning and coordination between public water systems (Section 1.6).
- Identification of key water supply problems within the Housatonic Public Water Supply Management Area (Section 1.7).

1.2 DESCRIPTION OF EXISTING WATER SUPPLY SYSTEMS

1.2.1 General

This section of the report is designed to provide a brief summary description of the area's existing utilities. More detailed descriptive information about the area's utilities has been incorporated into Appendix A due to its voluminous nature. Therein the utilities have been grouped by community in order to provide a community perspective of water supply issues since land use and population information typically is reported and evaluated in this manner. Furthermore, the potential use of large surface or groundwater sources spanning more than a single community or utility service area can commonly involve inter-town or city political issues, as well as inter-utility and community/utility conflicts.

1.2.2 Data Acquisition Problems and Inconsistencies

For better understanding of the remainder of this document, it is important to discuss various data acquisition problems and inconsistencies which were encountered during the development of the Water Supply Assessment. The introduction to the Assessment noted some of the sources which were utilized for data development. Since individual utility plans were not available at the onset of the Housatonic planning process, a questionnaire (see Appendix B) was developed for the WUCC and sent to each of the area's utilities. The response rate was about 30 percent of the total utilities receiving the questionnaire, with the returned documents filled out to varying degrees of completeness. These returns, on the other-hand, did represent approximately 80 percent of the utility supplied customers. However, from a broad sense and especially from a smaller utility perspective, these returns provided a relatively incomplete data base from which to draw areawide conclusions. Table 1.1 profiles the WUCC questionnaire returns by utility size. It

TABLE 1.1

PROFILE OF WUCC QUESTIONNAIRE RETURNS

UTILITY CUSTOMER BASE	NUMBER OF AREA UTILITIES		NUMBER OF AREA UTILITIES RESPONDING		PERCENT OF AREA UTILITIES RESPONDING	
	ALL (1) DIVISIONS	(1) GROUPED	ALL DIVISIONS	GROUPED	ALL DIVISIONS	GROUPED
0 - 100	33	32	6	5	18	16
101 - 200	35	26	12	7	34	27
201 - 300	15	10	6	3	40	30
301 - 400	14	10	3	2	21	20
401 - 500	7	6	2	1	29	17
501 - 1000	11	8	6	3	55	38
1001 - 5000	8	10	4	5	50	50
5001 - 10000	3	1	3	1	100	100
10001 - 20000	1	2	1	2	100	100
20001 - 30000	0	0	-	-	-	-
30001 - 40000	0	0	-	-	-	-
40001 - 50000	1	1	1	1	100	100
UTILITIES WITH WATERSHED AREA ONLY	-	5	-	4	-	80
TOTAL	128	111	44	34	34%	31%

Note: (1) Four utilities have been grouped by DOHS in enumerating the number of utilities in the Housatonic area. These include General Water Works, Rural Water Co., Dancon Corp, and Topstone Hydraulic Co. The "All Divisions" column lists each separate division or independent service area of the four utilities, while the second conlumn considers each of these four entities as single utilities.

is apparent from the data in Table 1.1 that the greater percentage of response was derived from the larger utilities. This is not surprising given that these utilities typically have a greater resource pool to draw from (e.g., staff dedicated to utility operation and/or management) versus smaller utilities which typically do not have full time staff to complete questionnaires and respond to other regulatory requirements.

To supplement the WUCC questionnaire, results from an independently developed questionnaire, completed as part of the inspection of utilities with fewer than 1000 customers, were provided by DOHS. A review of DOHS' files (inspection reports) on each utility was conducted in order to gather additional information on the area's utilities. Various DEP sources were examined including DEP's computerized "Connecticut Water Use Information System" of the area's utilities, and various maps and other documents were obtained from the Natural Resources Center. The larger utilities also typically provided copies of their annual reports to the Department of Public Utility Control (DPUC) along with their WUCC questionnaires. These sources filled in many of the data gaps resulting from the lack of response from many of the smaller utilities, and thus collectively provided a broad base of information about the Housatonic area.

The extensive data-gathering exercise did produce additional useful information, but it also highlighted the presence of inconsistent information. These inconsistencies are illustrated by the tables (Tables A.1 to A.11) contained in Appendix A. One good example is a comparison of the "population served" numbers listed for the various sources (DOHS, utility, and average household size) from which these data were derived. Each of these values was developed as follows:

- DOHS

  Typically derived by multiplying 4 people by each service connection. For larger utilities, the utility derived estimates were used.

- UTILITY

  Values reported by each utility responding to the WUCC questionnaire. Numbers cited are based on the utility's understanding of its system and the application of an appropriate (varies per utility) number of individuals to the corresponding service connections (accounts) within the system.

- AVG HH SIZE (Average Household Size)

  Typically derived by multiplying number of service connections identified in DOHS inspection reports and/or questionnaires by the average household size updated from 1980 U.S. Census Data by DOHS.

- A fourth data set which was also examined, but ultimately removed from the tables included values listed in DEP's computerized "Connecticut Water Use Information System." These data were derived from DPUC reports submitted by regulated utilities (data updated annually) and from DOHS file information for the non-DPUC regulated utilities (updated by DEP periodically). These data were deleted since it provided redundant information and/or was not as up to date as information derived directly from DOHS files.

The foregoing discussion includes only one of many such problems and is designed to set the scene for the remainder of this document. The impact of the varied "population served" numbers and other data acquisition problems and inconsistencies will be expanded upon as appropriate in subsequent sections of the Assessment, particularly in instances where the conclusions drawn from these data appear to be impacted or biased.

1.2.3 Summary Description

In all, 111 utilities are represented in the Housatonic Public Water Supply Management Area. Of these 111 only 19 have a customer base of greater than 1000 individuals. Within this group, 14 actually supply water to users within the study area, while the remaining five presently only have watershed area or wells within the bounds of the Housatonic area.

The distribution of these utilities or divisions of utilities by community is shown in Table 1.2. The total of 128 listed for the second column (number of utilities) is an apparent discrepancy to the aforementioned 111 utilities. This apparent discrepancy is due to the fact that such utilities as the General Water Works, Rural Water Company, Dancon Corp. and Topstone Hydraulic Co. are considered to be single utilities although they include a number of different divisions with distinct service areas. This grouping plus the five utilities which only have watershed areas within the management area yields the commonly used 111 number.

The number of people in each community receiving water from one of the area's utilities varies dramatically, ranging from a low of zero percent for Roxbury to about 80 percent for the City of Danbury. As noted in the previous section, the population served estimates represented one of the prime examples of inconsistent data. Thus, an understanding of the manner in which the percent served values listed in Table 1.2 were derived will be addressed at this point. (It is also important to understand that these population served estimates and other similar estimates used in subsequent tables are areawide planning level values and thus may not have the same degree of precision as values derived in a utility's individual plan.) Following review and comment upon the validity of the various data sets, it was concluded that a combination of utility supplied and average household size derived figures would provide the best population served estimates. With this approach, the population served estimates provided by the larger utilities (typically greater than 1000 users) in the WUCC questionnaire have been used, since these systems are typically metered and commonly have a significant commercial/industrial component. To assume a standard number of users per connection for the larger utilities may bias the subsequent use of these data for projecting future water consumption. The smaller utilities, however, tend to be more residential in nature. Thus, applying a community average household size to these systems would

TABLE 1.2

COMMUNITY SUMMARY OF UTILITIES

COMMUNITY	NUMBER OF[1] UTILITIES AND/OR DIVISIONS OF UTILITIES	NUMBER OF UTILITIES RESPONDING TO QUESTIONNAIRE		PERCENT[3] POPULATION SERVED BY UTILITIES	TOTAL AVERAGE[4] DAILY CONSUMPTION BY UTILITY USERS (MGD)
		WUCC	DOHS		
Bethel	4	3	1	68	1.30 - 1.36
Bridgewater	1	0	1	3	0.004 - 0.005
Brookfield	25[2]	8	14	43	0.450 - 0.567
Danbury	31	10	16	80	7.06 - 7.23
New Fairfield	8[2]	3	3	16	0.144 - 0.157
New Milford	25[2]	4	13	54	1.08 - 1.21
Newtown	9	6	7	32	0.462 - 0.658
Ridgefield	10	6	4	49	0.909 - 1.23
Roxbury	0	-	-	0	-
Sherman	2[2]	0	1	12	0.022 - 0.033
Southbury	5	2	1	54	1.10 - 1.24
Woodbury	8	2	5	56	0.251 - 0.323
TOTALS	128[1]	44[1]	66		12.78 - 14.01

Notes: (1) All divisions of General Water Works, Rural Water Co., Dancon Corp., and Topstone Hydraulic Co. are listed in accounting of utilities. DOHS enumeration typically groups these divisions and considers each grouping as a single utility.

(2) CLC Owners Corp. (Brookfield and New Milford) and Timber Trails (Sherman and New Fairfield) have service area in two separate communities. For consistency these utilities have been counted once in the tabulation of utilities.

(3) Percentages based on combination of utility estimated and average household size estimated population served data.

(4) Consumption ranges reflect differences in consumption data reported by utilities, computed by average household size information and included in DOHS inspection reports.

tend to properly reflect the customer base. When obvious error would result from the application of these average household size values to each service connection, alternate means were employed. For example, for a housing complex having one bedroom units a maximum of two people per bedroom was assumed, while for units of two bedrooms or greater the average household size values were used. For population served estimates based on average household size, the following figures have been used for each community (the figures constitute an update of 1980 U.S. Census data by DOHS to 1986):

TOWN	HOUSEHOLD SIZE
Bethel	3.01
Bridgewater	2.76
Brookfield	3.14
Danbury	2.71
New Fairfield	3.09
New Milford	2.85
Newtown	3.08
Ridgefield	3.01
Roxbury	2.59
Sherman	2.69
Southbury	2.32
Woodbury	2.54

A review of the supply source data included in the various tables in Appendix A reveals that wells constitute the vast majority of the supplies for the area's utilities. Only the Bethel Water Dept., Danbury Water Dept. and Ridgefield Water Co. utilize surface water sources for their water supply. The New Milford Water Co., Newtown Water Co., and Woodbury Water Co. presently do not use their surface water reservoirs except as emergency backups. Their prime source now consists of groundwater due to the cost of providing water treatment facilities for their surface water sources as required by Federal criteria. The higher yield groundwater supplies, such as Newtown and New Milford, consist of wells in unconsolidated deposits (stratified drift), while, from a total number perspective, lower yield rock wells dominate the water supply picture in the Housatonic area.

1.2.4 Water Quality History

With respect to water quality issues, in general, the DOHS files indicate that the majority of the utilities have not experienced serious problems with the quality of their water. Table 1.3 summarizes the various water quality problems which have been detected by utilities in the Housatonic area. Also, there have been reported incidences of wells abandoned due to groundwater contamination (e.g., phenols in Bethel, salt in Southbury, and gasoline in Brookfield). In Woodbury, one of the main supply wells of the Woodbury Water Co. requires treatment due to the presence of industrial solvents in the source aquifer. Although the number of presently known contaminated wells is not large, it is recognized that many potential contamination sources exist (e.g., landfill sites, failing septic systems, deteriorating gasoline tanks, and chemical spills).(6) In addition, the State is in the process of developing a mapping system illustrating areas that have geologic formations which could lead to radon contamination in bedrock wells. To date, there is not sufficient evidence to determine whether this is a widespread problem in the Housatonic area.

1.2.5 System Reliability, Service and Supply Adequacy

Information on reliability problems was derived from both the WUCC questionnaires and DOHS inspection reports. This information has also been summarized in Table 1.3 and is listed in the utility summary tables for each community. It is apparent from the available data that many smaller utilities do not have water supply capability during power outages. Various utilities experience supply difficulties under high flow demand conditions due either to a combination of inadequate supply and/or storage or due to old or inadequately sized distribution piping. Older distribution piping can create additional system reliability difficulties for many utilities. This older piping is subject to a greater potential for leakage and pipe failures which utilities will ultimately be required to address.

TABLE 1.3
SUMMARY OF WATER UTILITY DATA

WATER UTILITY NAME	SINGLE SOURCE SUPPLY	SUFF. VOL. FOR MAX. HR. DEMAND	WATER USE RESTRICTIONS		CITED WATER QUALITY PROBLEMS			SMALL DISTRIBUTION PIPING		SYSTEM FIGHTING CAPABILITY	EMERGENCY POWER	AVERAGE DAY DEMAND VS. WELL YIELD		COMMENTS
			PERM.	OCC.	HARD.	COLI.	Na	4" OR LESS	6" OR LESS			EXCEEDS	WITHIN 10%	
Acre Lane, Inc.	yes	yes	x	x										
Aqua Vista Assoc., Inc.	no	no	x			x	x	x						
Arrowhead Point Homeowners	no	yes						x						
Ashlar of Newtown	no	yes										see comments		. well yield adequate per DOHS calculation, inadequate per utility supplied value.
Ball Pond Water District	no	yes	x		x	x	x	x						. slightly acidic
Bay Colony Mobile Home Park	yes	no	x					x				x		. pipe corrosion
Bethel Consolidated Co.	yes	yes			x			some 6"						
Bethel Water Dept.	no	NA				x		34%						
Birch Groves Assoc.	no	no						x						
Boulder Ridge Assoc.	no	yes		x										
Briar Ridge, Dancon Corp.	no	yes						x						
Bridgewater Common Condos.	no	yes						NA						
Brook Acres, Rural Water Co.	yes	yes						x						. permanent water conservation restrictions
Brookfield Div. Rural W.C.	no	yes							x					
Brookfield Elderly Housing	yes	yes							x					
Brookfield Hills Condos.	no	yes						x						
Brookview Water Co.	yes	yes							x					
Brookwood, Dancon Corp.	no	yes						x						
Butternut Ridge, Dancon Corp.	no	yes							NA					
Camelot Estates Water Co.	no	yes	x						NA					. permanent water conservation restrictions
Candlewood Acres Holding Corp.	no	no							NA					. permanent water conservation restrictions
Candlewood Knolls Comm. Inc.	no	NA							NA					
Candlewood Lake Condos.	no	no						x					x	
Candlewood Orchards P.O.	no	no							NA			NA		
Candlewood Shores Estates	no	yes						x						
Candlewood Springs P.O.	no	yes				x			NA					
Candlewood Trails Assoc.	no	no		x		x		x				x		
Carmen Hill Orchards Water Co.	no	yes							NA					
Cedar Heights, Rural Water Co.	no	no				x			x					
Cedar Terrace Prop. Owners	no	yes	x						NA					
Cedarbrook Condo. Owners	yes	yes				x		x				see comments		. well yield adequate per utility supplied value, inadequate per DOHS yield calculation.
Cedarhurst Assoc.	yes	yes	x						NA					. low pH, color problems
Chestnut Hill Village	no	yes					x							
Chestnut Tree Hill Water Co.	no	no	x			x	x							. color and turbidity violations and rust
Clapboard Ridge Heights	yes	yes				x		x				x		
							x							. well yield adequate per utility supplied value, inadequate per DOHS calculation.
														. color, turbidity problems - high iron and

NOTE: (1) DNA = Does not apply
(2) NA = Information not available

TABLE 1.3 CONTINUED

WATER UTILITY NAME	SINGLE SOURCE SUPPLY	SUFF. VOL. FOR MAX. HR. DEMAND	WATER USE RESTRICTIONS		CITED WATER QUALITY PROBLEMS			SMALL DISTRIBUTION PIPING		SYSTEM FIREFIGHTING CAPABILITY	EMERGENCY POWER	AVERAGE DAY DEMAND VS. WELL YIELD		COMMENTS
			PERM.	OCC.	HARD.	COLI.	Na	4" OR LESS	6" OR LESS			EXCEEDS	WITHIN 10%	
CLC Owners Corp.	no	yes							92%					
Cornell Hills Assoc.	yes	no					x	x				x		
Craigmoor, Rural Water Co.	no	yes					x		x					
Danbury Water Dept.	no	NA							53%					
Dean Heights Water Assoc.	no	yes							NA				NA	
Eagle Hill Rehabilitation	no	yes						x						
Fairfield Hills Hospital	no	yes							NA					
Fieldstone Ridge, Rural W.C.	no	no					x		x					
Greenridge Inc Water Div.	no	yes							x					
Harrybrooke Park Condos.	yes	no	x			x		x						
Har-Bil Water Co.	no	yes							NA					
Hawthorne East Apts.	yes	no							NA					
Hawthorne Terrace Assoc.	yes	yes		x				x						
Heritage Hills Condo. Assoc.	yes	no						x						
Heritage Village Water Co.	no	yes				x			20%					. pipe leakage; pH adjustment rec. to reduce pipe pitting
Hickory Hills Corp.	no	yes						x						
High Acre Mobile Home Park	yes	yes							NA					
Hi-Vu Water Co.	no	yes	x						x					
Holiday Point Assoc. Inc.	yes	yes				X		x						
Hollendale Estates, Top. H.C.	no	yes							x					
Hollywyld Park Assoc.	yes	yes						x						
Indian Fields Homeowners	no	yes							x					
Indian Ridge Water Co.	no	no			x				NA					
Indian Springs Water Co.	yes	yes							x					
Interlaken Water Co.	yes	NA						x					NA	
Iron Works Aqueduct Co.	yes	yes						x						
Ken Oaks, Rural Water Co.	no	no							x					
Knollcrest Real Estate Corp.	no	yes							NA					
Lake Lillinonah Shores	no	yes							NA					
Lake Waubeeka Prop. Owners	no	yes					x							
Lakeside Water Co.	no	no						x				x		
Ledgewood Association	no	no							NA					
Lillinoah Park Estates	no	no							NA					
Lone Oak Water Co.	no	no			x	x	x	x						. low pressures occasionally
Lords Mobile Home Park	yes	no	x					x				x		
Mamanasco Lake	no	no				x		x					x	
Maple Glen Trailer Park	yes	NA		x				x						
Meadowbrook Terrace M.H. Park	no	no							NA					. odor
Meckauer Circle (HSKCON WC)	yes	yes							x					
Middle River, Dancon Corp.	no	yes							NA					
Millbrook Water Co.	no	no				x			NA					. permanent water conservation restrictions
Millstone Ridge	no	no					x					x		. low pressure problems . low pressure occ.; additional storage needed

NOTE: (1) DNA = Does not apply
(2) NA = Information not available

TABLE 1.3 CONTINUED

WATER UTILITY NAME	SINGLE SOURCE SUPPLY	SUFF. VOL. FOR MAX. HR. DEMAND	WATER USE RESTRICTIONS		CITED WATER QUALITY PROBLEMS			SMALL DISTRIBUTION PIPING		SYSTEM FIREFIGHTING CAPABILITY	EMERGENCY POWER	AVERAGE DAY DEMAND VS. WELL YIELD		COMMENTS
			PERM.	OCC.	HARD.	COLI.	Na	4" OR LESS	6" OR LESS			EXCEEDS	WITHIN 10%	
New Milford Water Co.	no	NA							43%					
Newbury Crossing	no	yes				x			NA					. shortage in 6/86.
Newtown Water Co.	no	yes												
Oakdale Manor Water Assoc.	yes	yes							NA					
Oakwood Acres, Rural Water Co.	no	yes							x					
Old Farms Condo. Assoc.	no	yes		x	x			x						
Olmstead Water Supply Co.	no	yes	x					x				see comments		. well yield adequate per utility supplied value, inadequate per DOHS yield calculation.
Parkwood Acres	no	no							NA					
Pearce Manor, Rural Water Co.	no	yes							x				x	. high iron, manganese, turbidity in well 2
Pleasant Acres Water Co.	no	yes	x				x	x				x		. high odor and turbidity; slightly high iron and manganese; pipes corroded.
Pleasant View Estates	no	yes							x					. 115 new homes planned
Pocono Point	yes	yes	x			x		x						. turbidity occasionally
Possum Ridge, Dancon Corp.	no	yes							NA				x	. permanent water conservation restrictions
Quassak Heights Condos.	no	yes						x						
Racing Brook Water Co.	no	yes							NA					. water slightly corrosive
Ridgebury Ests., Dancon Corp.	no	yes							NA					. permanent water conservation restrictions
Ridgefield Knolls, Top. W.C.	no	yes												. low pressure in upper system
Ridgefield Lakes, Rural W.C.	no	no			x		x		x					. 5 (of 9) systems do not have max. hour demand
Ridgefield Water Co.	no	yes							49%				x	. low water pressure in one development; tank must be full
Ridgeview Gardens, Dancon Cor.	no	yes					x		NA					. permanent water conservation restrictions
River Glen Contin. Care Center	no	no					x	x						. nitrate violation
River View Court Assoc.	yes	NA	x				x	x				NA		
Robin Hill Condos.	no	yes							NA					
Rolling Ridge, Top. Hyd. Co.	no	no												. high color occasionally
Rollingwood Condos.	no	yes		x	x									
Sand Dune Swim Club	yes	yes							NA					
Sandy Lane Village	no	yes			x		x		x					
Scodon, Rural Water Co.	no	yes							x					
Sherwood Forest, Dancon Corp.	yes	no							NA					. permanent water conservation restrictions
Siboney Terrace	yes	yes			x		x	x						. high turbidity
Silvermine Manor	yes	yes		x	x			x						
Snug Harbor Devel. Corp.	yes	yes		x				x						. low pressure complaints
Soundview, Rural Water Co.	yes	no							x					
Southbury Training School	no	yes							NA					
Stony Hill Village	no	yes							NA					. high turbidity in well 2
St. Thomas Seminary	no	no				x	x	x				NA		
Sunny Valley Farm	no	NA							NA			NA		. nitrates from fertilizers
Sunny Valley Tax District	yes	no			x				NA					
Swiss Village Apts.	yes	yes						x				x		

NOTE: (1) DNA = Does not apply
(2) NA = Information not available

TABLE 1.3 CONTINUED

WATER UTILITY NAME	SINGLE SOURCE SUPPLY	SUFF. VOL. FOR MAX. HR. DEMAND	WATER USE RESTRICTIONS		CITED WATER QUALITY PROBLEMS			SMALL DISTRIBUTION PIPING		SYSTEM FIREFIGHTING CAPABILITY	EMERGENCY POWER	AVERAGE DAY DEMAND VS. WELL YIELD		COMMENTS
			PERM.	OCC.	HARD.	COLI.	Na	4" OR LESS	6" OR LESS			EXCEEDS	WITHIN 10%	
Tavi Village Condo. Assoc.	no	NA					x		NA					
Ta'agen Point	yes	yes	x					x					NA	
The Cedars Water Supply	yes	yes						x						
Timber Trails Water Co.	no	yes (only in summer)							NA					. color complaints in fall
Town in Country Condos.	no	yes (demand=vol.avail)							NA					. high iron and manganese in well 1
Westfall Mobile Home Park	no	no	x				x		NA					
Whisconier Village	yes	yes		x	x			x					NA	
Willow Run, Dancon Corp.	no	NA				x			NA					. permanent water conservation restrictions
Woodbury Place Condo Assoc.	yes	yes						x						
Woodbury Water Co.	no	yes							68%					. trichlorethylene level
Woodcreek Village Condos.	no	yes							NA					
Woodlake Water Co.	no	yes				x	x					x		. fairly high iron and manganese

NOTE: (1) DNA = Does not apply
(2) NA = Information not available

Many utilities also do not have alternate sources available in the event their prime groundwater supply is lost. As shown in Table 1.3, some of these utilities rely on either a single rock well or a greater number of rock wells which have marginal "safe yields." When a contamination problem or loss of capacity occurs, the users of the affected system may be without water for an extended period until a new or alternate supply is obtained. Single source wells also can be impacted by short-term outages resulting from routine well maintenance, pump replacement or other minor problems.

Table 1.3 also provides a summary of DOHS' analysis of the capability of various utilities to meet peak hour demand. As is illustrated in this table, various utilities do not have sufficient storage and/or excess pumping capacity to meet peak hour demand.

1.2.6 Fire Fighting Capability

Frequently high flow demand situations are associated with fire flows. Thus, a general discussion of this issue is appropriate at this point. Based on DPUC report data provided by various larger utilities along with their WUCC questionnaires, it is apparent that a wide variety of pipe sizes, materials and ages are found in the distribution systems of these utilities. This variability commonly reflects the needs and standards of the distribution piping at the time of installation. Thus, in older communities, the distribution network typically includes piping which may have been appropriate for its intended use, but which is no longer adequate for present needs and/or design standards. Good examples of this are areas with a large portion of 4 or 6-inch pipe that are now inadequate or marginal for transmission of fire flows due to the high friction losses. For example, for fire flows in the 1500 to 3000 gpm range, friction losses (with Hazen-Williams "C" factor equal to 100, commonly used for old cast iron pipe) in 4-inch piping would range from about 185 to 670 feet per 100 feet of pipe, with losses of about 25 to

90 feet per 100 feet of 6-inch pipe. Thus, it is apparent that a single run of a few tens of feet of 4-inch pipe would render a hydrant useless for firefighting needs similar to the flows noted above, while a few hundred feet of single source 6-inch piping would also compromise a hydrant. Consequently, those areas characterized by old, smaller distribution piping, which is not adequately looped to a hydrant connection, will likely have supply problems during fire flow conditions.

While the distribution networks of many of the larger systems contain areas with piping 6-inch in diameter or less, the majority of the systems serving smaller residential or cluster housing developments have little if any piping greater than 4 to 6-inches in diameter. See Table 1.3 for a summary of those utilities which have all 4-inch or less piping or all 6-inch or less piping, and a listing of those which do and do not provide for firefighting. These smaller systems typically do not presently provide firefighting capability with system connected hydrants. Furthermore, even if additional storage and/or a system interconnection to a larger source were provided, it would be virtually impossible to transmit adequate fire flows to hydrants within a typical smaller utility's distribution network due to inadequate pipe sizing and/or looping. In other words, without the addition of the appropriately sized distribution piping and/or system looping, it is impossible to provide future firefighting capability with the distribution network in the majority of the smaller utilities.

It should be also be pointed out that at present there are no state regulations governing the provision of fire protection capability. Thus municipalities rely on their own regulations, if such exist, or more often on criteria established by the Insurance Services Office (ISO) or the National Fire Protection Association (NFPA). As a result, many of the smaller utility distribution systems were never intended to be designed for future firefighting capability due to alternate sources for firefighting (e.g. on-site ponds) or other arrangements (e.g. coverage

provided by community tanker trucks). Furthermore, unless these systems desire to expand, it is not anticipated that their distribution piping would necessarily need to be upgraded for firefighting purposes.

1.2.7 Major Facility Needs

Little information was provided in the WUCC questionnaires regarding the need for major upgrading of facilities. However, various utilities have identified the need to supplement their supply with additional sources (some examples include Danbury Water Department, New Milford Water Co., Bethel Water Department and Bethel Consolidated Co.). In addition, the Danbury Water Department recognizes the need to upgrade its Margerie Filtration Plant. These needs have been identified by ongoing planning which is conducted by utilities such as these, and it is anticipated that additional needs will be identified by utilities during the completion of their individual plan. These plans will ultimately become a part of the Coordinated Water System Plan, and thus will be more fully addressed later as part of the planning process. It is also suspected that recently proposed EPA regulations may place additional capital improvement burdens on some of the area's utilities.

In essence, the 1986 amendments of the Safe Drinking Water Act include provisions for three major changes. The first of these is the requirement that chlorination be provided for groundwater supplies. Secondly, the amendments stipulate that under most circumstances surface water supplies must be filtered, although the specific criteria for this requirement apparently have not been defined. Thirdly, periodic analysis of approximately eighty contaminants is proposed, and EPA has until mid-summer 1987 to establish the sampling frequency and the maximum contaminant level (MCL) for each of the contaminants.

1.3 AVAILABILITY AND ADEQUACY OF FUTURE SOURCES

1.3.1 Potential Water Supply Sources

The potential, significant additional water supply sources have, at least in a broad sense, been addressed in prior reports or studies. Generally, these sources consist of all significant stratified drift aquifers, surface water impoundments, and the area's streams and rivers. These sources have recently been summarized by HVCEO[1][5] for the bulk (HVCEO member communities) of the Housatonic Public Water Supply Management Area, while others have been discussed in other documents.[7][8] These potential sources are summarized in Table 1.4. In addition, possible problems or conflicts which could impact the viability of these sources are listed in order to provide a more realistic perspective as to their potential.

The sources listed in Table 1.4 provide potential on both a local and regional basis. Typically the aquifer yields are such that they are suitable for only the local area in which they are found. The river and lake diversion projects, however, have a much larger single source safe yield. Thus, these sources constitute supplies of a regional significance.

Any of these sources present some degree of risk. With an aquifer supply, despite the existence of a good degree of subsurface data, the true potential of a well site cannot be ascertained until the appropriate test wells are sunk to evaluate the aquifer's hydraulic response to the withdrawal of water, as well as to examine the water quality. The "estimated or theoretical yield" values listed in Table 1.4 for aquifers generally consist of estimates based on USGS groundwater models and/or theoretical well yields based on limited actual well pump test data. These values then are indicative of the available data and assumptions used and may well provide a good estimate of the yield from the aquifer

TABLE 1.4

POTENTIAL FUTURE WATER SUPPLY SOURCES

COMMUNITY(IES) SERVED	SOURCE	ESTIMATED OP THEORETICAL YIELD (MGD)	QUALIFICATION TO USE OF POTENTIAL SOURCE	WATER QUALITY CLASSIFICATION(1)
Bethel	Sympaug Brook Aquifer	1.2(2)	. Closed landfill; 5 industrial lagoons or sludge beds; metal finishing discharge; salt storage in aquifer recharge area.	. Class GB-45%; GA-40%; GAA-10%; GB/GA-5%.
	East Swamp Aquifer	1.0(3)	. Oil spill; active & closed landfill; 2 lagoons or sludge beds (metal finishing); oil discharge; salt storage in aquifer recharge area (all but oil spill in northern portion of aquifer in Danbury)	. Class GA-95%; GAA-5%.
	Dibble's Brook Aquifer	0.3(2)	. Former lead & solvents discharge; petroleum spill in aquifer recharge area.	. Class GA-75%; GB/GA-20%; GAA-5%.
Brookfield	Gallows Hill (Still River North)	0.5(3)	. Gasoline & fuel oil spill; metal hydroxide sludge lagoon; waste disposal site.	. Class GA
	Potential Reservoir (Tranquil Valley Water Co.)	2.0(4)	. Existing gravel pit operation requiring hydrologic, water quality, environmental and economic evaluation prior to implementation.	. Class A
Danbury	Osborne Well Field Expansion	N.A.		
	Raise Storage Levels in West Lake & Margerie Reservoirs	1.1(3)		. Class GAA . W. Lake Reservoir, Class AA . Margerie Reservoir, Class AA
	Ball Pond Brook Diversion	1.7(5)	. Concerns of New Fairfield Selectmen. Potential conflict with hydroelectric power generation in Candlewood Lake.	. Class B with goal of A.
	Candlewood Lake Diversion	8.2(6)	. Receives pumped Housatonic River water. Potential conflict with hydroelectric power generation and recreactional activities.	. Class B
	Shepaug River Diversion	11.0(3)	. Existing wastewater discharge in Litchfield	. Class B with goal AA.
	West Aspetuck River Diversion	4.7(3)		. Class AA
	Sugar Hollow Aquifer	1.0(3)	. Potential for stream flow depletion in watershed of other utlities.	. Class GAA-75%; GAA-10%.
New Fairfield	Short Woods Brook Aquifer	N.A.	. Salt storage in aquifer recharge area.	. Class GA-90%; GAA-10%.
New Milford	Expand existing well field in Indian Field Aquifer	0.60 - 0.75(3)	. Oil & gasoline spill; closed landfill; failed septic systems; salt storage; metal finishing discharge in aquifer recharge area.	. Class GA-50%; GB/GA-25%; GAA-25%.
	Develop New Milford Center Aquifer Well Field	N.A.	. Gasoline and oil spill; salt storage; latex lagoons; septage disosal site in aquifer recharge area.	. Class GA-60%; GB-40%
	Reactivate Reservoirs 1-4	0.8(3)	. Water treatment facility required.	
	West Aspetuck River Diversion	4.7(3)		. Class AA
	Shepaug River Diversion	Part of 11.0(3)		. Class AA
	Candlewood Lake Diversion	Part of 8.2(3)	. Existing wastewater discharge in Litchfield . Receives pumped Housatonic River Water. Potential conflict with hydroelectric power generation and recreational activities.	. Class B with goal of AA. . Class B
Newtown	Reactivate Tauton Pond	0.54(3)	. Former taste and odor complaints, water treatment facility required.	. Class B/AA.
	Housatonic Aquifer	1.5(3)	. Cyanide & petroleum spills; 3 active waste landfills; 3 closed waste landfills; 3 salt storage piles in aquifer recharge area. Known industrial solvent contamination of utility well.	. Class GA-90%; GAA-5%; GB/GA-5% . Class GA-80%; GB/GA-10%; GAA-10%.
	Pootatuck Valley Aquifer	1.4(2)		
Ridgefield	BCI Geonetics Study Sites	N.A.		. -
	Expand Oscaleta Field	N.A.		. Class GAA
	Titicus Valley Aquifer	0.5(3)	. Outfall from sewage treatment plant; closed landfill.	. Class GA
	Great Swamp Aquifer	N.A.		. Class GA
	Sugar Hollow Aquifer	1.0(3)	. Potential for stream flow depletion in watersheds of other utilities	. Class GAA-75%; GA-25%.
	Upper Saugatuck Aquifer	0.5(3)	. Potential for stream flow depletion in watersheds of other utilities.	. Class GAA
	Interconnection with Danbury	1.0(3)		
Southbury	Pomperaug River Aquifer	5.0-8.8(7)	. PCB spill; active waste landfill; 3 closed waste landfills; 2 salt storage areas; industrial waste discharge to ground in aquifer recharge area.	. Class GA-50%; GB/GA-10%; GAA-30%; GB-10%.
Woodbury	Pomperaug River Aquifer	5.0-8.8(7)	. Solvent or TCE spills; active waste landfill closed waste landfill; subsurface sewage systems; salt storage in aquifer recharge area.	. Class GA-85%; GB/GA-5%; GAA-10%.
	Nonewaug Aquifer	2.6(8)	. Yield includes artificial recharge.	. Class GA-85%; GB/GA-5%; GAA-10%
	Reactivate Woodbury Reservoirs		. Water treatment facility required.	. Upper reservoir Class AA; Lower reservoir, N.A.

