INTEGRATED REPORT

for the

HOUSATONIC WATER SUPPLY MANAGEMENT AREA

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HOUSATONIC WATER SUPPLY
MANAGEMENT AREA

CHAPTER THREE

INTEGRATED REPORT

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HOUSATONIC WATER SUPPLY

MANAGEMENT AREA

CHAPTER THREE

INTEGRATED REPORT

3.1 INTRODUCTION

3.1.1 The Coordinated Water System Planning Process

As discussed in Chapter One, 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 process is designed to bring together utility representatives and regional planning 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.

As shown on Figure 3.1.1, the Coordinated Water System Plan for each Public Water Supply Management Area incorporates the individual water system plans from those utilities within the management area required to prepare such pursuant to Connecticut General Statutes Section 25-32d and the Areawide Supplement prepared under the auspices of the WUCC. The Areawide Supplement consists of four key components. The Water Supply Assessment is the first of these components, and constitutes the area's problem statement (constructed from the best

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available information at the time of writing) on which the remainder of the planning process is built. The Assessment's purpose is to evaluate water supply conditions and to identify areawide water system issues, concerns and needs. The Water Supply Assessment is found in Chapter One of the Coordinated Water System Plan, and is separately bound.

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

- existing 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

Although WUCC members have agreed to exclusive service area boundaries, the individual plans submitted by the utilities are still undergoing review by State regulatory agencies. One possible outcome of this review process may be the adjustment of exclusive service area boundaries, should any doubts be raised as to a utility's ability to provide a pure and adequate supply of water to its entire declared exclusive service area.

The third component (Chapter 3) 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 must address at least the following:

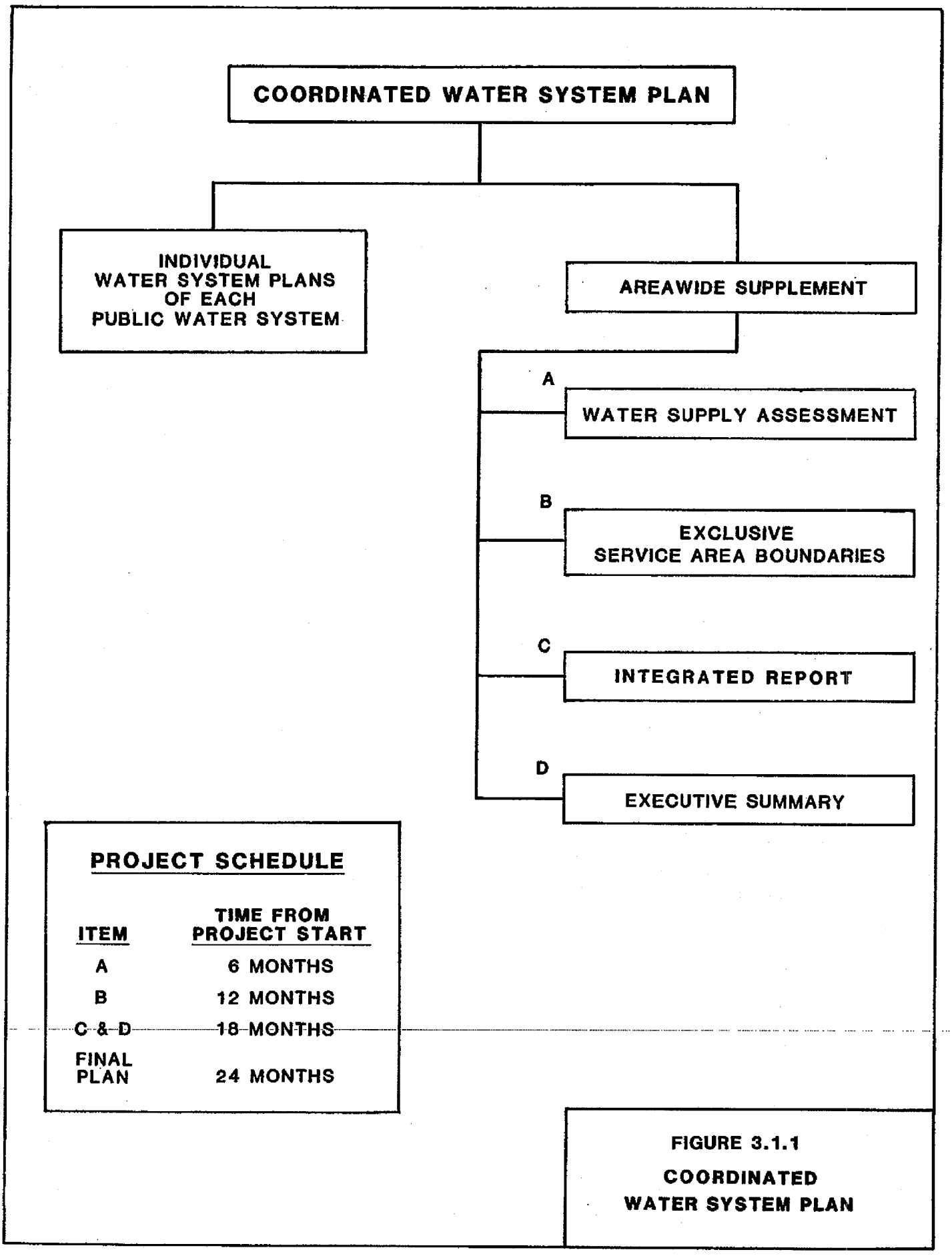

FIGURE 3.1.1

COORDINATED WATER SYSTEM PLAN

- 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.

3.1.2 Development of the Integrated Report

This report is a compilation and integration of information received to date, including all information received during the preparation of the Water Supply Assessment; more recent city and town legislation affecting water supply; and, most importantly, information provided by Individual Water Supply Plans submitted by those water utilities serving greater than 1,000 people or 250 customers, as required by the state. It must be pointed out, however, that these plans are in draft form and have not yet been approved by DOHS. If the DOHS does not approve a utility's individual plan as it relates to consumption and safe yield projections, alternative water resources for the future, exclusive service area boundaries, or any other issues addressed in Chapters 2 and 3 of this Areawide Supplement, then the utility must appropriately revise its individual plan to the satisfaction of DOHS - a process which will also influence the content of both the Exclusive Service Areas Report and the Integrated Report.

The various items addressed in this chapter are listed in Section 3.1.1; these provide the framework around which the Integrated Report is built, using the Water Supply Assessment Chapter, Exclusive Service Areas Chapter, and new information discussed above as resources.

3.2 POPULATION, CONSUMPTION, AND SAFE YIELD PROJECTIONS

3.2.1 Introduction

The projections presented in this section are based mainly on the data provided by the water supply systems as a part of the individual water supply plans. Data not provided by the utilities were obtained from the Final Water Supply Assessment. In some cases, calculations were made using available information from the individual plans or from the Assessment so that consistent data would be presented in the tables. Some inconsistencies between the individual plans and the Assessment were found. Whenever such inconsistencies arose, the information from the individual plans was used when available.

The assessment identifies 111 utilities within the Housatonic Public Water Supply Management Area. Since some utilities, such as General Water Works, Rural Water Company, Dancon Corporation and Topstone Hydraulic Company include a number of different divisions with distinct service areas, the actual distribution of utilities within the study area includes 128 systems. These utilities presented separate data for each individual system in their individual plans. Thus, the following discussion considers the 128 systems separately in terms of population, consumption, and safe yield projections.

3.2.2 Water System Trends and Projections

3.2.2.1 Residential Population

The population projections for each water supply system and each town serviced are listed in Table 3.2.1. Of the 128 utilities in the Housatonic Study Area, only 19 serve a customer base of greater than 1,000 people. Within this group, 14 actually supply water to users within the study area, while the remaining five only have watershed areas within the study area. These 14 larger utilities have provided both total and service population figures for each municipality within their service areas.

TABLE 3.2.1

PROJECTIONS OF POPULATION SERVED FOR EACH WATER UTILITY

WATER UTILITY	COMMUNITY SERVED	RESIDENTIAL POPULATION SERVED (1)				% OF TOWN POPULATION SERVED (2)			
		1986	1991	2000	2030	1986	1991	2000	2030
Acre Lane, Inc.	Ridgefield	40	40	45	45	0.2	0.2	0.2	0.2
Aqua Vista Assoc., Inc.	Danbury	150	150	160	160	0.2	0.2	0.2	0.2
Arrowhead Point Homeowners	Brookfield	225	225	235	235	1.2	1.5	1.4	1.0
Ashlar of Newtown	Newtown	155	155	165	165	0.7	0.7	0.7	0.5
Ball Pond Water District	New Fairfield	570	570	600	600	4.7	4.4	4.3	3.3
Bay Colony Mobile Home Park	Newtown	135	135	145	145	0.6	0.6	0.6	0.4
Bethel Consolidated Co.	Bethel	1840	2220	2910	5200	10.7	12.1	14.5	19.8
Bethel Water Department	Bethel	7780	8140	8680	9280	45.4	44.5	43.3	35.3
Birch Grove Assoc.	New Milford	240	240	250	250	1.2	1.1	1.1	0.9
Boulder Ridge Assoc.	Danbury	35	35	40	40	0.1	0.1	0.1	0.1
Briar Ridge, Dancon Corp.	Danbury	205	205	205	205	0.3	0.3	0.3	0.3
Bridgewater Cannon Condos.	Bridgewater	50	50	50	50	3.1	2.9	2.8	2.3
Brook Acres, Rural Water Co.	Brookfield	200	210	220	230	1.4	1.4	1.3	1.0
Brookfield Div. Rural W.C.	Brookfield	870	970	1045	1080	6.2	6.4	6.2	4.7
Brookfield Elderly Housing	Brookfield	45	45	45	45	0.3	0.3	0.3	0.2
Brookfield Hills Condos.	Brookfield	140	140	145	145	1.0	0.9	0.9	0.6
Brookview Water Co.	Ridgefield	70	70	75	75	0.3	0.3	0.3	0.3
Brookwood, Dancon Corp.	Brookfield	230	230	240	240	1.6	1.5	1.4	1.0
Butternut Ridge, Dancon Corp.	Brookfield	95	95	100	100	0.7	0.6	0.6	0.4
Camelot Estates Water Co.	New Milford	515	515	530	530	2.5	2.4	2.3	1.9
Candlewood Acres Holding Corp.	Brookfield	65	65	70	70	0.5	0.4	0.4	0.3
Candlewood Knolls Comm. Inc.	New Fairfield	280	280	295	295	2.3	2.2	2.1	1.6
Candlewood Lake Condos.	New Milford	205	205	205	205	1.0	1.0	0.9	0.7
Candlewood Orchards	Brookfield	110	110	110	110	0.8	0.7	0.6	0.5
Candlewood Shores Estates	Brookfield	1470	1470	1545	1545	10.4	9.7	9.1	6.7

TABLE 3.2.1 - (Continued)

WATER UTILITY	COMMUNITY SERVED	RESIDENTIAL POPULATION SERVED (1) 1986	1991	2000	2030	% OF TOWN POPULATION SERVED (2) 1986	1991	2000	2030
Candlewood Springs P.O.	New Milford	90	90	95	95	0.4	0.4	0.4	0.3
Candlewood Trails Assoc.	New Milford	190	190	190	190	0.9	0.9	0.8	0.7
Carmen Hill Orchards Water Co.	New Milford	300	300	315	315	1.5	1.4	1.4	1.1
Cedar Heights, Rural Water Co.	Danbury	470	470	480	490	0.7	0.7	0.7	0.6
Cedar Terrace Prop. Owners	Danbury	45	45	50	50	0.1	0.1	0.1	0.1
Cedarbrook Condo. Owners	Brookfield	100	100	105	105	0.7	0.7	0.6	0.5
Cedarhurst Assoc.	Newtown	60	60	65	65	0.3	0.3	0.3	0.2
Chestnut Hill Village	Bethel	145	145	155	155	0.8	0.8	0.8	0.6
Chestnut Tree Hill Water Co.	Newtown	145	145	145	145	0.7	0.7	0.6	0.4
Clapboard Ridge Heights	Danbury	110	110	110	110	0.2	0.2	0.2	0.1
CLC Owners Corp.	Brookfield	445	445	475	475	3.2	3.0	2.8	2.1
	New Milford	315	315	330	330	1.5	1.5	1.4	1.2
Cornell Hills Assoc.	Danbury	80	80	85	85	0.1	0.1	0.1	0.1
Craigmoor, Rural Water Co.	Ridgefield	70	70	95	110	0.3	0.3	0.4	0.4
Danbury Water Dept.	Danbury	45000	49000	53000	59000	71.6	75.6	78.4	75.4
Dean Heights Water Assoc.	New Milford	170	170	180	180	0.8	0.8	0.8	0.6
Eagle Hill Rehabilitation	Newtown	80	80	80	80	0.4	0.4	0.3	0.2
Fairfield Hills Hospital	Newtown	1950	1950	1950	1950	9.4	8.8	7.9	6.0
Fieldstone Ridge, Rural W.C.	New Fairfield	110	115	125	130	0.9	0.9	0.9	0.7
Greenridge Inc. Water Div.	Brookfield	700	700	735	735	5.0	4.6	4.3	3.2
Harrybrooke Park Condos.	New Milford	115	115	115	115	0.6	0.5	0.5	0.4
Har-Bil Water Co.	New Milford	320	320	335	335	1.6	1.5	1.4	1.2
Hawthorne East Apts.	New Milford	130	130	130	130	0.6	0.6	0.6	0.5
Hawthorne Terrace Assoc	Danbury	100	100	100	100	0.2	0.2	0.1	0.1
Heritage Hills Condo. Assoc.	Woodbury	100	100	105	105	1.4	1.4	1.4	1.3
Heritage Village Water Co. (3)	Southbury	7080	7545	8110	10245	46.6	47.4	47.0	47.0
Hickory Hills Corp.	Brookfield	105	105	110	110	0.7	0.7	0.6	0.5
High Acre Mobile Home Park	Danbury	60	60	70	70	0.1	0.1	0.1	0.1
Hi-Vu Water Co.	New Milford	145	145	150	150	0.7	0.7	0.6	0.5
Holiday Point Assoc. Inc.	Sherman	15	15	15	15	0.6	0.7	0.5	0.3
Hollandale Estates, Top. H.C.	Danbury	170	170	170	170	0.3	0.3	0.3	0.2
Hollywyle Park Assoc.	New Fairfield	30	30	30	30	0.2	0.2	0.2	0.2

TABLE 3.2.1 - (Continued)

WATER UTILITY	COMMUNITY SERVED	RESIDENTIAL POPULATION SERVED (1)				% OF TOWN POPULATION SERVED (2)			
		1986	1991	2000	2030	1986	1991	2000	2030
Indian Fields Homeowners	Brookfield	90	90	95	95	0.6	0.6	0.6	0.4
Indian Ridge Water Co.	New Milford	270	270	285	285	1.3	1.3	1.2	1.0
Indian Spring Water Co.	Danbury	250	250	250	250	0.4	0.4	0.4	0.3
Interlaken Water Co.	New Fairfield	50	50	55	55	0.4	0.4	0.4	0.3
Iron Works Aqueduct Co.	Brookfield	35	45	50	70	0.2	0.3	0.3	0.3
Ken Oaks, Rural Water Co.	Danbury	200	200	210	215	0.3	0.3	0.3	0.3
Knollcrest Real Estate Corp.	New Fairfield	290	290	320	320	2.4	2.3	2.3	1.7
Lake Lillinonah Shores	Brookfield	100	100	105	105	0.7	0.7	0.6	0.5
Lake Waubeeka Prop. Owners	Danbury	335	710	710	710	0.5	1.1	1.1	0.9
Lakeside Water Co.	Southbury	450	450	475	475	3.0	2.8	2.8	2.2
Ledgewood Association	Brookfield	120	120	125	125	0.8	0.8	0.7	0.5
Lillinoah Park Estates	New Milford	85	85	90	90	0.4	0.4	0.4	0.3
Lone Oak Water Co.	New Milford	260	260	270	270	1.3	1.2	1.2	1.0
Lords Mobile Home Park	New Milford	180	180	190	190	0.9	0.8	0.8	0.7
Mamanasco Lake	Ridgefield	50	50	55	55	0.2	0.2	0.2	0.2
Maple Glen Trailer Park	Danbury	25	25	25	25	0	0	0	0
Meadowbrook Terrace M.H. Park	Newtown	140	140	140	140	0.7	0.6	0.6	0.4
Meckauer Circle (RSKCON WC)	Bethel	150	150	160	160	0.9	0.8	0.8	0.6
Middle River, Dancon Corp.	Danbury	195	195	205	205	0.3	0.3	0.3	0.3
Millbrook Water Co.	New Milford	500	500	525	525	2.4	2.3	2.3	1.8
Millstone Ridge	New Milford	280	280	310	310	1.4	1.3	1.3	1.1
New Milford Water Co.	New Milford	5460	9380	11320	12325	26.6	44.0	49.0	43.4
Newbury Crossing	Brookfield	105	105	110	110	0.7	0.7	0.6	0.5
Newtown Water Co.	Newtown	3190	3430	4530	5265	15.3	15.5	18.4	16.1
Oakdale Manor Water Assoc.	Southbury	25	25	30	30	0.2	0.2	0.2	0.1
Oakwood Acres, Rural Water Co.	New Fairfield	375	380	420	435	3.1	3.0	3.0	2.4
Old Farms Condo. Assoc.	New Milford	205	205	215	215	1.0	1.0	0.9	0.8
Olmstead Water Supply Co.	Newtown	350	420	430	440	1.7	1.9	1.7	1.3
Parkwood Acres	New Milford	40	40	45	45	0.2	0.2	0.2	0.2
Pearce Manor, Rural Water Co.	Danbury	200	200	205	210	0.3	0.3	0.3	0.3
Pleasant Acres Water Co.	Danbury	315	315	335	335	0.5	0.5	0.5	0.4
Pleasant View Estates	New Milford	50	50	55	55	0.2	0.2	0.2	0.2

TABLE 3.2.1 - (Continued)

WATER UTILITY	COMMUNITY SERVED	RESIDENTIAL POPULATION SERVED (1) 1986	1991	2000	2030	% OF TOWN POPULATION SERVED (2) 1986	1991	2000	2030
Pocono Point	Danbury	35	35	40	40	0.1	0.1	0.1	0.1
Possum Ridge, Dancon Corp.	New Fairfield	395	395	415	415	3.3	3.1	3.0	2.3
Quassak Heights Condos	Woodbury	105	105	115	115	1.5	1.5	1.6	1.5
Racing Brook Water Co.	Danbury	300	300	300	300	0.5	0.5	0.4	0.4
Ridgebury Ests., Dancon Corp.	Danbury	235	235	245	245	0.4	0.4	0.4	0.3
Ridgefield Knolls, Top. H.C.	Ridgefield	240	240	240	240	1.1	1.1	1.0	0.9
Ridgefield Lakes, Rural W.C.	Ridgefield	670	685	755	790	3.2	3.1	3.3	2.8
Ridgefield Water Co.	Ridgefield	7015	7515	8090	11080	33.0	34.2	35.0	40.0
Ridgeview Gardens, Dancon Corp.	Danbury	80	80	85	85	0.1	0.1	0.1	0.1
River Glen Contin. Care Center	Southbury	160	160	170	170	1.0	1.0	1.0	0.7
River View Court Assoc.	New Milford	30	30	30	30	0.1	0.1	0.1	0.1
Robin Hill Condos.	Danbury	475	475	475	475	0.8	0.7	0.7	0.6
Rolling Ridge, Top. Hyd. Co.	Danbury	95	95	95	95	0.2	0.1	0.1	0.1
Rollingwood Condos.	Brookfield	460	460	485	485	3.3	3.1	2.9	2.1
Sandy Lane Village	Brookfield	260	260	275	275	1.8	1.7	1.6	1.2
Scodon, Rural Water Co.	Ridgefield	295	320	465	535	1.4	1.5	2.0	1.9
Sherwood Forest, Dancon Corp.	Danbury	115	115	120	120	0.2	0.2	0.2	0.2
Siboney Terrace	Danbury	25	25	25	25	0	0	0	0
Silvermine Manor	Brookfield	80	80	85	85	0.6	0.5	0.5	0.4
Snug Harbor Devel. Corp.	Danbury	100	100	105	105	0.2	0.2	0.2	0.1
Soundview, Rural Water Co.	Ridgefield	135	135	135	135	0.6	0.6	0.6	0.5
Southbury Training School	Southbury	1150	1150	1150	1150	7.6	7.2	6.7	5.3
Stony Hill Village	Brookfield	310	310	325	325	2.2	2.1	1.9	1.4
St. Thomas Seminary	Ridgefield	65	65	70	70	0.3	0.3	0.3	0.3
Sunny Valley Farm	New Milford	15	15	15	15	0.1	0.1	0.1	0.1
Sunny Valley Tax District	New Milford	385	385	405	405	1.9	1.8	1.8	1.4
Swiss Village Apts.	Woodbury	275	275	290	290	3.9	3.8	4.0	3.7
Tavi Village Condo. Assoc.	Danbury	40	40	45	45	0.1	0.1	0.1	0.1
Ta'agen Point	Danbury	40	40	45	45	0.1	0.1	0.1	0.1
The Cedars Water Supply	Danbury	20	20	20	20	0	0	0	0
Timber Trails Water Co.	New Fairfield	30	30	35	35	0.2	0.2	0.2	0.2
	Sherman	280	280	295	295	11.1	10.3	9.6	6.9
Town in Country Condos.	Woodbury	205	205	205	205	2.9	2.8	2.8	2.6

TABLE 3.2.1 - (Continued)

WATER UTILITY	COMMUNITY SERVED	RESIDENTIAL POPULATION SERVED (1)				% OF TOWN POPULATION SERVED (2)			
		1986	1991	2000	2030	1986	1991	2000	2030
Watertown Fire District	Woodbury (4)	0	NA	NA	NA	0	NA	NA	NA
Westfall Mobile Home Park	New Milford	115	115	115	115	0.6	0.5	0.5	0.4
Whisconier Village	Brookfield	130	130	135	135	0.9	0.9	0.8	0.6
Willow Run, Dancon Corp.	Danbury	110	110	115	115	0.2	0.2	0.2	0.1
Woodbury Place Condo Assoc.	Woodbury	60	60	60	60	0.8	0.8	0.8	0.8
Woodbury Water Co.	Woodbury	1610	1855	2115	3290	22.5	25.7	29.1	42.2
Woodcreek Village Condos.	Brookfield	75	75	75	75	0.5	0.5	0.4	0.3
Woodlake Municipal Tax District	Woodbury	1330	1330	1330	1330	18.6	18.4	18.3	17.1

NOTES:

1. The data used was submitted in individual water supply plans, or if not available, was obtained from the Water Supply Assessment.

2. Based on community populations from Connecticut OPM population projections.

3. Also serves areas outside the Housatonic in Oxford and Middlebury.

4. Only community served in Housatonic area.

Certain information that was not provided in individual plans was obtained from other sources, including the Final Water Supply Assessment, OPM projections, and various calculations based on service connections, average household size, and growth projections provided by each water utility. Projections for the remaining utilities were taken from the Assessment, which was based on information obtained from questionnaires and DOHS data. A majority of the small utilities responding to the questionnaires for the Assessment had not indicated an expansion of their service area. The population projections for these utilities were determined by either holding current populations steady for fully-developed systems or allowing a five percent growth for those systems which may have some expansion capability.

Most of the major water utilities have developed data and projections for the years 1986, 1991, 2000, and 2030. The projections included in this report will be based on these four planning years. For the utilities that did not provide data for any of the four planning years, projections were modified using straight line interpolation to present consistent data for summation and comparison.

The information presented in Table 3.2.1 has been reorganized in Table 3.2.2 to identify the total population, service population and percentage of population served for each community and for the entire Housatonic Water Supply Management Area. The total population projections for each community have been identified previously in the Final Water Supply Assessment based on OPM projections. The service population figures were obtained from the individual plans, or from the questionnaires and the Assessment. As shown in Table 3.2.2, the percentage of population served for the Study Area remains relatively constant through the planning period, ranging from a low of 53.1 percent in 2030 to a high of 58.1 percent in the year 2000.

3.2.2.2 Average Daily Water Demands

Total existing and projected average daily demand for each water supply system are presented in Table 3.2.3. Projections for the major

TABLE 3.2.2

POPULATION PROJECTIONS AND POPULATION SERVED FOR EACH COMMUNITY

	COMMUNITY POPULATION PROJECTIONS[1]				WATER UTILITY SERVICED POPULATION[2]				% POPULATION SERVED			
COMMUNITY	1986	1991	2000	2030	1986	1991[3]	2000[3]	2030[3]	1986	1991	2000	2030
Bethel	17144	18280	20040	26300	9915	10655	11905	14795	57.8	58.3	59.4	56.2
Bridgewater	1626	1700	1810	2200	50	50	50	50	3.0	3.0	2.8	2.3
Brookfield	14070	15080	16970	23100	6565	6685	7045	7110	46.7	44.3	41.5	30.8
Danbury	62870	64780	67570	78300	49615	53990	58125	64145	78.9	83.3	86.0	81.9
New Fairfield	12056	12820	14050	18400	2130	2140	2295	2315	17.7	16.7	16.3	12.6
New Milford	20560	21320	23120	28400	10610	14530	16695	17700	51.6	68.1	72.2	62.3
Newtown	20850	22090	24610	32700	6205	6515	7650	8395	29.8	29.5	31.1	25.7
Ridgefield	21260	21950	23120	27700	8650	9190	10025	13135	40.7	41.9	43.4	47.4
Roxbury	1616	1750	1970	2700	0	0	0	0	0	0	0	0
Sherman	2520	2720	3080	4300	295	295	310	310	11.7	10.8	10.1	7.2
Southbury	15200	15910	17260	21800	8865	9330	9935	12070	58.3	62.4	57.6	55.4
Woodbury	7132	7220	7260	7800	3685	3930	4220	5395	51.7	54.4	58.1	69.2
TOTALS	196904	205620	220860	273700	106585	117310	128255	145420	54.1	57.1	58.1	53.1

(1) Connecticut OPM Projections (interpolated from OPM projections to obtain listed values for 1986 and 1991).
(2) From Individual Supply Plans, questionnaires, or DOHS files.
(3) Includes 1986 value where projected population values were not available.

TABLE 3.2.3

AVERAGE DAILY DEMAND AND ESTIMATED YIELD FOR EACH WATER UTILITY

WATER UTILITY	COMMUNITY SERVED	AVERAGE DAILY DEMAND (1000 gpd) 1986	1991	2000	2030	ESTIMATED YIELD (1000 gpd)
Acre Lane, Inc.	Ridgefield	3.0	3.0	3.4	3.4	
Aqua Vista Assoc., Inc.	Danbury	11.3	11.3	12.0	12.0	
Arrowhead Point Homeowners	Brookfield	16.8	16.8	17.6	17.6	
Ashlar of Newtown	Newtown	11.6	11.6	12.4	12.4	
Ball Pond Water District	New Fairfield	42.8	42.8	45.0	45.0	
Bay Colony Mobile Home Park	Newtown	10.1	10.1	10.9	10.9	
(3) Bethel Consolidated Co.	Bethel	115.0	145.0	260.0	490.0	
Bethel Water Department	Bethel	1126.0	1108.0	1130.0	1252.0	
Birch Grove Assoc.	New Milford	18.0	18.0	18.8	18.8	
Boulder Ridge Assoc	Danbury	2.6	2.6	3.0	3.0	
Briar Ridge, Dancon Corp.	Danbury	15.4	15.4	15.4	15.4	
Bridgewater Cannon Condos.	Bridgewater	3.8	3.8	3.8	3.8	
Brook Acres, Rural Water Co.	Brookfield	13.7	13.8	14.6	15.0	
Brookfield Div. Rural W.C.	Brookfield	53.7	54.3	58.6	60.4	
Brookfield Elderly Housing	Brookfield	3.2	3.2	3.2	3.2	
Brookfield Hills Condos.	Brookfield	10.5	10.5	10.9	10.9	
Brookview Water Supply Co.	Ridgefield	5.3	5.3	5.6	5.6	
Brookwood, Dancon Corp	Brookfield	17.3	17.3	18.0	18.0	
Butternut Ridge, Dancon Corp.	Brookfield	7.1	7.1	7.5	7.5	
Camelot Estates Water Co.	New Milford	38.6	38.6	39.8	39.8	
Candlewood Acres Holding Corp.	Brookfield	4.9	4.9	5.3	5.3	
Candlewood Knolls Comm. Inc.	New Fairfield	21.0	21.0	22.1	22.1	
Candlewood Lake Condos.	New Milford	15.4	15.4	15.4	15.4	
Candlewood Orchards	Brookfield	8.3	8.3	8.3	8.3	
Candlewood Shores Estates	Brookfield	110.3	110.3	115.9	115.9	
Candlewood Springs P.O.	New Milford	6.8	6.8	7.1	7.1	
Candlewood Trails Assoc.	New Milford	14.3	14.3	14.3	14.3	
Carmen Hill Orchards Water Co.	New Milford	22.5	22.5	23.6	23.6	
Cedar Heights, Rural Water Co.	Danbury	23.8	23.9	24.5	24.9	
Cedar Terrace Prop. Owners	Danbury	3.3	3.3	3.8	3.8	
Cedarbrook Condo. Owners	Brookfield	7.5	7.5	7.9	7.9	
Cedarhurst Assoc.	Newtown	4.5	4.5	4.9	4.9	
Chestnut Hill Village	Bethel	10.8	10.8	11.6	11.6	
Chestnut Tree Hill Water Co.	Newtown	10.9	10.9	10.9	10.9	

TABLE 3.2.3
(continued)

AVERAGE DAILY DEMAND AND ESTIMATED YIELD FOR EACH WATER UTILITY

WATER UTILITY	COMMUNITY SERVED	AVERAGE DAILY DEMAND (1000 gpd) 1986	1991	2000	2030	ESTIMATED YIELD (1000 gpd)
Clapboard Ridge Heights	Danbury	8.3	8.3	8.3	8.3	
CLC Owners Corp.	Brookfield	6.7	8.8	9.0	9.9	
	New Milford	20.3	24.0	24.7	27.1	
Cornell Hills Assoc.	Danbury	6.0	6.0	6.4	6.4	
Craigmoor, Rural Water Co.	Ridgefield	3.9	4.2	5.5	6.2	
(1) Danbury Water Dept.	Danbury	6700	7300	7900	8800	
Dean Heights Water Assoc.	New Milford	12.8	12.8	13.5	13.5	
Eagle Hill Rehabilitation	Newtown	2.0	2.0	2.0	2.0	
Fairfield Hills Hospital	Newtown	358.0	358.0	358.0	358.0	
Fieldstone Ridge, Rural W.C.	New Fairfield	5.2	5.3	5.8	6.0	
Greenridge Inc. Water Div.	Brookfield	52.5	52.5	52.5	52.5	
Harrybrooke Park Condos.	New Milford	8.6	8.6	8.6	8.6	
Har-Bil Water Co.	New Milford	24.0	24.0	25.1	25.1	
Hawthorne East Apts.	New Milford	9.8	9.8	9.8	9.8	
Hawthorne Terrace Assoc	Danbury	7.5	7.5	7.5	7.5	
Heritage Hills Condo. Assoc.	Woodbury	7.5	7.5	7.9	7.9	
Heritage Village Water Co.	Southbury	769	925	1048	1537	
Hickory Hills Corp.	Brookfield	7.9	7.9	8.2	8.2	
High Acre Mobile Home Park	Danbury	4.5	4.5	5.3	5.3	
Hi-Vu Water Co.	New Milford	10.9	10.9	11.2	11.2	
Holiday Point Assoc. Inc.	Sherman	1.2	1.2	1.2	1.2	
(1) Hollandale Estates, Top. H.C.	Danbury	14.9	14.9	14.9	14.9	
Hollywyle Park Assoc.	New Fairfield	2.3	2.3	2.3	2.3	
Indian Fields Homeowners	Brookfield	6.8	6.8	7.1	7.1	
Indian Ridge Water Co.	New Milford	20.3	20.3	21.3	21.3	
Indian Springs Water Co.	Danbury	18.8	18.8	18.8	18.8	
Interlaken Water Co.	New Fairfield	3.7	3.7	4.1	4.1	
Iron Works Aqueduct Co.	Brookfield	2.0	2.7	2.8	3.1	
Ken Oaks, Rural Water Co.	Danbury	9.0	9.0	9.5	9.7	
Knollcrest Real Estate Corp.	New Fairfield	21.8	21.8	24.0	24.0	
Lake Lillinonah Shores	Brookfield	7.5	7.5	7.9	7.9	
Lake Waubeeka Prop. Owners	Danbury	25.0	53.4	53.4	53.4	
Lakeside Water Co.	Southbury	24.9	24.9	26.1	26.1	
Ledgewood Association	Brookfield	9.0	9.0	9.4	9.4	
Lillinoah Park Estates	New Milford	6.4	6.4	6.8	6.8	
Lone Oak Water Co.	New Milford	19.5	19.5	20.2	20.2	
Lords Mobile Home Park	New Milford	13.5	13.5	14.3	14.3	