Notes: (1) For surface supplies water quality goal listed is the goal at potential point of diversion.
(2) Yield estimate derived from Reference 1.
(3) Yield estimate taken from Reference 5.
(4) Yield estimate taken from Reference 14.
(5) Yield estimate taken from Reference 9.
(6) Yield estimate taken from Reference 16.
(7) Yield estimate taken from Reference 17.
(8) N.A. = Information not available.

on a general sense, but may not be indicative of the yield derived from a well sited at a given location within the aquifer. Even when a site is found to be suitable, a well is susceptible to varying aquifer recharge rates and the potential migration of contaminants to the well from a variety of sources (e.g., leachate from buried wastes or spillage within the recharge area). In summary, the well site must not only be carefully selected and monitored, but it must also be protected by means of proper controls within the recharge area. For regional aquifers water quality protection can be particularly difficult since the recharge areas can potentially be very large. Also for significant well withdrawals, the potential for stream flow depletion in watersheds of other utilities must not be overlooked since it can reduce the safe yield of downstream utilities. The State's diversion permit program requires that sufficient low flow be maintained in a stream in order to protect such factors as its waste assimilative capacity and fisheries. These permits consider a variety of factors set forth in Section 22a - 373 of the General Statutes which when considered collectively can reduce the amount of well withdrawal or surface water diversion if negative impacts are anticipated.

Most of the major surface water sources identified are presently not suitable as a drinking water source due to their present water quality classification (Class B or worse due to wastewater discharges into these water bodies) under Connecticut Laws as the following list illustrates:

- Shepaug River - Class B with goal of AA until approx. 1 mile upstream from confluence with Housatonic River where goal is A.
- West Aspetuck River - Class AA until 1 mile upstream from confluence with Housatonic River where goal is A.
- Ball Pond Brook - Class B with goal of A.
- Candlewood Lake - Class B.

Under State law those sources which are designated as Class B are prohibited for use as a water supply, although under this planning process their consideration as potential sources is permitted. Of the sources listed in Table 1.4, Candlewood Lake is the only potential supply which does not have either an A classification or a goal of A. Candlewood Lake is designated as a Class B source because it receives pumped storage (for hydroelectric power generation) from the Housatonic River which is presently a Class D river with a goal of B. Therefore, for this source to move beyond the level of this planning process, the fundamental question of upgrading the lake's classification to A or amending the State's statutes to allow the use of Class B water for water supply under certain conditions would need to be considered. In the case of Candlewood Lake, there has been some sentiment expressed by individual WUCC members that if the quality of a water body meets Federal criteria for a drinking water source and can be appropriately treated then it should not be excluded from this use by its present State classification. (This issue is discussed in more detail in Section 1.7.6.)

In addition to the State water quality classification issue, many other factors can come into play when considering a surface water body for water supply purposes. These include recreational uses, fisheries, hydroelectric generation and philosophical differences or legal restraints regarding the transport of water from one political entity to another. Candlewood Lake is probably the prime example of competing use in the study area. The lake has a long history of recreational use and continues to support major summer recreational activities. The lake, however, was created for the purpose of hydroelectric generation purposes and the land beneath and around the lake (up to the 440 foot contour) is in fact owned by Connecticut Light and Power. Due to its creation, use and licencing for power generation, Federal Energy Regulatory Commission (FERC) approval of diversions in excess of 1.0 mgd from the lake is required. At a minimum, the approval of the power

company is required for diversions of any size and Northeast Utilities has indicated that it would require compensation for loss of power generation and for additional pump up. A DEP diversion permit will also be needed and will necessitate the examination of the aforementioned factors, as well as the potential environmental impact associated with diverting water from this eutrophic lake.

Ball Pond Brook, which is a tributary to Candlewood Lake, illustrates the potential philosophical differences of transferring water from one political entity to another. Discussion of this diversion has been ongoing for a number of years, and its resolution does not appear to be imminent.

The above examples provide a back drop to the general issue of the diversion permit process. In essence, the development of additional supplies which leads to the supply of water in excess of 50,000 gallons per day to one water supply system from one or more, existing or new sources requires a diversion permit. A variety of factors must be considered collectively in the permitting process. As set forth in Section 22a - 373 of the General Statutes the following items must be considered:

- The effect of the proposed diversion on related needs for public water supply including existing and projected uses, safe yield of reservoir systems and reservoir and groundwater development;
- The effect of the proposed diversion on existing and planned water uses in the area affected such as public water supplies, relative density of private wells, hydropower, flood management, water-based recreation, wetland habitats, waste assimilation and agriculture;
- Compatibility of the proposed diversion with the policies and programs of the state of Connecticut, as adopted or amended, dealing with long-range planning, management, allocation and use of the water resources of the state;

- The relationship of the proposed diversion to economic development and the creation of jobs;
- The effect of the proposed diversion on the existing water conditions, with due regard to watershed characterization, groundwater availability potential, evapotranspiration conditions and water quality;
- The effect, including thermal effect, on fish and wildlife as a result of flow reduction, alteration or augmentation caused by the proposed diversion;
- The effect of the proposed diversion on navigation;
- Whether the water to be diverted is necessary and to the extent that it is, whether such water can be derived from other alternatives including but not limited to conservation;
- Consistency of the proposed diversion with action taken by the attorney general, pursuant to sections 3-126 and 3-127; and
- The interests of all municipalities which would be affected by the proposed diversion.

Each permit is evaluated in light of the above factors by DEP as to the need for an Environmental Impact Report (EIR). If interbasin transfer of water is proposed an EIR is mandated. As the competition for water resources intensifies (e.g., water supply versus other uses or competition for use of resources by different utilities) the diversion permitting process will become more difficult. However, as the demand for additional water supplies increases, the need for additional diversion permits, especially those requiring interbasin transfer, will become more necessary. Not only will competing environmental issues need to be addressed, but economic issues, such as those raised by Northeast Utilities, will become an important factor.

One interesting possibility which has come to light during this planning process is the potential water supply reservoir (Tranquil Valley Water Company) which could be created from an existing gravel pit operation (run by Fairfield Resources, Inc.) at some point 5 to 10 years

in the future. The pit apparently produces about 800,000 gpd of reportedly good quality water from the dewatering required for gravel pit operation. Upon closure, the potential reservoir would reportedly have a surface area of about 55 acres with a maximum depth of about 100 feet and a volume of 1.5 billion gallons. The watershed area and potential yield have been preliminary estimated at about 690 acres and 2 mgd, respectively, although the yield seems high given the commonly used average yield of 0.6 mgd per square mile for the New England area. This potential source, however, requires much more detailed evaluation before it can become reality.

The above three examples provide a glimpse of the issues surrounding some of the potential sources in the Housatonic area. Discussion of these and other sources will be expanded upon in the Integrated Report which constitutes a part of the Coordinated Water System Plan.

1.3.2 Adequacy of Future Sources

In order to assess the adequacy of the potential future sources cited above, a sense of the future water requirements must be provided. The water needs information can most logically be developed from an understanding of the per capita water consumption for the study area (or portions thereof) and the anticipated growth in population during the planning period. The population growth data for the coordinated water system planning process have been developed by Connecticut Office of Policy and Management (OPM)[3] and have been summarized in Table 1.5 (see Section 1.5 for discussion of population growth). The representative per capita consumption data, however, were not so conveniently derived and a discussion of how these data were developed follows.

In Section 1.3.1 difficulties associated with data inconsistencies were alluded to and one example of the potential error in the utility service population estimates was discussed in some detail. In Section

TABLE 1.5

HOUSATONIC AREA POPULATION DATA

COMMUNITY	CENSUS POPULATION[1]			OPM[2] POPULATION PROJECTIONS			
	1960	1970	1980	1985	1990	2000	2030
Bethel	8,200	10,945	16,004	16,910	18,080	20,040	26,300
Bridgewater	898	1,277	1,563	1,610	1,690	1,810	2,200
Brookfield	3,405	9,688	12,872	13,870	14,870	16,970	23,100
Danbury	39,382	50,781	60,470	62,470	64,470	67,570	78,300
New Fairfield	3,355	6,991	11,260	11,900	12,680	14,050	18,400
New Milford	8,318	14,601	19,420	20,420	21,120	23,120	28,400
Newtown	11,373	16,942	19,107	20,610	21,810	24,610	32,700
Ridgefield	8,165	18,188	20,120	21,120	21,820	23,120	27,700
Roxbury	912	1,238	1,468	1,590	1,720	1,970	2,700
Sherman	825	1,459	2,281	2,480	2,680	3,080	4,300
Southbury	5,186	7,852	14,156	15,060	15,760	17,260	21,800
Woodbury	3,910	5,869	6,942	7,110	7,220	7,260	7,800
TOTAL	93,929	145,831	185,663	195,150	203,920	220,860	273,700

Notes: (1) U.S. Department of Commerce, Bureau of Census.
(2) Connecticut OPM projections (see Reference 10).

1.2.3, discussion was provided for selecting the most valid population served estimates. These population served estimates, as well as the estimated average demand for the various utilities, is of particular importance in the determination of existing per capita consumption. An examination of the utility summary tables (Tables A.1 to A.11) in Appendix A will illustrate the data inconsistencies and the variable daily per capita consumption (gpcd) values that can be derived for each community depending upon the information selected.

Ultimately it was decided to estimate the future water needs for the Water Supply Assessment based on the per capita consumption values derived from a combination of the utility supplied and average household size data. The larger utility average daily consumption values are believed to be valid because they are typically based on metered flow data and the population served numbers are based on the utility's understanding of its service area. For the smaller utilities completing the WUCC questionnaire, the average household size population data were combined with the utility supplied consumption values. When coupled with the average household size based population served component multiplied by a per capita consumption rate of 75 gpcd (which is believed to conservatively estimate residential customer use) for the non-responding utilities, reasonable per capita consumption rates on a community wide basis will result. Furthermore, even though overall WUCC questionnaire response ran in the 30 percent range, these WUCC respondents represented around 80 percent of the utility customer base and thus solidifies the utility derived per capita consumption data. For the Town of Roxbury, which has no utilities, and the Towns of Bridgewater and Sherman, for which no utilities responded with sufficient data, a value of 75 gpcd was assumed (corresponding to DOHS' typically used design value and consistent with the value applied to the household size based population served component). Also, for convenience, these per capita consumption values were rounded to the nearest 5 gpcd.

The projected water usage data for each of the communities within the Housatonic Water Supply Management Area and the area as a whole have been summarized in Table 1.6. In this table, the future water needs data have been distributed between utility and self-supplied needs using the same ratios as presently exist in the communities. (Here it should be clarified that self-supplied water constitutes residents and commercial/industrial concerns who supply their own water with individual wells which are not part of any of the area's public water supply utilities.) It is recognized that the percent of utility-supplied versus self-supplied will change with time and that degree of change will vary from community to community. However, since the utility and self-supplied values are ultimately summed in the table, a worst case projection of the potential utility supplied needs is provided (i.e., total utility supply of a community's water users). At this juncture, a sense of the total future water needs is important and not the precision of the distribution of utility-supplied versus self-supplied water. A refinement of this distribution is more appropriately included as part of the Integrated Report.

It is also interesting to examine the per capita usage data by size of community using the utility supplied water usage data (no utility data was received from three communities thus only nine are represented below). The following is provided for this purpose:

Community Size Range	Number of Communities Represented	Range of Utility Supplied Values (gpcd) Min.	Median	Max.	Average GPCD
Less than 10,000	1		63		63
10,000 - 50,000	7	61	89	115	90
Greater than 50,000	1		142		142

TABLE 1.6

PROJECTED WATER SUPPLY NEEDS

COMMUNITY	EXISTING SUPPLY SOURCE (%) UTILITY	SELF	TOTAL EXISTING UTILITY ESTIMATED YIELD (MGD)(1)	EXISTING PER CAPITA CONSUMPTION (GPCD)	PROJECTED FUTURE WATER NEEDS (MGD)(2)(3) UTILITY SUPPLIED 1990	2000	2030	SELF SUPPLIED 1990	2000	2030	COMMUNITY TOTAL 1990	2000	2030
Bethel	68	32		115	1.41	1.57	2.06	0.67	0.74	.97	2.08	2.30	3.02
Bridgewater	3	97		75	.004	.004	.005	0.12	0.13	0.16	0.13	0.14	0.17
Brookfield	43	57		80	0.51	0.58	0.79	0.68	0.77	1.05	1.19	1.36	1.85
Danbury	80	20		145	7.48	7.84	9.08	1.87	1.96	2.27	9.35	9.80	11.35
New Fairfield	16	84		80	0.16	0.18	0.24	0.85	0.94	1.24	1.01	1.12	1.47
New Milford	54	46		95	1.08	1.19	1.46	0.92	1.01	1.24	2.01	2.20	2.70
Newtown	32	68		60	0.42	0.47	0.63	0.89	1.00	1.33	1.31	1.48	1.96
Ridgefield	49	51		90	0.96	1.02	1.22	1.00	1.06	1.27	1.96	2.08	2.49
Roxbury	0	100		75	0	0	0	0.13	0.15	0.20	0.13	0.15	0.20
Sherman	12	88		75	0.02	0.03	0.04	0.18	0.20	0.28	0.20	0.23	0.32
Southbury	54	46		115	0.98	1.07	1.35	0.83	0.91	1.15	1.81	1.98	2.51
Woodbury	56	44		65	0.26	0.26	0.28	0.21	0.21	0.22	0.47	0.47	0.51
TOTALS					13.30	14.21	17.16	8.36	9.09	11.40	21.65	23.31	28.56

Note: (1) Range used to encompass conflicting values provided by utilities or estimated by DOHS.
(2) For those utilities serving more than one community, the water usage has been apportioned between the respective communities. For utilities providing water to outside the study area the servive population and respective usage has been reduced appropriately.
(3) Self-supplied water consumption was estimated using the average town-wide existing per capita consumption values listed in this table.

TABLE 1.6A

METHODOLOGY FOR PROJECTING FUTURE WATER SUPPLY NEEDS IN TABLE 1.6

1. Estimate the current population served by each water utility within each town. For larger utilites (serving greater than 1000), utility supplied estimates were utilized. For smaller utilities (serving less than 1000), the population served estimate was based on 1986 average household size estimates (adjusted from the 1980 U.S. Census Data by DOHS) multiplied by the number of service connections. For instances where obvious error would result (e.g., one bedroom apartment) a lower number was used (e.g., two people per one bedroom apartment)(See Tables A.1 - A.11).

2. Calculate based on #1 above, the percent of the 1985 projected population (OPM) of each town which is currently served by public water systems. The remainder of each town is assumed to be self-supplied, that is served by individual wells. (See Tables A.1 - A.11).

3. Calculate average daily usage by utility within each town. Actual usage or production data was utilized if available from larger utilities (greater than 1000 population) and responding (to WUCC questionnaire) smaller utilities. For non-respondant smaller systems or where information was unavailable, usage was estimated by multiplying the estimated residential population served by a per capita consumption rate of 75 gpcd. (See Tables A.1 - A.11).

4. Sum the average daily usage for all utilities within each town, to give a town usage total.

5. Calculate a consumption rate (gpcd) for each town by dividing the town usage total (gpd) by the population served (Step 2).

6. Sum the estimated yields for every utility within each town, to give a town yield total. Due to varying data sources and accuracy of yields presented in Table A.1 - A.11, a range of yield values is given in Table 1.6. This total estimated yield is the water supply quantity which is currently available to provide current and projected needs.

7. Calculate projected water utility supply needs for each town by multiplying the following:

   Percent population served (utility-supplied) (Step 2) X
   Existing per capita consumption (Step 5) X
   OPM Population Projections (Table 1.5).

8. Compare the projected (utility-supplied) needs (Step 7) to the current yields (Step 6). See Figure 1.4.

9. In addition to the above, the future water supply needs for the self-supplied portion of each town were projected by repeating the calculation in Step 7 using the percent of the population which is self-supplied (Step 2). See Table 1.6.

10. Sum Steps 7 and 9 to produce a community total water supply projection (utility supplied plus self-supplied). See Table 1.6. This is equivalent to assuming that all residents currently served by individual (non utility) wells will need public water in the future due to contamination, etc. This is an overly conservative projection. Such a projection is unanticipated and merely serves as a comparison. See Step 11.

11. Compare the projected needs of the total community (Step 10, self-supplied plus utility-supplied) to the current yields.

There is indeed a logic to the distribution of these values, with the smaller less developed communities having a lower per capita consumption and the most heavily developed and commercialized community (Danbury) possessing a much higher per capita usage, reflecting the commercial/industrial influence on the overall demand on this community. Furthermore, these data fall within water usage ranges published in the literature.[11][12] One apparent anomaly is a 136 gpcd value which is reported in Table A.10 (Appendix A) for Southbury. This per capita usage is influenced by the relatively high water usage attributed to the residential population of the Southbury Training School. When the Training School value is eliminated, the utility derived per capita usage is reduced by about 16 percent (to 115 gpcd), reflecting the usage of the Heritage Village Water Co. A similar situation occurs in Newtown where the Fairfield Hills hospital significantly influences the average per capita water usage. In this case, the exclusion of the hospital reduces the per capita water use estimate from 97 to 63 gpcd. Consequently, values of 115 and 65 gpcd have been used in Table 1.6 for Southbury and Woodbury, respectively.

It should also be pointed out that the approach of estimating the future water needs deviates somewhat from the procedures used in Army Corps' regional planning efforts for the Housatonic River Basin.[7] In that study it was presumed that the per capita consumption would increase by 0.5 gpcd each year. A similar approach has not been used here since recent leak detection and educational/conservation programs, installation of water saving devices and, probably more importantly, the price of water have tended to stabilize the per capita consumption of water. This view is generally held by the WUCC membership.

For comparative purposes the total estimated yields of all the existing utility supplies within each community and for the area as a whole have been tabulated in Table 1.6. Additionally, Figure 1.4 graphically illustrates the relationship between existing utility

supplies and future community needs. Ranges have been listed in Table 1.6 to account for differences in yield values reported by the utilities and those contained in inspection reports which will be clarified, at least in part, by those utilities preparing individual plans. The use of these estimated yield values does have limitations in that they may not be consistently derived (different utilities may use different techniques) and they may represent estimates based on rated pump capacities versus actual well pumping tests. Despite these potential limitations this table does indicate that from an overall or areawide perspective the existing utility supplies can generally satisfy the needs projected for future utility customers (presuming of course a similar distribution of utility and self supplied water). However, from an individual community perspective (e.g., Ridgefield) or an individual utility perspective (see Table 1.3) water supply shortfalls may be imminent or already a reality. In other cases, it may appear that sufficient water already exists to satisfy all residents of a community for the next 50 years. Unfortunately, this excess water supply may be found in one part of the community while the future need is located in the opposite side of town. This boils down to a situation of having sufficient supplies available at the right place at the right time.

1.4 EXISTING SERVICE AREA BOUNDARIES

The service area boundaries for the existing utilities in the Housatonic Public Water Supply Management Area are illustrated on Plate 1 (contained in the map pocket at the end of the report). Where possible these boundaries were based on service area maps provided by the utilities. In lieu of utility supplied information service areas were extracted from the State's inventory map of community water supplies[12] and from an interpretation of the probable areas served near the supply source locations shown in State's Atlas of Public Water Supply Sources.[13]

The watershed areas for the surface water supplies in the Housatonic Public Water Supply Management Area are also illustrated on Plate 1, as are the watershed area's of utilities which do not supply water to residents within the 12 communities of the Housatonic planning area, but by virtue of the location of their watershed area are part of the Housatonic WUCC. These utilities include Bridgeport Hydraulic Company, Norwalk First Taxing District, Norwalk Second Taxing District, Stamford Water Company, and Watertown Fire District. New York City also has watershed area along the western border of the planning area, but is not a participant in the WUCC.

The final piece of information shown on this plate (based on DEP file information and preliminary mapping) are the franchise areas found within the Housatonic Water Supply Management Area. The criteria which define these areas varies and is dependent upon the charter which establishes a given area. For example, a municipal charter for a municipally run water utility may define the bounds of the Town or City as the franchise area, and may prohibit serving adjacent communities without approval of the municipal government. The City of Danbury is set up in this manner. Other franchises give the utility or water authority first preference in serving new customers in the franchise area. A charter may also be so broad as establishing the entire state as a utility's franchise area, e.g., the Connecticut Water Company. In the Housatonic Public Water Supply Management Area the vast majority of the utilities do not have defined franchise areas or specifically defined service area boundaries. The overlap and conflicts created by the various franchise charters will be dealt with in more detail during the next important phase of this planning process, the determination of exclusive service area boundaries.

1.5 LAND USE AND POPULATION TRENDS

The twelve town Housatonic Public Water Supply Management Area is the fastest growing area in Connecticut. Based upon OPM[3] population

projections for water supply planning, the population of this management area is projected to increase by 47 percent from 1980 to the year 2030. Table 1.5 provides both a tabulation of the Housatonic Public Water Supply Management Area's U.S. Census population between 1960 and 1980, as well as the Connecticut Office of Policy and Management's (OPM) 1985 projected population and the projected population for 1990, 2000 and 2030.[3] As may be seen therein, the population of the total water supply management area nearly doubled between 1960 and 1980, with the population within individual communities during this time frame increasing between 50 and 280 percent. The OPM's projections anticipate continued growth for the area, but at a slower rate - an approximate 20 percent increase between 1980 and the year 2000 and nearly a 50 percent increase by 2030.

An analysis conducted by HVCEO[4] indicated that, based on 1978 data, nearly 30 percent of the region had been developed, while of the remaining 70 percent about half was considered to be unsuitable for development or otherwise reserved and the remainder was available to absorb growth. Given the data in Table 1.5, it is reasonable to project that between 1978 and 1985 the population probably increased between about 15,000 and 20,000 people. Assuming a 1978 population of around 175,000 people distributed across 30 percent of the 400 square mile area of the study area, an average population density about 2.3 people per acre of developed land can be projected (average density = 175,000 people/(400 sq. mi.)(640 acre/sq. mi.)(0.30)). Presuming the population growth between 1978 and 1985 were applied to the 35 percent of land area available for development in 1978 at a similar average density, between 10 to 14 square miles (6500 to 8700 acres) would have been consumed by development since 1978. This would represent about 7 to 10 percent of the land available for development at that time. It is interesting to note that by the year 2030, with the population density cited, about 50 percent of the 1978 available developable lands would potentially be consumed.

What does this mean in terms of water supply? It was noted in the introductory section of the Water Supply Assessment that stratified drift deposits, in which the higher yield groundwater supplies are found, are generally found along stream valleys and the lowland areas. Coincidently, these same areas are generally amenable to or desirable for development, thereby creating a natural conflict of land use - development versus water supply watershed or groundwater recharge area. This is precisely the situation which has developed in the Housatonic area.

The character of growth in various communities was fostered by the zoning regulations, or lack thereof, established by various communities. Those communities desiring a strong commercial/industrial base attempted to set aside areas attractive for such development -- typically open flat areas near public water and sewer services or amenable to on-site water supply and wastewater disposal and with convenient transportation access. The combination of these factors often led to the establishment of commercial/industrial areas over significant groundwater aquifers. Once these lands had been established for such use reclamation is rarely possible. Thus, communities which now recognize the importance of their hidden water resources (i.e., groundwater aquifers) now find themselves playing catchup in an effort to preserve what may be left and/or cope with the damages of the past.

In general, past land use patterns have not been particularly sensitive to water resource needs. Although surface water reservoirs have commonly been fairly well isolated from development, groundwater resources have not been so well isolated. In fact, aquifer areas were typically some of the more desirable areas to promote development.

1.6 STATUS OF WATER SYSTEM AND LAND USE PLANNING AND COORDINATION BETWEEN PUBLIC WATER SYSTEMS

1.6.1 Water System Planning

The extent or degree of water system planning by the utilities in the Housatonic area varies considerably. Typically, for those utilities servicing residential areas or multi-family housing complexes which have no plans or space for growth little planning is really necessary. For systems such as these, plans for regular maintenance and periodic repairs typically constitute the bulk of the planning.

On the other hand, those systems servicing a larger and more diverse customer base normally conduct planning either with an internal engineering staff or utilize outside engineering consultants to conduct their planning. These utilities typically assess their need for future water supplies, as well as develop capital improvement programs for upgrading existing treatment and distribution facilities. Table 1.7 summarizes various planning or engineering documents which utilities indicated in their WUCC questionnaire responses to have recently completed, are in the process of completing, or other projects that they expect to address in the near future. All utilities greater than 1000 customers have also been required to prepare an individual utility plan which will become part of the Coordinated Water System Plan.

1.6.2 Land Use Planning

Land use planning is typically carried out from community perspective and takes the character of a community's plan of development. These plans are designed to set the framework for growth within a community and tend to reflect the desires of the community residents as implemented through the community's governing bodies. In the Housatonic Public Water Supply Management Area, the plans of development are in various stages of completion as is illustrated by Table 1.8. Given the

TABLE 1.7

STATUS OF UTILITY PLANNING

UTILITY	RECENTLY COMPLETED ENGINEERING/PLANNING	ONGOING OR ANTICIPATED PLANNING/ENGINEERING NEEDS
Bethel Consolidated Co.	. 1985 Plan of Development	. Development of additional wells and water main extension
Bethel Water Dept.	. 1970 engineering report for system improvements . 1985 test wells	. Evaluation of potential groundwater sources
Danbury Water Dept.	. 1981 report of Lake Kenosia flood skimming . 1983, 1984 reports on Margerie Lake Dam, East Lake Dam, Padanaram Reservoir Dam, Upper Kohanza Dam, Lower Kohanza Dam, & West Lake Dam . 1983 Study of Southwest High Service Area . 1984 report on West Lake High Service Pumping Station . 1984 engineering report . 1984 report on Ball Pond Diversion . 1985 Dam Inspections . 1986 engineering report on Lake Candlewood Diversion . 1986 report on West Lake and Margerie Reservoir	. Ongoing "Water and Sewer Study" involving potential distribution system improvements, water demand forecasts and sewer investigations. . Comprehensive water distribution study. . Distribution system improvements. . System storage expansion. . Margerie Treatment Plant - renovation and expansion. . Dam repairs. . Candlewood Lake water quality study. . Ball Pond Brook Diversion.
Heritage Village Water Co.	. 1975 engineering study by CDM	
New Milford Water Co.		. Evaluating additional well sites
Newtown Water Co. and Fairfield Hills Hospital	. 1977 Study of entire Pootatuck Aquifer	. USGS aquifer capacity evaluation
Ridgefield Water Co.	. 1985 engineering study by BCI: safe yield analysis of Round Pond Reservoir	. USGS evaluation of Sugar Hollow Aquifer . BCI well site evaluation . Analyzed water availability from Round Pond by evaluating inputs and demands
Rural Water Co.	. 1986 Study of possible interconnection	. Ken Oaks Division/Danbury Water Dept. Interconnection (currently planned)
Watertown Fire District	. 1970 Water Supply and Distribution Report . 1972 Nonewaug Basin study . 1977, Hart Farm Well Field Complex Report . 1985, Water Supply Report	. Development of Nonewaug Basin Aquifer for additional water supply; Additional capacity from (Woodbury) Hart Farm well field, storage, and distribution system . Test well drilling

TABLE 1.8

STATUS OF LAND USE PLANNING

COMMUNITY	PLANNING DOCUMENTS	ADDITIONAL SOURCE OF PLANNING INFORMATION	SUMMARY OF WATER SUPPLY RELATED PLANNING INFORMATION
Bethel	1984 Update to Plan of Development (prepared by Cahn Inc.)	Hamraj Khona, Director of Public Works and Town Engineer	. Majority of town is residentially zoned, about 80 industrial lots available for development in the town. . No extensive development forseen, southwestern section should see some future residential development but most likely with private wells. . Aquifer protection and new water sources proposed in Plan of Development.
Bridgewater	Plan in process of being completed (by McGowan Associates)	Ann Fallwell, Planning and Zoning Secretary	. Plan of development initiated due to sudden increase in development and applications for development. . Town presently 2 to 4 acre zoning. . All water supply derived from groundwater. . Innovative groundwater protection strategies for the Town in preparation by the Housatonic Valley Association.
Brookfield	1977 Plan of Development, in process of being updated (by Howard Kelly P.E.)	Jonathan Chew, Executive Director HVCEO Diane Evans, Secretary of Planning & Zoning Comm.	. Town predominantly 1 & 2 acre residential and industrial zoning although multi-family housing encouraged in certain areas. . Comprehensive study of Gallows Hill Aquifer now in progress. . Town has strict set of standards governing installation of new wells.
Danbury	1978 Plan of Development, adopted in 1980 (prepared by TPA Services)	Jerry Juretus, Assitant Planning Director	. Plan of Development considered to be outdated, portions being updated. . Growth anticipated in selected portions of City: - Planning and development of corporate office complexes along Ridgefield/Danbury Town line. - 529 unit condominium development off Nabby Road in northeast Section of City. . Downtown section generally saturated from a water connection perspective, however, changed use will create some growth. . Towards New York border and Redding town line 2-acre zoning prevalent and little growth anticipated. . Water supply watershed protection ordinance draft completed in 1984.
New Fairfield	Plan of Development and zoning map currently being completed (by Hiram Peck)	Cheryl Reedy, First Selectman	. Town encourages 2-acre zoning & discourages condo. & cluster housing. . Anticipate groundwater will continue to serve as source of water supply. . Town contains much forested area, and residents generally wish to maintain open character of Town.
New Milford	1986 Update of Plan of Development (prepared by TPA Services)	Tom Leahay, Planning and Zoning Commissioner	. 56 percent of land area undeveloped, but much has severe limitations to development. . Topographic relief limits expansion of Town's sewerage system, thus on-site sewage disposal necessary for most buildable lots as well as on-site water supply. . Commercial/industrial development limited to sewered areas or site amenable to large septic systems. Two tracts (300 acres and 100 acres) along Boardman and Kent Roads eyed for industrial development and are amenable to water supply and wastewater disposal. . Much interest in condominium & cluster housing and three complexes approved in the last 3 years. . Seasonal housing will continue to play important role in water supply, particularly as more and more of these housing units are converted to year-round residences. . Aquifer Protection Committee created by Board of Selectmen. . Innovative groundwater protection strategies for the Town in preparation by the Housatonic Valley Association.
Newtown	1981 Plan of Development (prepared by TPA Services)	Ted Whippie, Planning and Zoning	. Town has 1/2 to 3 acre zoning which does not allow multi-family or cluster housing except for non-profit elderly housing. . Plan of Development recognized Pootatuck Valley Aquifer as highest priority for future water supply and recommended adequate aquifer protection measures in the immediate future. . Town not interested in expanding water service area and existing system about saturated. . Developable lots will continue to provide on-site water & sewer service. . Construction of sewage collection system naturally limited due to shallow bedrock yielding high construction costs.
Ridgefield	1980 Comprehensive Town Plan (prepared by Frederick P. Clark Associates) 9/85 Ridgefield Center Traffic Study (prepared by Wilbur Smith & Assoc.)	Oswald Inglese, Planning Director	. Plan of development noted that aquifer protection should be stressed to protect water supplies. . Area along Route 35 to Route 7 to Copps Hill (near Center of Ridgefield) has projected growth of 349 housing units (22% increase) and increase of 1.2 million sq. ft. of commercial space (68% increase). . Development noted will constitute major portion of Ridgefield's projected growth by year 2000.
Roxbury	No existing Plan of Development		. Plan of Development seen as desirable, completion uncertain.
Sherman	1978 Plan of Development, Amended & Revised in 1984	Kenneth Grant, First Selectman	. Only about 6% of land area is developable. . Town enforces 2 acre zoning and allows no multi-family housing. Coupled w/generally poor soils for septic systems, growth is controlled. . No industry exists. Predominance of single family residences. . Community has strong desire to maintain current rural, isolated and self-sufficient characteristics of Sherman.
Southbury	Comprehensive Plan of Development adopted 6/17/86)(prepared by P.F. Bryan & Associates)		. Plan of development indicated that protection of Pomperaug River Aquifer to be issue of highest priority & set forth program to protect this aquifer. . Town uses P.F. Bryan & Assoc. for review of proposed development plans.
Woodbury	1987 Plan of Development, update in process		. Town uses Land Tech for review of proposed development plans.

rapidly changing character of the region these plans can become quickly outmoded if not examined and updated regularly. Furthermore, different objectives of different communities for their future growth or the manner in which growth has or has not been planned has led to irregular growth patterns throughout the region.

From a water supply perspective, many older planning efforts did not place particular emphasis upon the potential incompatibility of water resource needs and development with surface supply watersheds or more critically groundwater recharge areas. Recent legislation, Public Act 85-279 entitled "An Act Concerning the Protection of Public Water Supplies," requires municipal planning and zoning commissions to include consideration of existing and potential surface and groundwater source protection in their local plans and regulations. Satisfaction of this requirement by communities will place the probable conflict of development and water supply sources into clearer focus. In terms of potential groundwater source impacts, Table 1.9 provides a good illustration of existing and future potential conflicts between land use and groundwater contamination. Data used to develop this table were derived from existing informational sources, the State's inventory of leachate and wastewater discharges[6] and maps of significant stratified drift aquifers. What this table indicates very clearly is the historic conflict between development and waste disposal practices and the continued need for good quality groundwater supplies (which by number of sources constitutes the vast majority of the supply).

In order to gain a sense of land planning as it relates to water supply, plans of development were reviewed and individuals familiar with land use or planning for each community were consulted. The result of these efforts is represented in Plate 2 (located in the map packet in the back of the report) wherein the probable future areas requiring utility water supplies have been identified. It is believed that this map represents the most up-to-date perspectives of the individuals

TABLE 1.9

SUMMARY OF CITED AND/OR POTENTIAL GROUNDWATER CONTAMINATION PROBLEMS[1]

COMMUNITY	AQUIFER	CONTAMINATED WELLS	SPILLS	LANDFILLS ACTIVE	LANDFILLS CLOSED	LAGOONS/ SLUDGE BEDS	IND. WASTE DISCHARGES TO GROUND	LARGE SEPTIC SYSTEMS	SALT STORAGE PILES
BETHEL	Dibble's Brook		1 (petroleum)				1		
	East Swamp		1 (#2 fuel oil)	1[2]	1[2]	2[2]	1[2]	1[2]	1[2]
	Sympaug Brook	1 (phenol)			1	5	1		1
BROOKFIELD	Gallows Hill		? (gas or #2 fuel oil)		1	1			
	Still River Middle								1
DANBURY	Still River West		2 (gas, petroleum, or PCB's)		1	2			
	Great Plain								1
	Lake Kenosia	2 (TCE)	1 (soybean oil)		3	1	6		
	Sugar Hollow		no info. available						
NEW FAIRFIELD	Short Woods Brook								1
NEW MILFORD	New Milford Center		2 (gas or # 2 fuel oil)			2			1
	Indian Field	1	2 (#6 oil or gas)		1		1	?	1
	Lanesville			1			4		
	Pickett District					3			
	East Aspetuck						1		1
	Kent Road, Boardman Rd.		1 (# 6 oil)	1	1		1	1	
	Gaylordsville		no contamination sources reported						
	Merwinsville		no contamination sources reported						
NEWTOWN	Housatonic		no contamination sources reported						
	Pootatuck	1 (cyanide)	3 (cyanide or petroleum)	2	4				3 (1 active)
	Deep Brook							1	
	No. Branch Pootatuck		no contamination sources reported						
	Pond Brook		no contamination sources reported						
	Limekiln Brook		no contamination sources reported						
RIDGEFIELD	Titicus Valley		no contamination sources reported						
	Upper Titicus		no contamination sources reported						
	Sugar Hollow		no contamination sources reported						
	Little Pond	1 (solvents)				1		2[3]	1
	Great Swamp	1	3 (#2 fuel oil, gas, or motor oil)		1			(3)	1
SOUTHBURY	Pomperaug		1 (PCB)	1	3		1		2
WOODBURY	Pomperaug		3 (solvents or TCE)	1	1			7	1
	Nonewaug			1		1			1

Note: (1) Information derived from Conn DEP data (see Reference 6).
(2) Located in northern portion of aquifer in Danbury.
(3) Sewage plant discharge in recharge area.

familiar with planning in each of the communities, and supplants previous areawide planning efforts associated with wastewater collection and water supply (i.e., 208 planning information).

Ultimately the success of regional water supply planning will hinge upon the compatible marriage of local land use planning and the water supply needs of utilities. The utilities will respond to growth as controlled or fostered by the community plans of development which, as stated above, must by law include consideration of existing and potential surface and groundwater source protection. Since water supply issues can commonly transcend community borders, a regional perspective is helpful. Public Acts 84-502 and 85-535, which are administered by DOHS, require that individual utility water supply plans and the areawide supplement to the Coordinated Plan consider land use planning. Additionally, this perspective can be provided by the regional planning agencies (RPA) whose funding may in large part be derived from the member communities that they serve as well as from state and federal grant monies. These funding sources can either promote or limit the ability of the RPA's to respond to particular issues. The coordinated water system planning process recognizes the importance of the regional perspective as evidenced by the inclusion of a representative elected by the municipalities of each RPA in the area. These organizations should and must continue to play an active role in integrating local land use planning into a regional perspective particularly as it relates to the areawide protection of surface supply watershed areas and groundwater recharge areas.

1.6.3 Coordination Between Public Water Systems

On an areawide basis there appears to be little organized coordination between public water systems. Typically utilities appear to be cooperating more through a sense of need or as good neighbors versus an areawide vision of water supply planning. In some instances, it is

evident that various utilities are located within a "stones throw" of each other, but they either are not aware of this or choose not to recognize the situation. Thus, the potential for greater cooperation goes unrealized. However, in a few cases, utility representatives have recognized and have been responsive to common needs, e.g., servicing customers of an adjacent community which lie along the supply line running through that community or extending service to another utility which may have difficulty meeting peak demands. In any case, the potential exists but for the most part it goes unrealized in the Housatonic Public Water Supply Management Area.

1.7 IDENTIFICATION OF KEY WATER SUPPLY PROBLEMS WITHIN THE HOUSATONIC PUBLIC WATER SUPPLY MANAGEMENT AREA

The Housatonic WUCC has identified various key problems which have surfaced or have been re-emphasized during the development of the Water Supply Assessment. Many of these have become evident during the foregoing discussion while others are more subtle and merit additional discussion. The remainder of the assessment responds to the need to clearly identify all of the problems or issues which the WUCC considers to be important. These problems or issues have in some instances been resolved in this Water Supply Assessment. However, other components which have not been fully resolved herein will be addressed in the development of the Integrated Report so that the completed Coordinated Plan properly covers the key issues of the Housatonic Public Water Supply Management Area.

1.7.1 Inconsistent Data

One of the more prevalent problems which came to light during the development of the Water Supply Assessment has been the availability and inconsistency of the utility data base, a situation which has been discussed in length throughout the Assessment. The lack of individual utility plans has created a void in the potentially comprehensive source

of direct utility information. The WUCC questionnaire was designed to try to fill this void and to some extent it did so. However, many utilities did not provide the information requested, because in many cases they do not collect the requested data or were unable to respond for lack of resources. When the questionnaire data were supplemented by information from other sources, it became apparent that not only did utilities not approach data gathering or interpretation in a similar manner, but information developed from state agency inspection of the various utilities did not necessarily correspond to the utility supplied data. Thus, there was both a lack of data as well as procedural differences in how data were derived.

1.7.2 Need For Technical and/or Managerial Support/Information

It is apparent that there are many utilities in the Housatonic Public Water Supply Management Area which were not created strictly for the purpose of water supply. Typically, these utilities evolved from a need to supply water to a residential development or multi-family housing complex which by definition are water supply utilities. As a result, organizations such as these function with a minimum of staff, typically with no full-time commitment. Therefore, there is a significant need for those organizations who have the desire to respond to the requirements placed before them, but do not have sufficient managerial or informational resources to draw from. Thus, a resource pool of managerial and/or technical support/information is needed.

1.7.3 Regulatory Burden

Somewhat akin to the preceding problem is the application of regulatory requirements which are placed upon utilities regardless of their size. What may be easy or less burdensome for those organizations with a full-time staff may be entirely overburdening for those who function with a minimal, part-time staff commitment.

New requests for additional water quality information, completion of forms or preparation of planning documents seem to continually arise. Frequently, the same or similar information is requested by various agencies creating the burden of supplying redundant information. These problems affect utilities of all sizes, and tax everyone's resources.

1.7.4 Irresponsible Management

Although most utilities attempt to be responsible system managers, it is recognized that there are utilities which apparently do not take the interests of the customers to heart. This includes the improper maintenance of equipment or the inattention to operations due to the absence or apparent lack of interest of those responsible for the management of the water supply equipment. This can result in poor service to the customers (e.g. outages and breakdowns) and lead to accelerated deterioration of a utility's infrastructure.

1.7.5 Potential Groundwater Problems

Table 1.9 highlights the potential for contamination of the major stratified drift aquifers, as well as bedrock aquifers, in the Housatonic area. To some extent this contamination of wells has been documented, but for the most part it is anticipated that to date only the tip of the iceburg has been sighted. This situation has been created by a greater knowledge and awareness of the groundwater contamination problem, as well as increased monitoring of groundwater supplies and individual wells. The potential for groundwater contamination also affects water supply reliability and may influence growth by requiring public water system expansion or interconnection to meet the needs of individual homeowners or other utilities experiencing contamination. Furthermore, an understanding of existing contaminated groundwater sources or areas containing probable contamination sources will become increasingly important in siting new wells.

1.7.6 Regulatory Barriers to the Use of Some Supplies

There has been sentiment expressed by individual WUCC members that if the quality of a water body meets Federal and State criteria for a drinking water source and can be appropriately treated then it should not be excluded from use for water supply purposes due to its State Water Quality classification. This apparent conflict revolves around Section 22a - 417 of the General Statutes which prohibits the discharge of wastewater/sewage into waters used for public water supply. State regulators have generally interpreted this law conversely to mean that waste receiving waters are forbidden for use as public water supplies. State policy for the use of water resources is embodied in the State's Water Quality Classifications for both ground and surface waters which allocate these resources for specific uses. In the case of surface waters, those which presently serve as water supplies or have been proposed for water supply purposes either are classified as AA or have a goal of AA. Additionally, sources which may be suitable for existing or future water supply purposes are classified as A or have a goal of A. All other surface waters are designated as waste receiving streams with classifications of B, C or D but all with a goal of at least B and thus all have been generically referred to as "Class B waters."

The issue of the use of Class B waters for water supply purposes is not a new one. Due to the past controversy the 1984 Water Resources Task Force and the 1985 Class B Task Force addressed this issue. These task forces found that there was no immediate need for the use of Class B sources and recommended that the existing State policy of prohibiting the use of Class B waters for water supply be continued. The Water Resources Task Force did, however, recommend and adopt into law the provision that utilities be allowed to consider sources which receive sewage in their assessment of water supply alternatives for future needs when developing water supply plans under Section 25-32d of the General Statutes. Although utilities can consider Class B sources, there is

presently no mechanism in place to implement the use of such sources or to prohibit the release of additional wastewater discharges to these sources. Furthermore, there is no differentiation made in terms of any types of wastewater allocation between a Class B stream or water body which has not been identified as a future water supply source and a Class B stream or water body which has been identified as a potential future water supply. The absence of mechanisms to identify and protect these streams or water bodies creates the potential for future water supply problems.

Ultimately the resolution of the question of why not allow the use of Class B waters if they meet Federal quality criteria will have ramifications beyond the withdrawal of supply at a particular point within a water body. This would impact the foundation on which the State's Water Quality Classification system and water allocation programs are based and thus would require sufficient justification to merit change. Consequently, if the need for use of Class B waters is perceived at some point, the documentation to support this need and the mechanism by which such use would be allowed should be established well in advance of the actual need since the process for change promises to be a time consuming one.

1.7.7 Aging and/or Substandard Infrastructure

This is really a two-fold problem. With older utilities, water supply equipment and/or distribution piping may have reached or exceeded its useful life. Thus, its continued use represents a liability to reliable water supply for the utility's customers. Eventually such equipment or infrastructure must be replaced at increased cost to the system users.

The issue of substandard facilities may stem from the fact that older facilities (e.g., piping) which may have been appropriate at the

time of installation are no longer adequate due to new system demands. Other situations may be a result of changes in design standards or changes in use (e.g, conversion from seasonal to year-round use). In a few cases, the substandard infrastructure may be a result of the desire to cut corners (save capital costs) since no minimum design standards were in place at the time of installation.

1.7.8 Financing

The financing issue is multifaceted covering issues such as rate structures for customers, capitalization of improvements and bonding issues. In the Housatonic Public Water Supply Management Area there is a broad cross-section of the type of utility structure. These include utilities which are essentially an adjunct of a residential or multi-family housing complex, privately or investor-owned companies, and municipal utilities. This difference in structure will impact the rate structures of these utilities. For example, a utility may charge a nominal fee for water service to cover miscellaneous service, but with no long-term view towards replacement of worn-out equipment. An investor-owned company obviously must have a rate structure which provides a return on investment, as well as a plan for the capitalization of future needs or improvements. A municipal utility typically covers operating and debt service with its rate structure, while improvements normally take the bonding route wherein municipal bonds are sold to finance improvements. Since a municipality provides a number of different services requiring bond monies to its residents, there is a potential for conflict as to how bond money should be used, especially if the limits of a community's bonding capacity is stretched.

Regardless of the methodology used to obtain financing the inability to secure adequate monies can impact utilities in a variety of ways. These include the inability to make needed system improvements for replacement of aged facilities (maintenance), and improvements for

system expansion or increased reliability (an interconnection or new supply source).

1.7.9 Lack of Local Ordinances for Water Supply Protection

Development pressures have typically outpaced most communities' ability to deal with the lesser understood process of identifying and protecting water supply sources. Oft times those charged with approving building permits or zoning changes are not familiar with the relatively complex inter-relationship between water supply and the recharge of groundwater aquifers. Thus, conflicts of land use and water supply have occurred and have led to a situation (see Table 1.9) where potential contamination sources have been located within aquifer recharge areas. Communities are now playing catchup with the groundwater contamination issue, and the protection of the community's ground- and surface water resources.

Only Newtown has adopted a traditional aquifer protection ordinance. A water supply watershed protection ordinance reached the draft stage in Danbury in 1984. Aquifer protection strategies are being prepared for New Milford and Bridgewater by the Housatonic Valley Association. The development of similar plans will be stimulated by the recent (1985) passage of Public Act 85-279 entitled "An Act Concerning the Protection of Public Water Supplies." This act requires municipal planning and zoning commissions to include consideration of surface and groundwater supply protection in their community plans and regulations. The lack of protection for future water sources hinders the planning process, making it unknown whether future sources will be viable when needed. DEP has prepared a handbook on groundwater protection which can aid communities in developing their plans. In addition, OPM, DOHS and DEP are preparing a handbook with examples of how surface water supply protection can be accomplished.

1.7.10 Competing Uses of Sources

The issue of competing uses for potential water supply sources has been highlighted in previous sections of this report, principally with discussions about Candlewood Lake. With this source, potential recreational and power generation conflicts were cited. However, with any surface water supply a number of instream conflicts to water supply can be identified. These include the stream's waste assimilative capacity, minimum flows, fisheries, recreation potential and aesthetics.

There is also the potential for inter-utility competition for water supply sources. For example, a particular high yield aquifer may represent a desirable new source for more than one utility, and unless the resource is managed properly the withdrawal of water by one utility may impact the well yield at another. Also, given the large amount of surface supply watershed area within the region, there is the potential for groundwater withdrawal from aquifers (e.g., Sugar Hollow Aquifer) within a watershed to impact the stream flow to downstream utilities.

1.7.11 System and Source Reliability

A number of utilities have single source supplies or wells that draw from similar depths, while others do not have sufficient storage and/or pumping capacity to meet peak demands or have system constrictions which impact their ability to deliver sufficient fire flows. All systems require preventative maintenance and replacement schedules so that system reliability can be maximized and the reaction to crisis syndrome can be avoided. Table 1.3 also clearly indicates that a number of utilities do not have standby power which will enable them to operate adequately during power loss.

1.7.12 Lack of Coordination Between Utilities and Communities

In many ways the lack of coordination between utilities and communities centers around land use and water supply protection. This problem appears to revolve around either the general lack of communication or lack of defined mechanisms or procedures for communicating information. To bridge the communication gap a commitment of time and people will be required. For example, the regular participation of utility representatives in community task forces or planning board meetings dealing with water supply issues would represent the type of commitment needed to facilitate communication.

1.7.13 Conflict of Service and Franchise Areas

The language of each individual charter for a franchise area ultimately will determine the degree of potential conflict between one utility providing service in another's franchise area. The delineation of exclusive service areas as part of the Coordinated Water System Plan is designed to eliminate potential conflicts. The franchise issue will be one of the major items to be examined in the exclusive service area phase of this planning process. However, the issue of who may provide service to a particular area may be resolved by negotiations between utilities or may require a legal opinion of franchise area rights versus exclusive service area boundaries.

1.7.14 Lack of Coordination Between Utilities

Lack of coordination in many cases may stem from lack of knowledge, or more specifically from not knowing or recognizing that a utility directly abuts one or more other utilities. A realization of the close proximity of other utilities can in itself represent the first step in solving possible supply and/or reliability problems on a collective basis. On the other hand, utilities may have attempted to solve common

problems via interconnections, but have no formal agreement about the condition of use, means of monitoring the quantity of water used, or who is responsible for maintenance. When the utility supplying water has plenty of excess all may be well and good, but without a formal agreement when the excess is lost the receiving utility may be left high and dry.

Ultimately there are many avenues for cooperation and coordination, both on a formal and an informal basis. Examples include the sharing of information on how one utility was able to solve a particular problem experienced by another, or providing assistance on how to complete forms, or indicating where such help may be found.

1.7.15 Lack of Adequate Incentive to be a Satellite Manager

For some utilities, this issue revolves around the basic premise that "it's more trouble (too much expense) than it's worth (too little return)." An investor-owned company is obviously not anxious to take on a financially troubled utility if there is no reasonable way to recoup their potential investment. Also, there is a recognition that the new tax laws may make it even less attractive than previously to invest in other utilities. Until this issue is more fully understood by the privately owned utilities there will be a reluctance to jump in too quickly.

From another perspective, many utilities may not understand just what satellite management entails, or how a utility could benefit from it, or how such services can be obtained. Others may be concerned that satellite management is merely a mechanism for taking over utilities, instead of a means for obtaining services or assistance (for a fee) from someone who can provide such assistance. This issue will be addressed in more detail in the Integrated Report wherein the various possibilities for the potential benefits of satellite management will be delineated.

CITED REFERENCES

1. Housatonic Valley Council of Elected Officials, "A Policy Direction For Groundwater Protection," Regional Planning Bulletin No. 5, July, 1979.

2. Connecticut Department of Environmental Protection, Natural Resources Center, "Directory of Community Water Supplies in Connecticut," August, 1984.

3. Connecticut Census Data Center, Comprehensive Planning Division, Office of Policy and Management, "Connecticut Population Projections for Water Supply Planning," August, 1986.

4. Housatonic Valley Council of Elected Officials, "A Growth Management Option for the Housatonic Valley Region," August, 1981.

5. Housatonic Valley Council of Elected Officials," New Directions for Water Supply Planning," Regional Planning Bulletin No. 42, June, 1986.

6. Connecticut Department of Environmental Protection, "Leachate & Wastewater Discharges, An Inventory," June, 1984.

7. U.S. Army Corps of Engineers, "Housatonic River Basin Urban Study, Feasibility Report," September, 1982.

8. Wilson et al., U.S. Geological Survey, "Water Resources Inventory of Connecticut, Part 5, Lower Housatonic River Basin," Conn. Water Resources Bulletin No. 19, 1974.

9. Roald Haestad, Inc., "Investigation and Report on Lake Candlewood Diversion," prepared for the City of Danbury, February, 1986.

10. Steel, E. W. and McGhee, T.J., "Water Supply and Sewerage," 5th Edition, McGraw-Hill, 1979.

11. Linsley, R.K. and Franzini, J.B., "Water-Resources Engineering, " 3rd Edition, McGraw-Hill Book Co., 1979.

12. Connecticut Dept. of Environmental Protection, Natural Resources Center, "Community Water Systems in Connecticut, A 1984 Inventory," map compiled by H.W. Sternberg, III, 1986.

13. Connecticut Dept. of Environmental Protection, Natural Resources Center, "Altas of The Public Water Supply Sources & Drainage Basins of Connecticut," DEP Bulletin No. 4, June, 1982.

14. Letter of 11/6/86 from Leggette, Brashears & Graham, Inc. to Fairfield Resources, Inc.

15. Roald Haestad, Inc., "Ball Pond Brook Diversion, Effect of Development on Safe Yield," prepared for City of Danbury, July, 1984.

16. U.S. Geological Survey, "Ground-Water Availability and Water Quality at Southbury and Woodbury, Connecticut," Water Resources Investigations Report 84-4221, 1986.

17. Charles A. Maguire & Associates, Inc., "Water Supply and Distribution Report, "prepared for the Watertown Fire District, October, 1970.

FINAL
WATER SUPPLY ASSESSMENT
HOUSATONIC WATER SUPPLY
MANAGEMENT AREA

APPENDIX A

APRIL, 1987

APPENDIX A

DESCRIPTION OF EXISTING UTILITIES

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APPENDIX A

DESCRIPTION OF EXISTING UTILITIES

Appendix A presents the detailed information for the various utilities in the Housatonic Public Water Supply Management Area. Given the lack of individual utility water supply plans, the information used to develop a description of the existing utilities had to be derived from a variety of other sources. Where possible, information provided with the WUCC questionnaires was relied upon heavily since this document was specifically designed to gather the information that was relevant to this project, eg., population served data, supply source(s), water usage, supply yield, system problems, and other pertinent information. It also represents the most up-to-date and presumably most accurate information source.

However, the HVCEO's Regional Planning Bulletin[1] entitled "New Directions for Water Supply Planning" proved to be an invaluable resource, since it focused directly on the issue at hand and was prepared under the review of the respective communities in the Housatonic Valley Region's planning area. A questionnaire prepared by the Department of Health Services for small utilities, and DOHS files (inspection reports), and DEP's Water Use Information System have also been particularly valuable sources of information. Various utility representatives were also extremely helpful in clarifying information and providing individual issue perspective.

In terms of document development the individual utility write ups have been prepared from the WUCC questionnaires received from the respective utilities and the data included therein is reflective of that reported by each of the utilities completing the WUCC questionnaire. DOHS questionnaire data have been summarized in tabular form as stipulated in the titles of the appropriate tables. All other data sources (e.g., engineering reports) have been appropriately referenced and are listed at the end of Appendix A.

A.1 BETHEL

A.1.1 Utilities Serving Community

As indicated in Table A.1, five water utilities serve the Town of Bethel and, as is evident from this table, the largest is the municipally owned Bethel Water Department. This utility supplies about 80 percent of the serviced population or approximately 55 percent of Town's total projected 1985 population.

The service area boundaries of the various utilities are illustrated in Figure A.1 (also see Plate 1 in map pocket). The Bethel Water Department serves the main commercial center of the community (along Routes 53 and 302) and the nearby residential areas. The second largest utility, the Bethel Consolidated Water Company, provides water to the Chimney Heights residential area and the Berkshire Industrial Park in the northern part of the Town. The three wells owned by the Chestnut Hill Village utility provide water to the like named condominium development, while the homes in the Meckauer Circle are served by the Rskcon Water Company.

A.1.2 Existing Utility Supplies

With the exception of Meckauer Circle, all of the utilities in Bethel responded to the WUCC questionnaire. The information presented by each of the respondents is discussed below, while the information for Meckauer Circle is summarized in Table A.1 only.

Bethel Water Department. The Bethel Water Department derives its water from a combination of ground and surface water sources. This municipal water system is divided into two parts commonly referred to as the Eureka system and the Chestnut Ridge system each of which obtain their surface supply from independent watersheds.

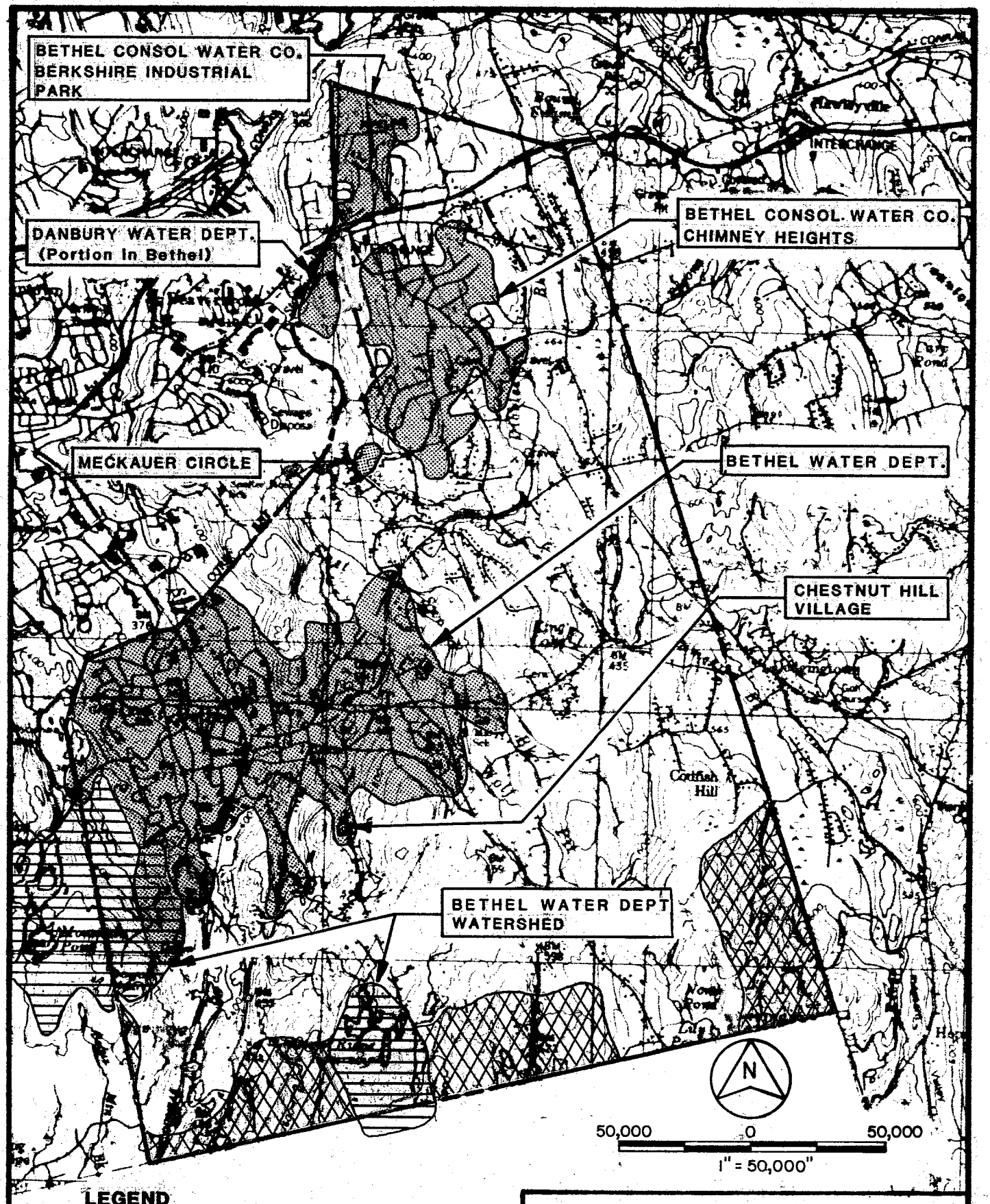

FIGURE A.1

BETHEL -

UTILITY SERVICE AREA

BOUNDARIES

TABLE A.1

BETHEL AREA WATER UTILITIES

WATER UTILITY NAME	RESIDENTIAL POPULATION SERVED (3) DOHS DESIGN EST.	UTILITY SUPPLIED EST.	PER AVG HH SIZE	WUCC CALC. EST.	PERCENT POP. SERVED (4)	SOURCE	AVG. DAILY USAGE PER CAPITA GPCD (6)	TOTAL (1000 GPD) (5)	ESTIMATED YIELD (9) (1000 GPD) DOHS CALC.	UTILITY SUPPLIED
Bethel Water Dept. (1)	9355 (assume)	9355	--	9355	55.3	2 wells, 3 res.	126.9	1187.0		
Bethel Consolidated Co. (1)										
Chimney Heights	1852	1840	--	1840	10.9	1 well	48.9	90.0		
Berkshire Indust. Pk.	600 (8)	600	--	0	0.0	1 well	15.0 (8)	9.0 (8)		
Chestnut Hill Village (1)	192	125	144	144	0.9	3 wells	75	10.8 (7)		NA
Meckauer Circle (RSKCON WC)	196	--	147	147	0.9	1 well	75	11.0		--
SUBTOTALS UTILITY SUPPLIED				11486	67.9		113 (avg) (10)	1298.8	1806.8	
SELF-SUPPLIED				5424	32.1					
1985 PROJECTED TOTAL POPULATION (2)				16910	100					

NOTES:

(1) Denotes that WUCC questionnaire was received.
(2) Conn. OPM Water Supply Population Projection.
(3) DOHS DESIGN EST.- Typically derived by assuming four people per service connection.
PER AVG HH SIZE - Population estimate based on 1986 average household size estimates for each municipality (adjusted from U.S. Census data by DOHS) multiplied by number of service connections. Where obvious error would result from this approach (e.g. one-bedroom apartments/condominiums noted community summary tables) alternate per residence values were used (e.g., two per one-bedroom units and average household size for two or more bedrooms).
WUCC CALC EST.- Calculated estimate used throughout report. Where utility values were available for larger utilities (greater than 1000) the utility supplied value was assumed. For smaller utilities (serving less than 1000), the number calculated based on average household size was utilized.
(4) Utilized throughout the report, and based on WUCC estimate of residential population served.
(5) Where utility data were not available, derived by multiplying WUCC estimate of population served by 75 gpcd.
(6) Where usage or production information was available from larger utilities, the per capita consumption value was calculated based upon these figures.
(7) Because utility supplied value of 650 gpd is extremely low, this value derived by multiplying WUCC estimate of population served by 75 gpcd.
(8) Berkshire Industrial Park values not used for estimating population served or for calculating per capita consumption since this system does not serve any residential customers.
(9) DOHS CALC.- Calculated by multiplying well capacity times 18 hours of pumping per day and reported as 1000 gallons per day.
UTILITY SUPPLIED - Consists of statistically derived safe yield calculations, well yield tests conducted during well installation, or well pump capacities.
(10) For projecting water supply needs elsewhere in the report the townwide per capita consumption rate has been rounded to 115 gpcd.