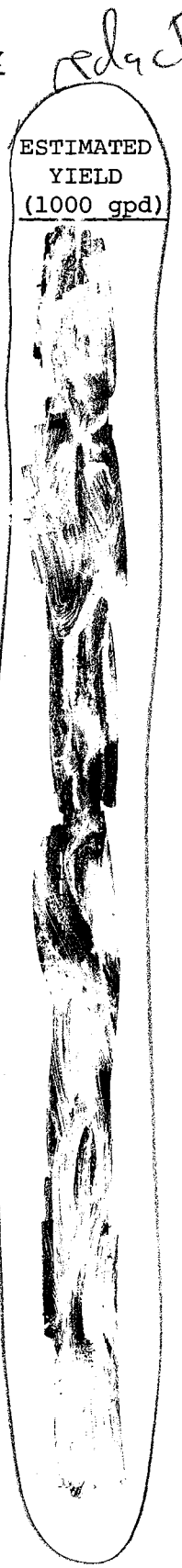

TABLE 3.2.3
(continued)

AVERAGE DAILY DEMAND AND ESTIMATED YIELD FOR EACH WATER UTILITY

WATER UTILITY	COMMUNITY SERVED	AVERAGE DAILY DEMAND (1000 gpd) 1986	1991	2000	2030	ESTIMATED YIELD (1000 gpd)
Mamanasco Lake	Ridgefield	3.7	3.7	4.1	4.1	
Maple Glen Trailer Park	Danbury	1.8	1.8	1.8	1.8	
Meadowbrook Terrace M.H. Park	Newtown	10.5	10.5	10.5	10.5	
Meckauer Circle (RSKCON WC)	Bethel	11.2	11.2	12.0	12.0	
Middle River, Dancon Corp.	Danbury	14.6	14.6	15.3	15.3	
Millbrook Water Co.	New Milford	37.5	37.5	39.4	39.4	
Millstone Ridge	New Milford	21.0	21.0	23.3	23.3	
New Milford Water Co.	New Milford	779	1102	1463	1593	
Newbury Crossing	Brookfield	7.9	7.9	8.2	8.2	
Newtown Water Co.	Newtown	265	329	432	538	
Oakdale Manor Water Assoc.	Southbury	1.9	1.9	2.3	2.3	
Oakwood Acres, Rural Water Co.	New Fairfield	27.0	27.5	30.0	31.3	
Old Farms Condo. Assoc.	New Milford	15.4	15.4	16.1	16.1	
Olmstead Water Supply Co.	Newtown	14.0	23.3	23.9	26.2	
Parkwood Acres	New Milford	3.0	3.0	3.4	3.4	
Pearce Manor, Rural Water Co.	Danbury	9.4	9.5	9.7	9.8	
Pleasant Acres Water Co.	Danbury	23.6	23.6	25.1	25.1	
Pleasant View Estates	New Milford	3.8	3.8	4.1	4.1	
Pocono Point	Danbury	2.6	2.6	3.0	3.0	
Possum Ridge, Dancon Corp.	New Fairfield	29.6	29.6	31.1	31.1	
Quassak Heights Condos	Woodbury	7.9	7.9	8.6	8.6	
Racing Brook Water Co.	Danbury	22.5	22.5	22.5	22.5	
Ridgebury Ests., Dancon Corp.	Danbury	17.6	17.6	18.3	18.3	
Ridgefield Knolls, Top. H.C.	Ridgefield	14.9	14.9	14.9	14.9	
Ridgefield Lakes, Rural W.C.	Ridgefield	28.1	32.1	35.1	37.1	
Ridgefield Water Co.	Ridgefield	720	888	944	1408	
Ridgeview Gardens, Dancon Corp.	Danbury	6.0	6.0	6.4	6.4	
River Glen Contin. Care Center	Southbury	12.0	12.0	12.8	12.8	
River View Court Assoc.	New Milford	2.3	2.3	2.3	2.3	
Robin Hill Condos.	Danbury	35.6	35.6	35.6	35.6	
Rolling Ridge, Top. Hyd. Co.	Danbury	7.1	7.1	7.1	7.1	
Rollingwood Condos.	Brookfield	34.5	34.5	36.4	36.4	
Sandy Lane Village	Brookfield	19.5	19.5	20.6	20.6	
Scodon, Rural Water Co.	Ridgefield	20.3	21.0	30.4	35.1	
Sherwood Forest, Dancon Corp.	Danbury	8.6	8.6	9.0	9.0	
Siboney Terrace	Danbury	1.8	1.8	1.8	1.8	
Silvermine Manor	Brookfield	6.0	6.0	6.4	6.4	

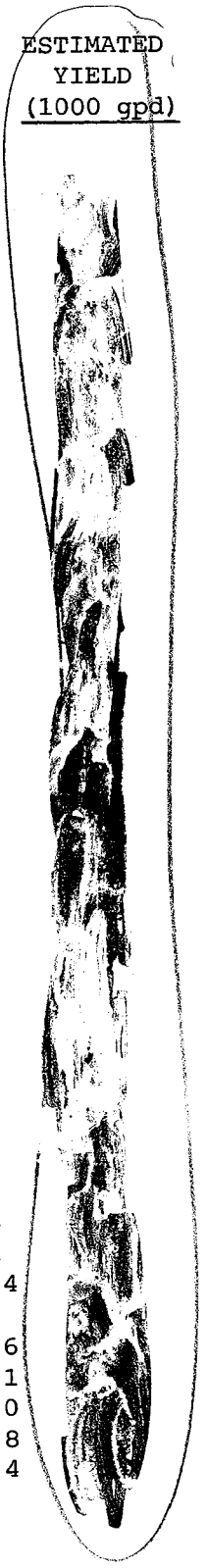

TABLE 3.2.3
(continued)

AVERAGE DAILY DEMAND AND ESTIMATED YIELD FOR EACH WATER UTILITY

WATER UTILITY	COMMUNITY SERVED	AVERAGE DAILY DEMAND (1000 gpd) 1986	1991	2000	2030	ESTIMATED YIELD (1000 gpd)
Snug Harbor Devel. Corp.	Danbury	7.5	7.5	7.9	7.9	
Soundview, Rural Water Co.	Ridgefield	7.3	7.3	7.3	7.3	
Southbury Training School	Southbury	270.0	270.0	270.0	270.0	
Stony Hill Village	Brookfield	23.3	23.3	24.4	24.4	
St. Thomas Seminary	Ridgefield	4.9	4.9	5.2	5.2	
Sunny Valley Farm	New Milford	1.1	1.1	1.1	1.1	
Sunny Valley Tax District	New Milford	28.9	28.9	30.4	30.4	
Swiss Village Apts.	Woodbury	20.6	20.6	21.8	21.8	
Tavi Village Condo. Assoc.	Danbury	3.0	3.0	3.4	3.4	
Ta'agen Point	Danbury	3.0	3.0	3.4	3.4	
The Cedars Water Supply	Danbury	1.5	1.5	1.5	1.5	
Timber Trails Water Co.	New Fairfield	2.3	2.3	2.6	2.6	
	Sherman	21.0	21.0	22.1	22.1	
Town in Country Condos.	Woodbury	15.4	15.4	15.4	15.4	
(2) Watertown Fire District	Woodbury	600	850.0	870.0	930.0	
Westfall Mobile Home Park	New Milford	8.6	8.6	8.6	8.6	
Whisconier Village	Brookfield	9.8	9.8	10.1	10.1	
Willow Run, Dancon Corp.	Danbury	8.3	8.3	8.6	8.6	
Woodbury Place Condo Assoc.	Woodbury	4.5	4.5	4.5	4.5	
Woodbury Water Co.	Woodbury	128	135	172	269	
Woodcreek Village Condos.	Brookfield	5.6	5.6	5.6	5.6	
Woodlake Municipal Tax District	Woodbury	74.6	74.6	74.6	74.6	

NOTES:

(1) Hollandale Estates purchased 14,910 in 1986.
(2) Watertown Fire Dist. h[illegible] for emergency use.
(3) Values represent consumption in years 1990, 2005 and [illegible].

water systems were generally provided by the utilities in their individual plans. Projections for the smaller utilities were obtained and expanded from the Assessment. In most cases the data provided were determined by using per capita average demand factors based on existing data. Average daily demands for years other than the four planning years were adjusted using per capita escalation factors determined from straight line interpolation of the projections provided in the individual plans.

The average daily demand projections for the small water systems were determined by applying a 75 gpcd factor to the residential population served to be consistent with the projections from the Assessment. Since most of the systems have little or no non-residential usage, the total demand figures in the Assessment were assumed to represent residential usage only. Consistent with the population projections of Table 3.2.1, most of the small systems are presumed to have either no growth, or a maximum of five percent growth, in average demand through the year 2030.

3.2.2.3 Non-Residential Growth

Of the 128 water utility systems, only eight utilities provided projections for non-residential (commercial, industrial, public, and non-revenue) growth and demand. Projections provided by these eight utilities are listed in Table 3.2.4, and were determined by reviewing available land within the service communities together with local zoning regulations, local and regional land use plans, and long term planning projections. This information was compared with existing data on commercial and industrial growth or decline within the service area. The individual utilities then developed the demand projections by applying standard or historical per capita use figures to the growth projections by using the number of employees or the available land and building area. Projections for public and non-revenue demand were developed using existing data or standard values to identify the percentage of total water usage for both categories.

TABLE 3.2.4

RESIDENTIAL/NON-RESIDENTIAL WATER DEMAND PROJECTIONS
(1000 gpd)

	1991	2000	2030
Bethel Water Dept.			
Residential	596.0	608.0	673.0
Non-residential	512.0	522.0	579.0
Bethel Consolidated Water Co. (1)			
Residential	130.0	222.5	390.0
Industrial/Commercial	15.0	37.5	100.0
TOTAL	145.0	260.0	490.0
Heritage Village Water Co.			
Residential	456	511	748
Non-residential	469	537	789
New Milford Water Co.			
Residential	649	835	NA
Non-residential	453	628	NA
Newtown Water Co.			
Residential	170	229	NA
Non-residential	159	203	NA
Ridgefield Water Supply Co.			
Residential	526	566	886
Non-residential	362	378	522
Woodbury Water Co.			
Residential	71	90	NA
Non-residential	64	82	NA

(1) Values represent demand in years 1990, 2005, and 2035.

NA = Information Not Available

3.2.2.4 Factors Affecting Demand Projections

The installation of metering systems often has the effect of reducing demand, since consumers have a tangible incentive to use water more wisely. Several utilities in the Housatonic Water Supply Management Area may experience this effect as they install metering systems. While this may cause significant changes in the demand projections of individual utilities, the effect on the area as a whole will probably not be very great, since the larger systems are already metered.

In addition, the implementation of conservation measures can reduce demand when necessary. Appropriate routine and emergency conservation measures have been, or will be, included in all individual water supply plans, and are reflected in the demand projections shown in Tables 3.2.3 and 3.2.4.

3.2.3 Water Supply Conditions

3.2.3.1 Sources of Supply

The sources of supply for the Housatonic Area include both groundwater supply wells and surface water reservoirs. Groundwater sources constitute the vast majority, in terms of the number of sources, of the supplies used by the Area's utilities. Only three water supply systems within the Housatonic Area own and use surface water sources: Bethel Water Department, Danbury Water Department, and Ridgefield Water Supply Company. None of these utilities relies entirely on surface water to satisfy system demands.

3.2.3.2 Purchased Water

There are two water utilities that regularly purchase water within the study area: Hollandale Estates and the Watertown Fire District.

Hollandale Estates is a division of the Topstone Hydraulic Company and purchases water from the Danbury Water Department to meet average daily demand requirements of around 15,000 gpd. Although no contract or limitations exist between Topstone and the City of Danbury, Topstone stated in their questionnaire response that up to 216,000 gpd is available if needed. For the purposes of this report, the continuing "yield" of this interconnection will be assumed to only be equal to the demand of Hollandale Estates. The Watertown Fire District purchases 0.72 mgd of water from the City of Waterbury during off-peak hours for emergency uses. (The supply from the City of Waterbury is outside of the Housatonic study area.)

3.2.3.3 Current Estimated Yields

The estimated yields tabulated in Table 3.2.3 represent the estimated yield from groundwater and surface water supplies as well as water purchased or sold through interconnections. The estimated yields were obtained from the individual plans, or, if not available, from the Assessment. State-approved yield estimates for groundwater sources were determined by using 90 percent of a stabilized pumping rate for an 18 hour duration for each day. The pumping rate was determined from pump tests performed in accordance with Section 19-13-B51k of the Regulations of Connecticut State Agencies. Operating data or design capacity were used if pump test data were not available to the utilities, while the yield estimates obtained from Table A.2 of the Assessment were based on DOHS figures for estimated source yield. Standard mass curve methods based on stream flow records are recommended by the Connecticut Department of Environmental Protection (DEP) and the Department of Health Services (DOHS) for the determination of the safe yield of surface sources. This method, or a variation thereof, was used by either the State or the utilities in developing the surface source yields shown in Table 3.2.3. Water systems that utilize interconnections to supplement

water supplies provided estimated yield information based on quantities identified in contractual agreements. If these agreements allowed for more supply than the 2030 consumption needs, the estimated yield was held at the 2030 values.

The estimated yields provided by many utilities were not based on the criteria listed above, or the method of determining the yield was not identified. Several listed an 18-hour pump test but did not state whether 90% of the pump capacity was used. Others listed yields as developed "from company records," which may be interpreted to mean well driller reports, yield tests, or operating records. Although these methods may be sound, it is likely that "safe" yield calculations provided in individual water supply plans will be given close scrutiny by State agencies during individual plan review if they do not correspond to the strict definition discussed above. Thus, some changes from the yield values listed in Table 3.2.3 are to be expected as the individual supply plans are finalized.

Of course, the vast majority of systems listed in Table 3.2.3 are not required to submit an individual supply plan, and the basis for their reported estimated yields may never be as firmly established. This is a key point, since many of the smaller utilities show estimated yields in excess of even their year 2030 consumption requirements - even some utilities who have been reported to have current supply deficiencies. It is the opinion of the WUCC that no credit should be taken for any apparent "surpluses" that appear to be available from these small utilities. Thus, it is presumed herein that all small utilities which are stated to have an excess supply capability will remain no better than self-sufficient through the planning period, with this "excess" capacity not truly available to ease any area-wide or large-system supply deficits which are shown to exist. (This decision is not based solely on the accuracy limitations associated with small system yield estimates, but also reflects the practical difficulties in incorporating numerous scattered small sources, many of which may require treatment or other upgrades, into a larger supply and distribution system.)

3.2.3.4 Future Water Supply Needs

Projections for future water supply needs for each water system have been developed from the data identified in the previous subsections. The projected water supply surplus or deficit for each water system was computed by comparing average daily demand projections with the estimated yields for present surface and groundwater supplies as well as water that is purchased or sold to meet average daily demands. The projected water supply surplus or deficit was calculated assuming that all existing supplies and all agreements to purchase or sell water will continue throughout the planning period.

The projected surplus or deficit of water to meet average daily demands for each water system is listed in Table 3.2.5, with Table 3.2.6 providing a separate listing of the six utilities projected to have a deficit at some time during the planning period (based on 1986 estimated yields). As shown, Candlewood Shores Estates, Cedar Heights, and the Ridgefield Water Company were in a deficit situation relative to estimated yields in 1986. Deficits are projected to occur for the New Milford Water Company and Craigmoor systems by 2000, and for the Heritage Village Water Company by 2030. By 2030, approximately 59 percent of the total projected deficit will be associated with the Ridgefield Water Company, 19 percent with the New Milford Water Company, 20 percent with the Heritage Village Water Company, and the balance with the other three smaller systems.

It should be borne in mind that the data summaries of Tables 3.2.5 and 3.2.6 reflect only the individual system's ability to meet <u>average</u> day demands. A system's ability to meet peak demands is dependent on a variety of factors, including the adequacy of not only supply sources but also system pumping, transmission, and treatment capabilities. Many of the systems which are able to meet average daily demands may need improvements in a variety of areas in order to meet peak requirements - an issue which requires detailed study of each system beyond the scope associated with this planning effort.

TABLE 3.2.5

PROJECTED WATER SUPPLY SURPLUS OR DEFICIT FOR EACH WATER UTILITY

WATER UTILITY	COMMUNITY SERVED	PROJECTED SURPLUS OR (DEFICIT) (1000 gpd) 1986	1991	2000	2030
Acre Lane, Inc.	Ridgefield	20.8	20.8	20.4	20.4
Aqua Vista Assoc., Inc.	Danbury	28.7	28.7	28.0	28.0
Arrowhead Point Homeowners	Brookfield	13.4	13.4	12.6	12.6
Ashlar of Newtown	Newtown	52.1	52.1	51.3	51.3
Ball Pond Water District	New Fairfield	7.2	7.2	5.0	5.0
Bay Colony Mobile Home Park	Newtown	13.9	13.9	13.1	13.1
Bethel Consolidated Co.	Bethel	485.0	355.0	240.0	110.0
Bethel Water Department	Bethel	524.0	542.0	520.0	398.0
Birch Grove Assoc.	New Milford	57.6	57.6	56.8	56.8
Boulder Ridge Assoc	Danbury	11.4	11.4	11.0	11.0
Briar Ridge, Dancon Corp.	Danbury	20.2	20.2	20.2	20.2
Bridgewater Cannon Condos.	Bridgewater	3.7	3.7	3.7	3.7
Brook Acres, Rural Water Co.	Brookfield	15.5	15.4	14.6	14.2
Brookfield Div. Rural W.C.	Brookfield	58.3	57.7	53.4	51.6
Brookfield Elderly Housing	Brookfield	11.9	11.9	11.9	11.9
Brookfield Hills Condos.	Brookfield	32.2	32.2	31.8	31.8
Brookview Water Co.	Ridgefield	10.9	10.9	10.6	10.6
Brookwood, Dancon Corp	Brookfield	52.9	52.9	52.2	52.2
Butternut Ridge, Dancon Corp.	Brookfield	51.2	51.2	50.8	50.8
Camelot Estates Water Co.	New Milford	18.6	18.6	17.4	17.4
Candlewood Acres Holding Corp.	Brookfield	12.4	12.4	12.0	12.0
Candlewood Knolls Comm. Inc.	New Fairfield	66.0	66.0	64.9	64.9
Candlewood Lake Condos.	New Milford	25.6	25.6	25.6	25.6
Candlewood Orchards P.O.	Brookfield	21.9	21.9	21.9	21.9
Candlewood Shores Estates	Brookfield	(13.7)	(13.7)	(19.3)	(19.3)
Candlewood Springs P.O.	New Milford	32.1	32.1	31.8	31.8
Candlewood Trails Assoc.	New Milford	33.2	33.2	33.2	33.2
Carmen Hill Orchards Water Co.	New Milford	30.4	30.4	29.3	29.3
Cedar Heights, Rural Water Co.	Danbury	(2.4)	(2.5)	(3.1)	(3.5)
Cedar Terrace Prop. Owners	Danbury	26.9	26.9	26.4	26.4
Cedarbrook Condo. Owners	Brookfield	22.7	22.7	22.3	22.3
Cedarhurst Assoc.	Newtown	27.9	27.9	27.5	27.5
Chestnut Hill Village	Bethel	10.8	10.8	10.0	10.0
Chestnut Tree Hill Water Co.	Newtown	0.7	0.7	0.7	0.7

TABLE 3.2.5
(Continued)

PROJECTED WATER SUPPLY SURPLUS OR DEFICIT FOR EACH WATER UTILITY

WATER UTILITY	COMMUNITY SERVED	PROJECTED SURPLUS OR (DEFICIT) (1000 gpd) 1986	1991	2000	2030
Clapboard Ridge Heigths	Danbury	24.1	24.1	24.1	24.1
CLC Owners Corp.	Brookfield	122.9	120.8	120.6	119.7
	New Milford	109.3	105.6	104.9	102.5
Cornell Hills Assoc.	Danbury	2.6	2.6	2.4	1.8
Craigmoor, Rural Water Co.	Ridgefield	0.5	0.2	(1.1)	(1.8)
Danbury Water Dept.	Danbury	3300	2700	2100	1200
Dean Heights Water Assoc.	New Milford	NA	NA	NA	NA
Eagle Hill Rehabilitation	Newtown	34.7	34.7	34.7	34.7
Fairfield Hills Hospital	Newtown	1478.0	1478.0	1478.0	1478.0
Fieldstone Ridge, Rural W.C.	New Fairfield	24.0	23.9	23.4	23.2
Greenridge Inc. Water Div.	Brookfield	31.7	31.7	31.7	31.7
Harrybrooke Park Condos.	New Milford	29.2	29.2	29.2	29.2
Har-Bil Water Co.	New Milford	66.7	66.7	65.6	65.6
Hawthorne East Apts.	New Milford	22.6	22.6	22.6	22.6
Hawthorne Terrace Assoc	Danbury	46.5	46.5	46.5	46.5
Heritage Hills Condo. Assoc.	Woodbury	24.9	24.9	24.5	24.5
Heritage Village Water Co.	Southbury	531	375	252	(237)
Hickory Hills Corp.	Brookfield	20.2	20.2	19.9	19.9
High Acre Mobile Home Park	Danbury	8.5	8.5	7.7	7.7
Hi-Vu Water Co.	New Milford	48.5	48.5	48.2	48.2
Holiday Point Assoc. Inc.	Sherman	106.8	106.8	106.8	106.8
Hollandale Estates, Top. H.C.	Danbury	0	0	0	0
Hollywyle Park Assoc.	New Fairfield	17.7	17.7	17.7	17.7
Indian Fields Homeowners	Brookfield	50.2	50.2	49.9	49.9
Indian Ridge Water Co.	New Milford	70.4	70.4	69.4	69.4
Indian Springs Water Co.	Danbury	48.2	48.2	48.2	48.2
Interlaken Water Co.	New Fairfield	NA	NA	NA	NA
Iron Works Aqueduct Co.	Brookfield	22.2	21.5	21.4	21.1
Ken Oaks, Rural Water Co.	Danbury	38.6	38.6	38.1	37.9
Knollcrest Real Estate Corp.	New Fairfield	85.1	85.1	82.9	82.9
Lake Lillinonah Shores	Brookfield	62.7	62.7	62.3	62.3
Lake Waubeeka Prop. Owners	Danbury	234	205.6	205.6	205.6
Lakeside Water Co.	Southbury	11.8	11.8	10.6	10.6
Ledgewood Association	Brookfield	21.2	21.2	20.8	20.8
Lillinoah Park Estates	New Milford	26.0	26.0	25.6	25.6
Lone Oak Water Co.	New Milford	3.7	3.7	3.0	3.0
Lords Mobile Home Park	New Milford	5.9	5.9	5.1	5.1
Mamanasco Lake	Ridgefield	15.7	15.7	15.3	15.3
Maple Glen Trailer Park	Danbury	NA	NA	NA	NA
Meadowbrook Terrace M.H. Park	Newtown	NA	NA	NA	NA
Meckauer Circle (RSKCON WC)	Bethel	21.2	21.2	20.4	20.4
Middle River, Dancon Corp.	Danbury	17.8	17.8	17.1	17.1

TABLE 3.2.5
(Continued)

PROJECTED WATER SUPPLY SURPLUS OR DEFICIT FOR EACH WATER UTILITY

WATER UTILITY	COMMUNITY SERVED	PROJECTED SURPLUS OR (DEFICIT) (1000 gpd) 1986	1991	2000	2030
Millbrook Water Co.	New Milford	3.0	3.0	1.1	1.1
Millstone Ridge	New Milford	20	20	17.7	17.7
New Milford Water Co.	New Milford	591	268	(93)	(223)
Newbury Crossing	Brookfield	13.7	13.7	13.4	13.4
Newtown Water Co.	Newtown	1235	1171	1018	962
Oakdale Manor Water Assoc.	Southbury	19.7	19.7	19.3	19.3
Oakwood Acres, Rural Water Co.	New Fairfield	41	40.5	38.0	36.7
Old Farms Condo. Assoc.	New Milford	22.9	22.9	22.2	22.2
Olmstead Water Supply Co.	Newtown	19.9	10.6	10.0	7.7
Parkwood Acres	New Milford	1.3	1.3	0.9	0.9
Pearce Manor, Rural Water Co.	Danbury	38.2	38.1	37.9	37.8
Pleasant Acres Water Co.	Danbury	15.3	15.3	13.8	13.8
Pleasant View Estates	New Milford	43.7	43.7	43.4	43.4
Pocono Point	Danbury	13.6	13.6	13.2	13.2
Possum Ridge, Dancon Corp.	New Fairfield	2.8	2.8	1.3	1.3
Quassak Heights Condos	Woodbury	5.1	5.1	4.4	4.4
Racing Brook Water Co.	Danbury	47.7	47.7	47.7	47.7
Ridgebury Ests., Dancon Corp.	Danbury	86.1	86.1	85.4	85.4
Ridgefield Knolls, Top. H.C.	Ridgefield	157.9	157.9	157.9	157.9
Ridgefield Lakes, Rural W.C.	Ridgefield	50.6	46.6	43.6	41.6
Ridgefield Water Co.	Ridgefield	(16)	(184)	(240)	(704)
Ridgeview Gardens, Dancon Corp.	Danbury	10.2	10.2	9.8	9.8
River Glen Contin. Care Center	Southbury	83.0	83.0	82.2	82.2
River View Court Assoc.	New Milford	NA	NA	NA	NA
Robin Hill Condos.	Danbury	5.4	5.4	5.4	5.4
Rolling Ridge, Top. Hyd. Co.	Danbury	60.6	60.6	60.6	60.6
Rollingwood Condos.	Brookfield	29.2	29.2	27.3	27.3
Sandy Lane Village	Brookfield	31.3	31.3	30.2	30.2
Scodon, Rural Water Co.	Ridgefield	72.0	71.3	61.9	57.2
Sherwood Forest, Dancon Corp.	Danbury	7.6	7.6	7.2	7.2
Siboney Terrace	Danbury	4.4	4.4	4.4	4.4
Silvermine Manor	Brookfield	26.4	26.4	26.0	26.0
Snug Harbor Devel. Corp.	Danbury	7.5	7.5	7.1	7.1
Soundview, Rural Water Co.	Ridgefield	7.3	7.3	7.3	7.3
Southbury Training School	Southbury	30.0	30.	30.	30.
Stony Hill Village	Brookfield	737.7	737.7	736.6	736.6
St. Thomas Seminary	Ridgefield	NA	NA	NA	NA
Sunny Valley Farm	New Milford	NA	NA	NA	NA
Sunny Valley Tax District	New Milford	160.1	160.1	158.6	158.6
Swiss Village Apts.	Woodbury	6.4	6.4	5.2	5.2

TABLE 3.2.5
(Continued)

PROJECTED WATER SUPPLY SURPLUS OR DEFICIT FOR EACH WATER UTILITY

WATER UTILITY	COMMUNITY SERVED	PROJECTED SURPLUS OR (DEFICIT) (1000 gpd) 1986	1991	2000	2030
Tavi Village Condo. Assoc.	Danbury	NA	NA	NA	NA
Ta'agen Point	Danbury	7.8	7.8	7.4	7.4
The Cedars Water Supply	Danbury	11.5	11.5	11.5	11.5
Timber Trails Water Co.	New Fairfield	101.7	101.7	101.4	101.4
	Sherman	83.8	83.8	82.7	82.7
Town in Country Condos.	Woodbury	65.6	65.6	65.6	65.6
Watertown Fire District	Woodbury	700	550	530	470
Westfall Mobile Home Park	New Milford	19.5	19.5	19.5	19.5
Whisconier Village	Brookfield	NA	NA	NA	NA
Willow Run, Dancon Corp.	Danbury	14.4	14.4	14.1	14.1
Woodbury Place Condo Assoc.	Woodbury	33.3	33.3	33.3	33.3
Woodbury Water Co.	Woodbury	302	295	258	161
Woodcreek Village Condos.	Brookfield	11.4	11.4	11.4	11.4
Woodlake Municipal Tax District	Woodbury	45.4	45.4	45.4	45.4

TABLE 3.2.6

WATER SYSTEMS WITH SUPPLY DEFICITS(1)

UTILITY	Projected Deficit (1000 GPD) 1986	1991	2000	2030
Candlewood Shores Estates	13.7	13.7	19.3	19.3
Cedar Heights, Rural Water Co.	2.4	2.5	3.1	3.5
Craigmoor, Rural Water Co.	-	-	1.1	1.8
Heritage Village Water Co.	-	-	-	237.0
New Milford Water Co.	-	-	93.0	223.0
Ridgefield Water Co.	16.0	184.0	240.0	704.0

(1) Deficit based on demand projections through 2030 compared to estimated supply source yield in late 1987.

3.2.3.5 Population Not Serviced

The percentage of the population that is not serviced by public water supplies remains relatively constant through the 50 year planning period, with approximately 47 percent of the area's total population (from Table 3.2.2) dependent on individual water supplies in 2030.

The water supply for the unserviced population consists of mostly individual wells. Applying a per capita consumption factor of 75 gpcd to the population projections, the projected residential consumption in unserviced areas will range from less than 7 mgd in 1986 to 9.6 mgd in 2030.

The unserviced population is located in scattered portions of the study area. The Town of Roxbury is projected to remain 100% dependent on private water supplies, while approximately 97 percent of Bridgewater and 93 percent of Sherman will remain on private supplies. These communities are much less densely populated than the more urban portions of the state, which would require water systems to extend distribution mains over large areas to serve a small population. These communities are also located within the watersheds of supply sources for some of the larger water systems, and any future development would be limited to that allowed by the current or future source protection measures taken by the communities at the request of the water companies or as required by State agencies. (See Section 3.3 for further discussion of this issue).

Conversely, unanticipated future development of areas within these communities could offset somewhat the financial requirements of servicing these private water supplies. Assuming that there would be little or no impact on present or future supplies in the area, this future development might allow a water system to be initiated and eventually extend to serve some of the remaining population. Additionally, contamination of private supplies may require an extension of a water system to provide potable water to areas that would not have otherwise been considered for public water supply. The potential for presently

3.3 LAND USE COMPATIBILITY

3.3.1 Introduction

The Housatonic Public Water Supply Management Area is blessed with numerous water resources, as listed in Table 3.3.1 and depicted on Figures 3.3.1 and 3.3.2. Table 3.3.1 lists resources or associated resource areas to be protected. Figure 3.3.1 shows major stratified drift aquifers[1], while Figure 3.3.2 shows existing water supply watersheds and potential supply watersheds as defined by the WUCC and/or regional or State agencies.

The character of growth in the various communities which make up the Housatonic Management Area has been shaped by the zoning regulations and/or plans of development, or lack thereof, established by the 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 important groundwater aquifers. In general, land use patterns have not been particularly sensitive to water resource needs and, as a result, incidences of groundwater contamination have become more frequent. (A summary of cited and potential groundwater contamination problems is given in Table 3.3.2[2].) Although surface water sources are generally more isolated from such development, they are still vulnerable to degradation from inappropriate development or land use within their watersheds.

[1] Major aquifers, as classified by the HVCEO in its 1985 "Regional Water Resource Atlas," are those land areas of unconsolidated stratified drift comprising at least 100 acres of area and possessing saturated water thickness of 10 feet or greater. Similar criteria are used to define major aquifers in Southbury, Roxbury, and Woodbury, which lie outside the HVCEO area.