TABLE A.1
(Continued)
BETHEL AREA WATER UTILITIES

WATER UTILITY NAME	STORAGE			DOHS PEAK DEMAND EVAL. AND CITED PROBLEMS		
	TYPE (2)	NO. UNITS	TOT. VOL. (gal)	MAX. HR. DEMAND (gal)	VOLUME AVAIL. MAX. HR. (gal)	CITED SUPPLY AND WATER QUALITY PROBLEMS
Bethel Water Dept. (1)	A P	3 1		395513	NA	.Occasional hardness problems in wells
Bethel Consolidated Co. (1) Chimney Heights	A	1		46300		.Underground fuel lines in aquifer recharge area .Location of generator and fuel storage ."Reliability" - single well
Berkshire Indust. Pk.	A P	1 1		2750		.Water high in sodium(59 mg/l) 7/19/86 and hardness .Well No. 2 located 100 ft. from sewage pumping station and within 100 ft. of I-84
Chestnut Hill Village (1)	A P	1 1		6800		None
Meckauer Circle (RSKCON WC)	A	1		4900		.Misc. repairs to well house needed .Investigate add. well or interconnection to increase reliability

NOTES: (1) Denotes WUCC questionnaire received.
(2) Letter abbreviations: A - Atmospheric tank
P - Pressurized tank

Provisional data

Most of the Eureka system's watershed is located in the adjacent City of Danbury, and provides service to the lower elevation section of the Town and the business district. There are two impoundments, Mountain Pond (storage reservoir) and Eureka Lake (distribution reservoir), within the watershed. The combined estimated yield of these reservoirs is [redacted] and they have a combined storage capacity of abou[redacted] There are also two gravel-packed wells (Maple Avenue wells) located in the Eureka system which individually have an estimated yield o[redacted]ut, when operating in parallel, a combined yield of arounc[redacted] Thus, the Eureka system has an estimated total yield of approximatel[redacted] The water withdrawn from Eureka Lake is treated by a [redacted] system (employing [redacted], and [redacted] ior to distribution to the users. The well water is also chlorinated prior to entering the distribution system. One storage tank is located within the Eureka system, the Hickok Avenue tank with [redacted]

The Chestnut Ridge system serves the higher elevations in the central portion of the community, and draws its water from the Chestnut Ridge Reservoir in the southern portion of the Town. The watershed for this reservoir is primarily located within Bethel although a small portion appears to extend into the adjacent Town of Redding. The yield of the Chestnut Ridge Reservoir is estimated to be abou[redacted] Water from this supply reservoir is treated by [redacted] and [redacted], followed by the addition of [redacted]) and [redacted]. A connection from the Maple Avenue wells to the Chestnut Ridge system is provided to supplement this surface water supply on an as needed (emergency) basis. A storage tank with a capacity of [redacted] is located at the Chestnut Ridge filtration plant, while [redacted] tank and pumping station are locate[redacted]

No water quality problems were cited for the Bethel Water Department's existing supply. However, it should be pointed out that two municipally owned wells capable of yielding approximately 1.0 mgd were abandoned in 1964 due to chemical contamination (phenol) and because of high hardness levels. These wells are located on the Sympaug Brook Aquifer. Other wells developed for industrial supplies along the brook have also experienced hardness and contamination problems. The Parloa Field Well off South Street was used as an emergency well in the 1960's, however, its use was discontinued due to the proximity of this well to a sanitary sewer.

The water department has noted some difficulty in maintaining a satisfactory source of supply although there is generally low leakage in the distribution system and system pressures have been adequate. The average day demand (1985) was reported to be about 1.19 mgd (which may actually be closer to about 1.0 mgd since excess well water is automatically diverted to the reservoir). The average day demand for the maximum month for that year is estimated at around 1.33 mgd. This compares to the total yield for the two systems of about [illegible]. The yield of the Chestnut Ridge system is exceeded on a regular basis and thus must be supplemented with Maple Avenue well water. Excessive pumping from these wells results in an appreciable increase in water hardness (greater than 250 ppm). At one point an attempt was made to shut down these wells and supply the Eureka system with the surface water only. However, a sufficient supply could not be maintained to meet system demands, and one well now operates on an average of about six months per year during the higher demand periods. During the drought of 1965 water from Murphy Brook was pumped to Mountain Pond to supplement the runoff from the watershed. In 1980, brook water was pumped to the reservoir for overflow testing. This source continues to serve as an emergency supply. The brook has an estimated yield of less tha[illegible] although it has been pumped at a rate of approximate[illegible] short durations in the past.

A 1970 engineering report[2] concerning the Bethel Water Department's water system noted potential during This contention is at least partly supported by hydrant flow testing conducted by the Insurance Services Office (ISO) of Connecticut in October, 1981. Results of these tests on 14 of the Town's 228 hydrants noted that in two test locations the available flow was significantly less than that required (2250 gpm @ 20 psi needed versus 600 gpm available and 2500 gpm versus 800 gpm). The overall result of the ISO testing, however, was an improvement in the Town's ISO rating since there was a general improvement of the fire flow situation as a whole.

Chestnut Hill Village, Inc. Chestnut Hill Village Inc. serves a residential area of 125 people near the center of Town with a total of three wells. These wells have a reported yield of abou hich is about 31 times the yearly average day demand of about 700 gpd. The system has a storage tank capacity of , pumping capacity of and no other major facilities, including No water quality problems were reported by the utility.

Bethel Consolidated Water Co. Bethel Consolidated's Chimney Heights well draws groundwater from the Dibble's Brook Aquifer and serves a residential area of about 1840 people. The estimated yield of the well i hich is about 5 times the average daily demand and is about twice the utility's projected ultimate daily demand of around 0.26 mgd. A 1985 engineering report[3] described the well water quality as excellent with no treatment required, although chlorination equipment has been installed for emergency use.

The water company also provides water service to the Berkshire Industrial Park via a single 8-inch diameter, gravel-packed well with an estimated yield of nearly This system has an average day demand of about 0.09 mgd. The water from this well is very hard and

high in sodium and chlorides, which may be due to its close proximity to Route I-84.

There is a total of about 8.4 miles of distribution piping in the two systems operated by Bethel Consolidated, although at present the systems are completely separate. The Chimney Heights and Berkshire Industrial Park systems have [redacted] and [redacted] of atmospheric storage and 27 and 8 hydrants, respectively. The Berkshire system also has [redacted] pressurized storage tank.

A.1.3 Future Water Needs

Bethel relies on a combination of ground and surface water supplies. The existing surface water supply is controlled by the Bethel Water Department and is not sufficient to handle this utility's existing demand much less additional future demand. Consequently, the Bethel Water Department presently supplements its water supply with well water on the average of six months per year, and, as discussed below, Bethel is looking to augment its supply with additional groundwater resources.

From an individual utility perspective, the Bethel Water Department has no plans for significant expansion of their service area or number of users. The utility, however, drilled two test wells behind the [redacted] in 1985 (East Swamp Aquifer) to evaluate the aquifer in this area to supplement its water supply. These wells have a projected yield of [redacted] The utility is now looking for and has plans to continue evaluating other potential groundwater sources in 1987. Given the relatively small buffer between the yield of the Water Department's supplies and the present system demand, it is apparent that additional supplies are desirable to supplement the existing sources. Barring any unforeseen conditions, such as the loss of a well field, the Bethel Water Department's supplies (with the newly developed wells) should be

sufficient for their needs to the turn of the century, given the Department's apparent desire for minimal expansion of their system.

A recent engineering report[3] completed for Bethel Consolidated made various recommendations regarding future improvements to both the Chimney Heights and industrial park systems. Since there does appear to be sufficient capacity to meet the future demands of these two systems (presuming a 50 to 100 percent increase in demand), the recommendations for additional well development and possible interconnection with the City of Danbury stemmed from the need to provide emergency backup (e.g., failure of mechanical equipment or well contamination). As a result the company is actively pursuing the development of their existing well fields to supplement their existing supplies and supply additional customers. A water main extension along Route 6 East is contemplated to serve commercial concerns in that area as well as other improvements (e.g., standpipe painting and water main looping). Bethel Consolidated also anticipates the possibility of extending water service to portions of Brookfield and Newtown.

Between them, the Bethel Water Dept. and Bethel Consolidated account for over 90 percent of the utility supplied water in the community. Thus, it might be anticipated that they would represent logical candidates for providing water to the expanded population base of the Town. Based on the foregoing discussion of future planning by these utilities, it appears that the projected expansion by Bethel Consolidated alone could account (in terms of available water supplies) for the bulk of the population expansion through the year 2000. In light of this, it is reasonable to project that a significant water supply deficit should not be encountered before then (a contention supported by the Army Corps of Engineers report[4]). However, beyond that point additional supply sources are anticipated. (The Army Corps projected a deficit of nearly 0.5 mgd.) Given the lack of obvious surface water supplies, additional groundwater resources appear to be the logical

direction to look for sources within the Town borders. The Sympaug Brook, East Swamp and Dibble's Brook Aquifers have been mentioned[1] as possible options.

A.2 BRIDGEWATER

A.2.1 Utilities Serving Community

Only one utility, Bridgewater Common Condominiums, serves a small portion of the residents of Bridgewater, while the vast majority of the Bridgewater populace relies on individual bedrock wells for their water source.

A.2.2 Existing Utility Supplies

The particulars pertaining to the Bridgewater Common Condominiums are listed in Table A.2 and the location of the wells and service area are shown in Figure A.2 (also see Plate 1).

Since a questionnaire was not received from Bridgewater Common, additional data pertaining to this utility were derived from DOHS files. Based on this information, Bridgewater Common derives its supply from two 6-inch diameter drilled wells, [redacted] and [redacted] with well pump capacities of [redacted] respectively. The well supply's yield is estimated to be about 1.5 times the average daily consumption. One [redacted] atmospheric storage tank and one [redacted] pressurized tank are connected to the system.

A.2.3 Future Water Needs

The Town has conducted past planning projects to assess the availability of water resources for a public water supply. These efforts resulted in an understanding that sufficient groundwater resources did not exist to support a public water system. The one appar-

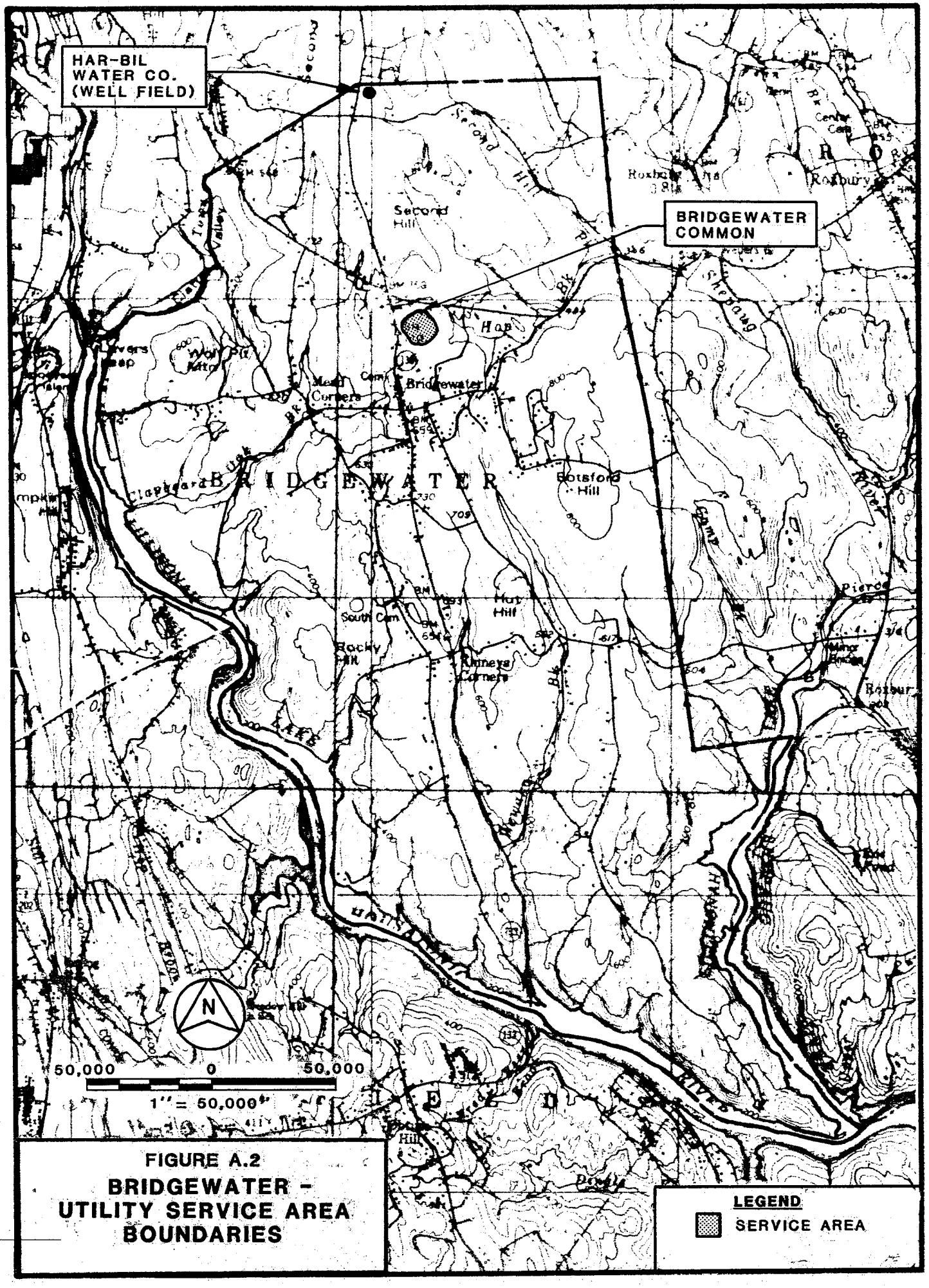

FIGURE A.2

BRIDGEWATER - UTILITY SERVICE AREA BOUNDARIES

LEGEND

SERVICE AREA

TABLE A.2

BRIDGEWATER AREA WATER UTILITIES

WATER UTILITY NAME	RESIDENTIAL POPULATION SERVED (2)						AVG. DAILY USAGE		ESTIMATED YIELD (5) (1000 GPD)	
	DOHS DESIGN EST.	UTILITY SUPPLIED EST.	PER AVG HH SIZE	WUCC CALC. EST.	PERCENT POP. SERVED (3)	SOURCE	PER CAPITA GPCD	TOTAL (1000 GPD) (4)	DOHS CALC.	UTILITY SUPPLIED
Bridgewater Common Condos.	68	-	48	48	3.0	2 wells	75	3.6		-
SUBTOTALS UTILITY SUPPLIED				48	3.0		75 (avg) (6)	3.6		
SELF-SUPPLIED				1562	97.0					
1985 PROJECTED TOTAL POPULATION (1)				1610	100					

NOTES:
(1) Conn. OPM Water Supply Population Projection.
(2) DOHS DESIGN EST.- Typically derived by assuming four people per service connection.
PER AVG HH SIZE - Population estimate based on 1986 average household size estimates for each municipality (adjusted from U.S. Census data by DOHS) multiplied by number of service connections. Where obvious error would result from this approach (e.g. one-bedroom apartments/condominiums noted community summary tables) alternate per residence values were used (e.g., two per one-bedroom units and average household size for two or more bedrooms).
WUCC CALC. EST.- Calculated estimate used throughout report. For smaller utilities (serving less than 1000), the number calculated based on average household size was utilized.
(3) Utilized throughout the report, and based on WUCC estimate of residential population served.
(4) Where utility data were not available, derived by multiplying WUCC estimate of population served by 75 gpcd.
(5) DOHS CALC.- Calculated by multiplying well capacity times 18 hours of pumping per day and reported as 1000 gallons per day.
UTILITY SUPPLIED - Consists of statistically derived safe yield calculations, well yield tests conducted during well installation, or well pump capacities.
(6) For projecting water supply needs elsewhere in the report, the townwide per capita consumption rate of 75 gpcd has been used.

TABLE A.2
(Continued)
BRIDGEWATER AREA WATER UTILITIES

WATER UTILITY NAME	STORAGE			DOHS PEAK DEMAND EVAL. AND CITED PROBLEMS		
	TYPE (1)	NO. UNITS	TOT. VOL. (gal)	MAX. HR. DEMAND (gal)	VOLUME AVAIL. MAX. HR. (gal)	CITED SUPPLY AND WATER QUALITY PROBLEMS
Bridgewater Common Condos.	A ~~P~~	1 ~~I~~	~~—~~	1700	~~—~~	None

NOTE: (1) Letter abbreviations: A - Atmospheric tank
P - Pressurized tank

ent source, the Housatonic River, is not considered viable due to its declaration as a wastewater receiving stream and thus is unsuitable by Connecticut criteria for use as a water supply.

In light of the foregoing discussion, the 1981 HVCEO growth management plan[5] recommended against the installation of any public utilities, such as community water supply, that would stimulate growth within the Town. In this vein, it should be pointed out that one of the alternatives (Shepaug River Diversion, presented in the U.S. Army Corps 1982 report[4] pertaining to water supply in the Housatonic Valley region) could place stress on this growth control philosophy because the diversion's close proximity to Bridgewater could potentially provide a readily available public water supply. The probability of implementing such a strategy on an individual community basis is, however, considered to be very low due to the high implementation cost (treatment, distribution and storage facilities) for the Town.

Although large stratified drift aquifers are not available as significant water sources, the Town's apparent desire for controlled community growth should provide a sufficient buffer between available groundwater and future water supply needs. This approach will lead to a continued reliance on bedrock wells for individual residences, which oft times can be marginal water supply sources. This reliance on groundwater necessitates an active plan to protect Bridgewater's groundwater resources.

A.3 BROOKFIELD

A.3.1 Utilities Serving Community

The Town of Brookfield does not have a community owned water distribution system. Thus, Town residents rely on either individual homeowner wells or receive water from one of the utilities listed in

Table A.3. As may be seen from this table, each of these utilities obtains its water from groundwater sources. Consequently, the entire Town relies upon groundwater supplies.

A.3.2 Existing Utility Supplies

Figure A.3 (also see Plate 1) illustrates the proliferation of small utilities which dominate the water supply situation in the Town of Brookfield. These systems consist of one or more wells (as shown in Table A.3), with the systems ranging from a handful of homeowners on a common well with a few hundred feet of distribution piping to larger residential developments of single family homes or condominiums with more than 200 units and a few miles of distribution piping. Only about one third of the utilities listed in Table A.3 responded to the WUCC questionnaire. Consequently, the data reported in this table consist of additional data derived from the DEP computerized data base and from DOHS questionnaires and utility inspection reports. The DOHS data typically reflect a population estimate equal to four persons per service connection and a per capita usage of 75 gpcd for unmetered (the vast majority) water supplies. Those utilities which did respond are discussed in the remainder of this section. Additional descriptive information on the utilities not responding to the WUCC questionnaire is contained in Table A.3A.

Brookfield Division, Rural Water Co. The Brookfield Division derives its water supply from nine fairly low capacity wells with a reported total combined estimated yield of ab[illegible] which is about three times the average demand of the system. However, recent water shortages have been experienced. For the maximum month of usage a daily average of about 0.056 mgd was reported. These wells supply water to an estimated 880 people in a residential area in the northwestern part of Brookfield. The system contains a variety of atmospheric and pressurized storage tanks, as illustrated in Table A.3. Fire fighting protection services are not provided.

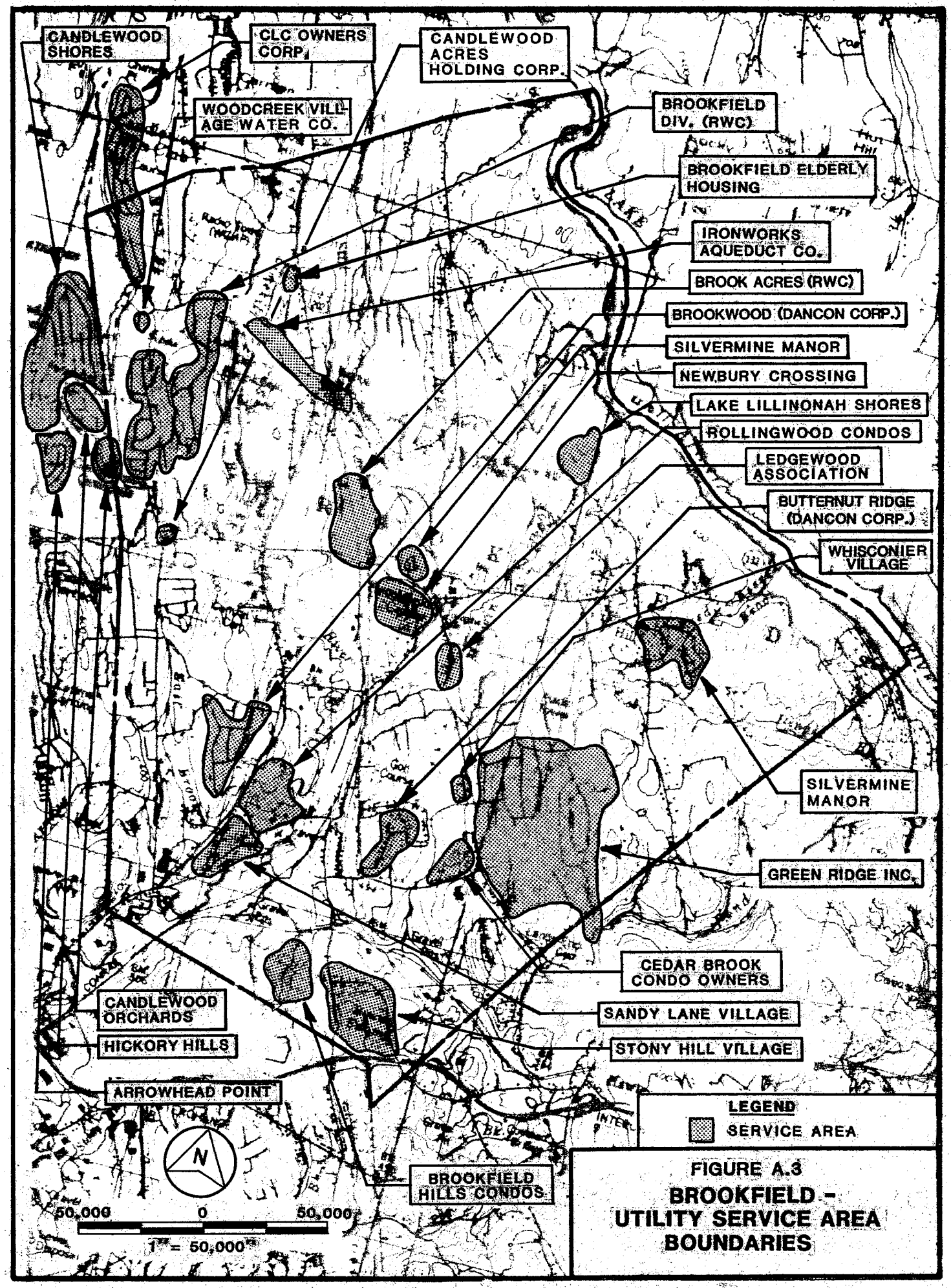

FIGURE A.3

BROOKFIELD - UTILITY SERVICE AREA BOUNDARIES

TABLE A.3

BROOKFIELD AREA WATER UTILITIES

WATER UTILITY NAME	RESIDENTIAL POPULATION SERVED (3) DOHS DESIGN EST.	UTILITY SUPPLIED EST.	PER AVG. HH SIZE	WUCC CALC. EST.	PERCENT POP. SERVED (4)	SOURCE	AVG. DAILY USAGE PER CAPITA GPCD (6)	AVG. DAILY USAGE TOTAL (1000 GPD) (5)	ESTIMATED YIELD (8) (1000 GPD) DO CA	ESTIMATED YIELD (8) (1000 GPD) UTILITY SUPPLIED
Candlewood Shores Estates	1872		1470	1470	10.6	4 wells	75	110.3		
Brookfield Div Rural WC (1)	956	870	750	750	5.4	9 wells	65	48.9		
Greenridge Inc Water Div (1)	836	700	656	656	4.7	4 wells	127	83.5		
Rollingwood Condos.	584		544	544	3.9	3 wells	75	40.8		
Stony Hill Village	392		180	180	1.3	3 wells	75	13.5		
Sandy Lane Village	318		315	315	2.3	2 wells	75	23.6		
Brookwood, Dancon Corp.	296		232	232	1.7	3 wells	75	17.4		
Arrowhead Point Homeowners (1)	288	265	226	226	1.6	2 wells	177	40.0		
Brook Acres, Rural WC (1)	208	200	163	163	1.2	1 well	83	13.5		
Whisconier Village	164		129	129	0.9	1 well	75	9.7		
Brookfield Hills Condos.	144		113	113	0.8	2 wells	75	8.5		
Newbury Crossing	132		139	139	1.0	2 wells	75	10.4		
Hickory Hills	132		104	104	0.7	2 wells	75	7.8		
Cedarbrook Condo. Owners	128		100	100	0.7	1 well	75	7.5		
Lake Lillinonah Shores	128		151	151	1.1	2 wells	75	11.3		
Butternut Ridge, Dancon Corp.	124		97	97	0.7	4 wells	75	7.3		
Candlewood Orchards PD (1)	120	110	94	94	0.7	2 wells	38	3.6		
Indian Fields Homeowners	196		154	154	1.1	2 wells	75	11.6		
CLC Owners Corp. (1) (446)	146		115	115	0.8	4 wells	63 (7)	7.2		
Woodcreek Village (1)	96	75	75	75	0.5	2 wells	75	5.6		
Ledgewood Association	95		98	98	0.7	3 wells	75	7.4		
Candlewood Acres Holding Corp.	80		63	63	0.5	2 wells	75	4.7		
Silvermine Manor	78		82	82	0.6	1 well	75	6.2		
Iron Works Aqueduct Co. (1)	46	30	36	36	0.3	1 well, 2 springs	56	2.0		
Brookfield Elderly Housing	43		---	43	0.3	1 well	75	3.2		
SUBTOTALS UTILITY SUPPLIED				6129	44.2		82 (avg.) (9)	505.4	12	
SELF-SUPPLIED				7741	55.8					
1985 PROJECTED TOTAL POPULATION (2)				13870	100.0					

NOTES:
(1) Denotes that WUCC questionnaire was received.
(2) Conn. OPM Water Supply Population Projection.
(3) DOHS DESIGN EST.- Typically derived by assuming four people per service connection.
PER AVG HH SIZE - Population estimate based on 1986 average household size estimates for each municipality (adjusted from U.S. Census data by DOHS) multiplied by number of service connections. Where obvious error would result from this approach (e.g. one-bedroom apartments/condominiums noted community summary tables) alternate per residence values were used (e.g., two per one-bedroom units and average household size for two or more bedrooms).
WUCC CALC. EST.- Calculated estimate used throughout report. Where utility values were available for larger utilities (greater than 1000), the utility supplied value was assumed. For smaller utilities (serving less than 1000), the number calculated based on average household size was utilized.
(4) Utilized throughout the report, and based on WUCC estimate of residential population served.
(5) Where utility data were not available, derived by multiplying WUCC estimate of population served by 75 gpcd.
(6) Where usage or production information was available from utilities, the per capita consumption value was calculated based upon these figures.
(7) Per capita daily usage based on the utility supplied value for the entire system; utility also serves residences in New Milford.
(8) DOHS CALC.- Calculated by multiplying well capacity times 18 hours of pumping per day and reported as 1000 gallons per day.
UTILITY SUPPLIED - Consists of statistically derived safe yield calculations, well yield tests conducted during well installation, or well pump capacities.
(9) For projecting water supply needs elsewhere in the report, the townwide per capita consumption rate of 80 gpcd has been used.

TABLE A.3
(Continued)
BROOKFIELD AREA WATER UTILITIES

WATER UTILITY NAME	STORAGE TYPE (2)	STORAGE NO. UNITS	STORAGE TOT. VOL. (gal)	DOHS PEAK DEMAND EVAL. AND CITED PROBLEMS MAX. HR. DEMAND (gal)	VOLUME AVAIL. MAX. HR. (gal)	CITED SUPPLY AND WATER QUALITY PROBLEMS
Candlewood Shores Estates	A	1	104000	46800	109388	.Slightly high sodium content .Inadequate pressure at [illegible] .Estimated yield not sufficient, additional 40 gpm source needed
Brookfield Div Rural WC (1)	A P	2 3		23900		.Estimated yield not sufficient
Greenridge Inc Water Div (1)	A	1		20900		None
Rollingwood Condos.	A P	2 25		14600		.Hardness
Stony Hill Village	A P	1 1		4800		.No. 2 well exceeds standards for turbidity
Sandy Lane Village	A	2		7950		.Hardness
Brookwood, Dancon Corp.	A P	1 2		7400		.Permanent water conservation restrictions
Arrowhead Point HO Assoc. (1)	A P	1 2		7200		None
Brook Acres, Rural WC (1)	A P	1 1		5200		None
Whisconier Village	A P	1 1		4100		.Some hardness
CLC Owners Corp. (1)	A	1		3650		.Debris dumped near Well No. 2 and filling near Well No. 6
Brookfield Hills Condos.	A P	1 1		3600		None
Newbury Crossing Condo. Assoc.	A P	1 1		3300		.1984, violation for bacteria .Transfer pump switches not working, one pump out of service .Source failure during dry conditions
Hickory Hills	A P	2 3		3300		None
Cedarbrook Condo. Owners	A P	1 4		3200		None
Lake Lillinonah Shores	A P	2 1		3200		.9/85, coliform bacteria, success. treat. w/chlorine
Butternut Ridge, Dancon Corp.	A P	1 1		3100		None
Candlewood Orchards PD (1)	P	6		3000		None
Indian Fields Homeowners	A P	1 1		4900		None
Woodcreek Village (1)	A P	2 1		2400		None
Ledgewood Association	P	5		1900		None
Candlewood Acres Holding Co.	P	3		2000		None
Silvermine Manor	A P	1 1		1950		None
Iron Works Aqueduct Co. (1)	NA			1070		.Well No. 1 not used due to high iron and manganese .Small (1.5") distribution piping prohibits expansion
Brookfield Elderly Housing	A P	1 1		1075		None

NOTES: (1) Denotes WUCC questionnaire received
(2) Letter abbreviations: A - Atmospheric tank
P - Pressurized tank

DOHS records indicate that one of the wells sampled in 1985 had a sodium content (23 mg/l) slightly in excess of the 20 mg/l standard. It was anticipated, however, that the blending of this water with the water from wells with a lower sodium content should result in acceptable sodium levels for the system users.

Brook Acres Division, Rural Water Co. Brook Acres serves an estimated 200 people in a residential area to the northwest of Brookfield Center. The supply source is a single 250 foot deep 6-inch drilled well with an estimated yield of around [illegible] which is about three times the average daily usage. For the maximum month of usage a daily average of about 0.016 mgd was reported. Two storage tanks, with a total capacity of [illegible] are located within this system. No fire protection utilities are provided.

Greenridge, Inc. The Greenridge supply system serves a 250 home site development adjacent to Route 25 near the Newtown town line, and presently serves an estimated 700 individuals via 208 service connections. The water supply consists of four 6-inch drilled wells with an estimated yield of around [illegible] hich is about 50 percent greater than the average day demand (although it was noted that the yield estimate may be low). For the maximum month of usage a daily average of 0.09 mgd was reported with a maximum day peak of nearly 0.1 mgd. The distribution system consists of about 5 miles of 4 and 6-inch asbestos cement pipe, plus another half mile of 3/4 and 1-inch plastic service connections. [illegible] rage tank is located within the system. Chlorination capability is provided at one well, and the well water quality is reported to meet State standards.

Woodcreek Village. Woodcreek Village is a 24 unit condominium development with about 75 residents located in the northwest part of Brookfield near Candlewood Lake. Water is supplied to residents with two 6-inch drilled wells [illegible] and [illegible] n depth) which the

State reports have an estimated yield of [illegible]. Average water usage is estimated at about 0.007 mgd. A total of [illegible] storage is provided with three tanks.

Candlewood Orchards Property Owners Corp. Candlewood Orchards provides water service to approximately 110 individuals from two wells with an estimated yield of near[illegible]eported average daily use in this residential development of about 3,600 gpd is low (around 30 gallons per person per day), assuming a correct user estimate, and probably represents the bias of summer recreational use. A total of abou[illegible] storage is provided by six pressurized tanks. The positive response in the WUCC questionnaire for difficulty of maintaining source of supply, stemmed from mechanical problems associated with the well pump, which has been replaced.

Arrowhead Point Homeowners Assoc. The Arrowhead Point residential development derives its water from two 6-inch rock wells with a reported yield of around [illegible] This compares to the 0.03 to 0.04 average day demand estimated for the estimated 265 users of the system. The typical daily demand does approach or exceed the safe yield of the well and is obviously the reason for the utility indicating that problems with the source of supply have occurred, although not very often. This situation also supports the utility's conclusion that they require an additional well to handle peak demand periods and pump failures. The water distribution system consists of a combination of 2-inch galvanized steel pipe and 4-inch plastic pipe. Three storage tanks with a total capacity of abou[illegible] are located within the system.

CLC Owners Corp. CLC Owners Corp. provides water service to residents of both Brookfield and New Milford since this development spans the towns' boundary. The data shown in Table A.3 for the population served is that estimated for the Brookfield portion of the development, with the number shown in parentheses indicating the total

population of the development. The average day usage reported in the table may also be somewhat biased by the fact that various users are summer residents only, although there appears to be a transition toward more year-round usage.

Water is provided to the development via three 8-inch and one 6-inch drilled wells (ranging in depth from 100 to 400 feet) with an estimated yield of around [redacted] A fifth drilled well (6-inch diameter by 150 feet deep) serves as a reserve and has an estimated yield of nearly [redacted] ter is provided to residents via nearly 6 miles of transmission and distribution mains ranging in size from 2 to 8 inches in diameter. Pipe material consists of galvanized and cast iron, plastic and asbestos cement. Fire protecton is provided via [redacted] gically placed hydrants, and one [redacted] ed storage tank is located in the system.

The Iron Works Aqueduct Co. The Iron Works Aqueduct Company serves a residential area of 30 people. Water service is provided from 2 springs with an estimated yield of about 10,000 gpd, which is five times the average day demand of the system. A 5 gpm well previously used for water supply has been shut down due to high iron and manganese levels. The company does anticipate a two square mile extension of their service area in the next ten years, also acknowledges the possibility of serving additional utilities. The distribution network is about two miles in length, consisting of 1 and 1/2-inch diameter piping (plastic, lead, copper and iron). The system also contains a covered storage tank with a capacity of 3,000 gallons. Firefighting capability is not provided. The Company also operates as a licensed bottled water company.

defunct

A.3.3 Future Water Needs

The Town has historically relied upon groundwater resources for water supply and the Town's land use policies are oriented towards a

dependence upon groundwater for future development. However, local officials have been concerned[1] about the availability of alternate sources of water for a public supply in the event the groundwater sources become inadequate. The Gallows Hill Aquifer which parallels the Still River in the northern part of Brookfield and southern portion of New Milford has been cited as the most logical location.[1] However, it was noted that more definitive data are required on this aquifer before a site can be identified and an adequate aquifer protection program implemented. The aquifer also lies under the Route 7/202 corridor which has been subjected to significant growth in recent years, and, thus, represents a potential conflict of use in this aquifer's recharge area.

With regard to the development of groundwater supplies, the Brookfield Zoning Commission has established a set of standards governing the installation of water supply wells. These standards represent an aggressive approach to protecting the adequacy of existing and future supplies. These criteria coupled with an aquifer protection program akin to that proposed in a 1979 HVCEO study[6] would help guarantee the viability of the Town's groundwater resources for the long-term. This is obviously a desirable marriage of the existing standards and planned development, however, until an aquifer protection plan is implemented, only the availability of the groundwater will be protected and not its potential quality. Since the Town will continue to rely on groundwater resources (in its entirety for the short-term and at least partially for the long-term), the implementation of an aquifer protection program is of particular importance given the anticipated developmental pressures in this community.

Brookfield also lies along the routes of potential water transmission lines from Candlewood Lake and from the Shepaug Diversion to points of use in the south. The implementation of either of these strategies would provide the potential for significant surface water

resources to the Town. These options, however, are limited by the need for water treatment and/or storage and thus have a low probability of implementation on an individual Town basis. Given the information available, it is difficult to assess the overall adequacy of water supplies in Brookfield. However, with continued reliance on groundwater as the sole source and the continued pressures of development and conflicting land uses, the need for examining alternative water sources is of importance.

A.4 DANBURY

A.4.1 Utilities Serving Community

Danbury has a greater number of utilities serving the City than any other community in the study area. These utilities are listed in Table A.4 and, as is apparent therein, the municipally owned Danbury Water Department provides water to about 90 percent of the community's serviced population or about 72 percent of the City's 1985 projected total population.

The service area boundaries of the various utilities are illustrated in Figure A.4 (also see Plate 1). The Danbury Water Department watershed (also shown in Figure A.4) encompasses approximately the western third of the City adjacent to the New York State border, excluding a section in the northwest corner of the City that falls within the New York City watershed. The Bridgeport Hydraulic Company controls watershed area in the southern portion of the City, as does the Bethel Water Department to a lesser degree. The Bethel Water Department also provides water to a few homes in Danbury that lie near Bethel's primary distribution main between the Eureka Reservoir treatment facility and Bethel proper.

TABLE A.4

DANBURY AREA WATER UTILITIES

WATER UTILITY NAME	RESIDENTIAL POPULATION SERVED (3) DOHS DESIGN EST.	UTILITY SUPPLIED EST.	PER AVG. HH SIZE	WUCC CALC. EST.	PERCENT POP. SERVED (4)	SOURCE	AVG. DAILY USAGE PER CAPITA GPCD (6)	AVG. DAILY USAGE TOTAL (1000 GPD) (5)	EST DDI CA	ED YIELD (7 00 GPD) UTILITY SUPPL
Danbury Water Dept. (1)	45000 (assume)	45000	--	45000	72.0	4 wells, 7 res.	148.9	6700.0	-	100
Lake Waubeeka Prop. Owners	1020		610	610	1.0	2 wells	75	45.7		
Pleasant Acres Water Co.	556		377	377	0.6	7 wells	75	28.3		
Cedar Heights, Rural WC (1)	468	348	317	317	0.5	2 wells	70	22.2		
Robin Hill Condos.	435		472	472	0.8	2 wells	75	35.4		
Indian Springs WC (1)	368	360	249	249	0.4	1 well	96	24.0		
Ridgebury Estates, Dancon	344		233	233	0.4	5 wells	75	17.5		
Racing Brook Water Co.	330		298	298	0.5	2 wells	75	22.4		
Briar Ridge, Dancon Corp.	304		206	206	0.3	3 wells	75	15.5		
Hollendale Estates, THC (1)	288	284	195	195	0.3	6 wells	272	53.1		
Middle River, Dancon Corp.	288		195	195	0.3	2 wells	75	14.6		
Aqua Vista Asso,Inc	224		152	152	0.2	4 wells	75	11.4		
Ken Daks, Rural WC (1)	200	150	136	136	0.2	2 wells	89	12.1		
Sherwood Forest, Dancon	172		117	117	0.2	1 well	75	8.8		
Willow Run, Dancon Corp.	164		111	111	0.2	3 wells	75	8.3		
Clapboard Ridge Heights (1)	164	132	111	111	0.2	1 well	75	8.3		A
Rolling Ridge, Top. HC (1)	160	160	108	108	0.2	2 wells	277	29.9		
Snug Harbor Dev. Corp. (1)	144	150	98	98	0.2	1 well	87	8.5		
Hawthorne Terrace Asso.	144		98	98	0.2	1 well	75	7.4		
Pearce Manor, Rural WC (1)	128	150	87	87	0.1	2 wells	152	13.2		
Ridgeview Gardens, Dancon	116		79	79	0.1	2 wells	75	5.9		
Cornell Hills Asso. (1)	116	100	79	79	0.1	1 well	75	5.9		NA
High Acre Mobile Home Park	88		60	60	0.1	1 well	75	4.5		
Cedar Terrace Prop. Owners	64		43	43	0.1	2 wells	75	3.2		
Ta'agen Point	60		41	41	0.1	1 well	75	3.1		
Tavi Village Condo. Assoc.	60		41	41	0.1	5 wells	75	3.1		
Boulder Ridge Asso.	52		35	35	0.1	2 wells	75	2.6		
Pocono Point	48		33	33	0.1	1 well	75	2.5		
Siboney Terrace	36		24	24	0.0	1 well	75	1.8		
Maple Glen Trailer Park	36		33	33	0.1	1 well	75	2.4		
Bethel Water Dept. (1)	30	30	20	20	0.0	2 wells, 3 res.	75	1.5		
The Cedars Water Supply	28		19	19	0.0	1 well	75	1.4		
SUBTOTALS UTILITY SUPPLIED				49676	79.5		143 (avg.) (8)	7124.4	1038.3	
SELF-SUPPLIED				12794	20.5					
1985 PROJECTED TOTAL POPULATION (2)				62470	100.0					

NOTES:
(1) Denotes that WUCC questionnaire was received.
(2) Conn. OPM Water Supply Population Projection.
(3) DOHS DESIGN EST.- Typically derived by assuming four people per service connection.
PER AVG HH SIZE - Population estimate based on 1986 average household size estimates for each municipality (adjusted from U.S. Census data by DOHS) multiplied by number of service connections. Where obvious error would result from this approach (e.g. one-bedroom apartments/condominiums noted community summary tables) alternate per residence values were used (e.g., two per one-bedroom units and average household size for two or more bedrooms).
WUCC CALC EST.- Calculated estimate used throughout report. Where utility values were available for larger utilities (greater than 1000), the utility supplied value was assumed. For smaller utilities (serving less than 1000), the number calculated based on average household size was utilized.
(4) Utilized throughout the report, and based on WUCC estimate of residential population served.
(5) Where utility data were not available, derived by multiplying WUCC estimate of population served by 75 gpcd.
(6) Where usage or production information was available from utilities, the per capita consumption value was calculated based upon these figures.
(7) DOHS CALC.- Calculated by multiplying well capacity times 18 hours of pumping per day and reported as 1000 gallons per day.
UTILITY SUPPLIED - Consists of statistically derived safe yield calculations, well yield tests conducted during well installation, or well pump capacities.
(8) For projecting water supply needs elsewhere in the report the townwide per capita consumption rate has been rounded to 145 gpcd.

TABLE A.4
(Continued)
DANBURY AREA WATER UTILITIES

WATER UTILITY NAME	STORAGE TYPE (2)	NO. UNITS	TOT. ((	..	DOHS PEAK DE MAX. HR. DEMAND (gal)	VOLUMI MAX.	) EVAL. AND CITED PROBLEMS AIL. gal)	CITED SUPPLY AND WATER QUALITY PROBLEMS
Danbury Water Dept. (1)	A				2233000			None
Lake Waubeeka Prop. Owners	A	2			25500			.4/86, high sodium levels
Pleasant Acres Estates Assoc.	A	3			13900			.Supply problems during power outages .High sodium due to caustic soda addition .Odor and turbidity exceed standards
Cedar Heights, Rural WC (1)	NA	3			11700			.Supply problems during droughts
Robin Hill Condos.	A P	1 1			10875			.Past water shortages, solved with interconnection with city
Indian Springs WC (1)	A P	2 1			9200			.Underground fuel oil tank leaks near well field (no contamination found)
Ridgebury Estates, Dancon	A P	1 1			8600			.Permanent water conservation restrictions
Racing Brook Water Co.	A P	2 1			8250			.Water slightly corrosive
Briar Ridge, Dancon Corp.	A P	1 1			7600			.Permanent water conservation restrictions
Hollendale Estates, THC (1)	A	1			7000			None
Middle River, Dancon Corp.	A P	1 1			7200			.Continual well pit flooding .Permanent water conservation restrictions
Aqua Vista Assoc., Inc.	A	5			5600			.Sodium(1983-85) & coliform(1984) in the past .Permanent conservation restrictions on car washing and lawn/garden watering
Ken Oaks, Rural WC (1)	P	1			5000			.Underground fuel oil tank developed leak near well field (no contamination found) .Vandalism protection needed .Difficulty in meeting supplies .Misc. minor repairs needed
Sherwood Forest, Dancon	A P	1 2			4300			.Water outages due to vandalism .Insufficient supplies to meet peak hour demands .Permanent water conservation restrictions
Willow Run, Dancon Corp.	A P	1 2			3310			.1982, high coliform count .Permanent water conservation restrictions
Clapboard Ridge Heights (1)	P	1			4100			.Periodic color, turbidity prob. .Proper well vent needed .Very rusty pipes
Rolling Ridge Top. HC (1)	P	2			4000			.High color periodically
Snug Harbor Dev. Corp. (1)	A P	1 1			3600			.Supply problems during power outages .Low pressure complaints at highest point in system
Hawthorne Terrace Assoc.	NA	3			3600			None
Pearce Manor, Rural WC (1)	A P	1 1			3200			None
Ridgeview Gardens, Dancon	A P	1 1			2900			.High sodium content .Permanent water conservation restrictions
Cornell Hills Assoc. (1)	P	2			2300			.High sodium (59 mg/l in 3/86)
High Acre Mobil Home Park	A P	1 1			2200			None
Cedar Terrace Prop. Owners	P	3			1600			.pH below 6.4 min. .Permanent (contracted) conservation restrictions on car washing and lawn/garden watering
Ta agen Point	A	1			1500			.Well casing and atmospheric tank badly rusted
Tavi Village Condo Assoc.	NA				1500			.High sodium
Boulder Ridge Assoc.	P	2			1300			.Water shortage proir to new well installation (7/84)
Pocono Point	A P	1 2			1200			.Turbidity when well is low .Permanent unattended lawn/garden watering restrictions
Siboney Terrace	P	1			900			.High sodium and turbidity
Maple Glen Trailer Park	P	1			900			.Odor .Low conc. of VOCs .Interconnection with City recommended as possibility for permanent or back-up source.
The Cedars Water Supply	P	9			700			None

Notes: (1) Denotes WUCC questionnaire received
(2) Letter abbreviations: A - Atmospheric tank
P - Pressurized tank

A.4.2 Existing Utility Supplies

Only about one-fourth of the utilities responded to the WUCC questionnaire. These, however, represent about 93 percent of the utility supplied water.

Danbury Water Department. The Danbury Water Department supply encompasses a relatively complex system of interconnected surface water impoundments with a total watershed area of about 13.7 square miles in the western part of the City. In addition, the City also derives a portion of its supply from wells. As is noted in Table A.4, the estimated total yield of the existing supply [illegible] from surface and groundwater sources, respectively. The surface water impoundments controlled by the Water Department have the following storage capacities:

Impoundment	Storage Capacity (MG)
West Lake Reservoir	
Boggs Pond	
Lower Kohanza Lake	
Upper Kohanza Lake	
Margerie Reservoir	
East Lake Reservoir	
Padanaram Reservoir	
TOTAL	

The surface water supply consists of two components - the West Lake Reservoir system and the Margerie Reservoir system. The West Lake Reservoir system is the largest component from which greater than 60 percent of the surface water supply is derived. This system includes Boggs Pond which is tributary to West Lake Reservoir.

own watershed. The reservoir water is treated at the West Lake Filtration Plant which was recently upgraded.

The Margerie Reservoir system consists of the [redacted] (via pumping). This surface water supply is treated by the Margerie Filtration Plant which is in need of upgrading.

The existing groundwater sources consist of a total of four wells, three of which are in use (one is not used due to high iron content) at the Kenosia Well Field adjacent to Lake Kenosia. An additional well is under construction at the Kenosia Well Field. One other well is located off of Osborne Street. The well water is [redacted] prior to being introduced to the distribution system. Phosphate (corrosion control) feed equipment is also available although it is not always used.

Water is provided to the users via approximately 86 miles of transmission and distribution piping consisting of various materials (cast and ductile iron both cement lined and unlined, as well as cement and asbestos cement pipe) and ranging in size from 4 to 36 inches in diameter. A total of [redacted] of distribution system storage is provided by 11 tanks, and fire protection is provided with approximately 1,100 fire hydrants.

No specific problems were cited with the quality of the water provided, although it was noted that some organic contaminants have been found near the Kenosia Well Field. Given the average day demand of about 6.7 mgd and the estimated yield [redacted] isting supplies are sufficient to meet present demands barring the loss of any portion of either the surface or groundwater supply. During the maximum month of usage a daily average of 7.4 mgd was reported. No supply difficult-

ies have been experienced other than that attributable to system piping restrictions.

With regard to fire flows, although ISO reports were not provided with the questionnaire, it is apparent from the DPUC report information submitted that slightly over one-half of Danbury's distribution piping is either 4 (about 3%) or 6-inch (about 50%) pipe. Given that some of this piping is quite old, it is not surprising that [redacted]

Other Respondents. Of the other 31 utilities providing water to residents of Danbury, only ten (including Bethel Water Department) responded to the WUCC questionnaire, and three of these are part of the Rural Water Co. Thus, DOHS questionnaire and file information were used to generate the bulk of the data presented in Table A.4. Additional information on those utilities not responding to the WUCC questionnaire is included in Table A.4A.

Ken Oaks Division, Rural Water Co. The Ken Oaks Division serves approximately 150 individuals in a residential area adjacent to Lake Kenosia. Service is provided from two drilled wells [redacted] and [redacted] in depth. System storage consists of a si[redacted]ed storage tank. [redacted] services are provided. As shown in Table A.4, the estimated yield of these wells is nearly five times the average daily demand. During the maximum month of usage an average daily flow of about 0.016 mgd was reported. An interconnection with Danbury to augment supply during peak periods is soon to be provided. Recent analytical testing on Well No. 1 of this system found no organics to be present and no other water quality problems were cited.

Cedar Heights Division, Rural Water Co. Cedar Heights draws water from two wells between [redacted] th and provides service to approximately 350 users located near Candlewood Lake. As noted in Table

A.4, the estimated yield of these wells exceeds the average daily demand by a factor of two, although this system has experienced difficulty in maintaining an adequate supply especially during periods of drought. During the maximum month of usage a daily average of abou reported. The distribution system contains three storage tanks with a combined capacity of and house modernization, which is now in progress, will include the addition of a an additional heric storage.

Pearce Manor Estates Division, Rural Water Co. The Pearce Manor Division provides water to a residential development adjacent to the western side of Upper Kohanza Lake. Two drilled we in depth, supply water to an estimated 150 residents of the area. The average daily demand of this system is estimated to be about one-fourth of the estimated well yield, and it is believed that there is sufficient water available to supply an adjacent system. During the maximum month of usage an average daily demand c as reported.

Indian Springs Water Co. The Indian Springs Water Co. serves approximately 360 users from a single well with a reported well yield of abou The estimated yield is about three times the reported average daily demand of about 0.024 mgd. The maximum day demand of aroun approaches the well's estimated yield, while the average daily demand during the maximum month of usage was reported to be abou mgd. Water is supplied via a 6000 foot distribution network which contains three storage tanks with a total capacity of about e provided and no problems with the water supply source were reported.

Snug Harbor Development Corp. The Snug Harbor Development Corp. serves approximately 150 users in a residential development along the

Danbury Bay portion of Lake Candlewood from a single well. The average daily demand is about one half of the estimated yield of the well. The residents connected to this system are served by approximately 2400 feet of distribution pipe which also has two storage tanks with a total capacity of [redacted]. Other than occasional breakdowns of mechanical equipment, no supply problems were cited. The utility also has plans to install an emergency generator.

Topstone Hydraulic Co. The Topstone Hydraulic Co. provides water service to two separate areas in Danbury (Rolling Ridge and Hollandale areas) through a total of 11 wells as shown in Table 1.5. These two systems have a combined average day demand of about 0.083 mgd, with an estimated peak output (well yield) c[redacted] and [redacted] om the Hollandale and Rolling Ridge well fields, respectively. The two systems contain approximately seven miles of 6 and 8-inch distribution piping, with four storage tanks containing about [redacted] ter. The level in the Hollandale wells was reported to have dropped 75 percent over the last 10 years, and as a result an interconnection with the Danbury water system is planned.

A.4.3 Future Water Needs

The Danbury area has been subjected to numerous water supply planning exercises recently both as part of a regional water supply perspective and on more of an individual community basis. Since Danbury represents one of the larger communities in the Housatonic River drainage basin, many of the regional approaches to water supply incorporated Danbury as a major participant. Various options were summarized in HVCEO's[1] recently completed "New Directions for Water Supply Planning," and include the following:

Water Supply Options[1]	Estimated Yield (MGD)
Osborne Well Field Expansion	N.A.
Raise Storage Levels in West Lake and Margerie Reservoirs	~~1.1~~
Ball Pond Brook Diversion	~~1.7~~
Candlewood Lake Diversion	8.?[7]
Sugar Hollow Aquifer	~~1.0~~
Shepaug River Diversion	~~11.0~~
West Aspetuck River Diversion	~~4.7~~

(Class B)
(Class B)

According to the City of Danbury, the Ball Pond Brook Diversion is probably at the top of the desirability and/or implementability list in terms of the most immediate impact on increased water supply. The viability of this source has been established in a 1984 engineering report[8] completed for the City of Danbury Water Department. In addition, Danbury's position on Ball Pond Brook has recently been confirmed in a Statement made by the Mayor of Danbury.[9] The communities of New Fairfield and Danbury, who are impacted by this diversion, have been meeting for several years to resolve the details of this diversion. (Also see Section A.5.3 for additional discussion of this source). Ultimately, the use of this source may involve Northeast Utilities and permits from federal power regulatory agencies due to the potential impact of this diversion on the water level in Candlewood Lake and potentially on its hydroelectric generating capability.

With regard to long-term future supply, Candlewood Lake (presently designated as Class B in the States Adopted Water Quality Classifications) has long been considered as a prime source and the viability of this source was the subject of a recent study[7] funded by the Danbury Water Department. This source is viewed by the Danbury Water Department as the key to a regional water supply approach in which Danbury, as the population center, would serve as the hub for a regional distribution network. This vision incorporates extending major transmission mains from Danbury towards Ridgefield, to Bethel and Newtown, up Route 7 through Brookfield to New Milford, and towards New Fairfield. The New

Milford connection could be further strengthened by the diversion of water from the Shepaug River to the no longer used New Milford Water Company's reservoirs. Following treatment this water could also be fed into the distribution system.

It should also be noted that in terms of protecting its future supplies the City did pass an ordinance in 1982 regulating the use, storage or production of significant quantities of hazardous materials. In addition, there is apparently movement towards the development of a "Water Supply Protection Zone Regulation," as required by a new state law.

The Army Corps report[4] projected an approximate 0.2 mgd and 2.8 mgd deficit for the Danbury Water Department in the years 2000 and 2030, respectively. Given that the average day usage is presently about 70 percent of the estimated yield with peak day usage approaching 100 percent of the estimated yield, additional supplies in the near future appear to be warranted.

A.5 NEW FAIRFIELD

A.5.1 Utilities Serving Community

There is no community owned water distribution system in the Town of New Fairfield, and less than 20 percent of the Town's population is served by the utilities listed in Table A.5. Since only three of the utilities (two of which are operated by the Rural Water Co.) responded to the WUCC questionnaire, the information contained in this table and the service area boundaries shown in Figure A.5 (also see Plate 1) are principally from DOHS questionnaire and file information and DEP's computerized data base. Additional information pertaining to those utilities which did not respond to the WUCC questionnaire is provided in Table A.5A.

TABLE A.5

NEW FAIRFIELD AREA WATER UTILITIES

WATER UTILITY NAME	RESIDENTIAL POPULATION SERVED (3) DOHS DESIGN EST.	UTILITY SUPPLIED EST.	PER AVG. HH SIZE	WUCC CALC. EST.	PERCENT POP. SERVED (4)	SOURCE	AVG. DAILY USAGE PER CAPITA GPCD (6)	AVG. DAILY USAGE TOTAL (1000 GPD) (5)	ESTIMATED YIELD (7) (1000 GPD) DOHS CALC.	ESTIMATED YIELD (7) (1000 GPD) UTILITY SUPPLIED
Ball Pond Water District	736	---	569	569	4.8	10 wells	75	42.7	[illegible]	---
Possum Ridge, Dancon Corp	396	---	306	306	2.6	2 wells	75	23.0	[illegible]	---
Oakwood Acres, Rural WC (1)	376	282	290	282	2.4	3 wells	77	21.8	[illegible]	[illegible]
Knollcrest Real Estate Corp.	372	---	287	287	2.4	4 wells	75	21.5	[illegible]	---
Candlewood Knolls Com. Inc.	360	---	278	278	2.3	4 wells	75	20.9	[illegible]	---
Fieldstone Ridge, Rural WC (1)	112	81	87	81	0.7	2 wells	80	6.5	[illegible]	[illegible]
Interlaken Water Co.	64	---	49	49	0.4	1 well	75	3.7	[illegible]	---
Timber Trails Water Co.	40	---	31	31	0.3	3 wells	75	2.3	[illegible]	---
Hollywyle Park Assoc. (1)	36	36	28	36	0.3	1 well	58	2.1	[illegible]	NA
SUBTOTALS UTILITY SUPPLIED				1919	16.1		75 (avg) (8)	144.4	460.8	
SELF-SUPPLIED				9981	83.9					
1985 PROJECTED TOTAL POPULATION (2)				11900	100.0					

NOTES:
(1) Denotes that WUCC questionnaire was received.
(2) Conn. OPM Water Supply Population Projection.
(3) DOHS DESIGN EST.- Typically derived by assuming four people per service connection.
PER AVG HH SIZE - Population estimate based on 1986 average household size estimates for each municipality (adjusted from U.S. Census data by DOHS) multiplied by number of service connections. Where obvious error would result from this approach (e.g. one-bedroom apartments/condominiums noted community summary tables) alternate per residence values were used (e.g., two per one-bedroom units and average household size for two or more bedrooms).
WUCC CALC EST. - Calculated estimate used throughout report. Where utility data not available, the number calculated based on average household size was utilized.
(4) Utilized throughout the report, and based on WUCC estimate of residential population served.
(5) Where utility data were not available, derived by multiplying WUCC estimate of population served by 75 gpcd.
(6) Where usage or production information was available from utilities, the per capita consumption value was calculated based on these figures.
(7) DOHS CALC.- Calculated by multiplying well capacity times 18 hours of pumping per day and reported as 1000 gallons per day.
UTILITY SUPPLIED - Consists of statistically derived safe yield calculations, well yield tests conducted during well installation, or well pump capacities.
(8) For projecting water supply needs elsewhere in the report, the townwide per capita consumption rate of 80 gpcd has been used.