TABLE 3.3.1

HOUSATONIC WATER SUPPLY RESOURCES

COMMUNITY	WATER SUPPLY RESOURCE	EXISTING OR POTENTIAL
Bethel	Dibble's Brook Aquifer	E
	East Swamp Aquifer	P
	Murphy's Brook	E
	Chestnut Ridge Reservoir	E
	Saugatuck Regional Basin Watershed	E
	Sympaug Brook Aquifer	P
	Wolf Pit Brook	P
Bridgewater	Shepaug River	P
Brookfield	Candlewood Lake	P
	Gallows Hill Aquifer (Still River North)	P
	Tranquil Valley Water Company Reservoir	P
Danbury	Boggs Pond, West Lake Reservoir	E
	Lake Kenosia, Margerie Reservoir, East Lake, Padanaram Reservoirs, Upper & Lower Kohanza Reservoirs	
	Candlewood Lake	P
	Lake Kenosia Aquifer	E
	Saugatuck Regional Basin Watershed	E
	Middle Still River Aquifer	P
	West Still River Aquifer	E
	Sugar Hollow Aquifer	P
	Eureka Reservoir, Mountain Pond	E
	East Swamp Aquifer	E
New Fairfield	Margerie Reservoir, East Lake Watershed	E
	Candlewood Lake	P
	Ball Pond Brook	P
New Milford	New Milford Reservoirs, #1-4	E
	West Aspetuck River	P
	Shepaug River Watershed	P
	North Still River Aquifer	E
	Candlewood Lake	P
	Housatonic Aquifer (New Milford)	P
	Housatonic Aquifer (Gaylordsville)	P
Newtown	Taunton Pond	E
	Pootatuck Valley Aquifer	E
	Dibbles Brook Aquifer	P
	Housatonic Aquifer (Newtown)	P
	Saugatuck Regional Basin Watershed	E
	Southwest Eastern Regional Basin Watershed	E

TABLE 3.3.1 - CONTINUED

HOUSATONIC WATER SUPPLY RESOURCES

COMMUNITY	WATER SUPPLY RESOURCE	EXISTING OR POTENTIAL
Ridgefield	Round Pond Watershed	E
	Norwalk Regional Basin Watershed	E
	Southwest Western Regional Basin Watershed	E
	Croton Regional Basin Watershed	E
	Saugatuck Regional Basin Watershed	E
	Sugar Hollow Aquifer	P
	Upper Titicus Aquifer	P
Roxbury	Shepaug River	P
Sherman	Candlewood Lake	P
	Housatonic Aquifer (Gaylordsville)	P
	Croton Regional Basin Watershed	E
Southbury	Woodbury Reservoirs Watershed	E
	Shepaug River	P
	Pomperaug Aquifer	E
Woodbury	Woodbury Reservoirs #1 & #2	E
	Pomperaug Aquifer	E

NOTES:

1. Watershed information derived from Connecticut DHS Draft Watershed Protection Handbook dated August 1987.
2. Aquifer information is detailed in Table 3.4.1.
3. Water supply sources are discussed in Section 3.4.

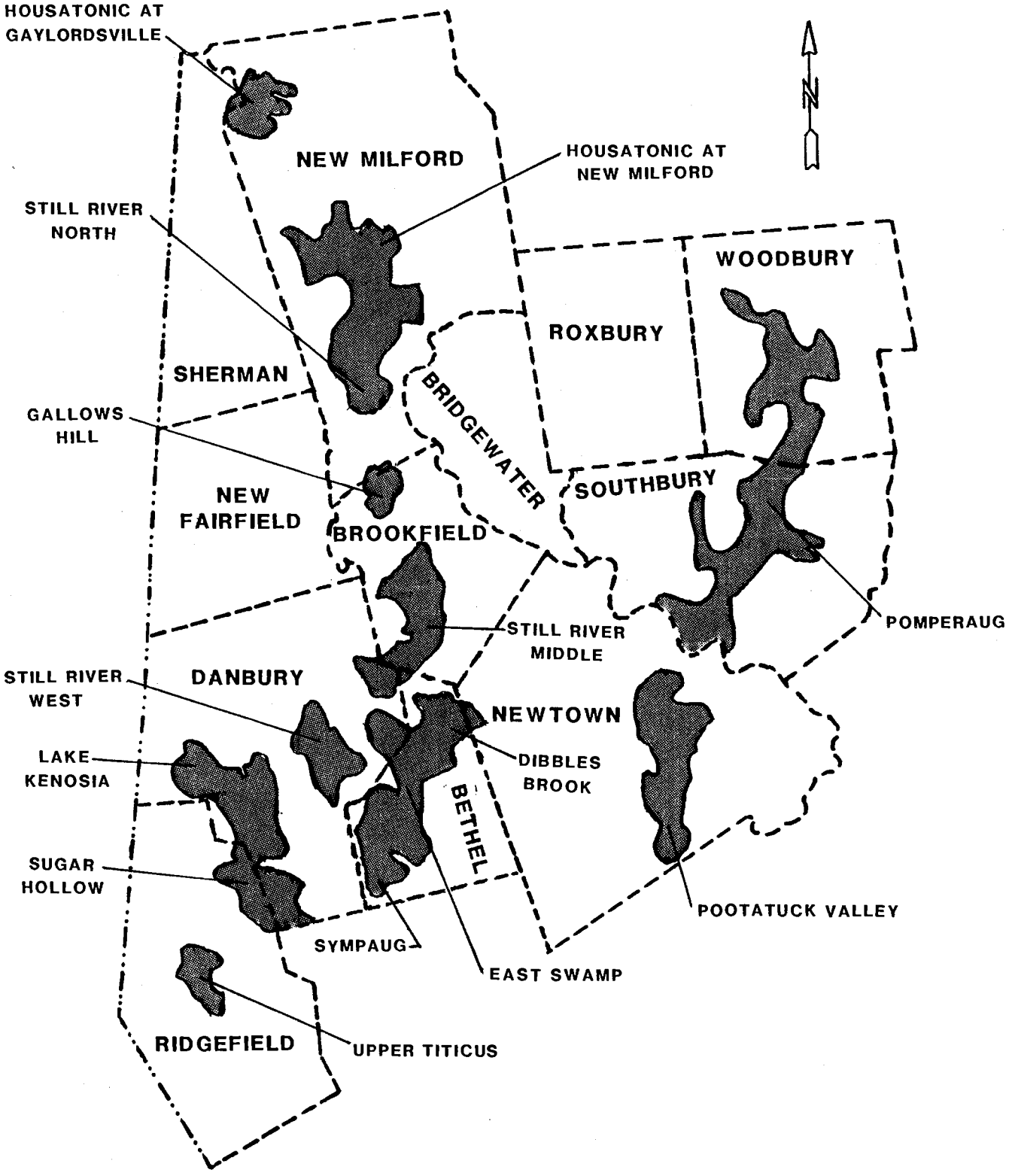

FIGURE 3.3.1
HOUSATONIC WATER SUPPLY MANAGEMENT AREA MAJOR STRATIFIED DRIFT AQUIFERS

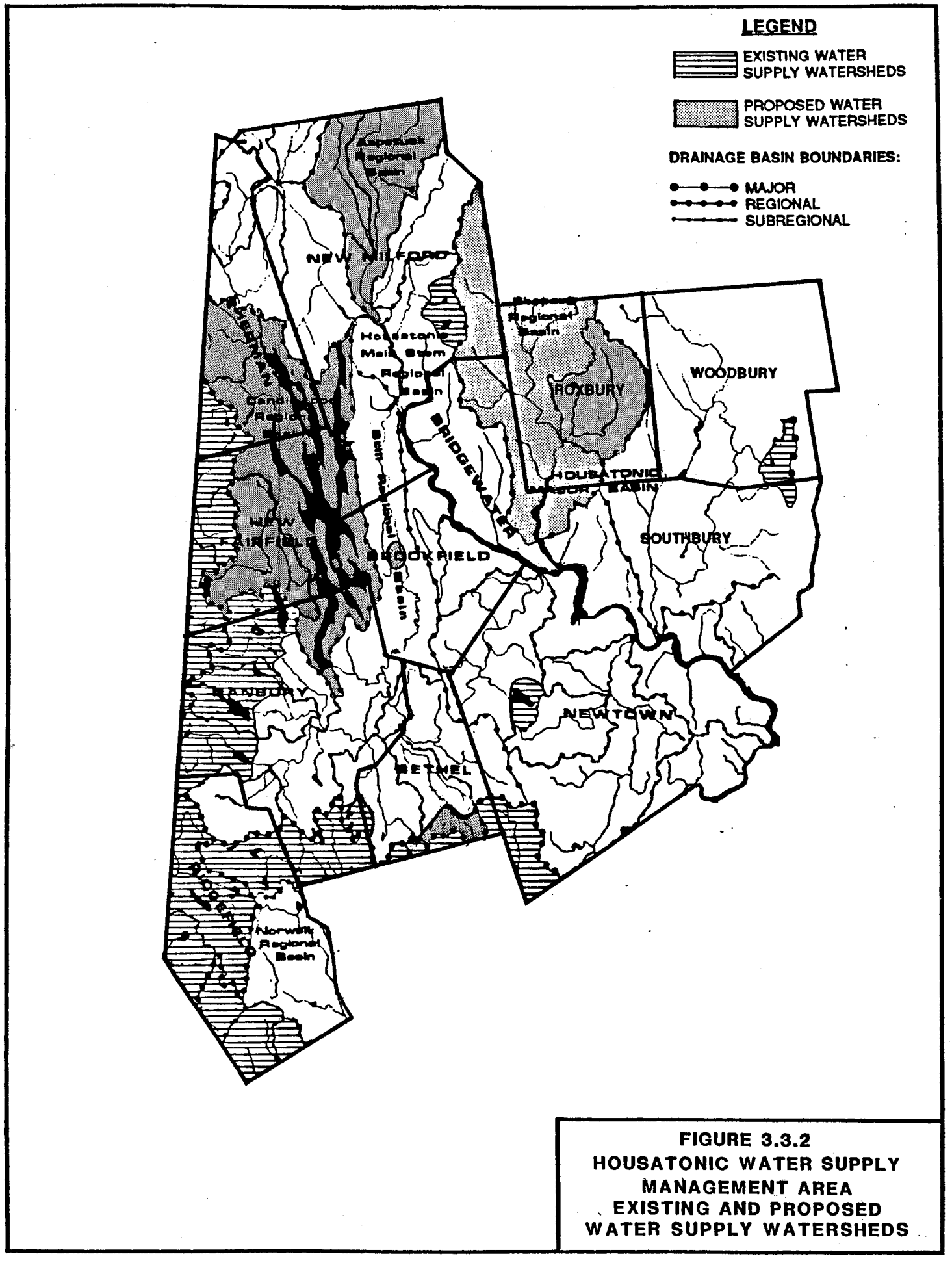

FIGURE 3.3.2
HOUSATONIC WATER SUPPLY MANAGEMENT AREA
EXISTING AND PROPOSED WATER SUPPLY WATERSHEDS

These instances of real or potential water contamination illustrate the need to better understand the relationship between community development and water supply requirements. For the communities in the Housatonic area, this relationship has been brought into clearer perspective by recent legislation enacted by the State of Connecticut. This 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.

Some communities have already taken steps to protect their water resources, as illustrated in Table 3.3.3. Unfortunately, only a few communities have put significant effort into developing a protection program. Examples include Brookfield, which has adopted aquifer protection measures; New Milford, Southbury and Bridgewater, which have draft measures for aquifer protection; and Danbury, where watershed protection measures have been proposed.

In addition to implementing water resource protection measures, it is also important that the pertinent information about such water supply protection programs be disseminated to the general populace, as well as to public officials responsible for implementing the programs, since the membership on a community's planning and zoning commission may change regularly. In an effort to further this program of information and education, this section of the Integrated Report examines land use issues and their relationship to the Housatonic Public Water Supply Management Area's water supply needs.

(2) Some aquifers listed in Table 3.3.2 do not appear in Figure 3.3.1 or Tables 3.3.1 and 3.3.6. This results from the fact that U.S.G.S. and D.E.P. data are based on a list of 26 aquifers, some of which are subdivided. Figure 3.3.1 and its related tables address only "priority aquifers" as designated by HVCEO.

TABLE 3.3.2

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		2 (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	2	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.

TABLE 3.3.3

INVENTORY OF ADOPTED OR PROPOSED LOCAL WATER SUPPLY PROTECTION MECHANISMS

	BETHEL	BRIDGEWATER	BROOKFIELD	DANBURY	NEW FAIRFIELD	NEW MILFORD	NEWTOWN	RIDGEFIELD	ROXBURY	SHERMAN	SOUTHBURY	WOODBURY
A. AQUIFER PROTECTION OVERLAY DISTRICT												
1. Special Management of Hazardous Materials		P	A			P					P	
2. Prohibition of Selected Land Uses		P	A			P	A				P	A
3. Various Special Standards (Fuel storage, sewage disposal, oil and grease traps, etc.)		P	A			P					P	
B. WATER SUPPLY WATERSHED OVERLAY DISTRICT												
1. Density Restriction				P			A					
2. Prohibition of Selected Land Uses												
3. Stream Setback		A		P			A					
4. Other Restrictions				P								
C. TOWNWIDE GROUNDWATER PROTECTION INITIATIVE												
1. Special Management of Hazardous Materials		P		A		P						
2. Prohibition of Selected Land Uses												
3. Various Special Standards (Fuel storage, sewage disposal, oil and grease traps, etc.)		P	A		P	P		A		A	P	

A = Adopted
P = Proposed

3.3.2 Community Planning and Zoning

3.3.2.1 Community Planning

The communities within the Housatonic Study Area utilize a plan of development to define long-term development and conservation goals, including the identification of service needs such as sewers and public water supply. Every town's plan of development should include a discussion of local water supply resources and the need for their conservation due to present and projected future use. A listing of aquifer and watershed protection measures that have been considered and/or adopted for use by each community is provided in Table 3.3.4. These protection measures have been obtained from the individual plans of development, and are an expansion of the overview information provided in Table 3.3.3.

Four towns do not address any form of water supply protection at all in their plans of development. These are Bridgewater, Brookfield, Roxbury, and Sherman. Of the remaining eight towns in the management area, only three address watershed protection in their plans of development. Danbury restricts multi-family development in water supply watersheds, while New Milford allows only low density residential development or reserved open space in watershed areas. New Fairfield's draft plan of development proposes watershed protection.

Different levels of aquifer protection exist throughout the study area, as well as throughout the state. Typically aquifer protection overlay districts are drawn to cover the entire area and adjacent recharge zones of a stratified drift aquifer. Prohibitions and restrictions in the district are applied uniformly across this area. However, the Connecticut DEP is recommending an evolution of these groundwater protection policies to reflect different strictness levels within such traditional overlay districts. The basic protection strategies that may be implemented, depending on the critical aquifer component and existing land use conditions, include: land acquisition, land use regulation to prevent the siting of high-risk activities, and increased monitoring, inspections and regulation of the more threatening land use activities.

TABLE 3.3.4

WATER SUPPLY PROTECTION MEASURES (1)

Bethel	. Aquifer protection and new water sources proposed in Plan of Development
Bridgewater	. Subdivision Regulations protect wetlands and water courses in the drainage standards . Development setback near Lake Lillinonah specified in zoning regulations . Development setback near any water body, brook, stream, spring or dug well specified in zoning regulations . Proposed Groundwater Action Project sets standards for: Groundwater Protection Zone, Site Plan Review, Subdivision Regulations, Underground Storage of Hazardous Materials, and Toxic and Hazardous Materials Ordinance.
Brookfield	. Groundwater protection criteria established in Zoning Regulations . Aquifer Protection District Standard adopted . Plan of Development does not address water supply protection.
Danbury	. Water supply watershed protection ordinance draft completed in 1984 . Plan of Development establishes guidelines restricting multi-family zoning in the watershed of the City reservoir system. . Hazardous materials management ordinance
New Fairfield	. Draft Plan of Development proposes watershed protection criteria
New Milford	. Aquifer Protection Committee created by Board of Selectmen . Plan of Development calls for low density residential development or preservation as public open space in watershed areas . Proposed Groundwater Action Project sets standards for: Aquifer Protection Zone, Site Plan Review, Subdivision Regulations, Underground Storage of Hazardous Materials, and Toxic and Hazardous Materials Ordinance
Newtown	. Plan of Development recognizes Pootatuck Valley Aquifer as highest priority for future water supply and recommends adequate aquifer protection measures in the immediate future; Aquifer Protection District established on the recharge areas of the Pootatuck Aquifer

TABLE 3.3.4 - CONTINUED

WATER SUPPLY PROTECTION MEASURES

	. Sanitary code includes provisions for sewage disposal system setbacks adjacent to ponds, lakes and streams . Water quality protection standards established in zoning regulations . Zoning regulations impose land use category restrictions in Aquifer Protection District
Ridgefield	. Subdivision regulations set criteria for residential fuel tank placement . Plan of Development noted that aquifer protection should be stressed to protect water supplies
Roxbury	. No water supply protection measures
Sherman	. Subdivision Regulations provide protection of brooks, rivers and bodies of water from pollution sources . Sanitary Code sets standards for water supply facilities and sewage disposal to protect water supplies . Plan of Development does not address water supply protection
Southbury	. Proposed zoning regulations set standards for groundwater protection townwide and with the establishment of the Aquifer Protection District . Plan of Development indicates that protection of Pomperaug Aquifer is highest priority, and sets forth protection program
Woodbury	. Plan of Development identifies new development of low density residential as aid to protecting water supplies . Zoning restrictions on industrial and some commercial and retail uses in the Middle Quarter District to protect underlying aquifer . Town stringently enforces inland/wetland regulations; Protection of Hart Farm Wellfield is Watertown Fire District's highest priority; District seeks to buy surrounding lands for protection of groundwater. Not known if Town of Woodbury supports these measures.

NOTES:

(1) Information derived from existing and proposed town documents, including Plans of Development, Zoning Regulations, Subdivision Regulations, and Sanitary Codes.

HRO053188

The 1987 Connecticut DEP report entitled "Protection of High and Moderate Yield Stratified Drift Aquifers" recommended severely restrictive controls (land acquisition, for example) in the relatively small "wellfield areas"; stringent protection (partial land acquisition or strict regulation of both future and existing land uses, for example) in the larger surrounding "drawdown areas"; and somewhat less stringent but still meaningful controls (existing and future land use restrictions, for example) in the remainder of the overlay district or "recharge areas". Additional protection may also extend to upstream "indirect recharge areas", which are largely protected through State surface and groundwater protection strategies.

The 1988 Report of the Aquifer Protection Task Force to the General Assembly builds upon the 1987 DEP report, recommending a plan of action to begin Statewide protection of aquifers. The Task Force concluded that all stratified drift aquifers with existing public water supply wellfields be mapped by 1992 and those of potential importance to water supply should be mapped in detail after the completion of the WUCC planning process. It was also recommended that each town either designate an existing land use commission, or form a new commission, for the purpose of carrying out an aquifer protection program using the data obtained from the mapping program. The Task Force asked that its term be extended an additional year to allow further study of several aspects of the aquifer protection problem.

3.3.2.2 Community Zoning

Each community maintains a set of zoning regulations in order to control new development. Once a determination has been made as to the level of protection needed through the planning process, additional actions should be taken to adequately protect existing and potential water supplies through local zoning and other regulatory mechanisms.

Revisions to the zoning regulations with the aim of water supply protection generally involve the prohibition of certain land uses from specified aquifer protection zones, or restrictions on development within the watershed areas of reservoirs. Once identified, the area's zoning designation may be changed to a low-risk use, such as low-density residential, or may become an aquifer protection overlay zone where land uses now allowed by right may be permitted subject to a special permit review by the Zoning Commission.

If water supply protection measures lead to the exclusion of certain industrial and commercial uses from existing zones, other areas of town which might accommodate those uses without threatening water resources or downstream and neighboring uses should be considered.

Zoning controls are especially effective in restricting incompatible new development in defined aquifer protection zones. However, controlling existing land uses through new zoning regulations is difficult. State guidelines suggest that communities now include a clause in their zoning that any reoccupancy of an existing building by a new use be in conformance with present zoning in order to allow a review of changes for potential effects on water supplies.

Local legislative bodies may also enact ordinances to protect surface water supplies in conjunction with zoning controls. Ordinances may be flexible in that they may apply to existing land uses, to certain water supply watersheds, or to the entire town.

Table 3.3.4 summarizes existing policies pertaining to aquifer and watershed protection for the communities in the Housatonic Management Area. The regulations are not consistent from community to community, and many of the zoning classifications are broad in the type of development that may be allowed. Furthermore, local zoning commissions have the latitude to grant variances or special permits within each classification, including residential zones.

Many water utilities have evolved solely from a need to supply water to residential developments or multi-family housing complexes. The Water Supply Assessment pointed out that several of these systems have been plagued with problems stemming from insufficient managerial, informational, or financial resources. However, the efforts of the Housatonic WUCC to develop exclusive service areas has helped to implement recent state laws to improve the quality of water supply management for new or expanded community systems.

Public Act 84-330 sets criteria which water companies must meet before beginning construction or expansion of a public water supply system. A water company must demonstrate that the area in question cannot be served by an existing system, that the system will be built to appropriate engineering standards, that the company is capable of operating the system reliably and efficiently, that the system does not result in a duplication of service, and that all Federal and State water supply standards are met. In addition, PA 84-330 states that "no proposal for a development using water supplied by a company incorporated on or after the effective date of this act shall be approved by a planning commission or combined planning and zoning commission unless such company has been issued a certificate" stating that it meets the above criteria. If a proposal is approved without a certificate, the municipality becomes responsible for ensuring adequate water supply to the development in the event that the utility at any time is unable or unwilling to provide adequate service to the consumers.

Review of each municipality's subdivision regulations in the study area shows that few address water supply requirements. It is important for municipalities to recognize and address this issue. One response to the proliferation of inferior systems is to prohibit new residential subdivisions from being served by small private water companies altogether, as in Brookfield. In Danbury, high density residential development is permitted only in areas where public water supply is already available.

The Town of Brookfield also has had specific performance standards since 1984 applicable to multi-family housing complexes for proposed well designs with a maximum daily demand of 2,500 gallons or more. In order to get local approval, the following requirements must be satisfied: an analysis of the impact on the water supplies of surrounding properties; bedrock wells must be developed to yield twice the average daily demand with the best well out of service; the demand shall not exceed the water supply available on the site at times of extreme drought conditions; a standby well and water conservation fixtures are required; and, a monitoring program of neighboring wells must be implemented to determine the impact attributable to new development. Brookfield's program is an excellent example of a town's effort to ensure reliable water systems for its residents, and can serve as a model for other towns in the Management Area.

Pursuant to Special Act 85-84, the Department of Environmental Protection has prepared a report (January, 1987) on the "Protection of High and Moderate Yield Stratified Drift Aquifers". A land use hierarchy was included in this report and originally developed in a guidance document titled "Protecting Connecticut's Groundwater" (September 1984). The appropriate categories of land uses according to this hierarchy have been listed in Table 3.3.5 for the land use zones in each community in order of high to low risk. These categories are defined as follows:

- Category A - land uses which provide maximum protection to high and moderate yield aquifers including:
  - water utility owned and maintained land
  - designated open space, passive recreation with no permanent facilities
  - state or local government-owned forest land
  - managed forest land, privately owned
  - developed recreation land use, public parks (excluding active recreational areas such as golf courses)

. Category B - land uses posing minimal risks to high and moderate yield aquifers, including:

  - field crops - permanent pasture, hay crops, corn and vegetable production

  - low-density residential and certain institutional uses (density of less than one dwelling per two acres)

. Category C - land uses which pose slight to moderate risks to ground water, including:

  - agricultural production
    (1) livestock

    (2) tobacco crops, nurseries and orchards

  - golf courses

  - medium density residential (one dwelling per one-half to two acres)

. Category D - land uses considered to pose a substantial risk to ground water, including:

  - institutional use - schools, colleges, hospitals, nursing homes, prisons

  - high density housing (greater than one dwelling unit per one-half acre)

  - certain commercial uses

    (1) conventional office buildings not including "professional" office or retail activity

    (2) banks, restaurants and other domestic sewage limited uses

. Category E - land uses which pose a major threat to ground water should be banned in drawdown areas and banned or strictly regulated in recharge areas, including:

  - retail commercial development (discharges limited to domestic sewage)

- commercial uses with chemical wastes in addition to domestic sewage as a result of the services offered by

  (1) professional offices, medical, veterinary, etc.

  (2) commercial retail processors, furniture strippers, dry cleaners, photo processors, beauty shops, appliance repairs, etc.

  (3) auto body shops, service stations, machine shops, junk-yards, etc.

  (4) industrial uses, manufacturing, processing, research and storage facilities, all of which have the potential to cause contamination

A 1979 study completed for HVCEO[1] analyzed the Housatonic Valley Region's (eight HVCEO member communities') urban growth and examined the area's 45 industrial sites with regard to their compatibility with water supply protection needs. This study ranked the area's commercial/industrial zones with respect to their potential for ground water contamination. This subjective ranking identified the various zones as having a slight, moderate or severe contamination potential. Although the 1979 work provided a good analysis of the potential impact of these zones on ground water, for the purposes of this study it was decided to use DEP's proposed categories as described above. The use of a State derived classification system has the advantage of providing a consistent basis for examining the potential for ground water contamination throughout the State's seven Public Water Supply Management Areas.

Although a similar categorization system has not been developed for surface water, the ground water protection strategy also has merit for surface water sources. Just as commercial/industrial activities can impact ground waters, they may contaminate surface water supplies. Not only will contaminants discharged to a stream or river within a drainage basin ultimately reach the water intake structure of the water utility, but contaminated ground waters will also contribute to the stream flow which reaches the water intake. Consequently, those categories which pose high risk to ground water sources also pose a high risk to surface sources.

TABLE 3.3.5

ZONING ANALYSIS

COMMUNITY	ZONE	LAND USE RISK CATEGORY	COMMENTS
BETHEL	C	E	Commercial zone, retail, commercial uses and apartments.
	CI	E	Commercial zone, commercial uses, limited industrial and selected other uses by special permit.
	I	E	Industrial zone, various industrial uses consistent with character of town, and commercial kennels and athletic clubs by special permit.
	R-10	D	High density residential, single family.
	RR-10	D	High density residential, single or two family.
	RM-O	D	Multi-family, three and four family, apartments and professional offices.
	R-40	C	Moderate density residential, single family with allowance for cluster subdivisions.
	RR-20	C	Moderate density residential, single family.
	R-30	C	Moderate density residential, single family.
	R-80	B	Rural residential, single family with allowance for cluster subdivisions.
BRIDGEWATER	C	E	Commercial zone, golf courses, commercial uses permitted.
	I	E	Industrial zone, limited industrial uses, special use permit for other industrial uses.
	R-2	C	Residential, two acre zone, multi-family housing with restrictions, allowance for subdivisions, farming and agricultural use, golf courses permitted.
	TG	A/D	Town Green zone, residential use permitted, allowance for subdivisions, professional offices, public buildings, schools, recreational activities permitted.
	R-3	A/C	Residential, three acre zone, allowance for subdivisions, farming and agricultural use, golf courses permitted.
	R-4	A/C	Residential, four acre zone, allowance for subdivisions, farming and agricultural use permitted.
BROOKFIELD	IR-80SE	E	Restricted Industrial District Southeast, various industrial uses with water resource protection standards, minimum lot 80,000 ft².
	IR-80N	E	Restricted Industrial District North, same uses and lot sizes as IR-80SE with additional selected uses.
	IL-80	E	Limited Industrial Districts, same uses and lot size as IR-80SE with additional uses on a broad service scale.
	IG-80	E	General Industrial District, industrial and major commercial development with water resource protective standards.
	IR/C-80/40	E	Restricted Industrial/Commercial Districts, uses restricted to broad range commercial, emphasis on service industry.
	IG/C-80/40	E	General Industrial/Commercial Districts - same uses as IR/C-80/40 and IG-80, in accordance with the land's ability to support development.
	RC-41	E	Restricted Commercial Districts permitted use linked to character of the area.
	RS-40	E	Recreational Service District recreational use linked to sustaining character of the neighborhood.
	R-80	C	Same uses as R-100, minimum lot 80,000 ft².
	R-60	C	Same uses as R-100, minimum lot 60,000 ft².
	R-40	C	Same uses as R-100, minimum lot 40,000 ft².
	R-7	C	Residential District: west Brookfield, same uses as R-100 but minimum lot 7,000 ft², five acres required for multiple family dwellings.
	R-100	B	Single family residential-rural zone, minimum lot 100,000 ft², ten acres required for multiple family dwellings.
	FP	A	Flood Plain Districts, development regulated by Inland Wetlands Commission for non-conflicting use.

TABLE 3.3.5 - CONTINUED

ZONING ANALYSIS

COMMUNITY	ZONE	LAND USE RISK CATEGORY	COMMENTS
DANBURY	CG-20	E	General Commercial, use intended for suburban commercial services with transportation needs.
	CA-80	E	Arterial Commercial Zone, use compatible with arterial roadways.
	CL-CBD	E	Light Commercial - Central Business District, use compatible with area.
	IL-40	E	Light Industrial, use to provide expansion areas for industrial base.
	IG-80	E	General Industrial, use permitted for heavy industrial.
	LCI-20,40	E	Limited Roadside Commercial Industrial Zones.
	CBD	E	Central business district.
	GC	E	General commercial.
	LI	E	Light industry.
	HI	E	Heavy industry.
	U	E	Utility.
	I & G	E	Institutional & governmental.
	RH-3	D/E	Residential High-Rise Zone, high density residential and professional use.
	CL-10	D/E	Light Commercial, permit limited use for office and retail development near cantral business district.
	CN-5	D/E	Neighborhood Commercial Zone, use permitted to service industry that serves the neighborhood.
	CN-20	D/E	Neighborhood Commercial Zone, same uses as CN-5 with special requirements tied to transportation needs.
	RA-8	D	Single family dwelling residential, minimum lot 8,000 ft², allowance for cluster subdivisions, with professional offices permitted.
	RA-20	D	Same as RA-8, minimum lot 20,000 ft².
	RM-4	D	Multi-Family residential, four dwelling units per acre.
	RM-8	D	Multi-Family residential, eight dwelling units per acre.
DANBURY (Continued)	RM-12	D	Multi-Family residential, 12 dwelling units per acre.
	S & MF	D	Single & multi-family residence.
	HR, R & O	D	High rise, residential & office.
	RC	D	Recreation commercial.
	OS & R	A	Open space & reserved land.
	RR-10	C/D/E	Waterfront Residential/Recreational Zone, compatible use of waterfront for residential, recreational and commercial uses.
	RA-40	C/D	Same as RA-8, minimum lot 40,000 ft².
	RA-80	C/D	Same as RA-8, minimum lot 80,000 ft².
	R-3	C/D	Multi-Family Residence Zone, use to reflect character of urban neighborhoods.
	SFR	C	single family residence
NEW FAIRFIELD	BUSINESS	D/E	Business District, retail/wholesale or service firms.
	COMMUNITY CENTER	D/E	Use must be compatible with the center of the community.
	R-44	C/D	Single Family Residence District, one acre; farm operations, schools, museums, recreational areas allowed.
	R-88	B/D	Single Family Residence District, two acres; farm operations, schools, museums, recreational areas allowed.
NEW MILFORD	B-1	E	Restricted Business Zone, use restricted to service industry.
	B-2	E	General Business Zone, use restricted to light industrial.
	MV	E	Motor Vehicle Junkyard Zone, restricted use for junkyards.
	I	E	Industrial Zone, use restricted to light-medium industrial.
	VC	E	Village Center Zone, with some historical buildings in areas; same uses as B-1.
	R-8-2	D	Residential Two-Family Zone, two families per 8,000 ft².

TABLE 3.3.5 - CONTINUED

ZONING ANALYSIS

COMMUNITY	ZONE	LAND USE RISK CATEGORY	COMMENTS
NEW MILFORD	R-5	D	Residential Zone, one family per 5,000 ft².
	B-3	D	Lake Business Zone, use restricted to recreation/tourism.
	RM	C/D	Multiple-Residence District.
	R-60	C	Residential zone, one family per 60,000 ft².
	R-40	C	Residential zone, one family per 40,000 ft².
	R-20	C	Residential Zone, one family per 20,000 ft².
	R-8	C	Residential Zone, one family per 8,000 ft².
	R-80	B	Residential zone, one family per 80,000 ft².
	LM	N.A.(1)	Landmark Village Zone.
NEWTOWN(2)	B-2	E	General Business Zone, includes retail, warehouse and commercial uses.
	M-1	E	Industrial Zone, restricted uses.
	M-2,M-2A	E	Industrial Zone, restricted uses.
	M-3	E	Industrial Zone, restricted uses.
	M-4	E	Industrial Zone, restricted uses.
	M-5	E	Industrial Zone, restricted uses.
	M-6	E	Industrial Zone, restricted uses, sand & gravel mining allowed.
	P-1	D/E	Professional Zone, single family and low density commercial use.
	B	D/E	Retail and General Business.
	B-1	D/E	Business Zone, commercial use permitted.
	NSC-1	D/E	Neighborhood Shopping Center Zone, retail complex use.
	B-3	D/E	Office Business Zone.
	B-4	D/E	Retail and General Business.
	BR-1	D/E	Business-Residential Zone.
	EH-10	D	Elderly Housing Zone.
NEWTOWN (Continued)	R-½	C/D	Farming & Residential, single family dwelling per ½ acre lot; farming, schools, parks, government buildings permitted.
	R-1	C/D	Same as R-½, single family dwelling per one acre lot.
	R-2	B/D	Same as R-½, single family dwelling per two acre lot.
	R-3	B/D	Same as R-½, single family dwelling per three acre lot.
	Aquifer Protection District	B/D	Same as R-½, one dwelling per lot, prohibit sanitary landfills, printing shops, and garages and filling stations.
RIDGEFIELD	B-2	E	Light Industry.
	MFDD	E	Multi-Family Dwelling Development.
	DPD	D/E	Design Professional District, residential areas with general business offices.
	CDD	D/E	Corporate Development District, regulate appropriate placement of corporate structures in community.
	PCD	D/E	Planned Corporate Development, use intended to attract growth in selected areas.
	B-1	D/E	Business Zone, use intended for residential and service industry.
	B-3	D/E	General Business and Industry, office buildings and special permit uses.
	RCDD	D/E	Restricted Corporate Development District.
	CBD	D/E	Central Business District, use intended to preserve historic character of community.
	R-20	D	Residential 20,000 ft² Zone, single family residential.
	R-10	D	Residential 10,000 ft² Zone, single family residential.
	R-7.5	D	Residential 7,500 ft² Zone, multiple family residential use.