TABLE A.5
(Continued)
NEW FAIRFIELD AREA WATER UTILITIES

WATER UTILITY NAME	STORAGE			DOHS PEAK DEMAND EVAL. AND CITED PROBLEMS		
	TYPE (2)	NO. UNITS	TOT. VOL. (gal)	MAX. HR. DEMAND (gal)	VOLUME AVAIL. MAX. HR. (gal)	CITED SUPPLY AND WATER QUALITY PROBLEMS
Ball Pond Water District	A P	3 4		18400		...ess, sodium levels, and bacteria problems reported in 11/85 .Permanent voluntary restrictions on lawn/garden watering. .Well No. 6 removed from service due to high iron and manganese .Supply problems until Well Nos. 7, 8, 9, and 10 put in service (1982-83)
Possum Ridge, Dancon Corp.	A P	1 2		9900		rent diminished well yields .Supply loss weekend 5/31-6/1/86 .Permanent water conservation restrictions
Oakwood Acres, Rural WC (1)	A P	1 1		9400		None
Knollcrest Real Estate Corp.	A P	2 1		9300		None
Candlewood Knolls Com. Inc.	NA			9000		NA
Fieldstone Ridge, Rural WC (1)	A P	1 1		2800		.High sodium content
Interlaken Water Co.	P	1			NA	None
Timber Trails Water Co.	A A P	1 1 2				summer.Color complaints in the fall er
Hollywyle Park Assoc. (1)	A P	1		900		.Occasional breakdowns due to winter freezing

Notes: (1) Denotes WUCC questionnaire received
(2) Letter abbreviations: A - Atmospheric tank
P - Pressurized tank
(3) Tank not in use
(4) Tank only used in summer

TABLE A.5A

NEW FAIRFIELD UTITILIES
SYSTEM DESCRIPTION SUMMARY FROM DOHS QUESTIONNAIRES AND INSPECTION REPORTS

UTILITY	DESCRIPTION OF SERVICE AREA AND DISTRIBUTION SYSTEM	WATER SUPPLY AND TREATMENT
Interlaken Water Co.	16 house residential area (3 summer, 13 year round). Distribution via approx.	[redacted]
Ball Pond Water District	184 house residential area. Distribution piping consi[redacted]	[redacted] dia. rock wells varying in dep[redacted] Chlorination provided on irregular [redacted]
Knollcrest Real Estate Corp.	93 house residential area [redacted]	Two [redacted] inch dia. [redacted] ft. [redacted] and [redacted]
Possum Ridge (Dancon Corp.)	99 house residential [redacted]	[redacted] 30 [redacted]
Candlewood Knolls Community, Inc.	Distribution [redacted]	[redacted]

A.5.2 Existing Utility Supplies

Oakwood Acres Division, Rural Water Co. The Oakwood Acres Division supplies water to approximately 285 residents in the residential area northwest of the Margerie Reservoir. The supply is derived from three 6-inch drilled wells (depths of , and) with a total estimated yield of nearly , which is more than two and one half times the estimated average daily demand (may be somewhat low due to potentially faulty meters). During the maximum month of usage an average daily demand of about was reported. The distribution system includes both pressurized (and unpressurized storage.

Fieldstone Ridge Division, Rural Water Co. The Fieldstone Ridge Division supply is obtained from a single 6-inch drilled well (a second well remains unused) which provides water service to between 80 and 90 users in a residential development located in the most southwesterly corner of New Fairfield. This system's well yield is estimated at about 6 times the average daily demand. During the maximum month of usage an average daily demand of about as reported. A is located within the distribution system.

Hollywyle Park Assoc., Inc. Hollywyle Park Association serves 36 people on a seasonal basis from April through October. Each fall the system is drained and remains inoperative throughout the winter months. Water service is provided from one 6-inch diameter rock well, with a The estimated yield of is about five times average day demand of the system. The distribution system is approximately 2500 feet in length, consisting of 2000 feet of 3-inch steel pipe and 500 feet of 3-inch PVC pipe. The system contains storage tank with a capacity of is not provided.

The only problems reported are occasional breakdowns due to leakage and winter freezes while the system is shutdown; these short segments of distribution pipe are repaired or replaced as required. The estimated pipe replacement length over a ten-year period is 2,000 feet. This system is apparently shrinking due to the drilling of private wells by homeowners converting from seasonal to year-round use.

A.5.3 Future Water Needs

The Town's growth policies are oriented towards the use of groundwater for water supply purposes and the avoidance of a costly municipal water distribution system.[1] This orientation and the potential use of the entire Town as a water supply watershed for regional water supply purposes has lead to numerous concerns by local officials which have been elucidated in HVCEO's recent report[1] on water supply planning. However, the crux of this matter is that New Fairfield's surface water resources (Candlewood Lake occupies more area in New Fairfield than any of the other four Towns abutting its shoreline) represent a tremendous economic, recreational and environmental resource for the Town, and obviously the Town's residents and officials are concerned that their interests are protected in the regional water supply arena.

This concern is exemplified by the Town's recently expressed desire[10] to form a municipal water supply company and the long negotiations which have transpired between the Town and City of Danbury regarding the Ball Pond Brook Diversion. This project has recently become more controversial, at least from New Fairfield's perspective, as evidenced by a recent statement[11] submitted to the Housatonic WUCC by the New Fairfield Board of Selectmen. This statement stated a preference for Candlewood Lake as a potential water supply option in lieu of the Ball Pond Brook Diversion. Town officials believe that gauging stations on the Brook and an environmental impact analysis are necessary prerequisites to any supportable position on the desirability

or ease of implementation of a Ball Pond Brook Diversion. The Town wants to insure that decisions on the Brook will be made on the basis of the actual conditions which prevail in the Brook and not on the basis of calculations gathered from an engineering "model." The Town has also expressed that the maximum yield of Ball Pond Brook may be higher than the 1.7 mgd presently proposed for diversion by Danbury and that the use of this potential additional resource is also of concern locally.

In summary, given the Town's complete reliance on groundwater as the supply for their residents, either individually or collectively, any decision making which may compromise their use of this resource will and should be examined carefully.

A.6 NEW MILFORD

A.6.1 Utilities Serving Community

The New Milford Water Co., which is owned by General Waterworks, provides water to over one half of the utility serviced population in New Milford. The remainder of the residents served by utilities receive water from one of the other 25 purveyors listed in Table A.6. The service areas of the various utilities are illustrated in Figure A.6 (also see Plate 1).

A.6.2 Existing Utility Supplies

The response to the WUCC questionnaire from the utilities in the New Milford area was poor, with only three of the twenty-six water suppliers responding. Consequently, the water usage data presented in Table A.6 has been principally derived from DCHS questionnaire information and inspection reports and DEP's computerized data base. Despite the poor return, over 60 percent of the population served is represented by the WUCC questionnaire data, because the largest utility, the New Milford Water Co., did respond. Additional information pertaining to

TABLE A.6

NEW MILFORD AREA WATER UTILITIES

WATER UTILITY NAME	RESIDENTIAL POPULATION SERVED (3) DOHS DESIGN EST.	UTILITY SUPPLIED	PER AVG. HH SIZE	WUCC CALC. EST.	PERCENT POP. SERVED (4)	SOURCE	AVG. DAILY USAGE PER CAPITA GPCD (6)	AVG. DAILY USAGE TOTAL (1000 GPD) (5)	ESTIMATED YIELD (8) (1000 GPD) DOHS CALC.	ESTIMATED YIELD (8) (1000 GPD) UTILITY SUPPLIED
New Milford Water Co. (1)	5920 (assume)	5920	---	5920	29.0	3 wells	117.2	694.0		
Camelot Estates Water Co.	720		513	513	2.5	6 wells	75	38.5		
Millbrook Water Co.	700		499	499	2.4	5 wells	75	37.4		
CLC Owners Corp. (1) (446)	442	335	315	315	1.5	4 wells	63 (7)	19.8		
Sunny Valley Tax Dist. (1)	539	550	384	384	1.9	1 well	86	33.0		NA
Har-Bil Water Co.	448		319	319	1.6	8 wells	75	23.9		
Carmen Hill Orchards W.C.	424		302	302	1.5	3 wells	75	22.7		
Millstone Ridge	392		279	279	1.4	3 wells	75	20.9		
Lone Oak Water Co.	360		257	257	1.3	2 wells	75	19.3		
Indian Ridge Water Co.	288		205	205	1.0	2 wells	75	15.4		
Old Farms Condo. Assoc.	285		271	271	1.3	3 wells	75	20.3		
Birch Groves Assoc. (1)	280	240	200	200	1.0	3 wells	35	7.0		
Candlewood Trails Assoc.	264		188	188	0.9	5 wells	75	14.1		
Lords Mobile Home Park	248		177	177	0.9	1 well	75	13.3		
Dean Heights Water Assoc.	236		168	168	0.8	3 wells	75	12.6		
Hi-Vu Water Co.	200		143	143	0.7	4 wells	75	10.7		
Candlewood Lake Condos.	198		190	190	0.9	2 wells	75	14.2		
Westfalls Mobile Home Park	160		114	114	0.6	2 wells	75	8.6		
Hawthorne East Apts.	126		120	120	0.6	1 well	75	9.0		
Candlewood Springs	124		88	88	0.4	2 wells	75	6.6		
Lillinoah Park Estates	120		86	86	0.4	1 well	75	6.5		
Harrybrooke Park Condos.	100		96	96	0.5	1 well	75	7.2		
Pleasant View Estates	72		51	51	0.2	3 wells	75	3.8		
Parkwood Acres	56		40	40	0.2	3 wells	75	3.0		
River View Court Assoc.	44		31	31	0.2	1 well	75	2.3		NA
Sunny Valley Farm Fndn. (1)	20	20	14	14	0.1	2 wells	75	1.1	NA	NA
SUBTOTALS UTILITY SUPPLIED				10969	53.7		97 (avg.) (9)	1065.1	2717.4	
SELF-SUPPLIED				9451	46.3					
1985 PROJECTED TOTAL POPULATION (2)				20420	100.0					

NOTES:
(1) Denotes that WUCC questionnaire was received.
(2) Conn. DPM Water Supply Population Projection.
(3) DOHS DESIGN EST.- Typically derived by assuming four people per service connection.
PER AVG HH SIZE - Population estimate based on 1986 average household size estimates for each municipality (adjusted from U.S. Census data by DOHS) multiplied by number of service connections. Where obvious error would result from this approach (e.g. one-bedroom apartments/condominiums noted community summary tables) alternate per residence values were used (e.g., two per one-bedroom units and average household size for two or more bedrooms).
WUCC CALC EST.- Calculated estimate used throughout report. Where utility values were available for larger utilities (greater than 1000), the utility supplied value was assumed. For smaller utilities (serving less than 1000), the number calculated based on average household size was utilized.
(4) Utilized throughout the report, and based on WUCC estimate of residential population served.
(5) Where utility data were not available, derived by multiplying WUCC estimate of population served by 75 gpcd.
(6) Where usage or production information was available from utilities, the per capita consumption value was calculated based upon these figures.
(7) Per capita daily usage based on the utility supplied value for the entire system; utility also serves residences in Brookfield.
(8) DOHS CALC.- Calculated by multiplying well capacity times 18 hours of pumping per day and reported as 1000 gallons per day.
UTILITY SUPPLIED - Consists of statistically derived safe yield calculations, well yield tests conducted during well installation, or well pump capacities.
(9) For projecting water supply needs elsewhere in the report the townwide per capita consumption rate has been rounded to 95 gpcd.

TABLE A.6
(Continued)
NEW MILFORD AREA WATER UTILITIES

WATER UTILITY NAME	STORAGE TYPE (2)	STORAGE NO. UNITS	STORAGE TOT. VOL. (gal)	DOHS PEAK DEMAND EVAL. AND CITED PROBLEMS MAX. HR. DEMAND (gal)	VOLUME AVAIL. MAX. HR. (gal)	CITED SUPPLY AND WATER QUALITY PROBLEMS
New Milford Water Co. (1)	A P	1 1		231000	NA	None
Camelot Estates Water Co.	A P	3 1		10000		.Restrictions on outdoor water use
Millbrook Water Co./ Candlewood Point Assoc.	A P	1 3		17500		.Coliform bacteria violation, (1st quarter 1986) .Sporadic bacteria problems .Low pressure problems .Supply problems, requires trucking water to meet summer weekend demand
Sunny Valley Tax Dist. (1)	P	2		13475		.Hardness
Har-Bil Water Co.	A P	1 1		11200		None
CLC Owners Corp. (1)	A	1		11050		.Debris dumped near Well No. 2 and filling near Well No. 6
Careen Hill Orchards W.C.	A P	1 1		10600		.1985 low coliform bacteria levels-corrected by system flushing and disinfection
Millstone Ridge	P	5		9800		.Low pressure in upper system when leakages occur
Lone Oak Water Co.	A P	1 1		9000		.Hardness .High sodium content .Occasional low level coliform bacteria, disinfect as required
Indian Ridge Water Co.	P	1		7200		.Hardness
Old Farms Condo. Assoc.	A P	1 1		7125		.Water shortages prior to well installation in 1981 .Hard water
Birch Groves Assoc. (1)	A P	1 3		7000		.Coliform bacteria
Candlewood Trails Assoc.	P	2		6600		None
Lords Mobile Home Park	P	3		6200		.Storage of potential contaminants in well house
Dean Heights Water Assoc.	A P	1 1		5900		.Supply problems due to diminished well yields, new well site approved
Hi-Vu Water Co.	A P	1 1		5000		.Restrictions on pool filling
Candlewood Lake Condos.	P	3		4950		.Periodic low pressure problems .Mains in poor shape .Well No. 2 high turbidity, color and iron levels
Westfall Mobile Home Park	P	3		4000		.Sodium above standard (1982 - present) .Permanent restriction on car washing
Hawthorne East Apts.	P	1		3150		.Trash dumping in well pit and inadequate drainage of pit
Candlewood Springs	A	1		3100		.1985 coliform bacteria problem due to system leaks, repaired and solved
Lillinoah Park Estates	A P	1 1		3000		.Periodic low pressure problems
Harrybrooke Park Condos.	P	4		2500		.Previous bacteria problems solved with chlorination
Pleasant View Estates	A P	5 1		1800		None
Parkwood Acres	A P	1 1		1400		.Well No. 2 high iron, manganese, and turbidity .Water trucked in 9/23/85 & 10/31/85
River View Court Assoc.	P	1		1100	NA	.High sodium .Restrictions on car washing
Sunny Valley Farm Foundation (1)	A	1		2400	NA	None

Notes: (1) Denotes WUCC questionnaire received
(2) Letter abbreviations: A - Ateospheric tank

TABLE A.6A

NEW MILFORD UTILITIES
SYSTEM DESCRIPTION SUMMARY FROM DOHS QUESTIONNAIRES AND INSPECTION REPORTS

UTILITY	DESCRIPTION OF SERVICE AREA AND DISTRIBUTION SYSTEM	WATER SUPPLY AND TREATMENT
Harrybrooke Park Condominiums, Inc.	35 unit condo. complex (30 two bedroom and 5 one bedroom). Water distribution system consists and	
Millstone Ridge/Forest Hill Estates, Inc.	98 house residential area. Water distribut	
Riverview Court Assoc.	11 house residential area. Distribution system consists of approx.	
Old Farms Condominium Assoc., Inc.	95 two-bedroom unit condo. complex. Water mains consist	and
Hi-Vu Water Co.	50 house residential area. Distribution system consists of	
Camelot Estates	180 house residential area.	
Candlewood Lake Condominiums	72 unit condo complex (18 one-bedroom and 54 two-bedroom).	
Candlewood Point Assoc./Millbrook Water Co.	175 house residential area, with approx. 30 percent used seasonally.	
Candlewood Springs	31 house residential area. Distribution	
Candlewood Trails Assoc.	66 home residential area.	

those utilities not responding to the WUCC questionnaire is listed in Table A.6A. As indicated by the data in Table A.6, the entire Town of New Milford presently derives its water supply from groundwater sources, either via utility owned wells or private individual wells.

New Milford Water Co. The New Milford Water Co. is the largest supplier of water in the Town, and presently derives its water from two gravel-packed wells and one driven well located off Fort Hill Road. The wells range fr[redacted] to about [redacted] in depth and draw water from the Indian Field Aquifer. The estimated yield of the Company's wells [redacted] mgd. Typically the two gravel-packed wells serve as the primary water source with the driven well providing back-up service. The utility serves an estimated 5,920 residents via more than 34 miles of transmission mains and distribution piping, ranging in size from 3/4-inch piping to 12-inch diameter mains. Pipe material varies from galvanized iron (2-inch and smaller service pipe) to cast iron, PVC and asbestos cement for 4-inch diameter or greater piping.

Two storage tanks are located in the distribution system and provid[redacted] total storage capacity of [redacted] ants for public fire fighti[redacted] privately [redacted]

No problems were cited with maintaining a satisfactory source supply [redacted] of sys[redacted] le wa[redacted] this conten[redacted] (27%) [redacted] looped [redacted]

high headloss in these lines. During maximum day demand periods, the water use does climb to within about 40 percent of the estimated yield of the system. Thus, in order to ensure a reliable supply for its existing and potential new customers, the utility is in the process of evaluating additional groundwater sources. The utility recently tested a well off of [redacted] in their Indian Field Aquifer well field which produced [redacted] No water quality problems with the well water were cited, although chlorinators have been provided at the gravel-packed wells in case of need.

It is also important to point out that until 1980 the water supply for the New Milford Water Company was derived from four surface reservoirs (total capacity 236 MG) with an estimated yield of about 0.8 mgd. A change over to groundwater was made in response to the Safe Drinking Water Act of 1974 which set more stringent requirements for color and turbidity and would have necessitated the construction of a treatment facility for this source. Consequently, the Company made an economic decision to transfer to groundwater sources. These reservoirs presently serve as an emergency back-up to the existing wells.

CLC Owners Corp. As discussed in the Brookfield section of this assessment, CLC Owners Corp provides water service to residents of both New Milford and Brookfield since this development spans the Town boundary. The data shown in Table A.6 for the population served is that estimated for New Milford portion of the development with the number shown in parentheses indicating the total population for the development. Additional discussion pertaining to this utility is contained in the Brookfield section of this assessment.

Sunny Valley Tax District Sunny Valley Tax District serves an estimated 550 people in a residential development via a single well with an unreported well yield (however, a DOHS well yield estimate is reported in Table A.6). This is a newly owned utility (formerly New Milford

Heights) which provides service to users via 1 to 2 miles of distribution and transmission mains. Two storage tanks provide a total of 8,000 gallons of storage. The utility does not provide fire protection services.

Birch Groves Assoc. Inc. The Birch Grove Assoc. draws water from three 6-inch rock wells, ranging in depth from [redacted]. The estimated yield of the wells is [redacted] which exceeds the average day demand by greater than 11 times. The maximum day demand and average day demand for the maximum month were reported to be 0.025 mgd and 0.015 mgd, respectively. Water is provided to an estimated 240 users via about 1.6 miles of predominantly 4-inch diameter asbestos cement pipe (remainder consists of about 600 feet of 6-inch cast iron). The system presently includes [redacted] although the addition of another 30,000 gallons of storage is planned. Fire fighting capability consists of two hydrants installed in 1980, but additional hydrant installation is contemplated. The viability of these hydrants for fire fighting is uncertain, however, given the size of the transmission piping. The distribution system also contains [redacted]

Sunny Valley Farms Foundation. The Sunny Valley Farms Foundation maintains water supply for a farming area with water needs for farm use and employee housing (20 people). Water is supplied via an eight-inch gravel well with a depth of [redacted] another six-inch rock well with a depth of [redacted] available as a standby source. The system also includes [redacted]. Firefighting capability is not required.

No demand or estimated yield data for this system was provided in the questionnaire, yet there were no supply problems reported and no growth anticipated. Although the Foundation property borders a nearby landfill, there is no recent record of water quality problems.

A.6.3 Future Water Needs

As discussed previously, New Milford presently relies strictly upon its groundwater resources for water supply purposes, and will continue to do so unless a suitable alternative source of treated surface water is tapped. In light of this reliance on groundwater, an advisory committee has been appointed by the Board of Selectmen to evaluate this situation and provide recommendations regarding protection of water resources and future water needs.

The existing (and formerly used) reservoirs offer an available surface water source of 0.8 mgd (estimated yield), but at the expense of a water treatment facility. Previous planning by the Army Corps of Engineers[4] addresses the issue of diverting West Aspetuck and Shepaug River water for regional water supply purposes. These diversions (with possible relocation of Shepaug diversion point) have also been cited as potential sources of water supply for New Milford itself by diverting this water to the former water supply reservoirs for treatment and distribution. The Shepaug River is presently a Class B source although with a goal of AA. Thus, the actual upgrading of this river, as well as other issues, must be addressed before the Shepaug Diversion could approach a reality. Although the West Aspetuck is classified as Class AA, the reality of this source is far from certain. The Candlewood Lake diversion discussed with Danbury also represents another alternative with similar previously cited limitations.

The Army Corps did not project[4] any water supply deficit for the New Milford Water Company, although the Corps used an estimated safe yield of abc [illegible]s the Water Company' [illegible]te. Given the utility's desire to develop additional groundwater resources, and the potential backup with the existing reservoirs (treatment required), this utility should not experience any foreseeable water quantity deficits. The bulk of the Town (greater than 60 percent) relies on

individual wells, and therefore future development will be closely linked to the ability to adequately dispose of wastewater and develop future groundwater supplies.

A.7 NEWTOWN

A.7.1 Utilities Serving Community

The Town of Newtown presently relies solely on groundwater resources for its water supply. As shown in Table A.7, the Newtown Water Company, which is owned by General Waterworks, supplies more than half of the population connected to water utilities or a little less than 20 percent of the total population of Newtown. Nine other utilities provide service to the remaining residents connected to utility systems, while the remaining two-thirds of the Town is served by individual wells. The service area boundaries of the various utilities are illustrated in Figure A.7 (also see Plate 1).

A.7.2 Existing Utility Supplies

Fifty percent of the utilities located in Newtown responded to the questionnaire, which represented nearly 95 percent of the residents receiving utility supplied water. The information provided about the respondents' existing water systems is presented below, while the remainder are summarized in Table A.7 using both DOHS and DEP information. Additional information on the non-respondents is provided in Table A.7A.

Newtown Water Co. The Newtown Water Co. serves a projected population of about 3,650. The water supply emanates from two gravel-packed well [redacted] d [redacted] depth) located off South Main Street in the Pootatuck Aquifer. The two wells have a combined yield of about [redacted] e other a[redacted] Since the capacity of the smaller of the two wells is about twice the yearly average daily

TABLE A.7

NEWTOWN AREA WATER UTILITIES

WATER UTILITY NAME	RESIDENTIAL POPULATION SERVED (3) DOHS DESIGN EST.	UTILITY SUPPLIED EST.	PER AVG. HH SIZE	WUCC CALC. EST.	PERCENT POP. SERVED (4)	SOURCE	AVG. DAILY USAGE PER CAPITA GPCD (6)	TOTAL (1000 GPD) (5)	ESTIMATED YIELD (7) (1000 GPD) DOHS CALC.	UTILITY SUPPLIED
Newtown Water Co. (1)	2980	3648	---	3648	17.7	2 wells	60.3	223.0		
Fairfield Hills Hosp. (1)	2085	1951	---	1951	9.5	3 wells	183.5	358.0		
Olmstead WaterSupply Co.(1)	396	350	305	305	1.5	5 wells	46	14.0		
Meadowbrook Terrace MHP (1)	180	NA	185	185	0.9	2 wells	75	13.9	NA	NA
Chestnut Tree Hill (1)	188	164	145	145	0.7	4 wells	77	11.1		
Bay Colony MHP	176	---	136	136	0.7	1 well	75	10.2		---
Ashlar of Newtown	156	156	---	156	0.8	9 wells	75	11.7		---
Eagle Hill Rehab. (1)	107	75	82	82	0.4	3 wells	24	2.0		
Cedarhurst Assoc.	75	---	77	77	0.4	1 well	75	5.8		
SUBTOTALS UTILITY SUPPLIED				6685	32.4		97 (avg) (8)	649.6	3361.5	
SELF-SUPPLIED				13925	67.6					
1985 PROJECTED TOTAL POPULATION (2)				20610	100.0					

NOTES:
(1) Denotes that WUCC questionnaire was received.
(2) Conn. OPM Water Supply Population Projection.
(3) DOHS DESIGN EST.- Typically derived by assuming four people per service connection.
PER AVG HH SIZE - Population estimate based on 1986 average household size estimates for each municipality (adjusted from U.S. Census data by DOHS) multiplied by number of service connections. Where obvious error would result from this approach (e.g. one-bedroom apartments/condominiums noted community summary tables) alternate per residence values were used (e.g., two per one-bedroom units and average household size for two or more bedrooms).
WUCC CALC EST.- Calculated estimate used throughout report. Where utility values were available for larger utilities (greater than 1000), the utility supplied value was assumed. For smaller utilities (serving less than 1000), the number calculated based on average household size was utilized.
(4) Utilized throughout the report, and based on WUCC estimate of residential population served.
(5) Where utility data were not available, derived by multiplying WUCC estimate of population served by 75 gpcd.
(6) Where usage or production information was available from utilities, the per capita consumption value was calculated based upon these figures.
(7) DOHS CALC.- Calculated by multiplying well capacity times 18 hours of pumping per day and reported as 1000 gallons per day.
UTILITY SUPPLIED - Consists of statistically derived safe yield calculations, well yield tests conducted during well installation, or well pump capacities.
(8) Townwide average per capita consumption is 97 gpcd with the inclusion of Fairfield Hills Hospital. As discussed in Chapter One, for projecting water supply needs elsewhere in the report, the townwide per capita consumption rate of 60 gpcd has been used.
(9) Safe yield of 4.0 mgd represents aquifer yield as derived from USGS computer modeling of aquifer. The 2.8 mgd value is calculated from the pump capacities reported in the WUCC questionnaire.

TABLE A.7
(Continued)
NEWTOWN AREA WATER UTILITIES

WATER UTILITY NAME	STORAGE			DOHS PEAK DEMAND EVAL. AND CITED PROBLEMS		
	TYPE (2)	NO. UNITS	TOT. VOL. (gal)	MAX. HR. DEMAND (gal)	VOLUME AVAIL. MAX. HR. (gal)	CITED SUPPLY AND WATER QUALITY PROBLEMS
Newtown Water Co. (1)	A	1	[illegible]	86000	[illegible]	None
Fairfield Hills Hosp. (1)	A	2	[illegible]	33800	[illegible]	.2 landfills located over source aquifer
Olmstead Water Supply Co. (1)	A P	2 1	[illegible]	9900	[illegible]	.Supply problems during power loss and leaks in service lines .Permanent voluntary lawn/garden watering restrictions
Meadowbrook Terrace MH (1)	P	2	[illegible]	4500	[illegible]	None
Chestnut Tree Hill (1)	P	2	[illegible]	4700	[illegible]	None
Bay Colony MHP	P	4	[illegible]	4400	[illegible]	.Permanent restrictions on lawn/garden [illegible]ering and sprinkler use
Ashlar of Newtown	A P	1 1	[illegible]	6250	[illegible]	.Water slightly acidic
Eagle Hill Rehab. (1)	A P	1 1	[illegible]	2675	[illegible]	.Generator and diesel storage tank located in well field
Cedarhurst Assoc.	P	1	[illegible]	1875	[illegible]	.Complaints of rust, violations in 1985 of color and turbidity .Restrictions on car washing, washing machines and lawn/garden watering in past

Notes: (1) Denotes WUCC questionnaire received
(2) Letter abbreviations: A - Atmospheric tank
P - Pressurized tank

TABLE A.7A

NEWTOWN UTILITIES
SYSTEM DESCRIPTION SUMMARY FROM DOHS QUESTIONNAIRES AND INSPECTION REPORTS

UTILITY	DESCRIPTION OF SERVICE AREA AND DISTRIBUTION SYSTEM	WATER SUPPLY AND TREATMENT
Ashlar of Newtown (Masonic Home)	Convalescent home with 156 residents (250 maximum).	[redacted]
Cedarhurst Assoc. Inc.	25 seasonal homes. Water distribution [redacted] pipe [redacted] connection	[redacted]
Bay Colony Mobile Home Park	44 unit mobile home park and one commercial connection. Water mains consist of approx	[redacted]

demand and about equal to the peak day demand, the larger well typically serves as a backup well. Taunton Pond which formerly served as the water supply source (replaced with wells due to need for surface water treatment facility) now represents an emergency back-up.

Water is supplied to the users via an approximate 24 mile long system of transmission mains and distribution piping, ranging in size from 2 to 12 inches. The 2-inch piping is predominately galvanized pipe with a lesser amount of copper piping. The 4-inch and larger piping consists of cast or ductile iron, asbestos cement and PVC pipe. The distribution network contains one [redacted] Fire fighting capability is provided with a total of 90 hydrants (company or privately maintained) and 22 privately owned sprinkler systems.

Fairfield Hills Hospital. The Fairfield Hills Hospital water system serves the hospital staff and patients in residence at the hospital, as well as the Newtown Housing for the Elderly complex. In all, water is provided for approximately 1950 individuals plus for the ancillary services associated with the hospital and elderly housing complex. Water is drawn from the Pootatuck Aquifer with three gravel-packed wells ranging in depth fr[redacted] These wells are presently not individually metered, although the total flow delivered to the reservoirs/distribution system is. Based on this metering, the hospital has an estimated water use of 0.35 mgd and the elderly housing complex of 8000 gpd. The estimated yield [redacted] rted is based on USGS modeling of the Pootatuck Aquifer. Given the well pumps presently installed a yield of abou[redacted] obtained from the wells (both values are listed in Table A.7).

The distribution system contains [redacted] storage tanks and fire fighting capability is provided with 37 hydrants located around the complex. Prior to entering the system the well water is [redacted]

The hospital distribution system is interconnected with the Newtown Water Co. system via an 8-inch pipe. This connection was provided to facilitate construction of the original building and is not used, although it theoretically could be used in an emergency to receive water from the Newtown system. No metering exists at the interconnection.

Meadowbrook Terrace Mobile Home Park. Meadowbrook Terrace provides water to 60 manufactured homes at their park as part of the space usage fees. Water is provided with two wells. The system h[redacted] of storage and no fire fighting services are provided.

Eagle Hill Rehabilitation. Eagle Hill is a health care facility which provides water to its 72 residents and staff. The water source consists of t[redacted] packed wells (ranging in depth from [redacted] with a reported yield [redacted]. The transmission piping from the wells to each building and the two storage tanks (total [redacted] sists of 4-inch cast iron (with 1}-inch copper service connections). A total of three hydrants are provided for fire protection. One new building is planned for the complex.

Olmstead Water Supply Co. The Olmstead Water Supply Co. serves a residential area adjacent to the Housatonic River, near the point where Interstate 84 crosses the river. A total of 350 residents are served by four supply wells located at various points around the development. The estimated yield of these wells is nearl[redacted] ich is nearly twice the average day usage and about one third greater than the average demand during the maximum month. Water is supplied to the users via a distribution network which is about 2.4 miles in length. The system has two storage tanks with a combined capacity of [redacted]s. Fire fighting service is not provided. Other than problems during power outages, no supply source difficulties were noted.

Chestnut Tree Hill. Chestnut Tree Hill serves approximately 164 people in a residential area located near the Pootatuck River south of

the Route 34/Interstate 84 interchange. Water service is provided from four wells with an estimated yield of nea[illegible]ch is only about 30 percent greater than the average day demand of the system. The distribution network is slightly less than one mile in length, and contains two storage tanks with a total capacity [illegible] ire-fighting capability is not provided.

A.7.3 Future Water Needs

The HVCEO[1] indicated past water supply planning has not identified any proposed surface water supply watersheds within the Town of Newtown. In light of this, it appears that groundwater will continue to serve as the prime or sole source for water. The Town's 1981 Plan of Development[1] has recognized the importance of groundwater and thus the Planning and Zoning Commission has established an Aquifer Protection District consisting of those lands considered to primary and secondary recharge areas for the Pootatuck Aquifer. This same plan considered the only expansion of the public water supply system to be a westward expansion along Route 6.

The Housatonic Aquifer has been mentioned[1] as a potential water supply source capable of yielding up to about 1.5 mgd. The Taunton Pond supply which presently serves as emergency back-up represents a potential of around 0.54 mgd, although treatment of this surface water would be necessitated.

It should also be pointed out that about 2,100 to 2,200 acres of land in the southern part of Newtown serve as watershed area for the Bridgeport Hydraulic Co.