TABLE 3.3.5 - CONTINUED

ZONING ANALYSIS

COMMUNITY	ZONE	LAND USE RISK CATEGORY	COMMENTS
RIDGEFIELD	R-5	D	Multi-family Residence, 15 family units per acre; abolished by planning and zoning commission regulations but may still be regulated by provisions applicable to this district.
	R-5-1	D	Multi-Family Residence, ten family units per acre; abolished by planning and zoning commission regulations but may still be regulated by provisions applicable to this district.
	RA	C	Residential one acre Zone, single family residential; farming uses allowed.
	RAAA	B/C	Residential three acre Zone, single family residential; farming uses allowed.
	RAA	B/C	Residential two acre Zone, single family residential; farming uses allowed.
ROXBURY	D	D/E	Business Zone D, general business and service industry uses.
	A	B/C	Residence Zone A, low density residential.
	B	B/C	Residence Zone B, low density residential.
	C	B/C	Residence Zone C, low density residential, special uses permitted.
SHERMAN	C	C/D/E	Business and Residence Zone, low density residential and service industry use permitted.
	A	B/C	Farm - Residence Zone, low density residential, limited special uses permitted.
	B	B/C	Residence Zone, same uses permitted in Zone A, some additional uses permitted.
SOUTHBURY	M-2	E	Industrial M-2 District residential, light industry and special use permitted, minimum lot two acres.
	M-2A	E	Industrial M-2A District, same as M-2.
	M-5	E	Industrial M-5 District, same as M-2, minimum lot five acres.
	CD-M	D/E	Center District - Main Street, development coordinated for use tied to center commercial industrial center of Town.
SOUTHBURY (Continued)	SD	D/E	Southford District, retail and commercial service use permitted that supports rural character of Southford.
	PUD	D/E	Planned Utility District.
	R-20	D	Residential R-20 District, low density residential, minimum lot 20,000 ft².
	B-1A	C/D/E	Business District #1A, low density residential and service industry use permitted, minimum lot 40,000 ft².
	B-1B	C/D/E	Business District #1B, low density residential and service industry use, special uses permitted, minimum lot 60,000 ft².
	B-2	C/D/E	Business District #2, low density residential and service industry use, special use permitted, minimum lot 40,000 ft².
	B-2A	C/D/E	Business District #2A, low density residential, service industry and additional special use permitted, minimum lot 40,000 ft².
	B-2B	C/D/E	Business District #2B, low density residential, service industry and additional special use permitted, minimum lot 40,000 ft².
	B-2C	C/D/E	Business District #2C, low density residential, service industry and additional special use permitted, minimum lot 40,000 ft².
	B-2D	C/D/E	Business District #2D, residential, service industry use, additional special use permitted, minimum lot 40,000 ft².
	B-2E	C/D/E	Business District #2E, residential, service industry use, additional special use permitted, minimum lot 40,000 ft².
	B-3	C/D/E	Designed Business District #3, residential, service industry use, additional special use permitted, minimum lot 40,000 ft².
	B-3A	C/D/E	Designed Business District #3A, residential, service industry use, special use permitted, minimum lot five acres.
	B-3B	C/D/E	Designed Business District #3B, same as B-3A, minimum lot two acres.
	B-3C	C/D/E	Designed Business District #3A, Same as B-3A, minimum lot 40,000 ft².

TABLE 3.3.5 - CONTINUED

ZONING ANALYSIS

COMMUNITY	ZONE	LAND USE RISK CATEGORY	COMMENTS
SOUTHBURY (Continued)	B-4	C/D/E	Marine Business District #4, residential, restricted special use, minimum lot 40,000 ft².
	R-60C	C/D	REsidential/Corporate Park R-60C District, low density residential, corporate office use permitted, minimum lot 60,000 ft².
	R-30	C	Residential R-30 District, low density residential, minimum lot 30,000 ft².
	R-30A	C	Residential R-30A District, low density residential, some special uses permitted, minimum lot 30,000 ft².
	R-40	C	Residential R-40 District, low density residential, minimum lot 40,000 ft².
	R-60	C	Residential R-60 District, low density residential, minimum lot 60,000 ft².
	R-80	B	Residential/Corporate Park R-60C District, low density residential, corporate office use permitted, minimum lot 60,000 ft².
	AP	A/D	Aquifer Protection District - Prohibited uses: solid waste disposal, septage disposal, toxic and hazardous material handling and disposal.
	FP	A	Flood Plain District, use permit required.
	PDD#	A	Planned Development District, planned development to integrate use consistent with Town character.
	CD-VG	N.A.(1)	Center District - Village Green, Development coordinated for use with Heritage Village.
WOODBURY	MQ	D	Middle Quarter District; to protect aquifer zone, forbidden uses include multi-family residences, trucking and heavy construction facilities, fast food facilities, gasoline filling stations, oil storage facilities, heavy industries, solid waste facilities, limited salt storage, car-washing facilities, laundromats.
	MQ-A	D	MQ Restrictions plus auto sales forbidden.
	MQ-B	D	MQ Restrictions plus certain commercial and retail uses forbidden.
	MQ-C	D	Same as MQ-A.
	MQ-D	D	MQ Restrictions plus auto sales and certain commercial and retail uses forbidden.
	MQ-E,F,G	D	MQ Restrictions plus auto sales and certain commercial and retail uses forbidden.
	MSD	D	Preserve residential character of area, some commercial, offices, and retail uses.
	R-40	C	Minimum lot size 40,000 ft².
	OS-60	C	Minimum lot size 60,000 ft².
	OS-80	C	Minimum lot size 80,000 ft².
	OS-100	B	Minimum lot size 100,000 ft².
	FP	A	Flood Plain.

NOTES:

(1) N.A. = Information not available.
(2) Newtown Zoning Regulations do not specify separate regulations for the Newtown Borough.
(3) See Table 3.3.3 for an inventory of local efforts to date designed to reduce risks to groundwater of zones listed above.

In addition to zoning considerations, communities and water suppliers must be cognizant of the transportation arteries which cross the area's aquifers and surface water drainage basins. Road salting and storage are common practices on the roads within the study area, and many hazardous materials are transported via local highway and rail systems. Hence, accidental spills pose a significant risk to both ground and surface water sources. Most communities already have emergency response procedures to deal with such accidents. An upgrading of these procedures by each municipality is now in progress as mandated by the Superfund Amendment and Reauthorization Act, with response measures also included in each water utility's individual supply plan.

3.3.3 Areas Potentially Requiring Public Water Supply

Plate 2 (included with the Water Supply Assessment) identifies areas potentially requiring public water supply based on information provided by community planning representatives, the State Policies Plan for Conservation and Development, and existing regional planning documents. As discussed in the Exclusive Service Areas portion of the Housatonic Coordinated Water System Plan, all of the areas requiring public water supply in the future were included in the exclusive service area of one of the Housatonic Area's water utilities with the exception of a portion of the Town of Bethel. This area in Bethel was identified by the State Policies Plan for Conservation and Development and the HVCEO's regional plan as having long-term urban potential, from which it was inferred that public water supply may be required. The majority of this area is zoned for moderate density single family development, although cluster subdivisions are allowable in some portions.

Those responsible for community planning did not perceive this unclaimed area in Bethel as potentially requiring public water supply. Additionally, the Town's two largest utilities did not include the majority of this area in their exclusive service areas, and do not believe that public water supply will be needed there in the near future.

For areas where public water supply is not expected, high risk areas were identified (areas that the state DEP classifies as GB or GC) in order to anticipate where groundwater failure may someday necessitate linkage to public water supplies (most likely through satellite-managed treatment facilities or interconnections, as discussed in Section 3.5). The approximate acreage in high risk categories within areas where public water supply is not planned is as follows:

Town	Approximate High Risk Acreage in projected Unserviced Areas
Bethel	0
Bridgewater	20
Brookfield	0
Danbury	0
New Fairfield	210
New Milford	120
Newtown	220
Ridgefield	20
Roxbury	20
Sherman	80
Southbury	190
Woodbury	90

3.3.4 Conflicting Land Use and Water Supply Needs

Plate 4 illustrates the principal unconsolidated and stratified drift aquifers and water supply watersheds in the Housatonic Public Water Supply Management Area with the various land use risk categories superimposed over the aquifer and watershed areas. It should be noted that in Table 3.3.5 some zones were identified with varying risk category designations. This was due to the fact that certain zones allow a variety of different types of development. In such situations, the highest risk category has been illustrated on Plate 4. For example, a zone which allows residential and commercial development has been designated as Category E because of the potential for commercial development. Also, there are some land use zones which are described as "restricted industrial" (e.g. in Brookfield). For

situations such as this, the most severe category has been indicated due to the potential for contamination. The restrictive nature of this type of zoning gives the individuals who administer the regulations the ability to dictate the type of industrial development to help protect ground water resources which may be located in the area.

Existing conflicts between land use zoning and water supplies are illustrated in Tables 3.3.6 and 3.3.7, where aquifers and watersheds are quantified by the land use/risk category associated with each. In Table 3.3.6, the amount of land use zoning in the highest risk categories (D and E) varies significantly, ranging from zero percent in Ridgefield to 100 percent for the Middle Still River aquifer in Bethel. Table 3.3.7 shows that the risk to surface water supplies also varies significantly, with Lake Kenosia exhibiting a particularly high percentage of zoning in Categories D and E.

In those areas where development of the type that constitutes a substantial risk or major threat to water supply has already occurred, little can be done to eliminate the risk, unless a change of use requiring zoning approval is proposed. However, communities can institute procedures to identify the degree of risk posed by the existing development and work with the owners of the existing establishments to create programs to help control the release of hazardous materials to the environment, as Danbury has done with its Hazardous Materials Management Ordinance. For those areas which are zoned such that they would be classified as Category D or E and where development has not occurred, the communities have the opportunity to rezone to provide greater protection for existing and future ground and surface water supplies. As an alternative, the communities can carefully regulate the type of development which occurs within the present zoning. For example, "wet" industries may pose a greater degree of risk than those which do not generate liquid wastes that can readily enter ground or surface waters. In order to make the necessary decisions in such cases, the individuals who administer the zoning regulations must be aware of what types of industries pose the greatest degree of risk and which areas are the most critical in terms of water supply. Thus, it is important that the members of a community's

TABLE 3.3.6

RISK CATEGORIES FOR STRATIFIED DRIFT AQUIFERS[1]

AQUIFER	COMMUNITY	A%	B%	C%	D%	E%
Dibbles Brook	Bethel	3	7	79	0	11
	Newtown	0	0	100	0	0
East Swamp	Bethel	0	0	56	39	5
	Danbury	0	0	31	6	63
Housatonic @ Gaylordsville	New Milford	0	25	73	0	2
	Sherman	0	0	100	0	0
Housatonic @ New Milford	New Milford	0	14	49	2	35
Lake Kenosia	Danbury	8	0	28	4	60
	Ridgefield	0	100	0	0	0
Pomperaug	Southbury	0	8	66	16	10
	Woodbury	0	0	67	26	7
Pootatuck Valley	Newtown	0	0	86	0	14
Still River, Middle	Brookfield	0	15	31	0	54
	Danbury	0	0	25	0	75
	Bethel	0	0	0	0	100
Still River, North	New Milford	0	22	21	2	55
	Brookfield	0	0	49	0	51
Still River, West	Danbury	5	0	18	22	55
Sugar Hollow	Danbury	16	0	63	1	20
	Ridgefield	0	54	6	0	40
Sympaug Brook	Bethel	0	35	25	17	23
Upper Titicus	Ridgefield	4	0	96	0	0
No major aquifers	Bridgewater					
	New Fairfield					
	Roxbury					

(1) Areas include secondary recharge zones

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TABLE 3.3.7

RISK CATEGORIES FOR WATER SUPPLY WATERSHEDS

COMMUNITY	WATERSHED	A%	B%	C%	D%	E%
Bethel	Wolf Pit Brook (6605)	0	100	0	0	0
New Milford	Shepaug River (6700)	0	34	66	0	0
Bridgewater		0	0	100	0	0
Roxbury		0	0	99	0	1
Southbury		0	100	0	0	0
New Fairfield	Ball Pond Brook (6402)	0	79	18	0	3
Danbury		0	0	100	0	0
New Milford	West Aspetuck River (6500)	0	0	99	0	1
Woodbury	Woodbury Reservoirs (68)	0	93	7	0	0
Southbury		0	0	100	0	0
Newtown	Taunton Pond (6018)	0	76	24	0	0
New Milford	New Milford Reservoirs (6000)	0	45	55	0	0
Newtown	Saugatuck Regional Basin (72)	0	100	0	0	0
Bethel		0	100	0	0	0
Danbury		12	0	79	0	9
Ridgefield		18	66	0	0	16
New Fairfield	Margerie, East Lake and Padanaram Reservoirs (6603)	0	20	79	0	1
Danbury	Lake Kenosia (6600)	7	0	37	1	55
Ridgefield		0	0	0	0	100
Danbury	Boggs Pond, West Lake and Kohanza Reservoirs (6602)	26	0	65	8	1
Danbury	Margerie, East Lake and Padanaram Reservoirs (6603)	26	0	69	5	0

TABLE 3.3.7

RISK CATEGORIES FOR WATER SUPPLY WATERSHEDS
(Continued)

COMMUNITY	WATERSHED	A%	B%	C%	D%	E%
Danbury	Eureka Reservoir, Mountain Pond (6604) (1)	0	0	73	27	0
Danbury	Candlewood Lake (6400)	26	0	64	5	5
New Fairfield		24	49	26	0	1
Sherman		12	22	64	0	2
Brookfield		13	0	85	2	0
New Milford		35	0	65	0	0
Sherman	Croton Regional Basin (81)	43	57	0	0	0
New Fairfield		0	62	38	0	0
Danbury		0	0	98	2	0
Ridgefield		5	55	35	0	5
Ridgefield	Norwalk Regional Basin (73)	12	0	86	0	2
Ridgefield	Mill River Watershed (7404)	3	0	97	0	0
Bethel	Chestnut Ridge Reservoir Watershed (6604)	0	100	0	0	0
Bethel	Murphy's Brook Watershed (6604)	0	0	100	0	0
Newtown	Southwest Eastern Regional Basin (71)	0	100	0	0	0
Brookfield	Tranquil Valley W.C. Proposed Reservoir	0	100	0	0	0

(1) Much of this watershed is owned by the Bethel Water Department, with further development unlikely. Present ownership of other parcels in other watersheds may also limit development such that the actual risk realized is less than that associated with the zoning category.

zoning and planning commissions be educated as to the areas of the community which are important to water supply and which types of development pose a significant degree of risk to these supplies.

In addition, through zoning and plans of development, the municipalities should either foster development at densities which facilitate the use of traditional water and sewer facilities, or encourage development at a density whereby only on-lot systems would be necessary. Exclusive service areas should be designated to overlap areas planned for higher densities, while on-lot densities should be coordinated with both the areas outside of a utility's exclusive service area and those portions of an exclusive service area where protection of a resource, such as a public water supply, is essential. The object would be to avoid development at an in-between level which may, over time, require the provision of water and/or sewer services to areas of scattered development. These services may then encourage additional development which can be detrimental to sound planning and possibly the protection of ground and surface water supplies. Futhermore, the cumulative effects of incremental growth on a water supply source should be taken into consideration in a municipality's planning, programs and regulations.

The involvement of representatives of water utilities with a community's planning and zoning process can also be instrumental in the protection of a utility's water resources. Communities should make an effort to seek the input of water supply professionals in their planning processes, since their collective efforts can be a key for protecting the future water supplies of the community. Also, where a utility has an existing or proposed water supply source which requires greater municipal regulatory protection, the water company should state in its individual plan that it will actively lobby local governments for the provision of local protection.

The preparation of DEP's report on the "Protection of High and Moderate Yield Stratified Drift Aquifers" (pursuant to Special Act 85-84) is designed to stimulate understanding of the procedures and needs for protecting the State's ground water supplies. Some communities have already taken steps to implement regulations for protecting their water resources, as shown in Table 3.3.3.

This document, and examples of procedures taken by some communities, provide guidance as to the type of efforts and/or regulations that communities should implement to protect their vital water resources. It is important that the communities, in cooperation with the suppliers of their water, implement programs to protect their water resources. In Section 3.4 of the Integrated Report, potential future water supplies for the Housatonic Public Water Supply Management Area are identified. It is important that those sources which represent key future water supplies for the region be protected now. If these protection efforts are delayed, the development which occurs prior to the tapping of these resources may threaten their viability. Thus, community leaders must be aware of potential future supplies so that community planning efforts properly address these areas, and appropriate protective zoning regulations are instituted or continued for the strict protection of both present and future water sources.

3.3.5 Conclusions and Recommendations

Community planning and development of zoning regulations have only recently been sensitive to the protection of water resources, as evidenced by the increasing passage of water supply protection measures in the individual towns. A review of Plate 4 indicates that the majority of the communities in the Housatonic Water Supply Management Area have significant land areas that pose a risk to water resources based on existing zoning. Although State legislation requires that community planning and zoning commissions consider existing and future water resource protection in their planning and zoning regulations, communities still have much to do in terms of implementing the appropriate protection strategies, as shown in Table 3.3.3.

Communities in the Housatonic Area which have not taken sufficient steps to protect their existing and future supplies (as identified as part of this coordinated planning process) should set up an ad hoc committee to establish appropriate protection procedures, both for watersheds and for aquifers (as recommended by the Aquifer Protection Task Force). Representatives of each community's water suppliers should be invited to participate in the development of the community's water resource protection strategies.

The local committee should use the water resource protection features listed in Table 3.3.3 as a starting point checklist. In this way, it will be clear in which areas the municipality is deficient so that its plan of development and zoning regulations can be amended accordingly.

Communities need to work with the businesses within their bounds to establish what types of hazardous substances are in use. The Resource Conservation and Recovery Act (RCRA) regulates the use of hazardous materials, but excludes users who handle less than 100 kilograms (220 pounds) of hazardous materials per month. Local ordinances should be used to ensure that all users, including those not covered by RCRA, have adequate hazardous material handling procedures. Spill control procedures should be established for the appropriate businesses to minimize the possibility of accidental spills. Emergency response procedures must be set up in the event such spills do occur. Good models for such hazardous materials control ordinances exist: a prime example is Danbury's Hazardous Materials Management Ordinance.

Appropriate protection zones must be established to ensure the long-term viability of critical water resources. In addition, public education programs should be established to gain resident support and involvement in the watershed protection programs that are established. All members of the community's planning and zoning commissions must be made aware of the importance of water resource protection so that they can properly implement the established regulations. A successful protection program needs the involvement and commitment of all facets of the community and the commitment of those principally responsible for implementation of the program.

REFERENCES

1. Hayes, John, "Urban Development and Water Quality Protection, Housatonic Valley Region," prepared for HVCEO, July, 1979.

2. Connecticut Department of Health Services, "Working Draft Watershed Protection Handbook", March 1988.

3. Connecticut Department of Environmental Protection, "Protection of High and Moderate Yield Stratified Drift Aquifers", 1987.

4. Harrison and Dickinson, Connecticut Department of Environmental Protection, "Protecting Connecticut's Groundwater", 1984.

5. Connecticut Office of Police and Management, State Policies Plan for the Conservation and Development of Connecticut, 1987-1992", adopted June, 1987.

6. Housatonic Valley Council of Elected Officials, "Regional Water Resource Atlas", Bulletin No. 37, June 1985.

7. Aquifer Protection Task Force, "Report of the Aquifer Protection Task Force to the General Assembly," March 1988.

3.4 ALTERNATIVE WATER RESOURCES FOR FUTURE SUPPLY NEEDS

3.4.1 Proposed Sources

Potentially significant additional water supply sources for the Housatonic Water Supply Management Area have been addressed in previous reports or studies as well as in the Water Supply Assessment. Potential sources have included all significant stratified drift aquifers in the management area, surface water impoundments, and the area's streams and rivers. These sources have recently been summarized by HVCEO[1][2] for nine towns of the Housatonic Water Supply Management Area, while sources in the other towns have been discussed in other documents[3][4]. Potential sources were listed in Chapter 1.3, Table 1.4 of the Water Supply Assessment. With the additional information given by the recently submitted Individual Water Supply Plans (8-20) now available, this table has been revised, and appears herein as Table 3.4.1.

The sources listed in Table 3.4.1 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 greater single source safe yield. Thus, these sources constitute supplies of regional significance, although they have generally been presented in the individual plans with an emphasis on their local applicability.

Generally, the individual plans identified potential sources that concurred with those listed in Table 1.4 of the Assessment, with several eliminated due to negative factors. Reasons for the elimination of potential sources from consideration include existing or former contamination/water quality problems, excessive development in the area, source distance from service area, and economics (relatively high cost of source development compared with yield). Water quality issues and the sources' proximity to the service area appear to be the major factors influencing the utilities' decisions as to whether or not to develop certain alternate sources for future needs, as well as the order in which they will develop those sources.

TABLE 3.4.1

POTENTIAL FUTURE WATER SUPPLY SOURCES

COMMUNITY(IES) SERVED	IDENTIFIED BY:	SOURCE	ESTIMATED OR THEORETICAL YIELD (MGD)	ITEMS TO BE ADDRESSED PRIOR TO USE OF POTENTIAL SOURCE(1)	WATER QUALITY CLASSIFICATION(2)
Bethel	Bethel Water Dept.	Sympaug Brook Aquifer	1.2	. 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%.
		. Parloa Wellfield		. Previously abandoned due to proximity of sewer main.	
		. Grassy Plain Wellfield		. Phenols and other organics - needs removal technology; may be suitable for emergency use but not economical or practical for normal use.	
		East Swamp Aquifer	1.0	. Oil spill; active & closed landfill; two lagoons or sludge beds (metal finishing); oil discharge; salt storage in aquifer recharge area; sewage treatment plant discharges and waste disposal areas	. Class GA-95%; GAA-5%.
	Bethel Water Dept.	. 64 acre well site behind Police station on Plumtrees Rd.	0.75-0.8		
		. Creation of lake in East Swamp as recharge zone for aquifer.	N.A.	. Environmental impacts must be investigated	. Unclassified
	Bethel Consolidated	. Well sites	N.A.	. High cost involved	

TABLE 3.4.1 - CONTINUED

POTENTIAL FUTURE WATER SUPPLY SOURCES

COMMUNITY(IES) SERVED	IDENTIFIED BY:	SOURCE	ESTIMATED OR THEORETICAL YIELD (MGD)	ITEMS TO BE ADDRESSED PRIOR TO USE OF POTENTIAL SOURCE(1)	WATER QUALITY CLASSIFICATION(2)
Bethel (Continued)		Dibble's Brook Aquifer	0.3	. Former lead & solvents discharge; petroleum spill in aquifer recharge area; on site sewage disposal systems; buried underground oil distribution piping (due to be abandoned); storm water runoff into brook; future groundwater development may be limited by future subdivisions planned; high costs involved.	. Class GA-75%; GB/GA-20%; GAA-5%.
	Bethel Water Dept.	. Potential well site on Kristy Drive			
	Bethel Consolidated Water Company	. Well site in vicinity of Well #1	0.38		
	Bethel Consolidated Water Company	Upper Lime Kiln Brook* Watershed-Berkshire Industrial Park Area	N.A.	. Locate as far from highway and storm drain discharges as possible to reduce potential for sodium and chlorides.	. GAA in proximity to existing wells; GA in surrounding area.
	Bethel Water Dept.	Huntington Pond* (Aspetuck River Watershed)	N.A.	. Part of Huntington State Park in northern Redding.	. N.A.
	Bethel Consolidated and Bethel Water Dept.	Interconnection with Danbury	N.A.		
	State of Connecticut	Wolf Pit Brook Diversion	N.A.		
Brookfield	Tranquil Valley Water Co.	Potential Reservoir	2.0	. Existing gravel pit operation requiring hydrologic, water quality, environmental and economic evaluation prior to implementation. . Potentially in corridor of Route 7	. Unclassified

TABLE 3.4.1 - CONTINUED

POTENTIAL FUTURE WATER SUPPLY SOURCES

COMMUNITY(IES) SERVED	IDENTIFIED BY:	SOURCE	ESTIMATED OR THEORETICAL YIELD (MGD)	ITEMS TO BE ADDRESSED PRIOR TO USE OF POTENTIAL SOURCE(1)	WATER QUALITY CLASSIFICATION(2)
Brookfield (Continued)	Brookfield Division, Rural Water Company	Additional well on existing lot	N.A.	. Some subsurface sewage system failures in area.	. Class GAA
		Interconnections with Candlewood Acres and Ironworks Aqueduct system.	N.A.		
	Water Supply Assessment	Gallows Hill (Still River North)	1.5	. Gasoline & fuel oil spill; metal hydroxide sludge lagoon; waste disposal site.	. Class GA
	Candlewood Shore Estates	Three Additional Wells	N.A.		N.A.
Danbury	Danbury Water Dept.	Osborne Well Field Expansion	N.A.		. Class GAA
		Raise Storage Levels in West Lake & Margerie Reservoirs	1.1		. W. Lake Reservoir, Class AA . Margerie Reservoir, Class AA
		Ball Pond Brook Diversion	1.9, (2.0-3.2 when combined with raising Margerie Res.	. Concerns of new Fairfield Selectmen noted in their comments on the draft Integrated Report (Appendix C). Potential conflict with hydroelectric power generation in Candlewood Lake.	. Class B with goal of A.
	Danbury Water Dept.	Candlewood Lake Diversion	8.2	. Receives pumped Housatonic River water. Potential conflict with hydroelectric power generation and recreational activities; conflict with present State law and policy.	. Class B
	Cedar Heights, Rural Water Company	Additional wells located in Candlewood Lake basin	0.0147	. None	. Class GAA

TABLE 3.4.1 - CONTINUED

POTENTIAL FUTURE WATER SUPPLY SOURCES

COMMUNITY(IES) SERVED	IDENTIFIED BY:	SOURCE	ESTIMATED OR THEORETICAL YIELD (MGD)	ITEMS TO BE ADDRESSED PRIOR TO USE OF POTENTIAL SOURCE(1)	WATER QUALITY CLASSIFICATION(2)
Danbury (Continued)	Indian Spring Water Company Ken Oaks, Rural Water Company	Interconnection with Danbury Interconnection with Danbury			
	Lake Waubeeka Assoc.	Saugatuck River Watershed . 50-acre lake on association-owned land* . Well sites	0.5	. None, completely undeveloped and isolated from roads.	. Class GAA
	Water Supply Assessment	Sugar Hollow Aquifer	1.0	. Potential for stream flow depletion in watershed of other utilities; some failing septic systems in area.	. Class GAA-85%
New Fairfield	Water Supply Assessment	Short Woods Brook Aquifer	N.A.	. Salt storage in aquifer recharge area.	. Class GA-90%; GAA-10%.
New Milford	New Milford Water Company	Expand existing well field in Indian Field Aquifer New well field in Indian Field Aquifer.	0.60-07.5 2.16	. 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%.
	New Milford Water Company	Reactivate Reservoirs 1-4	0.8	. Water treatment facility	. Class AA
	New Milford Water Company	Candlewood Lake Diversion	Part of 8.2 noted under Danbury	. Receives pumped Housatonic River Water. Potential conflict with hydroelectric power generation and recreational activities.	. Class B

TABLE 3.4.1 - CONTINUED

POTENTIAL FUTURE WATER SUPPLY SOURCES

COMMUNITY(IES) SERVED	IDENTIFIED BY:	SOURCE	ESTIMATED OR THEORETICAL YIELD (MGD)	ITEMS TO BE ADDRESSED PRIOR TO USE OF POTENTIAL SOURCE(1)	WATER QUALITY CLASSIFICATION(2)
New Milford (Continued)	Water Supply Assessment	Develop New Milford Center Aquifer Well Field	N.A.	. Gasoline and oil spill; salt storage; latex lagoons; septage disposal site in aquifer recharge area.	. Class A.
Newtown	Newtown Water Company	Reactivate Taunton Pond	0.54	. Former taste and odor complaints, water treatment facility required.	. Class B/AA.
	Water Supply Assessment	Housatonic Aquifer	1.5		. Class GA-90%; GAA-5%; GB/GA-5%.
	Water Supply Assessment	Pootatuck Valley Aquifer	1.4	. 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-80%; GB/GA-10%;
Ridgefield	Ridgefield Water Supply Company	BCI Geonetics Study Sites	0.223		. N.A.
	Ridgefield Water Supply Company	Titicus Valley Aquifer	0.5	. Primary area 95% undeveloped; distance from existing distribution system.	. Class GA
	Ridgefield Water Supply Company	Great Swamp Aquifer	0.4	. Outfall from sewage treatment plant; closed landfill; salt storage; industrial & commercial areas; primary area 80% undeveloped	. Class GA
	Ridgefield Water Supply Company	Sugar Hollow Aquifer	1.0	. Potential for stream flow depletion in watersheds of other utilities; primary area 80% undeveloped; control measures must be taken to prevent future degradation of water quality.	. Class GAA-75%; GA-25%

TABLE 3.4.1 - CONTINUED

POTENTIAL FUTURE WATER SUPPLY SOURCES

COMMUNITY(IES) SERVED	IDENTIFIED BY:	SOURCE	ESTIMATED OR THEORETICAL YIELD (MGD)	ITEMS TO BE ADDRESSED PRIOR TO USE OF POTENTIAL SOURCE(1)	WATER QUALITY CLASSIFICATION(2)
Ridgefield (Continued)	Ridgefield Water Supply Company	Upper Titicus	0.3	. Surrounding area fully developed for residential use; potential problem of on-site sewage disposal; primary area 70% undeveloped.	. Class GA-75%; GAA-25%
	Ridgefield Water Supply Company	Little Pond Aquifer*	0.3	. Existing water quality problems: former salt storage, failing septic systems, trace solvents in well, abandoned metals lagoons, sewage treatment plant; primary area 40% undeveloped.	. Class GA-50%; GB-25%; GAA-25%.
	Ridgefield Lakes, Rural Water Company	Develop new wells in Sugar Hollow Aquifer (Saugatuck River Watershed)	1.0	. Limited by septic clearances to less than 10 gpm; potential for stream flow depletion in watershed of other utilities.	. Class GAA 85%.
	Ridgefield Lakes, Rural Water Company (three different systems)	Interconnections with possibly six other systems of company.		. None	. N.A.
	Water Supply Assessment	Expand Oscaleta Field	N.A.		. Class GAA
	Water Supply Assessment	Upper Saugatuck Aquifer	0.5	. Potential for stream flow depletion in watersheds of other utilities.	. Class GAA

TABLE 3.4.1 - CONTINUED

POTENTIAL FUTURE WATER SUPPLY SOURCES

COMMUNITY(IES) SERVED	IDENTIFIED BY:	SOURCE	ESTIMATED OR THEORETICAL YIELD (MGD)	ITEMS TO BE ADDRESSED PRIOR TO USE OF POTENTIAL SOURCE(1)	WATER QUALITY CLASSIFICATION(2)
Southbury	Heritage Village Water Co.	Well #6	N.A.		. N.A.
	Water Supply Assessment	Southbury Aquifer	2.2	. PCB spill; active waste landfill; 3 closed waste landfills; 2 salt storage areas; industrial waste discharge to ground in aquifer recharge area.	. Class GA-70; GB/GA-10%; GAA-10%; GB-5%; GA/GC-5%.
Woodbury	Woodbury Water Co., Woodlake Municipal Tax District	Pomperaug Aquifer	2.1	. Solvent or TCE spills; active waste landfill closed waste landfill; 7 subsurface sewage systems; salt storage in aquifer recharge area.	. Class GA-85%; GB/GA-5%; GAA-10%.
	Watertown Fire District	Hart Farm Well Field Expansion*		. Well field needs protection, District owns only 0.14% of watershed land.	. Class GAA
	Water Supply Assessment	Nonewaug Aquifer	2.6	. Yield includes artifical recharge; salt storage, brass pickling lagoons, active and closed mixed waste landfills.	. Class GA-90%; GB/GA-5%; GAA-5%.
	Water Supply Assessment	Reactive Woodbury Reservoirs	2.6	. Water treatment facility required.	. Upper reservoir Class AA; Lower reservoir, N.A.

TABLE 3.4.1 - CONTINUED

POTENTIAL FUTURE WATER SUPPLY SOURCES

COMMUNITY(IES) SERVED	IDENTIFIED BY:	SOURCE	ESTIMATED OR THEORETICAL YIELD (MGD)	ITEMS TO BE ADDRESSED PRIOR TO USE OF POTENTIAL SOURCE(1)	WATER QUALITY CLASSIFICATION(2)
Regional	State of Connecticut	Shepaug River Diversion	11.0	. Existing wastewater discharges	. Class B, with goal AA.
	State of Connecticut	West Aspetuck River Diversion	4.7		. Class AA

Notes: (1) In addition to satisfying DEP Diversion Permit requirement.
Specific comments by DEP on individual plans reviewed to date are included in Appendix C.

(2) For surface supplies water quality goal listed is the goal at potential point of diversion.
N.A. = Information not available.
* = source not previously identified in Water Supply Assessment.

The future need for interconnections is again apparent from the information in the Water Supply Plans. Three utilities have indicated an interconnection with the Danbury Water Department as a possible water source for the future. In addition, there are about 30 water utilities operating within the Danbury City limits, of which several are active candidates to receive backup support by interconnecting to the Danbury system. (Interconnections are further discussed in Section 3.5 of this report.)

Although it is not Danbury's intent to be the sole provider of raw or finished water to all purveyors operating within or near the City's limits (nor to assume operation of these systems), the City is likely to be the first utility turned to in case these smaller entities face financial problems or supply difficulties. Danbury (and the other major utilities in the Management Area) is likely to be in a continuing better position than these small utilities relative to the monitoring and treatment requirements of the Safe Drinking Water Act, and is likely to be able to provide these systems with a greater degree of reliability in terms of safe yield, system pressures, and conformance to minimum design standards. This situation emphasizes the need to provide a margin of safety for conservatism in developing future supply sources not only for Danbury, but for other major utilities whose exclusive service area encompasses an entire community or abuts a variety of smaller water utilities, as illustrated by the following:

Major Utility	No. of Small Utilities Within or Near ESA*	Small Utilities 2030 Demand, gpd
Danbury WD	36	436,000
New Milford WC	25	406,000
Newtown WC	10	131,000
Ridgefield WC	9	119,000
Woodbury WC	6	133,000

* "Near" is defined as within ½ mile of major utility's ESA.

Table 3.4.2 was developed to identify, in priority order, the sources that the water utilities in the Housatonic area consider to be the most developable, as cited in their individual water supply plans. As with present water supplies, the continued emphasis is on groundwater for future supplies. Only four utilities identify surface water: Bethel Water Department[9], Danbury Water Department[11], Lake Waubeeka Association[12], and the Tranquil Valley Water Company[21]. Of these four, the sources Danbury cites have the most significance on an area-wide basis. These are the Candlewood Lake Diversion and the Ball Pond Brook Diversion, with estimated source yields of 8.2 MGD and 2.0-3.2 MGD, respectively.[5][11] Depending on the outcome of ongoing tests, the Tranquil Valley Reservoir, which is proposed for development from an existing gravel mining operation, could also be significant, with a preliminary yield estimate of 2.0 mgd. However, much more detailed evaluation must be undertaken to determine the feasibility of this potential source before it can become a reality.

In order to assess the viability of these surface sources, certain criteria must be investigated. For example, the State's diversion program requires that sufficient low flow be maintained in a stream in order to protect its waste assimilative capacity and fisheries. The permit applications under the diversion program also consider a variety of factors set forth in Section 22a-373 of the General Statutes which, when considered collectively, can reduce the amount of surface water diversion allowed if negative impacts are anticipated.

Another criterion which must be considered is the water quality classification of the potential sources. By State law, no person or municipality is allowed to discharge any sewage or other point source discharges into any waters of the State which are tributary to an existing water supply impoundment. State regulatory agencies have interpreted this law as eliminating Class B waters as a primary drinking water supply source, although consideration as potential future sources is permitted in planning processes.

TABLE 3.4.2

ALTERNATIVE WATER SOURCES IN PRIORITY ORDER
FOR EACH WATER UTILITY SERVING GREATER THAN 1000 PEOPLE (1)

WATER UTILITY	COMMUNITY SERVED	POTENTIAL SOURCE	ARRANGEMENTS REQUIRED FOR DEVELOPMENT OF SUPPLY SOURCE (2)
Bethel Consolidated Water Company	Bethel		
a. Chimney Heights System		1) Groundwater exploration to locate new well in Dibble's Brook Aquifer or East Swamp Aquifer.	1) Groundwater exploration program for both aquifers, and monitoring wells adjacent to existing Well #1.
		2) Interconnection to Danbury, or	2) Water main extension of 2750 feet; booster pumping stations needed.
		3) New standpipe.	2 and 3) Further studies should be conducted.
b. Berkshire Industrial Park System		1) Groundwater exploration to locate new well in area of industrial park, or	1) Locate to minimize sodium and chlorides concentrations.
		2) Interconnection with Chimney Heights system.	2) Extend water main across I-84 and reduce pressure.
Bethel Water Department	Bethel	1) Well field located behind police station (East Swamp Aquifer)	1) Test wells drilled
		2) Interconnection with Danbury	2) For emergency use only; a permanent connection not required - a hydrant to hydrant connection located on Wooster Street preferred. Would require booster pump and possibly new 12" mains.
		3) New Well	3) Groundwater exploration, identification and purchase of high quality well sites.
		4) Huntington Pond	4) As part of a state park, may only be available as an emergency supply-feasibility study will be required.

ALTERNATIVE WATER SOURCES IN PRIORITY ORDER FOR EACH WATER UTILITY SERVING GREATER THAN 1000 PEOPLE (1)

WATER UTILITY	COMMUNITY SERVED	POTENTIAL SOURCE	ARRANGEMENTS REQUIRED FOR DEVELOPMENT OF SUPPLY SOURCE (2)
Candlewood Shores Estates	Brookfield	1) Three Additional Wells	1) Wells are in place and operational.
Danbury Water Department	Danbury	1) Raise West Lake and Margerie Reservoirs*	1) Raise West Lake by 10 feet, Raise Margerie Res. by 3 feet, pump stations planned
		2) Ball Pond Brook Diversion	2) Two pumping stations would be constructed; land acquisition necessary; conflicts with Town of New Fairfield.
		3) Lake Candlewood Diversion	3) Would include a pump station and intake on the shore of the lake, a discharge pipeline and an access road; storage for the diverted water would be in Margerie Reservoir Pump Station designed for three 5 MGD pumps; pipeline length of 4750 feet and diameter of 30 inches; pump rate of 15 MGD for an estimated 200 days per year, yielding 8.2 MGD. Class B Water may be permitted for use for water supply during emergencies and considered in planning studies for future supplies. Resolve conflicts with Northeast Utilities and with present State law and policy regarding Class B water use.
Heritage Village Water Company	Southbury	1) Well #6	1) Yield N.A., well is operational.
Lake Waubeeka Association	Danbury	1) Well sites just to the north of Section Two on Parcel D. 2) 50-acre lake on Parcel D.	Both on association-owned land; need further study.
Topstone Hydraulic Co.			
Hollandale Estates	Danbury	None	
Rolling Ridge	Danbury	None	
Ridgefield Knolls	Ridgefield	None	

never constructed

* Must be done in conjunction with Ball Pond Brook or Candlewood Lake division.

TABLE 3.4.2 - CONTINUED

ALTERNATIVE WATER SOURCES IN PRIORITY ORDER
FOR EACH WATER UTILITY SERVING GREATER THAN 1000 PEOPLE[1]

WATER UTILITY	COMMUNITY SERVED	POTENTIAL SOURCE	ARRANGEMENTS REQUIRED FOR DEVELOPMENT OF SUPPLY SOURCE[2]
New Milford Water Company	New Milford	1) Indian Field Well Field	1) First well will be equipped, connected to distribution system, and placed in service early in 1988; add second well in 1991; well #3 in 2030. Main improvements in 1988 and 1990.
Newtown Water Company	Newtown	None	
Ridgefield Water Supply Company	Ridgefield	1) Beechwood Well Field 2) Bacchiochi Well Field (Upper Titicus Aquifer) 3) Little Pond wells	1) [redacted] awaiting DOHS approval. 2) [redacted] 3) [redacted] ield; may require treatment or protective pumping due to previous contamination.
Rural Water Company			
a. Cedar Heights	Danbury	1) Two wells drilled in 1987; 2) Drill additional well (Still River Watershed)	1) None 2) 1988
b. Craigmoor	Ridgefield	1) - 2) Deepen existing well.	1) Install customer meters to reduce demand (1988). 2) 1989
c. Ridgefield Lakes #10, 10A, 16, 17	Ridgefield	1) New well	1) Run main to new well on corner of Rustic and Bennetts Farm Road, bring in electricity, meter, etc. (1988);
d. Ridgefield Lakes #15	Ridgefield	1) Interconnect with Ridgefield Lakes #10A, 16, 17	1) To be implemented in the event that the existing wells construction deficiency is not corrected and is abandoned (1989).

TABLE 3.4.2 - CONTINUED

ALTERNATIVE WATER SOURCES IN PRIORITY ORDER
FOR EACH WATER UTILITY SERVING GREATER THAN 1000 PEOPLE (1)

WATER UTILITY	COMMUNITY SERVED	POTENTIAL SOURCE	ARRANGEMENTS REQUIRED FOR DEVELOPMENT OF SUPPLY SOURCE (2)
Rural Water Company (Cont'd)			
e. Brookfield Division	Brookfield	1) Drill well on existing lot or have developer drill well, or 2) Interconnect with Candlewood Acres system. 3) Interconnect with Iron Works Aqueduct system.	1) As prerequisite for extension of system (1990) 2) Buy Water (1990) 3) Buy Water (1990)
f. Ken Oaks	Danbury	1) Interconnect with Danbury	1) 1990
g. Ridgefield Lakes #5 & #14	Ridgefield	1) Interconnect with Ridgefield Lakes #15 or #7 & #18	1) Long-term (after 1992)
h. Ridgefield Lakes #7 & 18	Ridgefield	1) Drill new well on #18 property.	1) Long-term (after 1992); also install new boosters.
Rural Water Company	Brookfield	-	Engineer and construct extended water system in southern Brookfield with developer contributions and/or financing backed by guaranteed revenues - long-term.
Rural Water Company	New Fairfield	-	Engineer and construct extended water system in New Fairfield with developer contributions and/or financing backed by guaranteed revenues - long term.
Watertown Fire District	Woodbury	1) Hart Farm Well Field Expansion (Nonewaug Aquifer)	1) Test well program; District has made attempts to purchase surrounding land - watershed protection is a priority.
Woodbury Water Company	Woodbury	1) Well located on company owned land at Well #2 site.	1) Develop and construct by 1990.

TABLE 3.4.2 - CONTINUED

ALTERNATIVE WATER SOURCES IN PRIORITY ORDER
FOR EACH WATER UTILITY SERVING GREATER THAN 1000 PEOPLE[1]

WATER UTILITY	COMMUNITY SERVED	POTENTIAL SOURCE	ARRANGEMENTS REQUIRED FOR DEVELOPMENT OF SUPPLY SOURCE[2]
Woodlake Municipal Tax District	Woodbury	1) Well site on five acre parcel owned by District (Pomperaug Aquifer)	1) None known

Notes: (1) Information from Individual Water Supply Plans submitted by the Water Utilities to the Connecticut Department of Health Services; plans not yet approved by the DOHS. Plans not submitted as of 3/1/88 for Dancon Corp., Candlewood Shores, Southbury Training School, and Fairfield Hills Hospital.

(2) In addition to satisfying DEP Diversion Permit requirements.

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. Ball Pond Brook is also presently Class B, but has a goal of Class A. If this goal is reached, water quality classification issues will apparently no longer play a role in the assessment of the Brook's suitability as a future water supply source.

At one time, DEP had considered dividing the classification of Candlewood Lake, with the area near the hydroelectric pump discharge Class B and the rest of the Lake Class A. This approach has not been implemented because of the difficulty in identifying the portions of the Lake where water quality is affected due to pumping and the effects that future use patterns would have on the classification boundaries. The concept of establishing differing classes of water within the Lake remains a valid one, however, and has not been eliminated from consideration by DEP.

The Danbury Water Department has been sampling and testing Candlewood Lake's water quality for several years. The Department reports that the water has been found to be of good quality and able to meet Federal Safe Drinking Water criteria after treatment at the Margerie Filtration Plant. In addition, a 1986 report[5] stated that the raw water was meeting the standards in the Public Health Code. It is clear that sampling and analysis should continue, with sample collection located at the proposed diversion site.

The issue of the use of Class B waters for water supply purposes is not a new one. Due to 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 their use for water supply be continued. In fact, in the State Policies Plan for the Conservation and Development of Connecticut, 1987-1992, the State policy was to "continue to prohibit the use of sources of water receiving point discharges of sewage for drinking water purposes, except

in water supply emergencies when appropriately treated and approved by the Commissioner of Health Services".[7] The Water Resources Task Force did, however, recommend and adopt into the law the provision that utilities be allowed to consider sources which receive sewage in assessing 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.

Ultimately the resolution of the issue of whether to 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. A decision to allow the use of Class B waters 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.

3.4.2 Review of Areawide Needs and Sources

As shown in Section 3.2, the Housatonic Water Supply Management Area does not need large quantities of additional supply to meet the needs presently projected through the year 2030. Only six utilities were shown to have an existing or projected deficit situation relative to the safe yields available at the time the Water Supply Assessment was prepared. More recent information gathered from individual plans and from WUCC meetings indicates this list will be reduced shortly to one (the Craigmoor division of the Rural Water Company), with Cedar Heights (Rural Water Company) and Candlewood Shores Estates having recently installed new wells to meet projected demands, and the Ridgefield Water Supply Company and the New Milford Water Company in the process of obtaining permits for new well construction.

The Ridgefield Water Company believes that its initial wells in the Beechwood Wellfield will provide over [redacted] additional supply, or about enough to satisfy system demands through the year 2000. Further development of this wellfield and the Bacchiochi Wellfield should satisfy system demands though the end of the study period. Similarly, the New Milford Water Company is proceeding with the phased development of the Indian Field Wellfield, with the first well brought on line in early 1988. Additional wells are scheduled in 1991 and 2030, and should be sufficient to meet all projected needs of this utility.

Long-term supply needs of the Candlewood Shores Estates system were met through the addition, in early 1988, of the three new wells noted in Table 3.4.2. The Heritage Village Water Company states that its new well #6 will allow demand to be met for the foreseeable future, while the new Cedar Heights wells will meet demands projected through the year 2030.

The only remaining system with an existing or projected deficit is the Craigmoor division of the Rural Water Company. Craigmoor problems should not surface until around the year 2000, with the Rural Water Company planning to meet system needs through consumption control (metering) and well enhancements.

Although development of relatively few sources will satisfy the calculated demands of the utilities within the Housatonic Management Area, the WUCC recommends that all sources listed in Table 3.4.2 continue to be protected as potential supplies. This recommendation is made for a variety of reasons, including the following:

- Estimated yields may change considerably following State review of individual plans, and further deficit situations may become evident.

- Any projection of population or water consumption for a 50 year period is extremely tenuous, and could change dramatically in the future.

- Alternative sources may be needed to replace existing sources which become contaminated or to supplement existing sources during short or long-term emergencies, and/or natural or man-made disasters.

- Utilities may wish to develop new sources for reasons other than safe yield shortfalls, such as economics, location within the system, ability to meet peak demands, quality and quantity of water available, etc. This point is particularly pertinent regarding the Candlewood Lake situation, with preliminary engineering investigations indicating that it may be preferable from an economics and operations standpoint to develop Candlewood Lake (or Ball Pond Brook) as a source as opposed to interconnecting the Margerie and West Leg portions of the Danbury system.

- Problems could develop with individual wells which would require an unanticipated expansion of public water supplies.

- The safe yield information is suspect for many of the smaller systems in the Housatonic area, while many of these small systems also suffer from poor management. It is likely that a number of these systems will be incorporated within the service areas of larger utilities over the planning period, thereby increasing demands over those projected herein.

This recommendation is consistent with the protective land use recommendations made in Section 3.3, and will allow Housatonic area utilities to continue to provide potable water in a manner consistent with the programs outlined in their individual supply plans.

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- Utilities may wish to develop new sources for reasons other than safe yield shortfalls, such as economics, location within the system, ability to meet peak demands, quality and quantity of water available, etc. This point is particularly pertinent regarding the Candlewood Lake situation, with preliminary engineering investigations indicating that it may be preferable from an economics and operations standpoint to develop Candlewood Lake or Ball Pond Brook as a source.

- Problems could develop with individual wells which would require an unanticipated expansion of public water supplies.

- The safe yield information is suspect for many of the smaller systems in the Housatonic area, while many of these small systems also suffer from poor management. It is likely that a number of these systems will be incorporated within the service areas of larger utilities over the planning period, thereby increasing demands over those projected herein.

This recommendation is consistent with the protective land use recommendations made in Section 3.3, and will allow Housatonic area utilities to continue to provide potable water in a manner consistent with the programs outlined in their individual supply plans.

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9. FGA Services, Inc., "Individual Water Supply Plan," prepared for Bethel Water Department, 1987.

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13. Topstone Hydraulic Company, "Individual Water Supply Plan," August, 1987.

14. New Milford Water Company, "Water Supply Management Plan," 1987.

15. Newtown Water Company, "Water Supply Management Plan," 1987.

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17. FGA Services, Inc., "Individual Water Supply Plan," prepared for Heritage Village Water Company, August, 1987.

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19. Woodbury Water Company, "Water Supply Management Plan," 1987.

20. PSC Consultants, "Water Supply Plan, Draft," prepared for Woodlake Municipal Tax District, September, 1987.

3.5 COORDINATION AND COOPERATION BETWEEN WATER UTILITIES

3.5.1 Introduction

In previous portions of the Areawide Supplement we reviewed the current arrangements for water supply in the Housatonic Public Water Supply Management Area, the service areas for each purveyor, and the water supply arrangements for the foreseeable future based on land use and new supplies. It is now appropriate to discuss the interface of these elements with each other.

No water utility can exist in complete isolation from its neighbor, be they contiguous or separated by many miles. At times of drought or emergency or even during minor problems, it is comforting to be able to turn to a fellow professional for assistance. Public Act 85-535 and its Regulations suggest three main areas of cooperation:

- Interconnections
- Joint use of Facilities
- Satellite Management

It is convenient to analyze these three areas of coordination together, as they form the basis of actions for the common good and lead to other benefits, such as standardization in design.

3.5.2 Definitions and Descriptions

3.5.2.1 Interconnections

There are many definitions of "Interconnection." We prefer the Critchlow definition as modified by Greenburg and Hordon:

> "Permanent pipe connections between adjacent water supply systems including all utility links whether or not they are regular or emergency, two-way or one-way."

It is important at the outset to understand that this definition includes connections intended both for daily (regular) use and those for intermittent use in case of emergency or temporary shortage of water in either system.

Those in daily use are, in effect, linking two water systems by providing an extra source of water for one or both of the two systems. They are usually of larger size and supported by financial and contractual agreements between the two parties. The interconnections in this management area are recorded in Table 3.5.1, but receive no further mention in view of their relatively small use in the Housatonic Public Water Supply Management Area. In fact it should be pointed out that half of the interconnections listed are not located within the bounds of the management area, but instead involve utilities that are WUCC members by the fact that they have watershed area in the management area. Furthermore, a study of the map of the service areas (Plate 1) indicates that the relatively long distances between many service areas make regular daily interconnections uneconomical, while the close proximity of others makes interconnection quite feasible.

Emergency interconnections are often of greater significance, but it must be noted that they are but one means of providing water in an emergency. Other feasible methods include storage in the distribution system, standby wells, alternative sources and emergency equipment. It may well be that one of the latter alternatives will prove more appropriate to the Housatonic Public Water Supply Management Area.

3.5.2.2 Joint Use

Joint use of facilities by two or more water utilities can be in the form of temporary or permanent use.

"Permanent use" would be the sharing of such permanent structures as a source of water (well or reservoir), a common transmission main, treat-

TABLE 3.5.1

EXISTING AND PROPOSED INTERCONNECTIONS

UTILITY	CONNECTED UTILITY	CAPACITY AND DIA	LEGAL AND FINANCIAL AGREEMENT	METER	MANAGEMENT AND COMMENTS
Bethel Consolidated Water Company (Chimney Heights system)	Danbury Water Dept.	-	-	-	Proposed 2-way connection for emergency backup purposes; presently city has a moratorium on water and sewer main extensions
Rural Water Company (Ken Oaks Division)	Danbury Water Co.	-	-	-	Possibility of augmenting supply to 50 residential customers in peak periods
Danbury Water Dept.	Ken Oaks Division (Rural Water Co.),	-	-	-	Possibility of water sales (proposed)
	Robin Hill	-	-	-	Existing
	Hollandale Estates (Topstone Hydraulic Co.),	-	-	-	Existing
	Briar Ridge	-	-	-	Existing
	Indian Spring Water Co.	-	-	-	Proposed
New Milford Water Co. (General Waterworks)	Sunny Valley Tax District	-	-	-	Anticipates serving on a standby basis only
	Lone Oak Water Co.				Wholesale service, awaiting DPUC approval
	Millbrook Water Co.				Uncertain, in DPUC hearing process, potential interconnection or takeover
	Camelot Estates Water Co.				Negotiating interconnection or takeover
	Parkwood Acres				Negotiating interconnection or takeover
Hollandale Estates (Topstone Hydraulic Co.)	Danbury Water Dept.	-	-	-	Plans to purchase water
Fairfield Hills Hospital	Newtown Water Co.		No Agreement	No Metering	y be
	to Newtown Housin for the Elder				
Heritage Village Water Co.	Woodbury Water Co.	-	-	-	Emergency above-ground connection between hydrants on Route 6 possible
Watertown Fire District	City of Waterbu Bureau of Water				
Bridgeport Hydraulic	Norwalk First Taxing District	222,000 gal. bought in 1985			
	Norwalk Second Taxing District				
	New Canaan Water Co.				Completed in 1985
	Stamford Water Co.				Completion expected in 1989
	Connecticut-American Water Company				Completion expected in 1989
	South Central Conn. Regional Water Authority				Completed in 1986
Norwalk First Taxing District	Bridgeport Hydraulic Co.		Yes		
	Norwalk Second Taxing District				

3.5.2.2 Joint Use (Continued)

ment facility, meter reading staff, repair crew, billing equipment or even laboratory facilities.

"Temporary use" implies sharing or loaning equipment between utilities for only a short period in times of emergency or exceptional circumstances of short duration, particularly the sharing of specialized equipment. In all such cases, the advantages of easy access and reduced cost are obvious.

The objective of this study is to determine the degree to which such a liaison is being carried out in the Housatonic area, to suggest a philosophy for future operations, and to make recommendations.

3.5.2.3 Satellite Management

One of the biggest problems facing small water utilities is the lack of capital needed to finance new works and to maintain existing infrastructure. System management, whether in the office or in the field, cannot take advantage of the "economy of scale"; hence, standards fall or can only be maintained by the determination and integrity of a small number of dedicated workers.

The Regulations pursuant to Public Act 85-535 define Satellite Management as "management of a public water supply system by another public water supply system". As noted below and discussed in Section 3.5.5, Satellite Management can take a variety of forms and it can run the gamut from outright ownership and operation to contracted services. Regardless of the form it takes, such arrangements generally require a formal agreement between the manager and the system being managed which clearly delineates the services being provided and the appropriate fees for such services. Such agreements can take various forms such as the following:

- Contract Service/Satellite Operation -

  where the owner of the water supply system contracts with a company to perform routine operation and maintenance of the mechanical/electrical equipment

. Direct Service/Satellite Operation -

where the satellite manager assumes ownership and operational control of a water supply system that is not contiguous with the manager's principal system.

The concept of Satellite Management (including the means, advantages and disadvantages) is generally well documented, but the extent to which it is used in the Housatonic Public Water Supply Management Area has come to light during the development of this section.

The objectives of this section are to examine the present extent of Satellite Management in the study area, to present philosophies for future operations and to make recommendations.

3.5.3 Interconnections

3.5.3.1 Concepts and Criteria

The concept of an interconnection is a physical connection between two water utilities with a view to interchanging water with each other on a regular or intermittent basis.

It follows that some form of written agreement including a basis of cost of the transferred water or standby cost will be needed. Perhaps the most important factor in any interconnection is the cost, as alternative water supplies might be provided at a lesser cost, such as drilling a standby well.

Interconnections can and should play a role in the area's water supply picture where feasible. When two or more utilities are located within close proximity of each other an interconnection may offer a cost-effective solution to the development of an alternative supply source. However, as the distance between two utilities increases the cost of an interconnection can become financially prohibitive. For example, the cost of a one-half mile run of 6- or 8-inch ductile iron pipe can easily exceed $100,000. Such

a cost represents a significant financial investment for most of the area's utilities, and, thus, distances in excess of one-half mile represent a logical barrier beyond which interconnections between most of the area's utilities are not feasible. DPUC's regulations (Docket No. 84-09-18), which became effective on September 28, 1987, for Application Procedures and Criteria for Issuing Certificates of Public Convenience and Necessity for Small Water Companies defines "feasible interconnections" as follows:

- "... the extension of an existing utility's water mains is considered feasible to serve a proposed project with at least fifteen service connections or twenty-five persons if the developer's investment for such extension, including service connections and appurtenances, is less than $5,000 (construction costs only) per dwelling or office unit and if there is sufficient supply and storage facilities to accommodate the anticipated demand available from the existing utility. If there is insufficient supply and storage available from the existing utility, the cost of developing such facilities may be included in the water main extension proposal, as additional items."

The State Public Health Code requires potential customers located within 200 feet of a water main to connect to the public water supply.

3.5.3.2 Reliability

Two adjacent systems considering an interconnection should first examine the reliability of the backup source. For example, two adjacent ground water systems are likely to encounter the same problems of a falling water table and an interconnection between them will likely be of little comfort no matter how compatible the waters.

Ground water systems may respond to cyclical changes of the seasons much slower than surface water systems. For supply reliability, interconnections between ground water and surface water systems reduce chances of simultaneous failure.

Emergencies evoked by equipment failure or main breaks in the distribution system are more likely to correspond to short range considerations, and such situations happen frequently enough to make

interconnections between similar systems or adequate storage particularly worthwhile.

Some utilities, especially those which have grown by aggregation of separate systems in the past, may have ground water and surface water supplies available as a regular condition. Normally they operate so as to keep the same type (either ground or surface water or a consistent mix of the two) of water supplied to the same customers. This could be because of hydraulic gradient considerations as well as a desire to avoid customer relation problems caused by a change in water quality.

Management of such a utility is well aware of inherent water quality problems and takes steps to maintain compatibility of water as far as possible. Nonetheless, there would be no hesitation to supply whatever is available in an emergency.

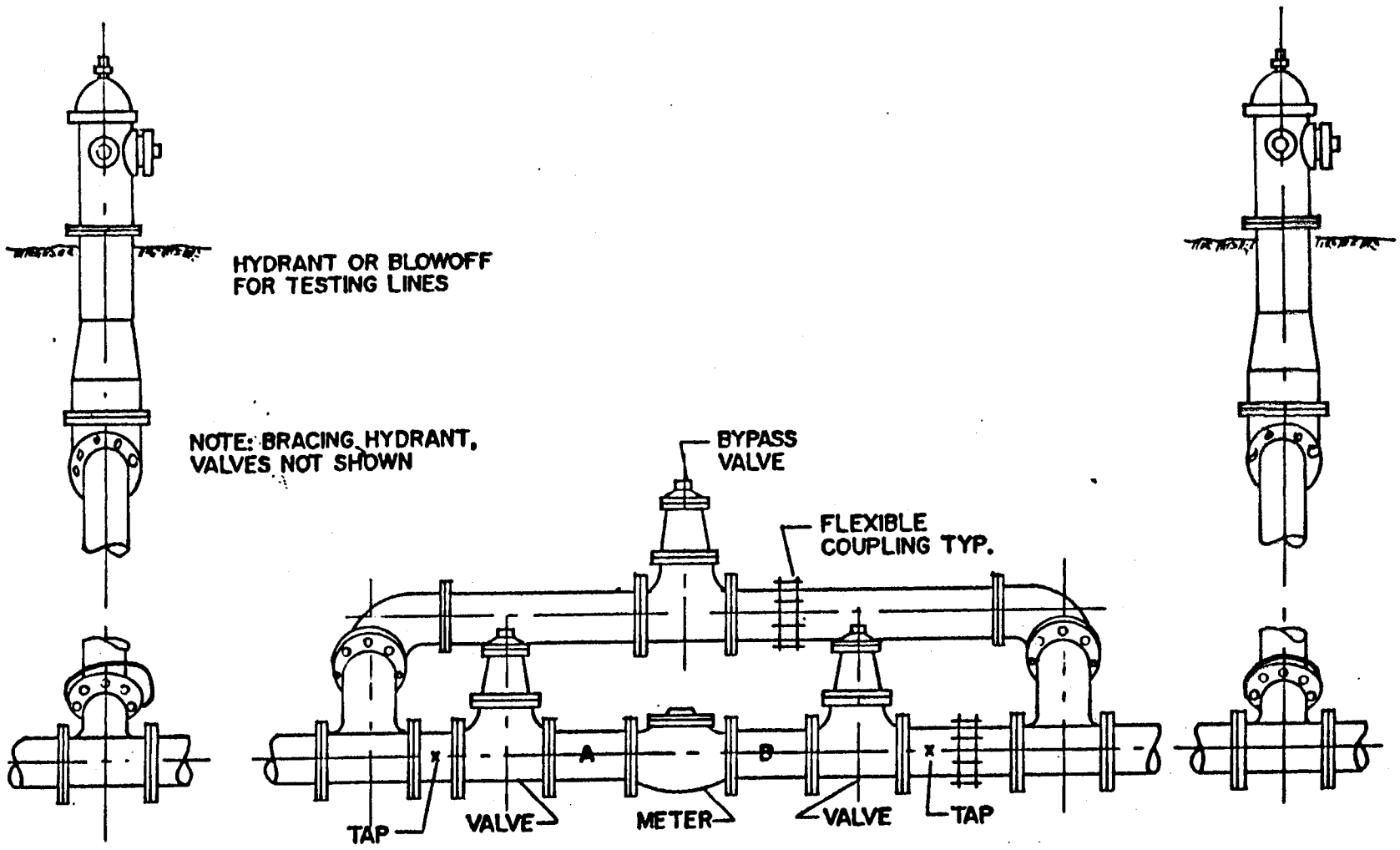
Figures 3.5.1 and 3.5.2 show sketches of a typical interconnection. In the first example, either utility can receive supplies from the other if a bi- directional water meter is used. Alternatively, as shown in Figure 3.5.2, two meters would be required to measure flows from either source. Both types of arrangements are in use, although the dual meter approach tends to be more reliable and the installation cost of the two systems are comparable. The flow is metered for measurement of the quantity purchased. Provisions are included to bypass the meter for service and maintenance.

The basic criteria for such interconnections are as follows:

1. Physical connection between the two systems using piping adequately sized to transmit the water required at the differential pressure concerned.