A.8 RIDGEFIELD

A.8.1 Utilities Serving Community

The Ridgefield Water Supply Co. is the principal provider of water in the Town, supplying around 80 percent of the water to the utility serviced population. The other utilities which also serve residents in the Town are listed in Table A.8. Information pertaining to the non-respondents was derived from DOHS and DEP sources and is presented in Table A.8A. Responses were received from 50 percent of the utilities, which represented nearly 98 percent of the utility supplied water.

A.8.2 Existing Utility Supplies

The service areas of the various utilities are illustrated in Figure A.8 (also see Plate 1). As shown therein, the central portion of Ridgefield is serviced by the Ridgefield Water Supply Company.

Ridgefield Water Supply Company. The Ridgefield Water Supply Co. serves an estimated population of 8,450 in the central part of the community. Water is supplied from a combination of surface and groundwater supplies. The surface water is derived from Round Pond Reservoir which has a yield o[illegible] Groundwater is pumped from a series of eight wells (four at the Oscaleta Well Field, three at North Street site and one at Prospect Ridge site) which provide a reported yield o[illegible] mgd, resulting in a total system estimated yield o[illegible] As may be seen from a comparison of the estimated yield and the demands listed in Table A.8, the yearly average day demand is nearly equal to the estimated yield, while the maximum month average demand exceeds the estimated yield and the peak demand is nearly 40 percent over th[illegible] mgd value. As a result of the low estimated yield versus demand, the Ridgefield Water Supply Company has located a potential 0.38 mgd deep rock well source in the western part of Ridgefield near the Titicus River and, presuming the land can be obtained, the Company will apply for a diversion permit to use this source.

Water is supplied to the users via more than 35 miles of transmission and distribution piping ranging in size from one and 1/2-inch

TABLE A.8

RIDGEFIELD AREA WATER UTILITIES

WATER UTILITY NAME	RESIDENTIAL POPULATION SERVED (3) DOHS DESIGN EST.	UTILITY SUPPLIED EST.	PER AVG HH SIZE	WUCC CALC. EST.	PERCENT POP. SERVED (4)	SOURCE	AVG. DAILY USAGE PER CAPITA GPCD (6)	AVG. DAILY USAGE TOTAL (1000 GPD) (5)	ESTIMATED YIELD (7) (1000 GPD) DOHS CALC.	ESTIMATED YIELD (7) (1000 GPD) UTILITY SUPPLIED
Ridgefield Water Co. (1)	13950	8450	---	8450	40.0	8 wells, 1 res.	91.5	773.0	NA	[illegible]
Ridgefield Knolls, THC (1)	948	952	713	713	3.4	6 wells	116	83.0	NA	[illegible]
Ridgefield Lakes, Rur.WC(1)	656	516	494	494	2.3	14 wells	57	28.1	[illegible]	[illegible]
Scodon, Rural Water Co. (1)	300	216	226	226	1.1	3 wells	86	19.4	[illegible]	[illegible]
Soundview, Rural WC (1)	136	102	102	102	0.5	1 well	73	7.4	[illegible]	[illegible]
Brookview Supply	92	---	69	69	0.3	1 well	75	5.2	[illegible]	---
St. Thomas Seminary	45	45	---	45	0.2	3 wells	75	3.4	[illegible]	---
Acre Lane, Inc.	56	---	42	42	0.2	1 well	75	3.2	[illegible]	---
Craigmoor, Rural WC (1)	68	54	51	51	0.2	3 wells	80	4.1	[illegible]	[illegible]
Mamanasco Lake	64	---	48	48	0.2	2 wells	75	3.6	[illegible]	---
SUBTOTALS UTILITY SUPPLIED				10240	48.5		91 (avg) (8)	930.3		
SELF-SUPPLIED				10880	51.5					
1985 PROJECTED TOTAL POPULATION (2)				21120	100.0					

NOTES:
(1) Denotes that WUCC questionnaire was received.
(2) Conn. OPM Water Supply Population Projection.
(3) DOHS DESIGN EST.- Typically derived by assuming four people per service connection.
PER AVG HH SIZE - Population estimate based on 1986 average household size estimates for each municipality (adjusted from U.S. Census data by DOHS) multiplied by number service connections. Where obvious error would result from this approach (e.g. one-bedroom apartments/condominiums noted community summary tables) alternate per residence values were used (e.g., two per one-bedroom units and average household size for two or more bedrooms).
WUCC CALC EST.- Calculated estimate used throughout report. Where utility values were available for larger utilities (greater than 1000), the utility supplied value was assumed. For smaller utilities (serving less than 1000), the number calculated based on average household size was utilized.
(4) Utilized throughout the report, and based on WUCC estimate of residential population served.
(5) Where utility data were not available, derived by multiplying WUCC estimate of population served by 75 gpcd.
(6) Where usage or production information was available from utilities, the per capita consumption value was calculated based upon these figures.
(7) DOHS CALC.- Calculated by multiplying well capacity times 18 hours of pumping per day and reported as 1000 gallons per day.
UTILITY SUPPLIED - Consists of statistically derived safe yield calculations, well yield tests conducted during well installation, or well pump capacities.
(8) For projecting water supply needs elsewhere in the report the townwide per capita consumption rate has been rounded to 90 gpcd.

TABLE A.8
(Continued)
RIDGEFIELD AREA WATER UTILITIES

WATER UTILITY NAME	STORAGE TYPE (2)	STORAGE NO. UNITS	STORAGE TOT. VOL. (gal)	DOHS PEAK DEMAND EVAL. AND CITED PROBLEMS MAX. HR. DEMAND (gal)	VOLUME AVAIL. MAX. HR. (gal)	CITED SUPPLY AND WATER QUALITY PROBLEMS
Ridgefield Water Co. (1)	A	2		267000	(4)	.Low water pressure in Eleven Levels development (DPUC ordered eval. of booster station)
Ridgefield Knolls, THC (1)	A	1		23700	(5)	.Low pressure problem in upper distribution system
Gordon, Rural WC (1)	A P	2 3		7500		None
Soundview, Rural WC (1)	A P	1 1		2460		None
Brookview Supply	A P	2 1		1925		None
St. Thomas Seminary	P	2		1125		.High sodium content Well No. 1 (which is to be abandoned after new well is installed)
Acre Lane, Inc.	P	1		1400		None
Craigmoor, Rural WC (1)	A P	1 1		1700		.High sodium levels
Mamanasco Lake	P	3		1600		.3/85 bacteria problem, resolved by chlorination
Ridgefield Lakes, Rural WC (1) (3)						
Well system No. 2	P	1		700.0		.High sodium conc., hardness
No. 1	A P	1 1		1000.0		
No. 5 & 14	P	1		2400.0		.High sodium conc., hardness
No. 7 & 18	A P	1 1		4800.0		.High sodium conc., water was being softened due to high hardness
No. 15	P	1		1000.0		.High sodium conc., hardness
No. 11	P	1		600.0		.High sodium conc., hardness
No. 9 & 9A	P	1		900.0		.High sodium conc., hardness
No. 10, 10A, 16 & 17	A P	2 2		5000.0		.High manganese levels
No. 22	NA			120.0	N	None

Notes: (1) Denotes WUCC questionnaire received
(2) Letter abbreviations: A - Atmospheric tank
P - Pressurized tank
(3) Consists of independent systems in same area
(4) DOHS indicates that storage is adequate when tank is full each day
(5) DOHS indicates that storage is adequate if distribution piping does not restrict flow

TABLE A.8A

RIDGEFIELD UTILITIES
SYSTEM DESCRIPTION SUMMARY FROM DOHS QUESTIONNAIRE AND INSPECTION REPORTS

UTILITY	DESCRIPTION OF SERVICE AREA AND DISTRIBUTION SYSTEM	WATER SUPPLY AND TREATMENT
Acre Lane, Inc.	14 house residential area. Water distribution via approx. 2000 ft. of copper pipe.	[redacted]
Brookview Water Co.	23 house residential area. Distribution system consists of approximately 2500 ft. of 1-½ to 2-½" galv. pipe.	[redacted]
Mamanasco Lake	16 house residential area, with interconnected upper (9 houses) and lower (7 houses) systems.	[redacted]
Ridgefield Knolls	237 house residential area, several of which hav[redacted]	[redacted] driven well are no longer used. No treatment.
St. Thomas Aquinas Seminary	Seminary with maximum service population of 45.	[redacted] Well No. 1 to be abandoned and replaced [redacted]

(service connections) to 12-inch diameter piping. The bulk of the larger piping is cast or ductile iron with a lesser amount of asbestos cement, cement and PVC. The service piping (2-inches and smaller) composition is quite variable. The distribution system contains 253 hydrants, all 4-inch, for fire fighting and a single 0.488 million gallon storage tank. Other than [redacted] addition no other treatment is provided for either the surface or groundwater supplies.

Problems were noted with maintaining source supply for fire fighting, as well as occasional difficulties with power outages. Given the system's estimated yield, the pipe sizing and low pressures noted at higher elevations, the problems associated with fire fighting is most probably attributable to a combination of excess system demand during fires as well as water transmission difficulties.

No particular water quality problems were reported although data provided indicated the presence of commonly occurring [redacted] very low levels and one other organic (all below acceptable drinking water standards).

Ridgefield Lakes Division, Rural Water Co. The Ridgefield Lakes water system provides service to a residential area around Wataba and Forest Hill Lakes in the northeastern part of Ridgefield. Water is supplied to an estimated 513 residents via 16 six-inch drilled wells ranging in depth from [redacted] to [redacted]. This service area really consists of 10 independent water systems, with the following usage and estimated yields:

Well Nos.	Estimated Yield (1000 gpd)	Average (Yearly) Daily Usage (1000 gpd)
1	[redacted]	1.4
2		0.96
4		0.10
5 & 14		3.9

Well Nos.	Estimated Yield (1000 gpd)	Average (Yearly) Daily Usage (1000 gpd)
7 & 18		11.0
9 & 9A		1.3
10, 10A, 16 & 17		6.0
11		1.6
15		1.5
22		0.36
TOTAL		28.1

The foregoing information indicates that with the exception of one system, the estimated yield is at least four to five times the average daily usage.

To complement the 16 wells a total of 16 storage tanks are provided ranging in capacity from less than 100 gallons to ove[redacted]. Total storage capacity for this service area is nearly 0.31 million gallons. No fire protection services are provided and no water quality problems were cited.

Soundview Division, Rural Water Co. The Soundview area consists of a small residential area of slightly over 100 residents in the southern-central part of Ridgefield. Water is provided to the users with a single 275 foot deep, 6-inch drilled well, with an estimated yield of nearl[redacted]ne estimated yield is about 2.5 times the average demand of the system. A [redacted]age tank is located within the system.

Craigmoor Division, Rural Water Co. The Craigmoor system supplies water to a small residential area of about 50 people adjacent to Mamanasco Lake. Water is supplied from three 6-inch drilled wells with an estimated yield around [redacted] is about four times the average (yearly) demand of the system. Despite the apparent buffer, the Craigmoor system has experienced difficulties of maintaining supply during dry years indicating that their source is

rather sensitive to groundwater recharge. As a result, the Company has plans to install an additional well to augment the existing supply. The system contains [illegible] storage tank and does not provide fire fighting capability.

Scodon Division, Rural Water Co. Scodon system serves approximately 215 people in a residential area in the north-central part of Ridgefield near the City of Danbury. The four 6-inch drilled, water supply wells (ranging in depth from [illegible] have an estimated yield of nearly [illegible] which is about seven times the average daily demand of the system, and nearly six times the peak demand. As a result, the Company feels that there is potential to supply up to 50,000 gpd of water to neighboring systems. Three storage tanks, with a total capacity of about [illegible] located within the system.

A.8.3 Future Water Needs

With regard to water supply issues, it is important to note the over 60 percent of Ridgefield's land area is used as water supply areas for other communities. This includes the City of New York, Norwalk First Taxing District Water Department, Norwalk Second Taxing District Water Department, Stamford Water Company, Bridgeport Hydraulic Company and the Danbury Water Department. Obviously, many diverse interests receive water from the Ridgefield watershed areas.

The Town has recognized the problems associated with its overall water supply needs, and, as a result, has invested in a USGS study to evaluate various stratified drift aquifers within the community. In addition, the Town has formed a Water Task Force consisting of various officials and commission representatives to regularly review water supply issues. The Task Force and the Ridgefield Water Supply Co. typically cooperate on long range water planning efforts. In coordination with these efforts, the Water Supply Co. has engaged an engineering firm to locate bedrock water sources.

In addition, a joint study being conducted by the Connecticut DEP and USGS has preliminarily identified about 1.0 mgd of available water from Sugar Hollow Aquifer which straddles the Danbury-Redding-Ridgefield border. The availability of the water source will undoubtedly be subjected to competing interests.

A.9 ROXBURY

The entire community of Roxbury relies upon individual wells for its water supply, thus a discussion of the Town's utilities is not possible. The Town is predominately rural, and somewhat more remote from the major growth areas of the region than the other study area communities, both in physical distance and by the lack of major arterial connections to the urban centers. The reliance upon groundwater and the general lack of other major sources (see below), makes the protection of groundwater a very important facet of water supply and growth related planning activities for the community.

Other than the Shepaug River Diversion alternative (which would occur in the southwest corner of Roxbury) identified by the Army Corps[4] as a potential water supply for communities to the southwest of Roxbury, the Town has not figured into any regional water supply plans. This scheme, however, would have to overcome a number of obstacles before it could be implemented, for example the use of an existing Class B river (but with a goal of AA) for water supply purposes and construction of a long pipeline through a number of communities to the point of use. This water source or other points along the Shepaug do offer water supply potential for the Town, but the Class B water issue, probable water treatment requirements, and the distribution of this water to potential users promise to make this a difficult and expensive source for future water supplies.

A.10 SHERMAN

A.10.1 Utilities Serving Community

According to DOHS and DEP information only two utilities serve the Town of Sherman, while the remainder and vast majority (nearly 80 percent) of the Town's residents rely on individual wells for their water. The service areas of these two utilities are shown in Figure A.9 (also see Plate 1).

A.10.2 Existing Utility Supplies

Since WUCC questionnaires were not received from the two utilities in Sherman, the data in Tables A.9 and A.9A (derived from DEP and DOHS sources) provide a complete summary of available information on these utilities at this time.

A.10.3 Future Water Needs

All of Sherman's water supplies, both individual and utility sources, are derived from groundwater resources. Sherman represents one of the smaller communities (in terms of population) in the study area. As with Roxbury, it is somewhat isolated from the major population centers and growth areas, and, thus, significant future water demands are not anticipated for this community. Consequently, groundwater supplies will continue to play the predominant, if not the only, role in water supply for the area.

Sherman was not a targeted community in the Corps of Engineers regional water supply planning study.(4) The West Aspetuck Diversion, which occurs in New Milford, and the supply line running to the south from this diversion are relatively close to Sherman's eastern border. However, Sherman was not envisioned as a recipient of this water in the study, and it is not perceived that this source would be needed for the community.

TABLE A.9

SHERMAN AREA WATER UTILITIES

WATER UTILITY NAME	RESIDENTIAL POPULATION SERVED (2) DOHS DESIGN EST.	UTILITY SUPPLIED EST.	PER AVG HH SIZE	WUCC CALC. EST.	PERCENT POP. SERVED (3)	SOURCE	AVG. DAILY USAGE PER CAPITA GPCD	AVG. DAILY USAGE TOTAL (1000 GPD) (4)	ESTIMATED YIELD (5) (1000 GPD) DOHS CALC.	ESTIMATED YIELD (5) (1000 GPD) UTILITY SUPPLIED
Timber Trails Water Co.	420	---	282	282	11.4	3 wells	75	21.2		---
Holiday Point Assoc. Inc.	24	---	16	16	0.6	1 well	75	1.2		---
SUBTOTALS	UTILITY SUPPLIED			298	12.0		75 (avg) (6)	22.4	212.8	
	SELF-SUPPLIED			2182	88.0					
1985 PROJECTED TOTAL POPULATION	(1)			2480	100.0					

NOTES:
(1) Conn. OPM Water Supply Population Projection.
(2) DOHS EST.- Typically derived by assuming four people per service connection.
PER AVG HH SIZE - Population estimate based on 1986 average household size estimates for each municipality (adjusted from U.S. Census data by DOHS) multiplied by number of service connections. Where obvious error would result from this approach (e.g. one-bedroom apartments/condominiums noted community summary tables) alternate per residence values were used (e.g., two per one-bedroom units and average household size for two or more bedrooms).
WUCC CALC. EST.- Calculated estimate used throughout report. For smaller utilities (serving less than 1000), the number calculated based on average household size was utilized.
(3) Utilized throughout the report, and based on WUCC estimate of residential population served.
(4) Where utility data were not available, derived by multiplying WUCC estimate of population served by 75 gpcd.
(5) DOHS CALC.- Calculated by multiplying well capacity times 18 hours of pumping per day and reported as 1000 gallons per day.
UTILITY SUPPLIED - Consists of statistically derived safe yield calculations, well yield tests conducted during well installation, or well pump capacities.
(6) For projecting water supply needs elsewhere in the report, the townwide per capita consumption rate of 75 gpcd has been used.

TABLE A.9
(Continued)
SHERMAN AREA WATER UTILITIES

WATER UTILITY NAME	STORAGE			DOHS PEAK DEMAND EVAL. AND CITED PROBLEMS		
	TYPE (1)	NO. UNITS	TOT. VOL. (gal)	MAX. HR. DEMAND (gal)	VOLUME AVAIL. MAX. HR.(gal)	CITED SUPPLY AND WATER QUALITY PROBLEMS
Timber Trails Water Co.	A (2)	1		10500		.Color complaints in the fall
	A	1				
	P	2				
Holiday Point Assoc. Inc.	A	2		600		'?84, bacteria violation, corrected .Potential dual connections with individual well and community supply; in violation of health code

Notes: (1) Letter abbreviations: A - Atmospheric tank
P - Pressurized Tank
(2) Tank only in use during the summer

TABLE A.9A

SHERMAN UTILITIES
SYSTEM DESCRIPTION SUMMARY FROM DOHS QUESTIONNAIRES AND INSPECTION REPORTS

UTILITY	DESCRIPTION OF SERVICE AREA AND DISTRIBUTION SYSTEM	WATER SUPPLY AND TREATMENT
Timber Trails Water Co.	Two systems in 96 and 9 home residential areas. Also, some additional homes in area have individual wells. Some residences season[redacted]	First system (96 [redacted] A third well is not used. Second system (9 homes) [redacted]
Holiday Point Assoc.	Residential area with 6 homes attached to system. Also an additional 42 homes have curb stops for possible future connection. Distribution mains consist of 2", 2½" and 3" galv. pipe. Summer usage onl[redacted]	[redacted] more days per season.

A.11 SOUTHBURY

A.11.1 Utilities Serving Community

As shown in Table A.10, the Heritage Village Water Company is the largest of the utilities providing water to residents of Southbury. In addition to the Southbury residents served by Heritage Village, the utility also serves a few residents (approximately 75) in the Towns of Oxford and Middlebury. The bulk of their water supply to these other communities consists of commercial/industrial usage. As is evident from this table, all of the utilities derive their water supply from groundwater sources. Thus, the entire community relies upon groundwater for water supply. The service areas of the various utilities are depicted in Figure A.10 (also see Plate 1).

A.11.2 Existing Utility Supplies

Only two of the utilities serving Southbury responded to the WUCC questionnaire, therefore, the data presented in Table A.10 was derived principally from DOHS questionnaire and inspection report information and DEP's computerized data base. Additional descriptive information on the non-respondents is provided in Table A.10A.

Lakeside Water Co. The Lakeside Water Co. serves 450 residents with the supply provided from 3 wells having a combined estimated yield of [redacted]. Although the company did not provide average daily demand data, they did report difficulties maintaining supply throughout the summer of 1985, reflecting the increased demand by the seasonal residents. In addition, the company does anticipate a future extension of the service area. The company recognizes the need for additional sources and plans to dig a new well, pending a grant approval.

TABLE A.10

SOUTHBURY AREA WATER UTILITIES

WATER UTILITY NAME	RESIDENTIAL POPULATION SERVED (3) DOHS DESIGN EST.	UTILITY SUPPLIED EST.	PER AVG HH SIZE	WUCC CALC. EST.	PERCENT POP. SERVED (4)	SOURCE	AVG. DAILY USAGE PER CAPITA GPCD (7)	AVG. DAILY USAGE TOTAL (1000 GPD) (8)	ESTIMATED YIELD (9) (1000 GPD) DOHS CALC.	ESTIMATED YIELD (9) (1000 GPD) UTILITY SUPPLIED
Heritage Village WC (1)	9084	6425 (6)	---	6425	42.7	5 wells	117.7	765.0		
Southbury Training School	2200	1100 (5)	---	1100	7.3	3 wells	272.7	300.0		NA
Lakeside Water Co. (1)	572	450	332	332	2.2	3 wells	75	24.9		
River Glen Cont Care Center	270	---	157	157	1.0	4 wells	75	11.8		---
Oakdale Manor Water Assoc.	40	---	23	23	0.2	1 well	75	1.7		---
SUBTOTALS UTILITY SUPPLIED				8037	53.4		137 (avg) (10)	1103.4		
SELF-SUPPLIED				7023	46.6					
1985 PROJECTED TOTAL POPULATION (2)				15060	100.0					

NOTES:
(1) Denotes that WUCC questionnaire was received.
(2) Conn. OPM Water Supply Population Projection.
(3) DOHS DESIGN EST.- Typically derived by assuming four people per service connection.
PER AVG HH SIZE - Population estimate based on 1986 average household size estimates for each municipality (adjusted from U.S. Census data by DOHS) multiplied by number of service connections. Where obvious error would result from this approach (e.g. one-bedroom apartments/condominiums noted community summary tables) alternate per residence values were used (e.g., two per one-bedroom units and average household size for two or more bedrooms).
WUCC CALC EST.- Calculated estimate used throughout report. Where utility values were available for larger utilities (greater than 1000), the utility supplied value was assumed. For smaller utilities (serving less than 1000), the number calculated based on average household size was utilized.
(4) Utilized throughout the report, and based on WUCC estimate of residential population served.
(5) Per telecon residential population = 1100, staff = 1900. The 1100 value was used to determine total population served.
(6) Utility provides service to approximately 75 residents in Middlebury and Oxford, thus the 6500 person estimate provided by the utility was reduced to 6425 to be representative of the Housatonic area. The commercial/industrial component was retained so as to provide a proper weighting of the utility's strong commercial/industrial base which is expected to grow.
(7) Where utility data were not available, derived by multiplying WUCC estimate of population served by 75 gpcd.
(8) Where usage or production information was available from larger utilities, the per capita consumption value was calculated based upon these figures.
(9) DOHS CALC.- Calculated by multiplying well capacity times 18 hours of pumping per day and reported as 1000 gallons per day.
UTILITY SUPPLIED - Consists of statistically derived safe yield calculations, well yield tests conducted during well installation, or well pump capacities.
(10) Townwide average per capita consumption is 137 gpcd with the inclusion of Southbury Training School. As discussed in Chapter One, for projecting water supply needs elsewhere in the report, the townwide per capita consumption rate of 115 gpcd has been used.

TABLE A.10
(Continued)
SOUTHBURY AREA WATER UTILITIES

WATER UTILITY NAME	STORAGE TYPE (2)	STORAGE NO. UNITS	STORAGE TOT. VOL. (gal)	DOHS PEAK DEMAND EVAL. AND CITED PROBLEMS MAX. HR. DEMAND (gal)	VOLUME AVAIL. MAX. HR. (gal)	CITED SUPPLY AND WATER QUALITY PROBLEMS
Heritage Village WC (1)	A	2		330000	(3)	.Leakage in piping under slabs .pH adjustment recommended to reduce pitting of copper pipe .Coliform bacteria violations in the 4th quarter 1984
Southbury Training School	A	3		55000		None
Lakeside Water Co. (1)	A P	2 1		14300		.Supply problems Summer, 1985 .Additional well[illegible] recommended by DOHS
River Glen Cont. Care Center	A	2		6800		[illegible] nitrate vio[illegible] .3/85, sodium violation
Oakdale Manor Water Assoc.	P	2		1000		None

Notes: (1) Denotes WUCC questionnaire received
(2) Letter abbreviations: A - Atmospheric tank
P - Pressurized tank
(3) DOHS indicates that storage is adequate

TABLE A.10A

SOUTHBURY UTILITIES
SYSTEM DESCRIPTION SUMMARY FROM DOHS QUESTIONNAIRES AND INSPECTION REPORTS

UTILITY	DESCRIPTION OF SERVICE AREA AND DISTRIBUTION SYSTEM	WATER SUPPLY AND TREATMENT
River Glen Continuing Care Center	Distribution via 4" or less ductile iron pipe. Fire protection provided by 1 hydrant and sprinklers.	Four 6-inch gravel wells, all 70 ft. or more deep. No treatment.
Oakdale Manor	10 unit complex.	Three wells as follows: No. / Size / Depth / Capacity / Remarks 1 / 6" / / / 2 / 6" / Unkn. / Unkn. / 3 / - / - / - / Dug Well No treatment.
Southbury Training School	Fire protection from gravity fed hydrants on site.	Three 12-inch gravel, metered wells as follows: No. / Depth / Capacity / Remarks 1 / [illegible] / [illegible] / 2 / [illegible] / [illegible] / Not used in 50 yrs 3 / [illegible] / [illegible] / Treatment: [illegible]

The distribution network has 7000 feet of pipe and contains two storage tanks with a combined capaci [redacted] The company reports that additional storage is needed to supplement the existing facility. No firefighting capability is available. The results of the semi-annual state inspections show good quality well water meeting the state standards.

Heritage Village Water Co. The Heritage Village Water Co. constitutes the largest supplier of water in the Town of Southbury, serving a reported 6,500 people. The water supply consists of five 10 and 12-inch gravel packed wells ranging [redacted] depth and with pumping capacities [redacted] These wells have a reported yield of [redacted] which is about 45 percent greater than the average daily demand and only about 5 percent greater than the average demand during the maximum month of usage. A single industrial user typically accounts for about 10 to 20 percent of the average daily water use of the utility in the adjacent community of Middlebury.

Water is distributed to the users via nearly 40 miles of transmission and distribution piping ranging is size from 4 to 16 inches and consisting of transite, cast iron, ductile iron, PVC and Permastran pipe. The 4 and 6-inch piping constitutes about 20 percent of the distribution network. Two reinforced concrete storage tanks with a total capacit [redacted] are located [redacted] the system. [redacted] one. A total of 283 utility owned (271) and privately owned (13) fire hydrants are provided for fire protection.

Present treatment consists of [redacted], although the DOHS may require pH adjustment to reduce pipe corrosion. The utility anticipates the addition of several large users along a one mile extension of the distribution system, e.g., 192 room motel and a 100,000 gpd industrial user. A new well was cited as a needed facility improvement, apparently in response to the noted system expansion.

A.11.3 Future Water Needs

The Town of Southbury has historically relied on groundwater for water supply purposes, and in all likelihood this will represent the community's only source into the 21st century. The U.S. Army Corps report[4] did not project any supply deficits for the Town's major water purveyor (Heritage Village Water Co.) until the year 2030, and then only about a 0.1 mgd deficit. As a consequence, Southbury was not a receiver of any of the water supply diversions proposed by the Army Corps. The Town, however, does lie in close proximity to the Corps' proposed Shepaug Diversion.

The Pomperaug Aquifer parallels the Pomperaug River from Woodbury into Southbury and serves as a major existing source of groundwater supply. This aquifer system also has potential for continued future exploitation as a water source, and promises to be a major source of water for the Town's projected growth, provided the water quality of the aquifer is not compromised. Contamination of a portion of the Town's favorable aquifers has been reported.[12] Protection of Southbury's aquifers is obviously an important issue for the Town's long-term water supply picture.

A.12 WOODBURY

A.12.1 Utilities Serving Community

A total of seven utilities provide water service to about half of the Woodbury residents, with the remainder relying on individual wells. As shown in Table A.11, the largest of these utilities is the Woodbury Water Co. which serves about 30 percent of the Town's residents. The service area boundaries of these utilities are illustrated in Figure A.11 (also see Plate 1).

TABLE A.11

WOODBURY AREA WATER UTILITIES

WATER UTILITY NAME	RESIDENTIAL POPULATION SERVED (3) DOHS DESIGN EST.	UTILITY SUPPLIED EST.	PER AVG HH SIZE	WUCC CALC. EST.	PERCENT POP. SERVED (4)	SOURCE	AVG. DAILY USAGE PER CAPITA GPCD (6)	AVG. DAILY USAGE TOTAL (1000 GPD) (5)	ESTIMATED YIELD (7) (1000 GPD) DOHS CALC.	ESTIMATED YIELD (7) (1000 GPD) UTILITY SUPPLIED
Woodbury Water Co. (1)	2196 (assume)	2196	---	2196	30.9	2 wells, 2 res.	52.4	115.0		
Woodlake Water Co.	1600	---	1016	1016	14.3	3 wells	75	76.2		---
Swiss Village Apts.	432	---	274	274	3.9	1 well	75	20.6		---
Town in Country Condos.	320	---	203	203	2.9	2 wells	75	15.2		---
Heritage Hills Condo. Assoc.	160	---	102	102	1.4	1 well	75	7.7		---
Quassak Heights Condos.	104	---	104	104	1.5	4 wells	75	7.8		---
Sand Dune Swim Club	90	---	76	76	1.1	1 well	75	5.7		---
Woodbury Place Condo Assoc. (1)	72	NA	61	61	0.9	1 well	75	4.6		NA
SUBTOTALS UTILITY SUPPLIED				4032	56.7		63 (avg) (8)	252.7		
SELF-SUPPLIED				3078	43.3					
1985 PROJECTED TOTAL POPULATION (2)				7110	100.0					

NOTES:

(1) Denotes that WUCC questionnaire was received.

(2) Conn. OPM Water Supply Population Projection.

(3) DOHS DESIGN EST.- Typically derived by assuming four people per service connection.
PER AVG HH SIZE - Population estimate based on 1986 average household size estimates for each municipality (adjusted from U.S. Census data by DOHS) multiplied by number of service connections. Where obvious error would result from this approach (e.g. one-bedroom apartments/condominiums noted community summary tables) alternate per residence values were used (e.g., two per one bedroom units and average household size for two or more bedrooms).
WUCC CALC EST.- Calculated estimate used throughout report. Where utility values were available for larger utilities (greater than 1000), the utility supplied value was assumed. For smaller utilities (serving less than 1000), the number calculated based on average household size was utilized.

(4) Utilized throughout the report, and based on WUCC estimate of residential population served.

(5) Where utility data were not available, derived by multiplying WUCC estimate of population served by 75 gpcd.

(6) Where usage or production information was available from larger utilities, the per capita consumption value was calculated based upon these figures.

(7) DOHS CALC.- Calculated by multiplying well capacity times 18 hours of pumping per day and reported as 1000 gallons per day.
UTILITY SUPPLIED - Consists of statistically derived safe yield calculations, well yield tests conducted during well installation, or well pump capacities.

(8) For projecting water supply needs elsewhere in the report the townwide per capita consumption rate has been rounded to 65 gpcd.