2. Rugged meter(s) sized to suit the anticipated flow, complete with isolating valves.

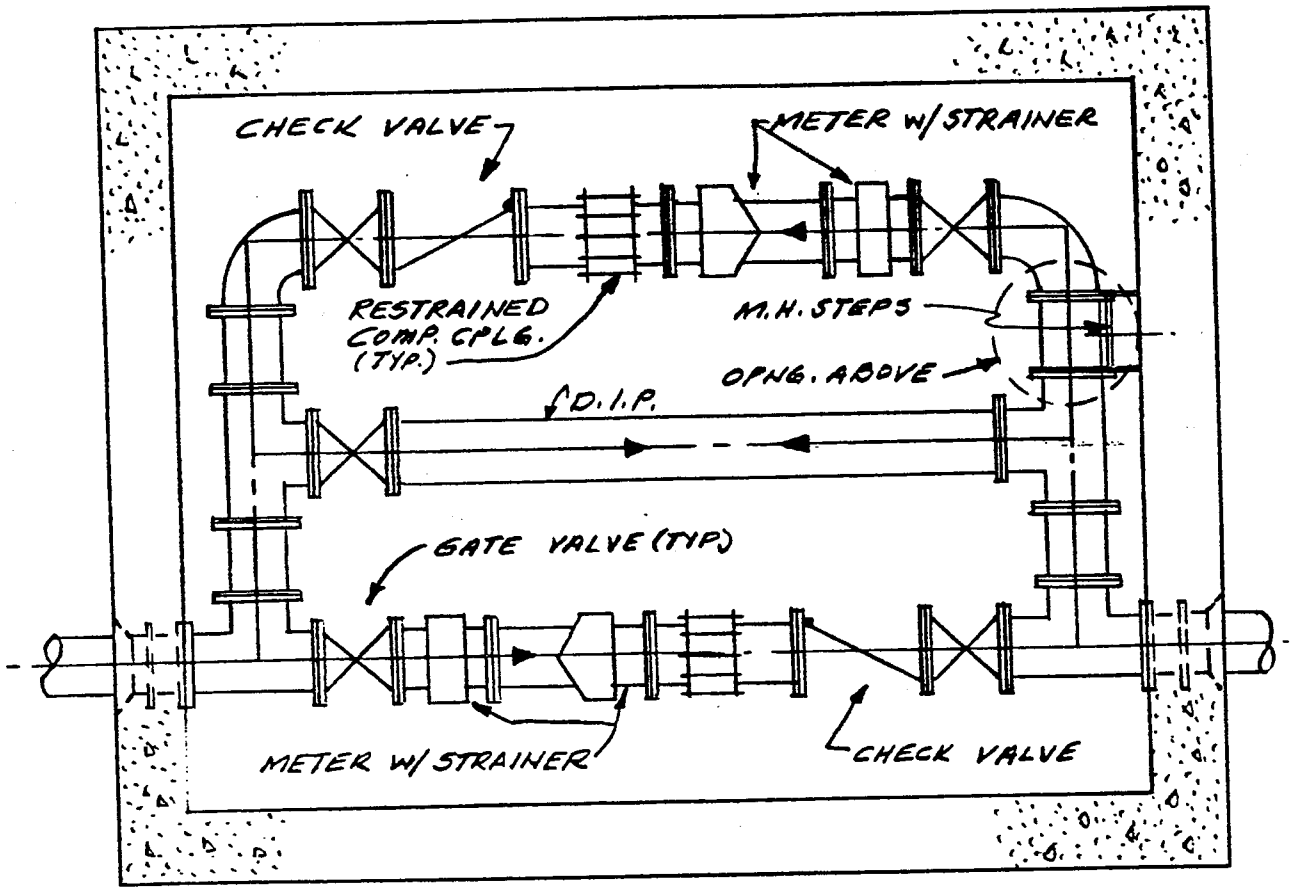
3. Flexible coupling to permit removal of pipes or meter(s) if required.



METER AND INTERCONNECTING PIPING TO BE SIZED IN ACCORD WITH ANTICIPATED FLOW. PIPES A & B COULD BE REDUCERS IF APPROPRIATE TO CONDITIONS

FIGURE 3.5.1

HYPOTHETICAL INTERCONNECTION WITH SINGLE BIDIRECTIONAL METER



PLAN

NO SCALE

FIGURE 3.5.2

HYPOTHETICAL INTERCONNECTION WITH DUAL METERS

4. Bypass for emergency use to allow the interconnection to be used at times when the meter is out of service.

5. Taps on each side of the meter isolating valves to check pressures prior to use and to empty pipes for dismantling for meter(s) servicing/calibration.

6. Hydrants nearby for use in testing for water sampling, flushing and flow measurement.

7. Meter pit (optional) enclosing meter body and the two tappings as a minimum, and as a maximum, all pipework and thrust restraints. Note that emergency interconnections may be needed in a hurry and flushing should be possible at a moment's notice day or night. Manhole covers must be capable of being opened quickly, meter reading taken, and valves opened as fast as readings on the pressure gauges will allow without causing surges. Battery-operated emergency lighting may also be considered. Design will, of course, vary from site to site depending on the quantity of water being transferred and the pressures pertaining; pumping may be required and incorporated.

3.5.3.3 Advantages and Disadvantages

Advantages are:

1. A readily available backup source for augmenting supply at times of emergency or peak demand.

2. May be less expensive than developing additional sources, or standby power for emergency use.

3. Interconnection between utilities of similar size can provide emergency service for both.

4. Regular interconnections may defer or eliminate the need to develop additional sources.

5. Improve water quality by replacing sources of inferior quality.

6. Reduce costs by eliminating the need for expensive treatment.

7. Provide additional supply in areas where source development is not feasible.

Disadvantages are:

1. Regular interconnections must be maintained and the meters calibrated.

2. Water quality differences between the systems may be noticeable to consumers, especially for interconnections not used on a regular basis.

3. Interconnections for emergency use must be flushed prior to activation.

4. Access and maintenance of emergency interconnections must be kept up so that they are operational when needed.

5. Long distances between utilities can make interconnections expensive.

6. Drought conditions can affect both utilities so that supply is not available when needed.

7. Pressure differences between systems may require pumping or pressure reducing valves.

8. Interconnections are frequently located at the fringes of the distribution systems and may be small diameter pipes with limited capacities.

3.5.3.4 Current Use in Management Area

3.5.3.4a Existing Interconnections

The questionnaire sent to WUCC members requested information concerning interconnections between the various utilities. It appears from the responses that interconnections have not been widely used as a means to augment supply in individual systems. Over 100 utilities were polled and 34 responded. Of these only ten reported interconnections or any plans for them. Specific details of these are given in Table 3.5.1 and summarized below.

Despite the lack of existing interconnections, many utilities did express an interest in interconnecting or sharing facilities in response to a DOHS questionnaire. The responses are summarized in Table 3.5.2.

3.5.3.4b Purchased Water Agreements

Returned questionnaires from WUCC members showed that few purchased water agreements are apparently in effect. The details that were received are listed below.

TABLE 3.5.2

UTILITIES INTERESTED IN SHARING FACILITIES OR INTERCONNECTING WITH ANOTHER WATER COMPANY(1)

TOWN	WATER COMPANY	COMMENTS
Brookfield	Iron Works Aqueduct Co.	Open to suggestions
	Newbury Crossing	Possibility
	Rollingwood	Possibility
	Woodcreek Village	Interconnection with a municipal system if ever available
Danbury	The Cedars	
	Indian Springs	Interconnect with Danbury Water Dept. for supplies in emergencies
	Ta'Agen Point	Suggest interconnection with Danbury Water Dept.
	Siboney Terrace	Unsure
	Snug Harbor Development Corp.	Open to proposals
	Ridgefield Water Co.	Danbury Water Dept. and Ridgefield Water Co. exploring interconnection in Ridgebury area of Ridgefield
New Fairfield	Hollywyle Park	Possibility
New Milford	Millstone Ridge	Depends on conditions
Newtown	Bay Colony Mobile Home Park	Possibility
Ridgefield	Acre Lane, Inc.	Possibility-unsure
	Danbury Water Dept.	Danbury Water Dept. and Ridgefield Water Co. exploring interconnection in Ridgebury area of Ridgefield
Sherman	Holiday Point Assoc.	If needed

Note: (1) Data compiled from 1986 Connecticut Department of Health Services Planning Questionnaires for utilities serving less than 1000 people. The remaining utilities answered "No" or unknown.

- Watertown Fire District, with watershed property in Woodbury, but no customers in WUCC territory, filed a detailed example of a purchased water agreement with the City of Waterbury Bureau of Water. It provides that Watertown may purchase [redacted] during off peak hours. The actual delivery is physically limited to [redacted] because of [redacted] The contract, originally approved in 1948, is being renegotiated to reflect some apportionment of costs to Watertown from Waterbury's new filtration plant.

- New Milford is considering selling water to Sunny Valley Tax District on an emergency basis but no terms were disclosed and Sunny Valley Tax District in its reply made no mention of the arrangement. Additionally, New Milford is negotiating with four other utilities in town for either wholesale or retail supply.

- Fairfield Hills Hospital reported no liaison with Newtown despite having an interconnection with that water system. No purchases are contemplated. Fairfield Hills does supply water to the adjacent elderly housing project, but details of the transactions are handled administratively elsewhere.

- Danbury anticipates selling water to local water utilities such as Ken Oaks, Hollandale Estates and Briar Ridge but, as yet, has no purchase agreements.

- Bridgeport Hydraulic Co. reports purchasing 222,000 gallons annually from Norwalk First Taxing District probably to meet the needs of an isolated situation, and also has a wholesale agreement with Norwalk Second Taxing District. Both buyer and seller are watershed members of WUCC. Bridgeport Hydraulic Company completed the Wilton-to-New Canaan stage of its Southwest Regional Pipeline in 1985. The project is a cooperative venture between four water companies in the lower Fairfield County area (Bridgeport Hydraulic Company, New Canaan Water Co., Stamford Water Co., and Connecticut-American Water Co.) and is the first multi-utility interconnection project of its kind in the state. The extension is expected to be completed by the end of 1989.

  Another recently completed interconnection (1986) is with the South Central Connecticut Regional Water Authority in the lower Naugatuck Valley area.

- The Norwalk First Taxing District purchases water from both Bridgeport Hydraulic and the Norwalk Second Taxing District. Neither purchase affects consumers in WUCC.

- Topstone Hydraulic has plans to purchase water from Danbury for one of its divisions, Hollandale Estates. No details were received.

- Heritage Village Water Co. reports that it has the capability of interconnecting with the Woodbury Water Co. via adjacent hydrants in the two systems, but apparently no formal agreement exists.

- Bethel Consolidated Water Co. has proposed a two-way connection between its Chimney Heights system and the Danbury Water Department for emergency backup purposes.

In summary, it is evident that to date purchased water agreements are limited to isolated situations and do not significantly impact the water supply situation in the Housatonic Public Water Supply Management Area.

3.5.3.5 Potential for Future Interconnections

The Housatonic Public Water Supply Management Area is highly fragmented with over a hundred water utilities and thousands of individual wells providing water. It consists of approximately 400 square miles with an estimated 1985 population of 195,150 spread over 12 municipalities. Similar conditions of size, area and population elsewhere in the United States are sometimes met by a single integrated water utility, but, whereas a large utility has the resources and management capability to deliver high grade service to consumers, many smaller utilities can only achieve the same by dedicated management.

One of the advantages of a large utility is the multiplicity and redundancy of transmission and distribution capability. An array of smaller utilities can only simulate this condition by establishing a large number of interconnections, to provide the capability of moving water expeditiously from one utility to another as needed.

The plethora of small systems presently offers somewhat limited possibilities for creating a larger connected entity able to withstand the rigors of extended drought or deterioration in ground water quality. Although there are examples of large water systems reaching a suitable operating size by buying up many small water systems, until major transmission facilities are added they cannot alleviate pressure and flow problems in one area despite having an adequate supply system-wide. However, the opportunity does exist on a localized basis for small utilities to increase their system reliability with interconnections (particularly for emergency situations). One example is in the Candlewood Neck area in the western part of Brookfield, where four to five utilities lie in close proximity to each other along Candlewood Lake (See Plate I in Chapter One). Here relatively short piping extensions would be required although other facilities may be required to overcome system pressure differentials. Additionally, for the larger utilities which have declared large areas as their exclusive service areas which encompass smaller, existing systems, the opportunity for future interconnection becomes more feasible as these utilities expand their systems to meet the needs of new or potential customers. Such expansions of the larger systems' distribution network should encourage interconnections for emergency supplies at a minimum.

3.5.3.5a Interconnections Within the Management Area

Within the Housatonic Public Water Supply Management Area there is only one large water system which is operated by the Danbury Water Department. Average usage in 1986 was reported to be 6.7 mgd. Peak usage has reached 9.6 mgd. The system's estimated safe yield is [illegible] with a maximum daily production of treated water reported to be in excess of [illegible] Danbury supplies water to 45,000 people over a 15 square mile area. These people represent about 25 percent of the total population in the Management Area.

Under average conditions Danbury Water Department would have up to 3.3 mgd available for others from its estimated yield, with up to about 8.9 mgd available when peak use and maximum production are compared. Although a sufficient buffer appears to exist between peak use and maximum treated water production, Danbury cannot be considered an unlimited source for other communities if they wish to maintain an adequate safety factor between the system safe yield and average daily demand.

There are a reported 30 other water utilities operating within Danbury City limits. Several are active candidates to receive backup support by interconnecting to the Danbury system. The average number of people served by these companies is about 150. (No beneficial support for Danbury is available from these small utilities, however.) Such possible interconnection is seen as one of the many reasons for Danbury Water Department to seek a new sources in order to address the possibility of eventually supplying some (or all) of these smaller utilities on a wholesale or retail basis.

Similar situations exist with Heritage Village (Southbury), New Milford, Newtown and Ridgefield Water companies in that each would require additional supply sources to provide service to the town at large.

3.5.3.5b Interconnections Outside the Management Area

Several large water systems operate in areas adjacent to the Housatonic Public Water Supply Management Area; some even have watershed properties within the Housatonic area communities.

These large systems include Bridgeport Hydraulic Co. (average daily usage 55.0 mg), Watertown Fire District (average daily usage 0.6 mg), Norwalk First Taxing District (average daily usage 6.1 mg) and Heritage Village (which supplies water both inside and outside the management area).

It is unlikely that emergency connections will be established from these potential sources except peripherally in isolated areas because of the distances involved. The provision for wholesale supply transmission mains from the large utilities to the south of the management area are also at least presently impeded by the distances involved.

3.5.3.5c Developing Future Interconnections

A normal order of preference for interconnection systems would be:

1. An adjacent system having compatible pressures and water chemistry, with adequate surplus water supplies.

2. An adjacent system with less compatible conditions requiring significant adaptations in the systems.

3. A more remote system from whom a supply could be obtained through an adjacent system or only by extensive construction.

Interconnections are obviously not feasible for all systems. Some systems have to stand alone and supply emergency backup by system storage, standby equipment, emergency use wells and the like.

It consequently behooves the managers of each of the small utilities in the Housatonic Management Area to have emergency plans, as well as to be aware of adjacent utilities and the location of possible interconnection points. Specific recommendations would be premature, but for those utilities where emergency interconnections are at least feasible this chapter will also indicate the possibilities.

3.5.3.5d Future Agreement Requirements

The scarcity of present agreements indicates that to date this route has not been widely followed as a means of supplying water.

If and when interconnections begin to play a wider role in the future, agreements containing standard terms and conditions will be required. Elements of such an agreement generally include:

- term of agreement,
- quantity to be taken with restrictions on times of day if applicable, storage details, etc.,
- price of water, mechanism for future price adjustments and frequency of payment,
- pressure of water at point of transfer,
- factors mitigating the contract - i.e. Acts of God, civil disturbance, strikes, etc.,
- notice required to terminate,
- metering devices required and ways to estimate quantities should the devices become inoperative,
- apportionment of cost of design for interconnection, construction cost - including for chamber if required,
- apportionment of maintenance costs, frequency of testing, flushing mains, etc., and
- location, type of water (raw or finished) and water quality guarantees, if any.
- minimum purchases or standby charges.

The current absence of purchase agreements does not necessarily foretell a future without interconnections. As development becomes more dense and as existing utilities become more cognizant of their opportunity for interconnecting with adjacent utilities, interconnections will become more important in the Housatonic Public Water Supply Management Area.

3.5.3.6 Water Quality Compatibility

It is possible that two potable waters could have significant chemical differences causing depositions, long sequestered by one system's water, to be released by a subtle change in pH, alkalinity or other factors in the other system's water. Such conditions may cause unpleasant tastes, odors, discoloration and other problems to consumers.

Consumers become accustomed to the particular quality or taste of their water. Consequently, when an alternative supply is used consumers may perceive a difference in water quality. This situation may lead to user concerns and/or complaints even though both water sources are high quality potable water supplies.

Surface and ground water supplies may display significant differences in hardness. There can also be significant effects on manufacturing processes which are water sensitive and on boiler feed water. Proprietary chemical additive systems designed to condition water may be programmed for one set of constituents which vary in the mixed water or may not be able to handle new ones. To a lesser degree temperature changes can cause problems in some conditions.

In all these circumstances, however, it must be remembered that the purpose of an emergency interconnection is to prevent system shutdown. Where fire protection is a major responsibility of the utility, none of the above considerations is as important as supplying water to a row of dry fire hydrants or waterless sprinklers.

If it is assumed that an interconnection is used for an emergency, quality considerations are of small consequence. If an interconnection is used to augment supplies on a regular basis, such considerations are more significant. Most interconnections are between utilities that are reasonably close to one another, therefore, these potential problems, although probably minimal, should be considered as part of the process in establishing an interconnection.

The time to be aware of problems is before they occur. Anticipation and preparation will aid in consumer acceptance. Chemical analysis of water and interpretation of results for individual systems is essential and may suggest auxiliary equipment, processes or steps necessary to increase compatibility of connected systems.

3.5.3.7 Philosophy for Interconnections

The purpose of this section is to provide a general philosophy for future interconnections in the Housatonic Public Water Supply Management Area. An additional policy questionnaire was distributed and reviewed at a WUCC monthly meeting to augment the few replies received in the original questionnaire and to facilitate obtaining the opinions of the utility managers present at the meeting regarding general philosophy.

The questions were grouped to cover four main areas: Supply and Backup; Control; Alternatives; and Financial Considerations. The following summarizes the philosophy and is generally in accord with the spirit of the replies and discussion.

3.5.3.7a Supply and Backup:

Interconnections serve many functions, but fall into three main categories:

1. Daily use (regular), where one utility supplies another on a daily basis and the water transferred is simply another source of water to the receiving utility.

2. Intermittent use for the transfer of water on an emergency basis.

3. Guaranteed supply to supplement safe yield on an as needed basis.

These three types should be distinguished as they differ in some important details, as shown in Table 3.5.3. However, all three would require a "sale of excess water permit" in accordance with Section 22a - 358 of the General Statutes which requires DOHS approval of such transfer of water.

Daily use interconnections assume that the receiving utility will require the transfer of water for a long period, certainly until they have time to prospect for a new source and construct the necessary pipework, treatment and storage facilities. Otherwise, they are simply becoming a part of the distribution system of the supplying utility. Construction will be permanent with the meter, valving and pipework in a chamber. From legal and financial aspects there will be a contract dictating the terms of sale of the water, defining the contract period, responsibility for maintenance, and terms for cancellation.

The philosophy of the daily use type of interconnection must be based in part upon the quantity of water required - which may constitute either a portion or up to 100 percent of the requirement of the receiving authority.

Emergency use interconnections, on the other hand, have quite a different reasoning and the following philosophy is suggested:

1. Interconnection should be fully operational at all times.

2. Inspection should be scheduled at least 4 times/year and the interconnection flushed out as frequently as found necessary, but not less than annually.

TABLE 3.5.3

DAILY AND INTERMITTENT USE INTERCONNECTIONS

FACTOR	DAILY	INTERMITTENT	GUARANTEED SUPPLY
Short-term Purpose	As a temporary source of raw water where circumstances militate against provision of a new source	Back-up use in emergency	Supplements safe yield of other sources
Long-term Purpose	The first step in regionalization of water supply planning	Remains simply as backup for potential emergencies	Supplements safe yield of other sources
Diameter	As needed for capacity required	Probably a size smaller to reduce initial capital cost. High velocity and heavy head loss can be tolerated for short periods	As needed for capacity required
Meter	Essential to measure amount of water transferred for payment	Desirable but not essential	Essential to measure amount of water transferred
Pressure Drop	Minimum, to reduce energy compatible with capacity	Whatever circumstances of transfer dictate	Minimum if regular use anticipated, but higher losses could be tolerated with irregular use
Testing	Seldom, as in constant use	Essential, as pipes are normally unused	Essential, especially with infrequent use
Flushing	Unnecessary as flow is continuous	Essential, as there is a "dead-end" in each system	Essential, especially with infrequent use
Agreement	Essential, particularly to cover payment	General agreement only as circumstances of use will vary	Essential, since each utility's safe yield is impacted

3.5.3.7a Supply and Backup: (Continued)

3. Quantity of water to be supplied should be at least 85% of the amount normally used but temporarily lost as conservation is unlikely to make up more than 15%.

4. Utilities must coordinate with emergency and drought response plans and document the existence of interconnections with the State and report upon testing and maintenance.

5. Consideration of metering devices such as Dall tubes, Dall orifices or Venturis as a more economical and less maintenance intensive than other types of meters.

6. Review of other means of backup before consideration of interconnection(s) such as system storage, alternative sources such as groundwater versus surface water and vice versa, standby well(s), tanker trucks, standby equipment such as spare motors, generators. Generally the most vulnerable items in a utility are the ones most needy of backup.

The philosophy for a guaranteed supply to supplement safe yield generally incorporates that espoused for both intermittent and daily use.

3.5.3.7b Control

Although the State presently regulates interconnections (DEP requires diversion permit), there is an inadequate data base of the existing interconnections. The WUCC members believe that the State should maintain and regularly update a roster of existing and potential interconnections identified herein. The WUCC is also generally concerned about the potential impact of the Proposed Water Diversion Regulations as they relate to interconnections. The WUCC believes that interconnections are sufficiently regulated by DOHS (as noted above). Furthermore, the regulations in their present form (September 4, 1987) are unclear and if passed may, from the utilities' perspective, actually be a deterrent to future interconnection (see the WUCC September 30, 1987 letter to DEP in Appendix 3.5C).

There being only a few interconnections in existence, concern over the mechanics of operation has received little attention. It is good practice that they should be tested annually, at least for volumes delivered, with either the buyer or seller of the water carrying the cost of these tests.

3.5.3.7c Alternatives

An examination of the service areas shown in Plate I (contained in Chapter 1) will indicate about 20 to 30 percent of the utilities are within about one-half mile of each other. For utilities such as these interconnections may be feasible and the philosophy expressed in this chapter should provide the basis for design and operation.

In the particular circumstances of the Housatonic Public Water Supply Management Area, a backup supply of water may be provided by different means:

1. An alternative supply from a standby well connected to the distribution system would provide water in the event of failure of a supply well.

2. Spare electric motors and associated equipment could quickly be installed to restore normal service.

3. System storage providing 2 or 3 days supply could be used for a 24-hour or 48-hour emergency such as a water main break or a power failure.

4. For particularly small areas, state approved mobile water tankers of up to 5,000 gallon capacity would be adequate.

5. Complete standby source of water. This is particularly suitable for those utilities where the raw water source includes both surface and groundwater.

Various options should be explored and the most applicable alternative selected bearing in mind particularly the most likely emergency which would occur.

3.5.3.7d Financial Considerations

It is believed that a water utility should be paid regularly for maintaining an emergency interconnection, possibly as a "ready to serve" (standby) charge or in the form of a meter charge.

When water is used it should be paid for under terms of a special agreement covering the situation based either on regular retail rates or using a wholesale rate.

One utility stated that interconnections will be more important in the future. The majority of the utilities are too spread out at present to make such a policy feasible on a broad scale, since the cost of installation rises rapidly with the distance between utilities. Therefore, in many cases, cost alone can represent the principal barrier for installation of an interconnection.

Another stated that the need is obvious and that regionalization of supply should have a high priority.

From these replies certain conclusions may be inferred. There is a general willingness to help, but also a lack of facilities to make this a practical proposition. Most believe a local body (water utility or town) should be central to the process. Many also believed the utilities benefitting from the interconnection should pay some agreed-upon rate.

A future growth in numbers and importance of interconnections was seen.

3.5.3.8 Conclusions and Recommendations

3.5.3.8a Conclusions

1. Given the relatively small size of the majority of utilities within the Housatonic Public Water Supply Management Area, the capital cost for installation of interconnections represents a significant barrier to their use.

2. Throughout much of the Housatonic Public Water Supply Management Area there is the need for an interconnections program under the supervision of the State and encouragement of the WUCC by which water utilities can develop and maintain information characterizing the use and value of their interconnections, both with other purveyors and with their own supply sources. Included should be the coordination of these data into a planning tool, a task in which the State can take major responsibility.

3. There is a tendency among water utilities to make emergency operations a low priority concern compared to the normal operation and maintenance of facilities. This in large part is due to the unpredictable nature of potential emergencies. Budget considerations also influence this lack of a regular program of maintaining existing emergency links. The result is that the condition and operability of many emergency interconnections are simply not known.

4. Every water purveyor in the State should have available sufficient alternative supply to provide for a major disaster. This backup supply may be internal (adequate direct surface and/or groundwater supplies), external (interconnections with adjacent purveyors), alternative (secondary grade sources), and/or remote (transmission of distant supplies via pipeline).

5. Water supply failures involve social, environmental and economic impacts which can substantially influence arrangements for water transfer. These issues should be evaluated and quantified in order to determine the practical benefit of an interconnection in meeting transfer requirements.

3.5.3.8b Recommendations

With these conclusions as a base, the following recommendations are made as being essential to any regional interconnections program.

1. Given the potential financial burden to smaller utilities of the area for interconnection installation, financial assistance programs similar to those recommended in Chapter 2 for aiding orphan utilities are needed to foster an interconnection program for the area. Examples of financial programs include the following:

    - 100 percent grants
    - combination grants and loans
    - revolving state loan fund with low interest which a utility borrows from and returns payment to for future use by other utilities.
    - large utilities finance capital improvements with smaller utilities amortizing the cost of these improvements with the large utilities.

2. The State should take an active role in the overall coordination of interconnections and provide the motivation for developing accurate data and integrating this data into a viable management tool. It is anticipated that the utilities' individual plan will help set the framework for this data base.

3. It must be recognized that water supply is, ultimately, a social and economic commodity, transferred to customers through private and public agencies, each with their own political, social and

economic responsibilities and each having to operate under diverse regulatory controls. Interconnections planning for effective and equitable transfer of water, particularly under emergency conditions, must be planned by an independent body, by WUCC or the State.

4. The WUCC endorses the philosophy and use of interconnections as appropriate. It is recommended that priority effort be directed toward the development of a consistent and reliable program of generating, confirming and updating information on interconnections, with particular emphasis on emergency links. It is essential to this effort that cooperative communication be maintained among water purveyors through the Housatonic Public Water Supply Management Area WUCC and State agencies. The State should exercise the authority and, if deemed appropriate, provide the funding required to obtain accurate data.

5. It is recommended that the basic requirements for data include:

   (a) A consistent definition of flow quantities available through an interconnection; this is particularly important for flows which cannot be measured directly.
   (b) Determination of actual flow quantities and the physical condition of interconnections. Each direction of flow through the interconnection is to be evaluated separately.
   (c) Operation of the interconnection must be specified and access to valve controls confirmed.
   (d) The impact of operating interconnections which have not been utilized for long periods of time should be evaluated. Data on operating integrity, siltation and potential stagnant water quality problems are to be evaluated.
   (e) In general, the inconsistencies and data voids reported in the questionnaire should be investigated.

6. Emergency interconnections, which see little or no use for extended periods, should be inspected at regular intervals, not less frequently than annually. Provisions for updating data on a regular basis are necessary for an effective, continual planning effort. Changes in the operating status of an interconnection may occur as a result of age, changes in distribution system functioning, construction of other interconnections and so forth.

7. A comprehensive program of testing of interconnections should be prepared and implemented. Both quantitative and qualitative tests are to be carried out particularly testing water quality, with priority emphasis on emergency links.

8. A working method by which data can be utilized and disseminated must be developed. A program of analysis for determining the backup capabilities of interconnections provides a rational tool for water supply management.

9. A detailed study should be undertaken as soon as possible to create a comprehensive strategic interconnection plan for the Housatonic Management Area. At a minimum, this study should determine the following:

- physically feasible points of interconnection.
- facilities required and their estimated costs.
- potential for continued use of small system sources, including considerations relative to water compatibility, operation and maintenance requirements, and the requirements of the Safe Drinking Water Act.
- upgrading requirements necessary to bring interconnected small systems into conformance with minimum design standards or the standards of the connecting utility.
- an assessment as to the role each system interconnection should play in the future (basic supply source, seasonal supplement, or emergency use).

Particular attention should be given in this study to strengthening the many troubled smaller water utilities within the Management Area, either through interconnections to larger systems or the creation of "clusters" of these smaller systems. Interconnections should also be considered which link larger systems (such as Danbury and New Milford) as a means of enhancing the capabilities of these systems in terms of emergency response, meeting peak demands, or more economically meeting normal system demands.

In summary, the WUCC supports the philosophy and endorses the use of interconnections where feasible throughout the Housatonic Public Water Supply Management Area. Permanent, daily use interconnections represent an integral part of a regular distribution network and require no additional consideration of design and maintenance than any other part of the system. Interconnections also constitute a functional means for providing emergency supplies for utilities, and, as appropriate and as economics allow, interconnections can well be regarded as the first step in the development of a regional system.

Emergency interconnections, on the other hand, are designed for intermittent use and require different treatment - particularly maintenance including frequent flushing, testing and recording results. They are part of a wider emergency plan which includes other means of maintain-

ing supply (albeit more expensive) in an emergency situation. For this reason alone they must be inspected frequently to ensure they are in a state of instant readiness.

Of necessity, the preceding pages have addressed the issue of interconnections in a somewhat general manner. However, the WUCC wishes to emphasize the importance of interconnections as a means of enhancing system reliability - particularly for those smaller systems who might have single supply sources. Interconnections can, and should, play a vital future role not only for these small or single source systems, but also as a means to enhance reliability for larger systems during any sort of supply, treatment, storage, or distribution emergency.

3.5.4 Joint Use or Ownership of Facilities

3.5.4.1 Introduction

The proliferation of small water companies in the Housatonic Public Water Supply Management Area (92 water utilities serve less than 1,000 people) gives rise to the idea that in order to strengthen these utilities, joint management or ownership of a range of facilities might be beneficial. This section seeks to determine where such joint use presently exists and to identify and recommend joint use of sources.

3.5.4.2 Concepts

The regulations for Public Law 85-535 are specific in requirements for this portion of the coordinated plan. They require a plan for joint use, management or ownership of services, equipment, or facilities, including:

> "aa. A list of existing and planned shared or joint use facilities, together with documentation from the utilities involved outlining limitations on and arrangements and schedules for development, use, operation, and maintenance of such facilities.
>
> bb. Identification of services and equipment which could be made available to other utilities such as but not limited to leak detection and repair, and emergency equipment."

The discussion of this aspect of the project is summarized in the Task Objective "To determine the degree of joint usage management or ownership of sources, services, equipment or facilities which exists, may be planned or may be required." The concept is thus to review the idea of improving the efficiency and reducing operational costs of the smaller water utilities by sharing certain facilities.

The possible joint use will depend upon the location of the two (or more) utilities to each other. Joint use, for example, of services or distribution piping is only feasible when the utilities are sufficiently close to each other, but joint management (such as billing, and meter reading, calibration, maintenance and repair) or joint use of equipment could take place when the utilities are further afield.

In order to review the possible items of joint use it is useful to have in mind the possible facilities.

3.5.4.3 Description of Types of Joint Use or Ownership

There are three broad categories of possible joint use and management. Infrastructure implies major engineering works of the type associated with the supply, conveyance and treatment of water. There is no such joint use in the Housatonic Public Water Supply Management Area at present. Future possibilities include a possible joint development of Candlewood Lake or other regionally significant sources by a large utility or regional water authority who would then wholesale raw or treated water to smaller utilities which need water, but are too small to develop such a source themselves.

Equipment is the second category and includes the typical contractor's equipment associated with main extensions carried out "in-house" by a utility rather than by using the services of a contractor. Over and above the equipment is the type which is very specific to water supply such as pressure gauges and recorders, portable chlorination

injectors, leak detectors, flow gauges, field communication apparatus, mobile generators and similar emergency items.

Manpower and facilities are the final category. Manpower skills range across the whole spectrum of water supply from chief engineer to meter reader. While the previous category covers something of the contractor's expertise, management strays into the field of consulting, be it engineering or accounting or even satellite services: thus its definition must be clear. Various facilities may be jointly purchased or rented and shared by two or more utilities.

The following items are the main groups of each category:

Infrastructure

Water Source-Surface
Water Source-Underground
Raw Water Storage
Treatment Mains
Treatment Facilities
Distribution Mains
System Storage

Manpower and Facilities

Meter Reading
Meter Testing Equipment
Records
Billing
Office Facilities
Computer Facilities
Skilled Manpower
Engineering
Laboratory Facilities
Public Relations

Equipment

Compressors
Water Tankers
Excavation Equipment
Pipe Stores
Special Pipes
Fittings
Jointing Equipment
Pipe Cutting Equipment
Meters
Leak Detection Equipment
Pumping Equipment
Standby Generator

3.5.4.4 Advantages and Disadvantages

How then can sharing these facilities be of assistance and to the common good? A review of the benefits is perhaps the best way to start.

The relative merits of sharing any or all of the above items are perhaps really minimal except in cases of emergency where equipment for

hire is not available. Good relations between utilities could well be strained if equipment loaned from one to the other was abused or broken, even accidentally, during use.

It seems that there is little merit in the sharing of equipment especially if a good local leasing equipment firm is available. The only case which could perhaps be considered would be the joint ownership of specialized equipment unlikely to be found in the normal equipment leasing firm, such as pipe cutters, leak detection equipment and the like.

3.5.4.5 Current Use In Management Area

An examination of the questionnaires returned at the commencement of the project indicates there has been no joint use of any type within the management area to date by those responding. It can be assumed that, under the circumstances, no firm agreements exist for joint use or ownership of facilities. With a view to determining this, a further memo to members of WUCC was distributed at the March 12, 1987 meeting to provide definition and clarification of this issue and to solicit additional response from the utilities (for details see Appendix 3.5A).

However, it is more than likely that some exchanges do take place in times of emergency. A good example of this is the loaning of a generator to Rural Water Co. by the Danbury Water Dept. when power was lost during an early snowstorm in October, 1987. This sharing of the generator was, in large part, made possible by the relationship which the two utilities developed during the planning process. This illustrates one of the benefits of being involved in the Housatonic WUCC.

It is interesting to note that the Coordinated Water System Plan for Clark County, Washington[1] Published in March, 1983 indicates that there were no shared facilities in Clark County, (Washington) at that time. This is noted in the following statement excerpted from the referenced report.

"Currently none of the major water purveyors in Clark County share supply or storage facilities. Instead, shared facilities have been limited to the use of emergency or supplemental interconnections between adjacent water purveyors."

3.5.4.6 Potential For Future Use

It is likely that the exchange of specialized equipment will be continued for emergency conditions, but this method is very much limited to abnormal times and emergencies and is also restricted to the very specialized type of equipment concerned. It is usually faster and more convenient to hire construction type machinery such as backhoes.

The exchange or joint use of staff for such items as meter reading is also unlikely to become a major entity in view of the unskilled nature of meter reading and the preference in the circumstances for using the water utilities staff who normally work in other areas. When a utility is large enough, of course, meter readers who specialize in that one subject are likely to be used on a full-time basis. There has, however, been some use of meter readers from one utility by another utility on an "off-hours" basis.

The greatest potential for future joint use in the Housatonic area will most likely be in the area of shared use of either a raw water source or transmission facilities for finished water. Candlewood Lake is the prime example of the proposed joint use of a water source. As noted in Section 3.4, the City of Danbury would likely be the lead entity in developing this source, with suggestions made by various members of the WUCC to provide transmission and storage facilities which would allow the use of treated water from Candlewood Lake by utilities in at least Brookfield and New Milford (most notably the New Milford Water Company).

Another realistic joint use concept that has been advocated by the WUCC is the creation of a two-way finished water transmission main along the proposed Route 7 corridor which would link the Danbury and Bridgeport Hydraulic Company systems, thereby providing emergency backup for both systems as well as basic or supplementary source of supply for systems along the potential route.

3.5.4.7 Philosophy For Joint Use or Ownership

The concept of sharing facilities is a very broad one. We feel that the future of this strategy should fall along the following philosophical lines:

1. Infrastructure will be the major joint use foreseen in the Housatonic Public Water Supply Management Area in the near future. As demands increase, new sources of water must be located and if this exploration and development (be it surface water or underground water) can be shared and the full advantage of scale utilized, then it pays to think in terms of regional development. The availability of water, particularly underground water, will obviously be restricted to certain confined areas, and this will probably determine the number of utilities which can take advantage of this particular source. Proximity of the two or more service areas will also have a big effect on the number of participating utilities.

2. The most likely development of aquifers on a regional basis will comprise a well field, test pumped to indicate the maximum yield including interference between adjacent wells, a transmission main to a location somewhere near the center of gravity of the water utilities forming the regional venture, terminating in a storage tank, which will not only have the advantage of fire protection, but also even out demand in the areas concerned. This would appear to be quite a feasible method of future development and would require protection of any such identified regionally significant aquifer source.

3.5.4.7a Equipment

The fact that there have been no reports on the exchange of technical equipment does not necessarily mean that it has not occurred. Several of the water utilities interviewed reported that they would be quite willing to lend equipment on an emergency basis. It is our belief that this type of emergency loan will continue with the only likelihood of long-term joint use of facilities would be a joint laboratory set up to respond to the provisions of the 1986 Safe Drinking Water Act. Local laboratories may not yet be able to carry out this type of work and, unless a commercial laboratory opens in the near future, it is possible that a shared laboratory could be required. Although it is quite possible for equipment to be shared in a specialized field, there is really no equipment which could not be purchased by a water utility unless it was very small indeed and the equipment very expensive. Additional discussion

on the financial burden that the Safe Drinking Water will have on utilities with regard to analytical costs, as well as other factors, is included under financial section of this chapter.

3.5.4.7b Manpower and Facilities

This is perhaps a lead into the next section of this chapter, Satellite Management. The various levels of joint use of manpower and facilities could include, in its most elementary form, the counsel of fellow professional engineers, accountants and managers between two utilities, but this must be well defined as it really becomes the first stage of Satellite Management.

3.5.4.7c Advantages of Non-structural Agreements

Informal agreements are far more prevalent than written agreements because of the convenience and trust involved on each side. In some cases it is preliminary to a contractual arrangement, and represents the stage of sorting out the "bugs" before a contract is made up.

3.5.5 SATELLITE MANAGEMENT

3.5.5.1 Concept

The background definitions and data which will be used in this study are, for the sake of consistency, those generated by U.S. EPA,[2] AWWA or otherwise in common use throughout the country. On this basis, system size would be as defined as follows:

Size	Population Served
Very Small*	25 - 500
Small*	501 - 3,300
Medium	3,301 - 10,000
Large	10,001 - 100,000
Very Large	Greater than 100,000

* Small and very small water systems comprise about 88% of all community public water supplies in the United States. DOHS uses a population base of 1000 to distinguish between small and large utilities.

The Environmental Protection Agency estimates that there are approximately 60,000 community water systems in the country. Of these, approximately 39,000 or 65 percent of the total can be categorized as "very small" - serving 25 to 500 people. An additional 14,000 systems, or 23 percent of the total can be categorized as "small" - serving 501 to 3,300 people.

It should be noted that the Safe Drinking Water Act defines community water supplies as those that provide piped water to at least fifteen service connections or 25 year-round resident persons.

The American Water Works Association[3] sees the small water system dilemma as follows:

> "Small systems have a basic problem rooted in their small size: specifically, a relatively limited economic base to deal with the water quality problems facing them. This has presented financial, management, operational, quantity and quality problems that severely challenge the ability of the owners as well as those responsible for legislation, planning, advice, regulation and support. In many cases they present serious health problems as the records show the small systems have disproportionately higher incidences of drinking water quality and monitoring problems. It is pertinent that 62 percent of the small water systems are privately owned with private ownership increasing significantly as the systems decrease in size. Ownership is significant as publically owned systems are eligible for public grants and loans, are non-profit, are subject to statutory restrictions, in many states are not subject to public utility commission rate control, and are subject to political pressures. The privately owned small systems are quite often a secondary concern of the owner, are not eligible for public grants or loans and find commercial loans hard to obtain."

The owners and operators of small water systems are often faced with situations that adversely affect their ability to provide an adequate system to their customers. Such problems of insufficient capital and operation and maintenance (O&M) costs cannot be spread over sufficient customers to keep individual rates at a reasonable level. The limited revenues and assets are the fundamental problem whether it is raising sufficient capital for expansions or repairs or for the salaries to attract skilled management. Moreover, many small water systems are located in rural or other low density areas with low population growth rates; these systems have no predictable larger customer tax base in the future to

finance capital improvements. Sharing the burden with one or more other utilities is often a great advantage. Regionalization or Satellite Management can be of great benefit to the smaller utilities: however, it follows that if one side benefits, so must the other. Advantages to the larger utility must be obvious, probably financial or quid pro quo. There must be an element of profitability.

The concept will be termed "Satellite Management." It can exist in many different degrees ranging on the one hand from the simple provision of a wholesale service through varying degrees of technical, managerial and operational help either on a handshake or a written contract, to the other extreme where the utility manager by outright purchase assumes complete ownership and operational responsibility. A review of the varying degrees of Satellite Management will form the subject of this section with the object of creating a certain philosophy for Satellite Management and its potential for future use.

It must be remembered that Satellite Management is but one of the alternatives for a small utility plagued by the problems of small utilities, particularly the lack of adequate working capital both for administration and for renewal of infrastructure. Such options as merging with adjacent small water utilities, formation of a water district, formation of regional water utilities (county water utilities is the term used by EPA) and the like are possibilities not covered in this report.

Perhaps the most important inducement to seek assistance by means of Satellite Management is the effect of the Safe Drinking Water Act and the Safe Drinking Water Amendments Act of June 1986. The frequent monitoring, analysis and reporting of water quality will be far outside the capabilities of the small water utility. When all the regulations under the 1986 Act are known, some means of relief will be essential for many smaller utilities.

3.5.5.2 Types of Management

The range of options is very wide-ranging from one extreme of complete isolation, to the other extreme of complete management by the larger

utility. In some cases, utility owners may request a transfer of ownership to a qualified agency. In other cases, utilities may require only support services utilizing qualified professionals on a contract or fee basis. It is convenient to divide this wide range of options into two basic types referred to as structural and non-structural options.

Non-structural options are generally limited to those which afford the smaller utility to retain its complete identity, service area, management, and in the case of a town utility, its own "Home Rule." Non-structural options simply emphasize a change in business practice or in technical assistance, but the important factor is that the organization and control of the water system remains essentially intact and unaltered.

Structural options, on the other hand, by their very definition create a new management structure to operate the water system: there is a permanent change in the status of the existing water supplier. Figure 3.5.3 provides a good example of the wide range of options that Satellite Management may include. As is illustrated in the organizational chart provided by Frederick Black, some of the utilities are completely owned and operated by Fred Black while in other cases the corporation of R.J. Black & Son provides maintenance service to a number of utilities and engineering and construction services to two of the area's utilities.

There are many different ways in which Satellite Management can be achieved particularly in the degree of assistance provided by the larger utility. The success of any satellite operation is very much dependent upon the resources of that larger utility. In order to ensure that it has adequate resources to meet both the current and future needs of the smaller utility, a prequalification process is recommended using the factors described below.

- Sufficient qualified operating personnel to assure service to customers on all systems managed.
- Experience in daily water system operation.
- Appropriate trade or professional licenses if services other than operations are provided.

- o Day and night emergency response service available to all customers.
- o A written financial plan for operations and maintenance services.

The satellite must decide which areas need reinforcement and whether these are, in fact, obtainable from the large utility. It is a choice between the two dependent on many factors such as the support available, resources of the larger organization, condition of the satellite system, the distance between the two and the type of ownership, quite apart from the political and statutory aspects. Some examples of the scope of agreement are as follows:

Non-structural (Informal Agreement)	Structural (Formal or Contractual)
Joint purchasing agreements for chemicals	Creation of a new water supply entity
Joint hiring of personnel	Change in policy of an existing entity
Joint storage facilities	Creation of an association or water supply corporation
Share billing equipment	Special districts
Provide water on emergency basis	
Share use of O&M personnel	
Share joint technical equipment	
Exchange of supplies on an emergency basis	

Informal agreements are far more prevalent than written agreements because of the convenience, but trust is involved on each side. In some cases it is the preliminary to a contractual arrangement, sorting out the problems before a structural contract is made.

3.5.5.3 Advantages and Disadvantages

Before considering the pros and cons of the various types of Satellite Management, it is perhaps beneficial to review the situation of "no-action." Here, the present water utility will maintain complete responsibility for its system. All infrastructure improvements and capital projects would be the responsibility of the utility. The responsibility for conforming with the administration and operation requirements of the Safe Drinking Water Act is that of the water utility, and improvements required by the Act, such as disinfection, water treatment and the like would have to be financed by the utility. This may pose a problem to a

water system owned by a private individual or a small housing association since it is unlikely that public funding assistance programs would apply to this structure. Perhaps the greatest concern in the future is complying with the Safe Drinking Water Act and its amendments. The necessity of collecting samples, payment of laboratory fees and public notification will cause a problem. It must not be forgotten that there is a liability potential for civil suits filed under the Safe Drinking Water Act which would be a severe drain on the finances of the very small utilities. For these reasons, the time has come for each small utility to review its future very carefully and to determine the advantages of widening the management or even ownership of the utility. Additional discussion pertaining to the potential financial burden caused by the SWDA amendments is included in the financial section of this chapter.

Informal agreements are perhaps the simplest form of merging with another utility where there are advantages for the two utilities to combine services, such as affecting the "economies of scale."

Specific functions which may be contracted between one or more utilities include:

- Water purchase contracts - both wholesale and resale
- Raw water supply
- Contract operations and maintenance work for emergency uses in special situations
- Water plant operation and maintenance shared when treating a common raw water source
- Distribution system - maintenance
- Meter reading, billing and collection
- Lab analysis
- Cross-connection surveys
- Leak detection

These contracts can also make available various types of specialized services to those small systems who do not have the necessary facilities and qualified staff to provide for themselves. Laboratory services by contract are increasingly used as the utility strives to comply with federal and state standards. Larger water systems are beginning to create laboratories for this purpose and can share them with smaller water systems.

The range of Satellite Management can lie anywhere between the "no-action" alternative through to complete merger or change in ownership with a larger utility. The two alternatives of structural and non-structural management have their own advantages and disadvantages. Each will now be reviewed.

3.5.5.3a Non-Structural Options - Informal Agreement

An informal agreement is the most flexible form of cooperation between utilities, and carries the advantage of being achieved without any user approval required. Water systems can generally agree to share such items as laboratory facilities, storage facilities, billing equipment, provide a supply of water on an emergency basis or even share O&M functions. The following gives an indication of the advantages and disadvantages of informal agreements:

Advantages	Disadvantages
Easy to create, implement or change	Not legally enforceable
Adjustable for the duration of the need	No formal continuity when top staff level changes occur
Easy to terminate	Easy to terminate
Could be the forerunner of a more formal type of agreement	Gives possibility for misunderstandings and misinterpretations

The type of agreement is generally arranged informally between superintendents or engineers, sometimes with a telephone call. It is generally a loose arrangement which is ideal for minor items, but for more important matters the basic service contract (where the agreement appears in writing) may be more appropriate. This provides a somewhat greater degree of control.

3.5.5.3b Joint Service Contracts

The next step further away from informality would be the joint service agreement by which each party would share or exchange certain activities among two or more water systems. It is one stage more complex than the basic service contract. Consequently the contract is more restrictive and binding upon the participants. Joint Service Contracts will be used most frequently in the planning, contracting, constructing and possibly operat-

ing of joint facilities such as the development of a new raw water source, the ownership of such facilities as storage, laboratory, maintenance, or vehicles and could also include bulk purchase of chemicals and other stores. As an example, the type of circumstance under which this could occur is when a series of small water utilities find that their wells, although independent, take water from a common aquifer which becomes increasingly polluted. It would consequently behoove them to seek a new joint source of water and to exploit this by pumping, treatment and distribution to each of the utilities for their own independent distribution pipework. Staff, particularly municipal employees, would retain their same conditions of employment with the utility concerned. Although an improvement to the area as a whole would result, corporate identity and Home Rule is retained. The following gives the advantages and disadvantages of joint service agreements:

Advantages	Disadvantages
Easily created	Certain impact on local autonomy and policy control
Minimal disruption of existing structure	Difficult to distribute costs equally
More permanent than a basic service contact	Difficulty in computing overhead costs
Realization of economy of scale savings	More difficult to terminate
More efficient use of new personnel and equipment	Problems supplying alternate service if shared facility fails
Ability to provide specialized services	
Increased overall efficiency of service	
No user approval required	

3.5.5.3c Structural Options

There are a series of structural options the common basis being the creation of some type of new water supply entity. The title of the entity depends upon the appropriate legislation. Associations or non-profit water supply corporations are one alternative, while a local special purpose district is another . Perhaps the largest of these is the areawide special district or authority such as regional water authority which may take in, either by voluntary action or ordered take-over, several municipalities. They are highly autonomous and for funding normally depend upon the revenue

bonding market. Additionally, the new entity may be an investor-owned utility. The general advantages of structural options can be summarized in a single general table, as follows:

Advantages	Disadvantages
Can be relatively easy to create	Power to raise funds spelled out in Charter
Authorized to acquire water sources	Limited powers in relation to other governmental units
Construct and operate a distribution system	Quasi-governmental entity
Power of eminent domain	
Authorized to issue bonds	
If public, not for profit operation	
Normally more efficient than local government	
Greater financial flexibility	
Provides centralized planning and coordination	

The specific advantages and disadvantages will, of course, depend on the type of agreement and the state concerned, ranging through the more usual ones of the non-profit water supply corporation to special purpose districts and where applicable, municipal utilities.

3.4.5.3d Role of WUCC's

With the establishment of Water Utility Coordinating Committees in the State of Connecticut being so recent, it is difficult to say with any degree of certainty the effect that these committees will have on the coalescence of smaller water utilities or in the Satellite Management Program generally. From the aspect of approval of all future service areas, the WUCC will act in a more advisory capacity than in management. Although the WUCC represents a certain degree of regionalization, its powers were not intended to go to the extent of providing Satellite Management. However, the WUCC can serve as a clearinghouse for those utilities interested in satellite management (or in being managed) - a role which the WUCC has already played during its first two years of existence.

3.5.5.4 Current Use in Management Area

The regulations issued with Public Law 85-535 require a plan for Satellite Management or transfer of ownership which identifies the utilities which have both the ability and willingness to assume Satellite

Management, the identification of public water systems willing to have such management provided by another utility and the development of a water system satellite management program. Unfortunately, the responses to the questionnaire did not indicate widespread interest in, or current use of, such management in the Housatonic Management Area. However, good examples of Satellite Management can be found in the Area, beginning with the operations discussed earlier for R. J. Black and Son. Another good example of the use of this concept is in the Rural Water Company[4]. Here a series of small water utilities are managed by a single company and, although they are not physically connected together, they share a common professional management with all the advantages of a first-rate management staff.

Other examples were reported by General Waterworks, which operates three divisions in New Milford, Woodbury and Newtown (New Milford Water Co., Woodbury Water Co., and Newtown Water Co.).[5] Additionally, General Waterworks provides satellite management services and will pursue additional such services in their exclusive service areas. However, each potential system will be carefully scrutinized before an agreement is entered into.

Also pending is the possibility of a satellite management situation in which the Bakes Property water supply may be managed by the Ridgefield Water Company.[6] Negotiations are currently underway for a water supply covering 65-70 units, possibly rising to 200 units.

Satellite Management depends upon the specifics of the contract, and the examples in the preceding pages can only be taken as typical. For the serious student, reference should be made to the document entitled "Regionalization Options For Small Water Systems" (No. 570/9-83-008, June 1983) published by the Environmental Protection Agency.[2] Various references to this document, which is much wider in scope, are to be found in the preceding pages, but again it must be emphasized that agreements vary widely.

3.5.5.5 Potential for Future Use

The general concept of Satellite Management is far more likely to be practiced in a state like Connecticut, especially in the Housatonic Public

Water Supply Management Area in view of the proliferation of small water utilities. The Satellite Management concept is the most appropriate type of organization in the Housatonic management area and possibly in other Public Water Supply Management Areas. Although the uses of Satellite Management is to be found elsewhere in the United States, they are generally on a much larger scale than is needed in this case. Examples[7] include the American Water Works Company, the Garden State Water Company, and the like.

Although there are not many utilities presently providing Satellite Management in the area, a number of utilities have expressed an interest in providing such service in the future. These utilities are listed in Table 3.5.4. It is also anticipated that the State's desire not to allow the proliferation of new water systems will provide an impetus for increased Satellite Management.

The WUCC regards the potential for future use of Satellite Management as being very great. Quite apart from the normal day-to-day operation of a utility, with its inevitable problems, a turning point in water supply in the United States has now been reached with the enactment of the Safe Drinking Water Act Amendments of 1986 mentioned earlier. This Act requires many changes in water treatment ranging, in most cases, from disinfection of ground water supplies to mandatory filtration of surface water at the other end of the scale. This will inevitably reflect on the cost of supplying water on a small scale. There is another aspect, however, that will cause a tremendous increase in operating costs and that is the monitoring of supplies to insure that maximum contaminant levels (MCL's) are not exceeded. All public water systems of ten service connections or more are required to comply with Maximum Contaminant Levels at the present time covering such contaminants as inorganic and organic chemicals, turbidity, radionuclides and coliform bacteria. This places a serious economic burden upon the small water systems not only for sampling and analysis costs, but also to meet the new capital construction and maintenance costs. Regular monitoring is required and if a sample exceeds the MCL for the contaminant concerned, water systems are required to report to the state within 48 hours. The 1986 Amendments Act directs the U.S. EPA to set primary drink-

ing water standards on eighty-three contaminants within the next three years. Ultimately, regulations will be made to determine the frequency of sampling by each utility. Whatever the future situation, it is certainly going to impose greater financial burdens on the small utility. Protection of raw water supply and the routine monitoring and analysis costs will be the initial push and for this reason alone, a substantial increase in shared laboratory facilities or Satellite Management will undoubtedly occur.

The agreement to satellite manage other systems provides the managing utility the opportunity to spread out the cost of the satellite operation over a broad customer base. Additionally, when other system improvements are made, the satellite manager can spread these costs over a wider customer base.

3.5.5.6 Philosophy For Satellite Management

It is important to emphasize that Satellite Management is a two-way street and must give advantages to both sides. As a start, the smaller utility, referred to for brevity as the satellite, should be clear as to the improvements it seeks in its operation. The larger utility or the manager should also be certain as to the services it is able to offer and the benefits it hopes to gain from the arrangement, whatever the terms may be. From the aspect of the manager, the arrangement could well be a financial advantage in the fees that it charges for management but there are also hidden benefits such as the ability to share a common valuable source of water or a transmission main which may be able to serve the needs of both utilities. As a rule, however, the greatest gain is to the smaller utility in sharing the capital or O&M cost of both equipment and manpower particularly the ability to call upon a larger source of help in times of emergency.

The WUCC's philosophy is that the concept is an excellent one, and suggests that the following procedure be followed:

1. The WUCC should determine, in conjunction with DOHS, which smaller utilities need assistance in one way or another and which larger utilities are willing to supply assistance. Additionally,

the incentives needed (e.g., premium rate of return) to promote the involvement by larger utilities must be clarified.

2. Based upon the situation as recorded in this document, the WUCC and DOHS should jointly assist in the preparation of a specimen agreement for certain services for both structural and non-structural agreements.

3. As a philosophy, the WUCC should obtain from DOHS a periodic analysis of the changes in the Safe Drinking Water Act regulation which occur with a view to assisting the smaller utilities in compliance, particularly in the laboratory facilities required for monitoring.

3.5.5.7 Criteria For Satellite Managers

DPUC's recently promulgated (September 28, 1987) regulations for issuing certificates of public convenience and necessity for small water companies provide a good framework for developing criteria for Satellite Managers. These regulations require the applicant to sufficiently illustrate financial, managerial and engineering capabilities to own and operate a new water company. The ability to provide Satellite Management requires all of the same qualities, and these capabilities needs to be demonstrated prior to designating a utility as a possible satellite manager for the Housatonic Public Water Supply Management Area. The State (DOHS and DPUC) is the most appropriate administrator of a program to collect and review the necessary materials to support the capability of a utility to provide Satellite Management, and to maintain a standing list of Satellite Managers for the Housatonic Area that potential developers or other utilities may contact for such services.

3.5.5.8 Conclusions and Recommendations

3.5.5.8a Conclusions

As a result of the studies for the Housatonic Public Water Supply Management Area and an examination of nationwide literature, the WUCC has drawn the following conclusions:

1. Satellite Management is a viable option in the State of Connecticut and is a desirable option in the Housatonic Public Water Supply Management Area.

2. There are several types of Satellite Management which should be reviewed prior to arriving at any decision.

3. In view of the new Safe Drinking Water Amendments Act, June 1986, all water utilities, particularly small ones, should review their new responsibilities and estimated costs.

4. The common use of monitoring facilities, laboratories and other requirements of the Safe Drinking Water Act will require many water utilities to need both technical and financial assistance.

5. It is in the interest of the State of Connecticut, particularly DOHS, that a potable water supply is maintained in the state and it is consequently incumbent upon the state to assist small water utilities to this end.

6. Larger water utilities (the managers) should review their ability to assist and be prepared to make offers as requested by either the small utility or the State of Connecticut to undertake a Satellite Management program.

7. Liaison in such activity, referred to above, can best be provided by the Water Utility Coordinating Committee for that management area. We see the role of the Water Utility Coordinating Committees as a catalyst in ensuring a continued satisfactory water supply in its area by Satellite Management or other means.

3.5.5.8b Recommendations:

Having investigated the situation and having come to the conclusions listed above, the following recommendations are offered:

1. Small water utilities should review their future position and, coupled with their known deficiencies, if any, decide if they should be a candidate for Satellite Management.

2. The larger utilities which would become the managers should review the items which they can offer, both management and otherwise and who would make good satellite utilities, bearing in mind proximity, size, etc.

3. DOHS should be prepared to advise all WUCCs particularly on provisions of the Safe Drinking Water Act Amendments and regulations as they occur from time to time and also act as liaison between the other departments of the state having jurisdiction.

3.5.5.9 Summary

There are many viewpoints, both to the managing utility and the smaller satellite utility. A summary of the advantages and disadvantages is indicated in Table 3.5.5.

TABLE 3.5.5

GENERAL ADVANTAGES AND DISADVANTAGES OF
SATELLITE MANAGEMENT FOR LARGE AND SMALL UTILITIES

SMALL UTILITY (SATELLITE)

ADVANTAGES:

- Can provide infusion of new capital
- Control of routine operations retained
- Use of trained personnel as required
- Interconnections may be feasible
- Common design criteria and standardization
- Wider range of professional expertise
- Economy of scale
- Lower laboratory costs
- Provides general improvement of resources
- Retains local autonomy
- Improve water quality
- Assistance in times of emergency

DISADVANTAGES:

- May lose some of its identity
- Less independent
- Fear of being absorbed at a later date
- If absorbed, and depending on past management system maintenance, rates may significantly increase

LARGE UTILITY (MANAGER)

ADVANTAGES:

- Financial fee for management
- Other services in lieu of fee (e.g. raw water source)
- Expands revenue base
- May ease later absorption if contemplated
- Common design criteria and standardization
- May absorb any small excess of staff time or stores
- Shared capital cost of laboratory
- Increased profit to investor owned utilities
- May open new source of water, being surplus from small utility

DISADVANTAGES:

- Problems of several small utilities may tax resources
- May require increasing staff
- May be inefficient due to travel

REFERENCES

1. Coordinated Plan for Clark County, Washington, March 1983

2. Regionalization Options for Small Water Systems
   EPA, Office of Drinking Water, Washington, D.C., June 1983

3. Institutional Alternatives for Small Water System
   AWWA Research Foundation - December 1985

4. Stephen Polizzi, Rural Water Company, CT
   Personal Meeting

5. Kevin Moran, General Waterworks Co., New Milford, CT
   Personal Meeting

6. Joseph J. McLinden, Ridgefield Water Supply Company
   Personal Meeting

7. Chester A. Ring III and Tom Cawley
   (President and Executive V.P. respectively)
   Elizabethtown Water Co., NJ Interview and Personal Communication

3.6 MINIMUM DESIGN STANDARDS

The State of Connecticut has included minimum design criteria as a portion of its recently-published Final Regulations for issuing certificates of public convenience and necessity for small (less than 1000 customers) water companies. This section briefly reviews these criteria, discusses their adequacy, and recommends additional minimum standards where necessary.

3.6.1 DPUC Design Criteria

The Final Regulations noted above were published by DPUC on September 28, 1987, and included design criteria as Section 16-262m-8. This Section of the regulations begins by providing a summary of key definitions, and then goes on to identify criteria associated with facility location, design population and demand, water supply requirements, source protection, well construction and water quality, atmospheric storage tanks, on-site standby power, transmission and distribution systems, materials of construction, fire protection, service pipes (service connections), and pump house requirements. Key points for each of these topics include the following:

- Definition of terms:

  - average daily demand = representative 24 hour water usage computed at 75 gallons per person per day.

  - peak hour demand = one-third of the average daily demand.

  - safe daily yield of a water supply system = all water delivered to the system from all sources operating simultaneously at their individual safe yields for an 18 hour period.

  - safe yield of a well = for unconsolidated aquifers, a site-specific determination based on the impact of dry period minimum water table elevations on the yield of the well and the impacts of decreased streamflow or pollutant induction; for confined or bedrock aquifers, 90 percent of the hourly yield for 18 hours per day, hourly yield based on a cone of depression which holds stable for 24 hours (lower

yields to be used if the calculated figures would cause unacceptable associated impacts or when records indicate the yield to be less than calculated.)

- Facility location (including treatment plants, pumping stations, storage tanks, etc.; excluding water intakes and connecting pipelines):

  - above the 100 year flood plain and outside of the floodway boundary.

  - all chlorine storage and use areas at least 300 feet from any residence.

  - not in an area subject to fires or other natural or man-made disasters.

- Water Supply Requirements:

  - must maintain a system safe yield of 115% of average daily demand.

  - must be capable of meeting average daily demand with largest well or pump out of service.

  - must subject all wells to a 72 hour yield test in which drawdown is to a stable level for at least 24 hours; test should be performed during summer dry periods if possible.

  - periodic review required of yield, especially for deep rock wells.

- Source Protection:

  - minimum distances established to septic systems, buried oil tanks, sanitary sewers, surface waters, drains, and miscellaneous pollutant sources; separation distances required increase as well capacities increase, with greater distances required for high-rate gravel-packed wells with high bedrock levels and soil percolation rates.

  - control of separation space must be by the water supply owner.

- Well Construction and Water Quality:

  - well construction based on the previously-promulgated Regulations of the Well Drilling Industry.

  - quality must conform to State requirements, with suitable treatment required if necessary.

- each well must be equipped with a level probe, low water level pump shut-off, and lightning protection devices.

. Atmospheric Storage Tanks:

- must be equipped with bolted entry hatches, capped and locked filler pipes, sight glass gauge, screened vent pipe, high and low water signal system, drain valve with discharge to the ground (not to a sanitary sewer).

- usable tank capacity equal to the greater of 200 gallons per residential customer or the system's average daily demand, with allowances made for commercial and industrial use.

- hydropneumatic tanks and transfer pumps must be sized to accommodate peak hourly demand; at least two transfer pumps operating alternately must be installed between the atmospheric and hydropneumatic tanks, each capable of pumping the peak hourly rate and each protected by low water shutoff controls.

- the usable volume of the hydropneumatic tank shall allow for storage of five minutes discharge from the largest transfer pump.

. On-Site Standby Power:

- should have a permanent or portable generator to power the largest well pump, one transfer pump, all booster stations, and all treatment systems.

- fuel storage must be above ground with full containment.

. Transmission and Distribution System:

- minimum distribution pipe = 6 inches; smaller permitted in cul-de-sacs or areas where the system cannot be extended.

- minimum distribution pipe = 8 inches where fire protection is provided.

- all mains to be installed within the rights-of-way of paved roadways to facilitate access.

- normal operating pressures to be between 35 and 125 psi at service connections, with pressure reducers provided where needed.

- dead-ends are to be avoided, with blow-offs installed if a dead-end is necessary.

- isolation valves required to facilitate repairs and flushing and at all intersections of water mains.

- customer booster pumps are prohibited except in extreme circumstances.

- a means of air relief must be provided at system high points and protected from flooding or contamination.

- all appurtenant structures such as chambers, pits, etc. shall not be connected to a sewer, and must drain to the ground surface or to underground absorption pits.

- pipes must be laid with a minimum cover of 4.5 feet (deeper if greater frost penetration is expected), provided with freezing protection at aerial crossings, and kept clean during installation; trenches must provide suitable bedding for at least six inches below the pipe invert, be kept as free of water as possible, continuously and uniformly backfilled in tamped layers to a height great enough to protect the pipe, covered overnight or when work is halted (with the pipe plugged).

- minimum separation distances are established between water lines and gravity and force sanitary sewers, drains, and/or manholes; force sanitary sewer restriction are inviolate, while alternate protection means such as sleeving, encasement, etc. can be provided upon approval where clearances cannot be maintained between crossing water mains and gravity sanitary sewers and drains.