TABLE A.11
(Continued)
WOODBURY AREA WATER UTILITIES

WATER UTILITY NAME	STORAGE			DOHS PEAK DEMAND EVAL. AND CITED PROBLEMS		
	TYPE (2)	NO. UNITS	TOT. VOL. (gal)	MAX. HR. DEMAND (gal)	VOLUME AVAIL. MAX. I (gal)	CITED SUPPLY AND WATER QUALITY PROBLEMS
Woodbury Water Co. (1)	A	2	[redacted]	38333	[redacted]	.Industrial waste disposal site located within watershed .Trichlorethylene level above or near DOHS "action level" in late 1985
Woodlake Water Co.	A P	1 1	[redacted]	40000	[redacted]	.Fairly high iron and manganese levels
Swiss Village Apts.	A	2	[redacted]	10800	[redacted]	.Supply problems during power outages
Town in Country Condos.	P	2	[redacted]	8000	[redacted]	.Well No.1, high manganese and iron conc.
Heritage Hills Condo. Assoc.	P	6	[redacted]	4000	[redacted]	None
Quassak Heights Condos.	A P	1 1	[redacted]	2600	[redacted]	None
Sand Dune Swim Club	P	1	[redacted]	2250	[redacted]	None
Woodbury Place Condo Assoc.(1)	P	1	[redacted]	1800	[redacted]	.Improper storage of gasoline in vicinity of water storage tank

Notes: (1) Denotes WUCC questionnaire received
(2) Letter abbreviations: A - Atmospheric tank
P - Pressurized tank

TABLE A.11A

WOODBURY UTILITIES

SYSTEM DESCRIPTION SUMMARY FROM DOHS QUESTINONAIRES AND INSPECTION REPORTS

UTILITY	DESCRIPTION OF SERVICE AREA AND DISTRIBUTION SYSTEM	WATER SUPPLY AND TREATMENT
Heritage Hills Condo Assoc.	40 unit complex.	[redacted]
Quassak Heights Condos	52 one-bedroom units. Distribution [redacted] 2" galv. steel pip[redacted]	Four wells as follows: [redacted] No. St- [redacted] Type Capacity
Swiss Village Apts.	108 unit complex. Distribution via 4" copper pipe	[redacted]
Woodbury Place Condo Assoc.	24 units, one or two-bedroom[redacted] Distribution via [redacted] No fire protect[redacted]	[redacted] provided.
Woodlake Water Co.	[redacted] connection residential area. Distribution via 4"-12" cement-lined ductile iron pipe, and 2" plastic and copper pip[redacted]	Treatment: 12.5% hypochlorite (Well No. 3); aquadene for sequestering. Caustic potassium hydroxide to raise pH.
Sand Dune Swim Club	30 connections.	[redacted]
Town in Country Condos	80 connections (2 systems, 40 units each).	[redacted] gpm,

A.12.2 Existing Utility Supplies

Presently all of the Town's water supply is derived from groundwater sources, although the Woodbury Water Co. has two surface water reservoirs (formerly the utility's supply) which serve as an emergency standby source. Woodbury Water Co. and Woodbury Place Condominiums are the only utilities which supply water to the Town residents that responded to the WUCC questionnaire. Consequently these utilities are discussed below, while the data for the other utilities which are summarized in Table A.11 consists predominantly of DOHS and DEP information. Additional description of those utilities not responding to the WUCC questionnaire is included in Table A.11A.

The Watertown Fire District also completed a questionnaire since this utility has nine wells located in Woodbury. Watertown's Hart Farm Well Field is located in the northwestern corner of Woodbury. These wells have a presently estimated yield [redacted]. With additional pumping capacity and wells the utility anticipates a future yield of about 2.6 mgd. The District's charter entitles this utility to provide water to customers in Woodbury and Bethlehem, and presently provides water to one house, two garages and a farm in Woodbury. The utility has received inquiries from potential future customers in Woodbury, and plans to retain the right to serve the customers they are entitled to serve.

Woodbury Water Co. The Woodbury Water Co. is owned by General Waterworks and is the largest supplier of water in Woodbury. Woodbury Water serves nearly 2200 residents with one 8-inch driven well and one 10-inch gravel-packed well (abou [redacted] in depth, respectively) having an estimated yield of [redacted] The estimated yield is approximately three times the average daily demand and about 50 percent greater than the maximum day usage. These wells were installed to replace the surface water supply which was inactivated due to required treatment to meet regulatory requirements. The two displaced reser-

voirs, with a total capacity of [redacted], presently serve as emergency standby sources.

Water is supplied to the users via nearly 11.5 miles of transmission and distribution piping ranging in size from 1½ to 8 inches. Pipe materials consist of galvanized iron and PVC for 3-inch and smaller service piping while the 4-inch and larger pipes are made of PVC, asbestos cement and cast iron. Fire protection is provided via 50 hydrants located throughout the system. Storage consists of two tanks with a total storage capacity of [redacted]. Water is [redacted] prior to being distributed to the users. Water derived from Well No. 2, which is the [redacted] is subjected to [redacted]

Woodbury Place Condominiums. The managing agent for Woodbury Place Condominiums, a 24-unit condominium development, did respond to the questionnaire. However, no new data beyond what is already included in Table A.11 was provided.

A.12.3 Future Water Needs

Similar to a number of other communities in the Housatonic area, Woodbury presently relies solely on groundwater supplies, although in the past surface water was used. Given the relatively small projected growth for the community, it does not appear that existing supplies will be taxed appreciably. Thus, a combination of the Town's existing supply sources, with minor expansion and the backup of the major utility with its surface supply [redacted], should serve the community well for some time to come. The heavy reliance on groundwater also points to the importance of protecting these sources.

REFERENCES
APPENDIX A

1. Housatonic Valley Council of Elected Officials," New Directions for Water Supply Planning," Regional Planning Bulletin No. 42, June, 1986.

2. Bethel Board of Water Commissioners, "Report of Improvements to the Municipal Water System," prepared by Cahn Engineers, Inc., March, 1970.

3. Bethel Consolidated Water Company, "Plan of Development," prepared by Lenard Engineering, Inc., Dec., 1985.

4. U.S. Army Corps of Engineers, "Housatonic River Basin Urban Study, Feasibility Report," September, 1982.

5. Housatonic Valley Council of Elected Officials, "A Growth Management Option for the Housatonic Valley Region," August, 1981.

6. Housatonic Valley Council of Elected Officials, "A Policy Direction For Groundwater Protection," Regional Planning Bulletin No. 5, July, 1979.

7. Roald Haestad, Inc., "Investigation and Report on Lake Candlewood Diversion," prepared for the City of Danbury, February, 1986.

8. Roald Haestad, Inc., "Ball Pond Diversion, Effect of Development on Safe Yield," prepared for the City of Danbury, July, 1984.

9. Statement of the City of Danbury, James E. Dyer, Mayor, to the Housatonic WUCC, October 28, 1986.

10. Letter from the New Fairfield First Selectman, Cheryl D. Reedy, to the Housatonic WUCC, January 29, 1987.

11. Statement of the New Fairfield Board of Selectmen to the Housatonic WUCC, September 25, 1986.

12. New England River Basin Commission, "Housatonic River Basin Overview," September, 1980.

FINAL
WATER SUPPLY ASSESSMENT
HOUSATONIC WATER SUPPLY
MANAGEMENT AREA

APPENDIX B

APRIL, 1987

MEMORANDUM

MEMO: WUCC Members

FROM: William Buckley, Co-Chairman
Stephen Polizzi, Co-Chairman

DATE: July 11, 1986

RE: Request for your response to the enclosed questionnaire

The enclosed questionnaire includes all of the comments you made at the July 1, 1986 meeting. As agreed, please complete and return by July 31, 1986 to:

Keyes Associates
55 Town Line Road
Wethersfield, CT 06109
Attn: Len Warburton

As you know, as a matter of self interest, it is necessary that your utility respond within this narrow time frame. The first four pages are most important, with the remaining pages providing elaboration if available. Do not go to the expense of developing new data; material on hand will suffice. Where estimates are made, please so specify.

The consultants are anxious to assist you as needed. Feel free to call Bruce Pierstorff of Havens and Emerson, Inc. at 617-350-6622 (except between August 4 and August 8), or Len Warburton of Keyes Associates at 1-563-2341.

As an entire planning process of importance to us all is dependent upon your providing this information, please respond in as much depth as possible by July 31st at the latest.

DR/es
Encl.

1062E/40

Revised 6/10/86
6/18/86
7/2/86

HOUSATONIC WATER UTILITY COORDINATING COMMITTEE

INSTRUCTIONS FOR COMPLETING QUESTIONNAIRE

The purpose of the questionnaire is to establish a data base of information on the State's water utilities. The data base is essential to the proper development of a Housatonic Water Supply Master Plan. The purpose of most questions is self-explanatory; however, a few questions are required for the development of sound institutional and financial plans. It is essential to know the present financial condition and to estimate needs, including distribution system needs, if an assessment of utilities capital improvement plans is to be made.

The attached questionnaire covers most aspects of water utility operation. We have structured the questions so that the minimum required amount of information can be obtained from you just completing the questions in Section A, which is only four pages. Questions in Section B are in a more detailed form. Please answer these also if you have the information.

We know that every question cannot be answered by every water utility. Several questions may not be pertinent to your utility or you simply may not have the required information. We ask that you mark such questions as:

DNA for "Does Not Apply" or
NA for data "Not Available"

In preparing the questionnaire, we have used the following definitions of terms below:

MG - million gallons
MGD - million gallons per day
Retail water - water which is sold for direct consumption
Wholesale water - water which is resold upon purchase
Interconnection - any link between two utilities capable of one-way or two-way transmission of water, and capable of use either permanently or in an emergency situation.
New Construction - construction of new facilities required to improve service or increase a utility's water production capability.
Rehabilitation - renovation or replacement of existing facilities, e.g., replacement of distribution pipe.

Here is a checklist of information requested in the questionnaire:

1. Water rate schedule
2. Map showing water sources including groundwater supplies/well, interconnections, and, most important, service area.
3. List of engineering studies or needs studies
4. List of recent questionnaires
5. Copy of annual report
6. Water demand forecast
7. Plans for emergency interconnections
8. Interconnection agreement
9. Recent chemical analyses

Thank you very much for your cooperation.

HOUSATONIC WUCC

WATER UTILITY QUESTIONNAIRE

RETURN TO

WATER UTILITY

(Place Mailing Label Here)

Please correct above label if necessary

Name and address of Chief Official to whom all correspondence should be addressed _____

_____

_____

Telephone No. of Water Utility (203) _____

Town Where Located _____

If part of a larger utility, please give name. _____

Person to contact for additional information _____

SECTION A - GENERAL INFORMATION

1. Total number of: Retail customers (1986) ---,---; Wholesale customers ---,---

2. Estimated total population served ---,---

3. Area (Existing) served (sq. miles) -,---;
   Service (Future) Area (sq. miles) -,---

4. Type of supplier (Check one) Municipal _____ Association _____
   Investor _____ Taxing District _____
   Other _____

5. Gross income for 1985 $--,---,---. ~~Please give further financial details~~ in Appendix D.

6. Residential water bill for monthly consumption of 10,000 gallons would be $---,---

   Please furnish a copy of your water rate schedule. Indicate effective day of rate _____ and if/when you anticipate a change in your rate.

   _____

Water Utility Name_____

7. Please furnish a map (or copy) indicating source location(s), well fields, service area boundaries (details, please in Appendix C), franchise area boundaries, interconnections, and give date of most recent revision. If you have interconnections, please also complete Appendix B. Use a U.S.G.S. map if this is convenient.

8. Please list recent engineering studies performed (within last ten years) for your utility or parts of your utility by consultants or in-house. (Give title, author, and date of report and copy if possible).

_____

_____

_____

_____

9. Have any other questionnaires been completed recently? If so, for whom? Please give name and address and subject covered.

_____

_____

10. Please attach a copy of your most recent annual report or audit. If not available, give most recent year available.

11. What was your average daily demand in thousands of gallons in 1985? (If you use other units, please state the units used).

	Retail Water	Wholesale Water	Total System
Average Day (Yearly average)	---.---	---.---	---.---
Average Day (Maximum month)	---.---	---.---	---.---
Which month?	_____	_____	_____
Maximum Day (Annual maximum)	---.---	---.---	---.---

Please give further information in Appendix F.

12. What do you normally consider to be the safe yield of your sources? (1000 gpd)

Surface Source ---.--- Groundwater Source ---.--- Total ---.---

On what basis is/was your safe yield determined? Please give examples if you can, such as extended pumping tests, pump capacity, etc.

_____

_____

_____

Water Utility Name_____

13. How many sources have you?_____

(Please list all details in Appendix A.)

14. Do you anticipate serving additional municipalities or water utilities? _____ If so, who?_____

_____

15. During the next five (5) years, do you anticipate an extension or addition in your:

Service Area? _____ If so, additional area (sq miles) ___

Franchise Area? _____ If so, additional area (sq miles) ___

Number of service connections? _____

If your projections are based on population data or land use patterns or trends please state source and if possible enclose statistics concerned. Do you have liaison and coordination with your Town on this subject?

16. What is the total length of pipe in your distribution system? _____ Please give details in Appendix H.

17. What storage does your system have?

(a) Raw Water Reservoirs

Name	Capacity in MG @ spillway level
_____	_____
_____	_____

(b) Distribution System Storage (standpipes, storage tanks, etc.)

Total Covered Storage (MG) -,---.--- Number of units ___

18. Facility needs: how would you rate your present needs for new construction? To give some idea of the scale of your needs, you can express this as a percentage of your annual income. _____

Please give details in Appendix E.

19. Do you have water demand forecasts for the next 5, 20 and 50 years? (i.e., Use years 1991 2000 2030) Yes_____ No_____

If Yes, please enclose a copy of these forecasts along with your completed questionnaire and any background information you may have readily available. What population projections did you use?

Water Utility Name_____

20. Do you ever have difficulty in maintaining a satisfactory source supply? Yes _____ No _____
Do you have problem with power outages? Yes _____ No _____
Supply during droughts? Yes _____ No _____
Fire protection? Yes _____ No _____

(If so, please give details in Appendix G.)

21. Do you share management or ownership or jointly operate or have a contractual arrangement for use of sources of water, services, equipment or facilities with another water utility? Yes _____ No _____

If yes, please give details in Appendix I.

22. Does your utility provide public or private Fire Protection service? Yes_____ No_____

If yes, please give details in Appendix H.

Please indicate the name of the person responsible for completing this questionnaire.

Name_____

Title_____

Signature_____

We appreciate your time and trouble: we realize this has been an imposition on your valuable time. Maybe you'd now like to tell us a thing or two, so we have provided Appendix J for the purpose. Your frank and open views on any water-related topic will be very much appreciated. You'll notice that we have even omitted the "Water Utility Name" on Appendix J so you can be anonymous if you wish!

Thank you.

Water Utility Name_____

SECTION B - APPENDICES

Index

Water Utility Name_____

APPENDIX A. SOURCES OF WATER 1986

A1. Surface Water Sources (own sources)

Name of Source	Status (Active) (Inactive) (Emergency)	Avg. Amt. Water Withdrawn (MGD)	Max. Amt. Water Withdrawn (MGD)	Max. Allow. Withdrawn-(MGD)
_____	_____	---.---	---.---	----
_____	_____	---.---	---.---	----
_____	_____	---.---	---.---	----
_____	_____	---.---	---.---	----

A2. a) Are all of your sources of raw surface water considered to be direct legislative grants or are some "grandfather rights"?

b) List source(s) and quantity_____

c) Give date and authority for such withdrawals.

_____

A3. List the letdown requirements (minimum required flow release) from your reservoir facilities._____

_____

_____

A4. Groundwater Sources (own sources). Please give summary below.

Name of Aquifer or Well Field	No. Wells.	Avg. Amt. Water Withdrawn (MGD)	Max. Amt. Water Withdrawn (MGD)	Permit No.	Max. Allow. Withdrawn-(MGD)
_____	--	---.---	---.---	----	---.---
_____	--	---.---	---.---	----	---.---
_____	--	---.---	---.---	----	---.---
_____	--	---.---	---.---	----	---.---
_____	--	---.---	---.---	----	---.---

Water Utility Name_____

A5. Water purchased from other utilities. (Please furnish details of interconnections to these utilities sources in Appendix B.)

FOR 1986

Name of Water Utility	Avg. Purchase (MGD)	Max. Purchase (MGD)	No. Connections	Avg. Purchase Price $ per MG	
_____	---.---	---.---	--	---	(____)
_____	---.---	---.---	--	---	(____)
_____	---.---	---.---	--	---	(____)
_____	---.---	---.---	--	---	(____)

A6. If applicable, give details on age, construction, capacity, and present yield of the following (provide map if available):

a. Infiltration gallery

_____

_____

b. Caisson well

_____

_____

c. Artificial recharge ponds

_____

_____

d. Artificial recharge wells

_____

_____

Water Utility Name_____

A7. Indicate plans for applying for additional groundwater diversions within the next 5 years. What is status of pending applications?

A8. Do you routinely check the water levels in your wells Yes _____ No _____

How frequently?_____

Describe any significant water level changes in your wells or well field within the last ten years. Indicate which wells are affected.

A9. Have you made any analyses for trace metals and/or organic compounds such as pesticide or PCB's? On which wells? Please provide most recent results and date of analysis.

Water Utility Name_____

A10. Describe any water quality trends in your wells or well field within the last ten years. Indicate which wells are affected.

A11. What type of treatment do you give, or plan to give, your well water?

A12. Are any of your well's systems near potential sources of pollution, such as landfills, industrial lagoons, salt piles, subsurface, disposal system, etc.?

A13. Describe any known cases of bacterial or chemical pollution of ground water in your franchise area.

A14. Please complete the attached well inventory sheet to the greatest extent possible.

A15. Indicate plans for applying for additional water sources within next 5 years.

Water Utility Name_____

APPENDIX G - RELIABILITY

G1. Were your operations adversely effected by any recent drought periods? State period. Describe briefly what measures were taken.

_____

_____

G2. To ease the impact of a short (3-12 months) drought period, what measures do you think could be taken:

(a) by your utility?_____

_____

(b) by your region?_____

_____

(c) by the State?_____

_____

G3. What measures do you think could be taken to ease the impact of an extended (excess of 12 months) drought period on your own utility.

_____

_____

G4. Have you ever experienced other problems that have affected the reliability of your system?

Problem	Plans to resolve problem
Frequent bursts on old mains?	_____
	_____
Plant breakdowns	_____
	_____
Fire protection	_____
	_____
Pressure	_____
	_____
Peak demand	_____
	_____
Other problems	_____
	_____

Water Utility Name_____

APPENDIX H - DISTRIBUTION SYSTEM INFORMATION

The W.U.C.C. Coordinated Plan calls for an assessment of the utilities' "distribution systems according to size, construction, type of service and utilities' estimate of system condition." The information will be assembled and tabulated, and an estimate of system rehabilitation costs will be established. In order to accomplish this task, please provide the following information (or copies on additional paper) if readily available.

H1. List the length of pipe in your distribution system according to size. (List type of material and year installed if known).

H2. List the number of valves in your distribution system according to size. (List year installed if known).

H3. List the number of fire hydrants in your distribution system according to size. (List year installed if known).

H4. List the booster stations in your distribution system giving the capacity, number and size of pumps, and year constructed.

Water Utility Name_____

H5. Please classify the present overall condition of your distribution system (check one).

Condition	
Adequate pressures, low leakage in 95% of system	_____
Inadequate pressures and/or high leakage in no more than 20% of system	_____
Inadequate pressures and/or high leakage in no more than 50% of system	_____
Inadequate pressures and/or high leakage in over 50% of system	_____

H6. Have you any I.S.O. rating problems? Is firefighting capability in any way limited? Are there an adequate number of fire hydrants?

Please include excerpts of I.S.O reports.

H7. What is normal system delivery pressure? Give range. _____

_____

_____

_____

_____

_____

H8. Do you have complaints of low pressure. _____

H9. What is system gradient or overflow elevation of major storage facility? _____

Please identify separately if you maintain more than one pressure zone.

H10. What is peak system output in GPM?_____

For how long can this be maintained?_____

What limits flow? Pumping? Treatment?_____

H11. Have you conducted a leakage survey? Yes _____ No _____

Date of survey. _____

Water Utility Name_____

APPENDIX I - JOINTLY USED FACILITIES

I1. Utility with which agreement exists:_____

I2. Type of agreement

a) Joint Ownership _____
b) Contract _____
c) Other _____

Please give details on agreement, such as scope, duration, rights and limitations.

I3. Facilities involved:

a) Management
b) Source of Supply
c) Treatment
d) Transmission
e) Storage
f) Other

Use separate sheet for each utility with which an agreement exists.

APPENDIX J - COMMENTS

Please give your views on any aspects of the water supply industry about which you feel strongly, in terms of items which you think might improve the industry in general and the State of Connecticut in particular. For example, are there any large-scale projects which would affect your utility? Are there any supply projects you would like to see? Is there legislation pending which you feel would help (or hinder) the industry?

Water Utility Name_____

A16. Indicate plans or needs for purchasing water from other utilities in next 5, 20, 50 years.

_____

_____

_____

_____

IDENTIFICATION	Well Name or Number
	Year Installed
	Well Driller
ELEV	Ground Elev., ft above Sea Level
HOLE	Well Diameter, in.
	Final Depth, ft below Ground Surface
CASING	Diameter, in.
	Length, ft below Ground Surface
SCREEN	Diameter, in.
	Setting, ft below Ground Surface
	Slot Size and Type
AQUIFER	Type: Sand and Gravel or Rock Well (Formation Name, If Known)
TEST DATA	Static Water Level, ft below Ground Surface
	Date Measured
	Pumping Rate - gpm/Duration of Test - hours
	Pumping Water Level, ft below Ground Surface
	Date Measured
	Specific Capacity, gpm/ft of Drawdown
PUMP	Final Pump Capacity, gpm
	Present Pump Setting
PUMPAGE 1985	Annual Pumpage, mg
	Average Daily Pumpage, mgd
	Well Status - Active (A) or Standby(s)
DATA AVAILABLE Y or N	Driller's Log
	Electric Log
	Gamma Ray Log
	Other Log
	Pumping Test Data
	Water Level Trends
	Consultant or Eng. Report

Water Utility Name_____

APPENDIX B - INTERCONNECTIONS

Please give details of links with other utilities on attached inventory sheet.

B1. If interconnection responsibility including operation, maintenance and ownership is shared, please describe your arrangements by footnote and/or answer on separate page if you have the required information.

B2. Use the attached Inventory Form to complete the desired information. Make additional copies of the form if you have more than two interconnections.

B3. Please provide a map identifying the interconnections if necessary. Place an identification number for the interconnection on the map, and use the same identification number on the attached form. Also indicate on the map major transmission pipelines and distribution mains if map scale permits.

B4. If your interconnection was included in any previous report, give name and date.

_____

_____

B5. Please explain briefly as appropriate.

a. Do you have any current plans for (additional) interconnections? If so, state system, location, capacity and general type of equipment (valves, meters, recorders, booster pumps, etc) and anticipated cost.

b. Do you feel you have a need for backup capability by another system?

c. Do you anticipate a need for backup by another system in the next 5 years? 20 years?

d. Do you have any contingency plans for supplying another system or an emergency basis (such as with fire hoses, irrigation piping, etc.). Please state other systems, distance between tie-in points and method of temporary supply or submit copy of plan(s) if available.

e. How much water could you supply to each neighboring system on an emergency (say, 1 week) basis? Over an extended period (say, 2 weeks to 3 months). Assume supply to one system at a time.

f. Do you have or subscribe to any formal emergency agreement with any other supply system or community (include Civil Defense plans)? Please attach me a copy or outline of any plans or agreements.

B6. If your interconnection is used on a permanent or seasonal basis for purchasing or selling a contractual amount of water to another utility please give details on specific requirements such as quantities, pressures and duration of agreement, whether it is interruptible, etc.

Water Utility Name_____

APPENDIX B
INTERCONNECTION INVENTORY SHEET

1.	Identification No. on Map	---	---
2.	Interconnected System	_____	_____
3.	Normal or Emergency Use	_____	_____
4.	Year Placed in Service	---	---
5.	Materials of Construction	_____	_____
6.	Diameter of Connection (in.)	--	--
7.	Length of Connection (feet)	--,---	--,---
8.	General Condition (good, poor, inoperative or unknown)	_____	_____
9.	Is Connection Capable of (a) two-way transfer:	_____	_____
	(b) two-way metering:	_____	_____
10.	Average Flow (MGD). If Seasonal or highly variable, indicate average while in use. Water received	--.--	--.--
	Water delivered	--.--	--.--
11.	Maximum capacity of interconnection (MGD). Indicate T if tested, M if measured, E if estimated. Water received	--.--	--.--
	Water delivered	--.--	--.--
12.	Are booster pumps required?	_____	_____
13.	Is flow metered? Water received	_____	_____
	Water delivered	_____	_____
14.	Do you have a program of maintenance and testing of your meters?	_____	_____
15.	Date of last meter calibration	_____	_____
16.	Normal operating hydraulic gradient (connection not in service) Water received	_____	_____
	Water delivered	_____	_____

Water Utility Name_____

APPENDIX C - SERVICE AREA

C1. What is the number of municipalities or portion of municipalities directly served (Retail only)? __ Use additional paper if necessary.

Name of Municipality	Size of Connection	Estimated Population Served?	Average Amount of Water Supplied in MGD
_____	_____	_____	---.---
_____	_____	_____	---.---
_____	_____	_____	---.---
_____	_____	_____	---.---
_____	_____	_____	---.---

C2. Water sold to other water utilities for redistribution (wholesale only). Number of water utilities __.

Name of Utility	Expiration Date of Contract	Amount-MGD	Nature of Contract Permanent (P) or Temporary (T)	Average Price $ per MG
_____	_____	---.---	-	---
_____	_____	---.---	-	---
_____	_____	---.---	-	---
_____	_____	---.---	-	---

C3. Service Area Details:

a. Does appropriate charter or service area agreement cover each municipal service area listed in C1?

By whom authorized?_____

b. List special conditions and duration of charter for areas served.

c. Do you have authority for areas not served?

Water Utility Name_____

APPENDIX D - FINANCIAL INFORMATION(1985)

D1. Operating revenue - total amount billed for water and related services. $__,___,___

D2. Total operating expenses including wages, materials, fuel or power, depreciation expense, and other expenses (taxes, etc). $__,___,___

D3. Other income (other than 1 above) $__,___,___

D4. Gross income (line 1 plus line 3 minus line 2) $__,___,___

D5. Interest on long-term debt $__,___,___

D6. Miscellaneous income deductions (interest, etc.) $__,___,___

D7. Net income (line 4 minus line 6) $__,___,___

D8. Gross book value of utility facilities at end of 1985:

Source facilities (reservoirs, dams, wells)	$__,___,___
Treatment facilities (plants, chlorination facilities)	$__,___,___
Transmission facilities (pumping stations, pipelines)	$__,___,___
Distribution facilities (storage tanks, distribution mains, booster stations)	$__,___,___
Administrative facilities (buildings, vehicles)	$__,___,___
Other (services, meters, fire hydrants, misc.)	$__,___,___

D9. Itemize (on an estimated basis if necessary) the respective total operation and maintenance costs of:

	1985	1980 (if possible)
Source of Supply	$__,___,___	$__,___,___
Pumping expenses	$__,___,___	$__,___,___
Treatment expenses	$__,___,___	$__,___,___
Transmission & Distribution Expenses	$__,___,___	$__,___,___
Administrative expenses (including customer accounts and sales expenses)	$__,___,___ (____)	$__,___,___ (____)

Water Utility Name_____

APPENDIX D - FINANCIAL INFORMATION(1985)

D1. Operating revenue - total amount billed for water and related services. $__,___,___

D2. Total operating expenses including wages, materials, fuel or power, depreciation expense, and other expenses (taxes, etc). $__,___,___

D3. Other income (other than 1 above) $__,___,___

D4. Gross income (line 1 plus line 3 minus line 2) $__,___,___

D5. Interest on long-term debt $__,___,___

D6. Miscellaneous income deductions (interest, etc.) $__,___,___

D7. Net income (line 4 minus line 6) $__,___,___

D8. Gross book value of utility facilities at end of 1985:

Source facilities (reservoirs, dams, wells)	$__,___,___
Treatment facilities (plants, chlorination facilities)	$__,___,___
Transmission facilities (pumping stations, pipelines)	$__,___,___
Distribution facilities (storage tanks, distribution mains, booster stations)	$__,___,___
Administrative facilities (buildings, vehicles)	$__,___,___
Other (services, meters, fire hydrants, misc.)	$__,___,___

D9. Itemize (on an estimated basis if necessary) the respective total operation and maintenance costs of:

	1985	1980 (if possible)
Source of Supply	$__,___,___	$__,___,___
Pumping expenses	$__,___,___	$__,___,___
Treatment expenses	$__,___,___	$__,___,___
Transmission & Distribution Expenses	$__,___,___	$__,___,___
Administrative expenses (including customer accounts and sales expenses)	$__,___,___ (____)	$__,___,___ (____)

Water Utility Name_____

APPENDIX E - FACILITY NEEDS

Please provide information regarding both your new construction requirements and your rehabilitation requirements to expand or upgrade your present facilities for immediate or near future (within five years) requirements. If you have information from recent in-house or contracted studies, please quote briefly from these and provide copies if possible.

E1. New Construction Requirements	Estimated Capital Cost ($)	Year Estimate Was Made
(a) Source needs.		
_____		
_____	--,---,---	----
_____	--,---,---	----
Have any new sources been recommended?		
_____		
_____		
(b) Treatment facilities		
_____		
_____	--,---,---	----
_____	--,---,---	----
(c) Transmission facilities		
_____		
_____	--,---,---	----
_____	--,---,---	----
(d) Interconnections to other utilities		
_____		
_____	--,---,---	----
_____	--,---,---	----

Water Utility Name_____

(e) Distribution system including storage facilities and booster stations	Estimated Capital Cost $	Year Estimate Was Made
_____		
_____	--,---,---	----
_____	--,---,---	----

E2. Rehabilitation Requirements

(a) Source Needs		
_____		
_____	--,---,---	----
_____	--,---,---	----
(b) Treatment Facilities		
_____		
_____	--,---,---	----
_____	--,---,---	----
(c) Transmission Facilities		
_____		
_____	--,---,---	----
_____	--,---,---	----
(d) Interconnections to other utilities		
_____		
_____	--,---,---	----
_____	--,---,---	----

Water Utility Name_____

(e) Distribution system including storage facilities and booster stations

_____		
_____	--,---,---	----
_____	--,---,---	----

Note: Details of existing interconnections should be given in Appendix B, irrespective of rehabilitation requirements.

Water Utility Name_____

APPENDIX F - WATER USAGE

F1. Please provide the following information of retail water usage for 1985. If actual quantity of water is unknown, please provide an estimate of percentage in each category. You may combine categories if necessary.

	No. of Customers	Percent Metered	Average Daily 1985 Water Supplied (MGD	Estimated Percent of Total
Residential	---,---	_____	---.---	--
Commercial	--,---	_____	---.---	--
Industrial	--,---	_____	---.---	--
Public Authority	--,---	_____	---.---	--
Non-Revenue Water		_____		
Other (Explain below)	--,---	_____	---.---	--
Total	---,---	_____	---.---	100

Explain "Other" here:_____

_____

_____

Water Utility Name_____

F2. Please list major non-residential users whose average daily use exceeds 100,000 gpd and state number greater than 50,000 gpd. If you know of any exceptionally heavy peak demands, please complete last column.

Name of Customer	Location (Municipality)	Approx. Daily Demand (MGD)	Peak Demand (MGD) & Time of Day

F3. If you know of any major self-supplied potable water users in your area, please list below.

Name of User	Location (Municipality)

F4. If you know of any major self-supplied non-potable (salt, brackish, or recirculated) water users (over 50,000 gpd) in your service area, please list below.

Name of User	Location (Municipality)