. Materials:

- in general, AWWA standards must be met for all materials, coatings, equipment, and testing.

- tracer wires must be used with nonmetallic pipe

- all facilities must be disinfected and meet appropriate pressure and leakage tests before being put into service.

. Fire Protection:

- requirements for fire protection set on a case-by-case basis.

- whenever fire protection is required, it must be in accordance with the recommendations of the Fire Underwriter's Insurance Services Office, DPUC, and the utility that will eventually own the water system.

- no fire hydrants will be permitted unless at least 150,000 gallons of water are in atmosphere storage.

- Service Pipes:

  - minimum size = 3/4 inch; depths similar to distribution requirements.

  - separate fire service connection.

  - direct service to be provided from the water main without crossing intervening properties; separate metered connection for each unit adaptive to individual ownership (with some exceptions, such as high-rise apartment complexes, multi-storied homes, commercial buildings, and high-rise condominiums, which will be reviewed on a case-by-case basis by DPUC).

  - shutoff valves to be provided at property line and interior of premises, with detector check meter on fire service.

  - no interconnection between public and nonpublic systems without special permission.

- Pumphouse Requirements:

  - rodents and small animals shall be prevented from entering facilities; locked gates and fences to be provided, along with suitable lighting, HVAC, and access facilities.

  - all manual and automatic controls, wiring and appurtenances to be installed in accordance with the National Electrical Code and provided with over and under voltage protection.

  - easily-read instantaneous and totalizing meters must be installed to measure each source of supply independently.

  - water treatment to be in accordance with procedures established by DOHS.

3.6.2 Review of DPUC Criteria

With the several references to previous State regulations, AWWA standards, Department of Health Services standards and regulations, the Public Health Code, and the National Electric Code, the DPUC design criteria become fairly comprehensive in scope, and can serve as a basic minimum design framework for all water companies, regardless of size. However, case-by-case exceptions to these criteria should be made if justifiable, particularly for larger utilities which do not fall under the jurisdiction of the DPUC regulations. Some specific examples of areas which should be subject to flexible interpretation include the following:

- average day and peak hourly demands different than those defined in the DPUC criteria should be acceptable if adequate historical information is available to justify a deviation (true for both large and small systems).

- the safe daily yield of systems which do not rely on confined or bedrock aquifers should be based on all sources operating simultaneously at their safe yield for a 24 hour (rather than 18 hour) period.

- facility location (especially wells) should be permitted within flood plains with proper protection.

- a 15 percent margin of safety between safe yield and average day demand may be excessive for certain systems, and should be examined on a case-by-case basis to determine the true adequacy of the source and system.

- only fuel oil stored on a wellfield or water supply watershed should be required to be installed aboveground; other storage should be done in accordance with DEP and EPA regulations based on site-specific criteria (in particular, underground storage may be preferable in areas where vandalism is a concern).

- pressure gauges should be an acceptable alternate for sight glass gauges on storage tanks; both should be adequately protected from vandals.

- emergency power may not be necessary for all portions of certain systems - high level systems may still deliver water at adequate pressure during power outages.

- where required due to unavailability of roadway rights-of-way or other engineering considerations, main placement should be permitted in easements which are out of the rights-of-way of a paved road.

- blanket permission should be given to allow master meters on "vertical" developments (e.g. high-rise office buildings, apartments, condominiums, etc.) regardless of their potential for individual unit ownership (individually metered connections should still be provided for "horizontal" developments.)

- it should be clear that pumping of chambers or pits is acceptable for areas where permanent drains are not feasible.

- in order to avoid repumping, it may occasionally be cost-effective to exceed the maximum pressure of 125 psi specified in the DPUC regulations, with pressure regulators provided at individual service connections.

- in special cases, it may be advisable to allow temporary or permanent individual booster pumps to serve homes which are either an excessive distance from, or elevation above, the distribution system, subject to the following conditions:

  . in no case can system pressures be less than 25 psi

  . the booster pump is needed as a temporary measure as a system is upgraded

  . properly installed and approved backflow preventers are provided, along with low water pressure cut-off switches

  . if possible, the need for a booster pump should be noted on the legal description of the property

- case-by-case flexibility should be granted for variations in minimum depth of cover, with depths of less than 4.5 feet allowable with proper protection and insulation.

A review of other generally-accepted standards also shows some minor deficiencies in the DPUC criteria, with suggested additions including the following:

. A two to three foot safety factor should be included for facilities elevation above the 100 year flood level.

. Surface water intakes should be designed to allow selective withdrawal from multiple levels, with protection by coarse screens or racks on each intake; intake velocities should be less than 0.5 fps.

. Status of remote pumping stations should be telemetered to a central location; pressure gages should be required on the discharge line from each pump (again, some flexibility may be needed for smaller systems.)

. Minimum and maximum clearance to the ground of six and thirty-six inches, respectively, should be specified for overflow and drain pipes from storage facilities; provisions should be included to drain the storage facility without service interruptions; properly-protected vents should be required; a maximum level variation should be required based on a case-by-case analysis.

. Reference should be made to AWWA or Ten State Standards for items such as flushing methodology at system dead ends; minimum isolation valve spacing, pipe restraints at bends, tees, dead ends, etc.; and minimum acceptable classes of various materials.

- Fire protection connections should be treated as system dead ends, with appropriate provisions made for regular flushing (further cross-connection control regulations on fire protection connections will be forthcoming from DOHS).

3.6.3 Individual Utility Standards

The DPUC regulations as noted are designed to address smaller utilities with a customer base of less than 1000. They do, however, provide a good framework for all utilities within the Water Supply Management Area to use. Many larger utilities have their own minimum design standards which parallel or in some instances are more stringent than those set forth earlier in this section. Those utilities which do possess more stringent standards (or site-specific variations of the DPUC standards) have the right to require developers to comply with these standards when constructing an extension to their existing system or service area. The new DPUC regulations (Section 16-262m-7) appear to support this contention by stipulating that the "specifications for materials, equipment, and testing shall be in accordance with ... the specified water utility which will eventually own the system ...". It is important for a utility to maintain consistency of design parameters throughout its service area as system expansion occurs, and to provide the appropriate pipe sizing to be consistent with continued expansion of the system.

3.6.4 Impact on Existing Systems

Concern has been expressed by some WUCC members that the criteria set forth in the new DPUC regulations (Sections 16-262m-1 to 16-262m-9) could have a significant impact on smaller systems if they desire to expand. This concern is specifically related to whether an entire system would have to be brought up to the minimum design criteria if expansion occurs, even if the water utility has provided an adequate supply of water at sufficient pressure to their customers. DPUC has stated that it is their intent to review an entire existing system for conformance to the regulations if expansions of five percent or more are contemplated by a regulated water company, with particular emphasis during this review on whether or not the proposed expansion will compromise existing service under any potential

average or peak demand conditions. The regulations do allow for a hearing process for aggrieved parties with which situations such as this could be addressed. However, it is uncertain if this process would look favorably upon the smaller systems.

3.6.5 Fire Protection Issues

Much discussion during subcommittee meetings revolved around the issue of fire protection. Although some comments were made which called for uniform State-wide standards for fire protection, the subcommittee ultimately decided it was best to continue to leave the decision as to whether or not fire protection is to be provided in the hands of the community fire marshall. If fire protection is to be provided, standards will be those used by the local community, or, at the community's option, those recommended by the State Fire Marshal. These requirements will normally conform to either ISO (Insurance Standards Organization) or NFPA (National Fire Protection Association) standards, leaving open the possibility that a utility which provides service to more than one community may have to meet differing requirements.

Utilities have addressed this issue in various ways in the past. For example, the Connecticut Water Company will provide fire protection as required by a municipality or DPUC. The Company will not accept responsibility for fire protection systems which are separate from the potable water system (e.g., tankers, ponds, etc.).

The General Water Co., which owns and operates three utilities (Newtown Water, New Milford Water and Woodbury Water Companies) in the Housatonic Public Water Supply Management Area, has been faced with fire protection issues during rate cases. In Woodbury, the DPUC required that a particular main be installed to meet fire flows as a contingency to the approval of the company's rate increase. Recently in New Milford, the company required a developer to install sufficient storage and piping to meet fire flows in his proposed condominium complex, in an effort to decrease the probability that fire protection questions will impact future rate cases.

Providing water for all purposes, including fire protection, is an obligation of Class A water utilities (those with gross revenues in excess of $100,000) regulated by the DPUC. However, many small systems which principally serve apartment or condominium complexes or smaller housing projects were not designed with fire protection in mind. Fire protection is often provided to such systems through the use of on-site ponds or tanker-supplied pumpers, rather than being incorporated into system design. There also appears to be some movement toward individual sprinkler systems - a circumstance which may reduce the need for traditional fire protection requirements in terms of storage, minimum main size, etc.

From a minimum design standards point of view, fire protection becomes a difficult subject to address in terms of general requirements for the various WUCC members. The new DPUC regulations do address this issue to some degree, stating that a minimum 8-inch diameter pipe (and at least 150,000 gallons of storage) be used for systems providing fire protection. Suggestions have been made that the WUCC's minimum design standards call for 8-inch pipe whenever a system might eventually be called upon to supply fire protection. This is a sensitive issue for the smaller utilities, however, and is probably best left to case-by-case analysis, bearing in mind that initial installation of smaller pipe may preclude the eventual cost-effective provision of conventional fire protection.

3.6.6 Conclusions and Recommendations

The new DPUC regulations for issuing certificates of public convenience and necessity for small utilities set forth minimum design criteria under Section 16-262m-8. These criteria provide an excellent framework from which to build the minimum design standards for the Water Management Area for both small and large utilities. These criteria have the advantage that they are set in law, and are thus legislatively supported. Additional items which may be added to enhance these have been suggested for the WUCC's consideration. It is recommended that these DPUC criteria be used as the basis for the WUCC minimum design standards with appropriate additions made on a consensus basis.

It must also be made clear that individual utilities have the right to impose their own site-specific standards within their existing or exclusive service areas. Furthermore, it is also important that the regulatory agencies support the imposition of these generally more stringent standards and preclude developers from attempting to shop for the cheapest service.

The WUCC has a continuing concern regarding the impact of any accepted set of minimum design standards. It was generally agreed that such rules or standards are essential and, at a minimum, must be applied to new systems or greatly expanded systems. However, it is also important that some realistic measure be incorporated for upgrading the existing portion of systems desiring to expand. For example, a system which is adding two or three houses, although it may represent a five percent or greater expansion, is certainly a different issue than expansion encompassing one hundred or more customers. There is indeed merit to having streamlined procedures for existing smaller utilities desiring minimal degree of expansion - a practice which DPUC intends to follow on a case-by-case basis.

In reviewing the draft versions of this document, DPUC again noted that the principal use of the minimum standards will be the evaluation of new small water systems. Expansion should be "substantially" in compliance with minimum standards, with DPUC examining expansion requests principally in terms of the expanded system's ability to continue to provide a continuous and adequate supply of water for existing and future customers with a reasonable margin of safety. New facilities needed to provide adequate service or safety margins will be required to meet minimum design standards.

3.7 FINANCIAL DATA

Because of the small size of most water suppliers in the Housatonic Water Supply Management Area, few projects of individual suppliers are regionally significant. In addition, the individual water supply plans indicate no need for extraordinary financing for any planned expansions or improvements.

Certain proposed projects do affect more than one supplier or customer group, such as proposed interconnections and the takeover of failing systems by other utilities. The financial implications of these proposals are generally not significant on an areawide basis. However, as pointed out in previous sections of this report, financial issues associated with interconnections or takeover of failing systems may be very significant to the utilities involved. Suggestions by the WUCC regarding financial assistance programs in these instances have been made previously, and are repeated here as follows:

- Interconnections (Section 3.5.3.8)
  - 100 percent grants
  - combination grants and loans
  - revolving state loan fund with low (or zero) interest which a utility borrows from and returns payment to for future use by other utilities.
  - financing of small utilities' costs by larger utilities with a negotiated payback

- Takeover of Failing Systems (Section 2.3.2)
  - 100 percent grants
  - combination grants and loans
  - revolving state loan fund with zero interest
  - guaranteed (State-backed) loans from local lending institutions

The WUCC has also emphasized the need for capital expenditures not covered by these suggested programs to be borne to a greater extent by the customers of the failed utility.

Comments have also been made by various WUCC members regarding the difficulties that will be faced by many small systems in raising sufficient funds to meet the requirements of both the Safe Drinking Water Act and the minimum design standards discussed in Section 3.6. Although each small system will be faced with a unique set of circumstances, the suggestion has been made that the various needs can be met through a combined program of joint use (particularly for laboratory facilities), satellite management (especially for system maintenance), and interconnections. If an interconnection were implemented such that a small system's total water demand was satisfied, a source of funds for distribution improvements might be found in the sale of land formerly held for source protection. Of course, such land sales would have to be carefully reviewed for their impact on other existing or potential uses of the water resource, with the land's potential value adversely affected if stringent land use controls will continue to be required.

Several projects of regional significance have been proposed or suggested by utilities in the Housatonic WUCC, including the use of Candlewood Lake as a raw water source, the routing of treated water from Candlewood Lake through a transmission system terminating in New Milford, and the creation of a treated water link between Danbury and the Bridgeport Hydraulic Company along the proposed Route 7 corridor. Danbury has estimated a cost of $2.24 million (1984 dollars) to draw raw water from Candlewood Lake and route it to Margerie Reservoir - a cost which can likely be borne entirely by Danbury through budgetary allocations and appropriate increases in rates charged to system users

An extremely rough estimate of the cost of the treated water linkage from Danbury to New Milford is around $10 million. Again, Danbury would likely be the lead agency in providing funding for this system (probably through the issuance of bonds), with benefitting utilities paying for services provided by Danbury on a contractual basis either in terms of their assistance with the initial funding or in a negotiated annual cost. A similar contractual system could be used to

pay for the proposed Danbury-Bridgeport Hydraulic link, which is preliminarily estimated to cost on the order of $15 million - a cost which could increase substantially if the link is not built in conjunction with the new Route 7.

3.8 IMPACTS OF THE PLAN ON OTHER USES OF WATER RESOURCES

Although sometimes subtle, the development of any new water source will impact upon other uses of the same water resource. For the Housatonic Area, potential impacts are perhaps most sharply focused for the proposed Ball Pond Brook Diversion and the use of Candlewood Lake. Impacts, or potential impacts, on these resources due to their development as a water supply have been the subject of extended debate and negotiations, and have revolved about questions relating to hydroelectric power generation, recreation, maintenance of minimum stream flows, and land use controls. This range of issues will not likely be present for most of the other proposed sources, but all will have the potential for their development to impact some aspect of the natural or man-made environment.

The water diversion regulations administered by the Connecticut Department of Environmental Protection now serve as a vehicle for insuring the compatibility of the various uses of water resources from which a diversion has been requested. A permit is required under the diversion program for any withdrawal of 50,000 gallons or more during any 24-hour period from either a surface water or groundwater source. Applications for flow diversion permits must include all physical details of the work, as well as the diversion's probable effects on the following:

- public water supplies
- water quality
- wastewater treatment needs
- flood management
- water-based recreation
- wetland habitats
- waste assimilation
- agriculture
- fish and wildlife
- low flow requirements

- groundwater
- adjacent wells
- hydropower

Decisions as to the appropriateness of a diversion request are made by the Commissioner of the Department of Environmental Protection. However, the Commissioner must inform the chief executive officer of the municipality in which the diversion is to take place (among others) that a diversion application has been filed, with a hearing mandatory if the diversion will cause a transfer of flow from one regional drainage basin to another. If flow transfer is within a regional basin, notice of the application must be placed in a newspaper of general circulation in the affected areas, and also be mailed to the chairpersons of the local conservation commission and wetlands agency. Public hearings will be held for any proposed diversion if petitions signed by at least 25 people are received by the Commissioner which make such a request.

The Housatonic WUCC fully supports the informational and public notification requirements of the diversion regulations. The WUCC believes that these regulations are a sound vehicle for ensuring a proper balance between competing uses of proposed water sources, and that the future water supply sources proposed herein will be shown by the diversion permitting program to be fully compatible with other water resource uses.

3.9 SUMMARY

3.9.1 Overview of the Results of the Planning Process

At the start of the coordinated water system planning process, it was clear that the Housatonic Management Area was beset with a variety of problems related to the many small, sometimes poorly run, existing utilities; the potential for conflicts among utilities in terms of future service areas; the lack of areawide land use controls for protection of water sources; the need for additional sources for certain utilities; and the relative isolation of the utilities' management and personnel from each other. Now that this planning process is nearing completion, we see improvement in a number of these areas, with a program established to address all problems in the near future.

Major accomplishments of the planning process include the following:

- The process has established a delineation of areas within which service will be provided by a single utility, thus allowing future supply needs to be clearly defined while providing municipal officials and developers with an understanding of how water service will be provided.

- Sources required to meet the projected demands of the Area have been identified in accordance with the individual plans prepared by the various utilities.

- The present status of watershed protection measures in each community in the Management Area has been defined, with suggestions made for improvements in plans of development or zoning controls where shown to be appropriate.

- Various deficiencies of the many small utilities have been catalogued, with general recommendations made (Section 3.5) for cooperation and coordination measures needed to address these problems.

- Finally, the coordinated planning process has served to bring more of a sense of common interests and concerns to the various utilities who have regularly participated. The WUCC meetings have acted as a vehicle for utility managers to get to know each other better and to informally discuss long-standing problems and potential solutions. The WUCC feels that this exchange has been a healthy one, and is reviewing ways in which the group that has been active in the process can continue to meet regularly to discuss issues of common concern.

The issue of inadequate small utilities is an extremely broad one, and is likely to continue to trouble the Housatonic Area in the near future. A review of the Assessment shows a variety of problems with these small systems, with those most frequently observed including the following:

- raw water quality problems (most often coliform or sodium)
- quantity of supply problems
- no emergency power
- single source of supply
- undersized distribution systems
- lack of adequate financial resources
- lack of adequate management
- no firefighting capability

Quality concerns are most pressing, and have been observed in at least 42 systems: 38 of which are classified as small systems. All but two of these small systems should be able to interconnect to a larger utility during the planning period, thereby allowing the abandonment of their present sources. (Perhaps as many as 21 of these systems may need to wait for the larger system to expand before an interconnection will be financially feasible. Thus, some interim improvements may be necessary.) Others will have to provide treatment - an option which is always open for all systems in lieu of interconnecting, but one which the WUCC wishes to see minimized.

Problems in delivering an adequate supply of water at all times are next in severity to those associated with quality, with water use restrictions or safe yield shortfalls reported in the Assessment for 30 small utilities. Interconnections can play a major role in solving many of these reported problems, although some further study of the smaller systems may be necessary in order to better define actual safe yields. This latter point is emphasized by the apparent conflict in supply problems noted in DOHS files and reported in the Assessment and the lack of calculated deficits shown for small systems in Section 3.4. Interconnections can also alleviate concerns associated with single source systems - a situation which was noted for 37 small utilities in the management area.

3.9.2 WUCC - Recommended Solutions to Identified Problems

At one time during the preparation of this plan, the WUCC considered the publication of a list of generic solutions keyed to solving the problems in evidence at each of these smaller utilities. After discussion, the WUCC decided it was more appropriate to simply recommend that each of the problem situations be thoroughly reviewed by a water supply professional hired by the individual utility, with specific solutions offered to the specific problems of each utility. The WUCC believes that many of these solutions involve the implementation of one or more of the actions discussed in Section 3.5 (interconnections, joint use, or satellite management). The utilities in the WUCC are committed to the philosophy expounded in Section 3.5 of furthering these cooperative actions, and will lend whatever assistance is required to address the problems of these problem-plagued small utilities within the limits of reasonable technical and financial constraints.

This philosophy will form the cornerstone of the Management Area's future program to address the variety of problems identified in the Water Supply Assessment. By way of summary, these general problems, and the WUCC's proposed approach to their solution, are as follows:

1) Inconsistent Data

This problem will be eased for the larger utilities through the inclusion of their individual plans in the final Coordinated Plan. The questionnaire used in the course of preparing the Water Supply Assessment has filled some of the remaining data gaps, with the WUCC recommending that the State take an active role in filling remaining small system data gaps.

2) Need for Technical and/or Managerial Support/Information

The WUCC encourages greater use of satellite management to meet these needs, with the type of management provided ranging from simple assistance in routine operation and maintenance to system takeovers. The following utilities in the Management Area have stated their willingness to provide a variety of satellite management services on a case-by-case basis:

- New Milford Water Company (General Waterworks)
- Newtown Water Company (General Waterworks)
- Woodbury Water Company (General Waterworks)
- Rural Water Company
- Bridgeport Hydraulic Company
- Heritage Village Water Company
- R. J. Black and Son, Inc.
- Ridgefield Water Supply Company

3) Regulatory Burden

The WUCC urges the State to allow greater flexibility in terms of minimum design requirements, diversion permit requirements (especially as related to interconnections), rate relief in instances where failed utilities must be taken over, and financial assistance programs for these takeover instances or to further interconnection programs. The WUCC strongly suggests that the State devise simpler rate increase applications for all utilities regardless of size, and points out that these simpler applications can be structured so that truly pertinent issues are highlighted rather than being hidden in a mass of marginally-useful information. The WUCC agrees in general with the concept of differing State require-

ments for Class A utilities, but feels that the present Class A definition (greater than $100,000 in gross annual revenues) is too inclusive, and creates undue burdens for those smaller utilities which are now categorized as Class A. The point has been made that a Class A designation is now roughly applicable to all systems of 300 or more connections. Some members of the WUCC have called for a new Class A definition which considers the number of accounts serviced by a utility and sets the Class A cutoff at a considerably higher number of accounts than is now the case. The WUCC has also noted the coming increase in regulatory burdens associated with complying with the requirements of the amendments to the Safe Drinking Water Act, and believes that satellite management in terms of operational assistance, monitoring and sampling, and meeting the reporting requirements of the Act will become increasingly common in the Management Area.

4) Irresponsible Management

The WUCC now believes that the term used in the Assessment (irresponsible management) was too harsh, with the vast majority of inadequate systems in the Area suffering more from inadequate financial, technical, or on-site managerial resources than from deliberate mismanagement. In general, this lack of on-site capabilities is due to the fact that the water system is a secondary concern of many small "utilities" that concentrate most of their efforts on overall property management. However, there are a few systems which are operated in an irresponsible manner, with full satellite management (or takeover) the WUCC-recommended solution to such instances following their identification by the State.

5) Potential Groundwater Problems

The WUCC has recommended that these problems be minimized through the use of protective zoning in aquifer (and watershed) areas. As a further safety factor, the WUCC has also identified, and recommended protection of, other

potential sources which are not shown to be needed through the year 2030 given simple calculations of projected demand versus estimated source yields.

6) Regulatory Barriers to the Use of Some Supplies

The WUCC recommends that State policy and law be amended to allow the use of Candlewood Lake, which is presently a Class B water body, as a source of public water supply.

7) Aging and/or Substandard Infrastructure

For larger utilities, replacement and upgrading needs are addressed in their individual plans. For smaller systems, these problems have been addressed by the WUCC in terms of their concurrence with DPUC's minimum design standards. It will remain up to the State to identify those smaller systems with substandard infrastructure and to require their replacement or upgrading.

8) Financing

Many of the utilities in the area may continue to suffer from a poor financial base - a situation which will make it difficult to make needed system improvements, and which may lead to some form of satellite management or system takeover for the hardest-pressed smaller utilities. Financing of system upgrades, including those necessitated by the amendements to the Safe Drinking Water Act, and replacement of old or inadequate components may be difficult for many of the otherwise well-run utilities in the Area regardless of size. There is a clear need for a State program of loan guarantees, grants, or revolving funds to allow these improvements to be made without creating an undue rate burden for present system customers.

9) Lack of Local Ordinances for Water Supply Protection

The WUCC has thoroughly addressed this problem in Section 3.3, and has identified areas requiring protection as water supply

sources, areas which presently have land uses in conflict with protection goals, and steps needed to provide appropriate levels of water supply protection.

10) Competing Uses of Sources

The Coordinated Plan has found virtually no need for development of new water supply sources through the year 2030. Thus, no conflicts are anticipated. However, unanticipated demands may arise (or better data may be developed) which will show the need for development of the various potential sources identified by the WUCC in Section 3.4. Should such a situation present itself, any potential conflicts (which are also identified in Section 3.4) will be addressed through the State's diversion permit program.

11) System and Source Reliability

Again, the major utilities in the WUCC have demonstrated in their individual plans the means by which their systems and sources can satisfy the needs of their exclusive service areas through the year 2030. These improvements will be constructed to conform to the minimum design standards endorsed by the WUCC, which will also assure system and source reliability for smaller utilities as specific problems are identified by the State. (Single source systems can also be enhanced by the WUCC's commitment to an interconnection program.)

12) Lack of Coordination Between Utilities and Communities

This concern was primarily addressed to the need for utilities and communities to work together to protect existing and potential water supply resources, and has been addressed by the WUCC in the land use compatibility discussion in Section 3.3.

13) Conflict of Service and Franchise Areas

The WUCC members have worked well together in establishing the exclusive service area boundaries recommended in Chapter Two,

with no conflicts arising relative to one utility requesting service rights in another's franchise area.

14) Lack of Coordination Between Utilities

As noted earlier, the WUCC process itself has represented a great step in the direction of further cooperation among the larger utilities in the Housatonic Management Area. Ready agreement was reached in a variety of areas of concern, including exclusive service areas and future philosophies regarding interconnections, joint use, satellite management, and land use protection. However, most of the small utilities have not participated in the WUCC process, and concern still exists over the general lack of coordination and communication among these small utilities and between these utilities and the larger systems in the Area.

15) Lack of Adequate Incentive To Be a Satellite Manager

As discussed in the Assessment, this problem is related to satellite management in the sense of the actual takeover of a troubled utility. The issues which act to discourage such action are diverse, and are not readily subject to resolution through the WUCC. It is clear that more needs to be done to compensate a utility which takes on the responsibility of owning or operating a troubled system, starting with the need to establish the right of the acquiring utility to seek premium rates of return on any investments necessary to bring the acquired utility up to minimum design standards and operating conditions. The State should devise a program which assures both that negative financial impacts will not accrue to the acquiring utility or its customers as a result of such a takeover, and that the acquiring utility cannot be held liable for actions taken by the previous owners/operators of the acquired system.

3.9.3 Ongoing Program for the Housatonic Management Area

Although the WUCC feels that the two-year Coordinated Planning Process has produced many valuable results, perhaps the greatest

result is the understanding that much remains to be done. In many instances, the Areawide Supplement has proven to be more a broad plan for future action than a specific series of solutions to existing problems. The WUCC strongly believes that the programs outlined in the Areawide Supplement are critical to assuring the continued availability of adequate quantities of potable water for the Management Area, and intends to serve in a continuing role as an expediter and check-point organization for these programs. The WUCC intends to actively pursue goals set during the planning process, and will continue to assign responsibilities on a committee basis to accomplish the following:

- Lobbying for regulatory relief, particularly in terms of rate increase applications, source availability, and troubled utility takeover programs.
- Encouraging and expediting interconnections whenever financially and physically feasible.
- Working with community officials in order to assure proper zoning and development in critical aquifer recharge and watershed areas.
- Working with the State in correcting the remaining instances of irresponsible management.
- Working with the State and other WUCC members to optimize coordination and cooperation between utilities, particularly in terms of assisting in the development of satellite management programs to meet the specific needs identified for the various smaller utilities reported to exhibit system deficiencies.

The WUCC's work in these areas will be in addition to their statutory responsibilities, which include review and approval of all significant changes to the Coordinated Plan (including individual plans, exclusive service areas, etc.) and future comprehensive updates of the Areawide Supplement. These updates must be conducted at least every ten years, but are likely to be done at closer intervals due to the continuing potential for growth and change in the Housatonic Management Area.

Certain administrative issues will need resolution as the WUCC meets its future responsibilities. These include the following:

- the provision of sufficient staff support or State funding for coordination of individual plans into WUCC documents.
- the right of the WUCC (rather than DOHS) to select consultants to assist in preparing future documents.
- the provision of computerized mapping services by Connecticut DEP as received by the other WUCCs which were convened subsequent to the Housatonic WUCC.

APPENDIX A

EXPLANATION NOTES TO WUCC

WHAT IS SATELLITE MANAGEMENT?
COOPERATION BETWEEN WATER UTILITIES

One of the primary objectives of Connecticut Public Act No. 85-535 is to review and improve coordination between water systems. Section (C) of the Regulations includes references to Coordinated Water System Plans regarding:

(C) (iv) - interconnection
(C) (v) - joint use, management or ownership of services
(C) (vi) - satellite management

When the returned WUCC questionnaires were examined, little or no positive response was received to the questions on these three subjects. Maybe there was some misunderstanding, particularly in respect of joint use and satellite management. Hopefully the following details will clarify the position.

The definition of these terms, quoting from the State of Connecticut's Water Supply Section Regulations, dated 6/17/86, are:

- "shared" or "joint use facility" means water supply facilities, source of supply or equipment developed, funded, managed, owned or utilized by two or more public water systems.
- "satellite management" means management of a public water supply system by another public water supply system.

There are many different types of satellite management or joint use options. At one end of the scale are informal or unstructured options where there is no formal agreement applied to trading or exchanging services or hardware when needed.

Perhaps the next degree of shared services or management would be a basic service contract by which a utility contracts out for maintenance/ repair services on well pumps or other facilities. In addition, utilities may find it advantageous to jointly purchase laboratory services

or materials such as pipe, hydrants and fittings. Utilities may also find it desirable to store their materials at a common facility providing protection and/or inventory control.

At the other end of the spectrum, such cooperative actions can be agreed to in ever increasing formality until there is a high degree of joint control and a smaller water utility becomes such as integral part of the larger utility that the latter provides:

- wholesale service, or
- technical, operational or managerial assistance, or ultimately
- ownership, operation and maintenance responsibility

The concept of satellite management, including the means, advantages and disadvantages, is generally well documented, but the extent to which it is used in the Housatonic WUCC region remains uncertain. We would appreciate hearing from any of the water utilities in the region who feel they are either already part of some type of satellite management arrangement, who may be candidates for consideration of such an arrangement or who are willing to provide such services.

Please contact one of the following:

Peter Doe
Havens and Emerson, Inc.
(201) 845-0470

Bruce Pierstorff
Havens and Emerson, Inc.
(617) 350-6622

Denise Ruzicka
Department of Health Services
(203) 566-1253

APPENDIX B

EXTRACT OF REGULATIONS CONCERNING INTERCONNECTIONS, JOINT USE AND SATELLITE MANAGEMENT

B.1 Interconnections

Plans for any necessary interconnection of both raw and treated water between public water systems for both daily and emergency water supply use, shall include:

(a) A list and description of existing and future interconnections. Specify legal, technical and financial requirement for use and any source, hydraulic or contractual limitations for use. Identify source of supply, size, location, operating controls and management. Include a schedule for facility development, noting limitations to proposed development, and a schedule for negotiation of any new contract or renewal for sale or purchase of water.

(b) Assessment of the need for and impact of potential interconnections between public water supply systems within the management area and with adjacent public water supply management area.

(c) Discussion and assessment of water quality compatibility between interconnections.

B.2 Joint Use

A plan for joint use, management or ownership of services, equipment, or facilities, including:

(a) A list of existing and planned shared or joint use facilities together with documentation from the utilities involved outlining limitations on and arrangements and schedules for development, use, operation, and maintenance of such facilities.

(b) Identification of services and equipment which could be made available to other utilities such as but not limited to leak detection and repair, and emergency equipment.

B.3 Satellite Management

A plan for Satellite Management or transfer of ownership which shall include:

(a) Identification of utilities which have both the ability and willingness to assume Satellite Management of another system or systems, whether within or outside the public water supply management area, and a map identifying areas within which the respective utilities will provide Satellite Management.

(b) Identification of public water systems willing to have Satellite Management provided by another utility, or willing to transfer ownership to another utility.

(c) Development of a water system Satellite Management program and schedule for its implementation.

APPENDIX C

HOUSATONIC WATER SUPPLY MANAGEMENT AREA

RESPONSE TO COMMENTS ON FINAL DRAFT REPORTS

A number of comments were received during the course of public review of the Water Supply Assessment, Exclusive Service Areas Report, Integrated Report, and Executive Summary for the Housatonic Water Supply Management Area. Public comments were incorporated in the versions of the Water Supply Assessment and Exclusive Service Areas Report, which were published in April and December, 1987, respectively. Only one minor additional comment was received on the Exclusive Service Areas Report, which will be incorporated into the appropriate section of the Executive Summary. Thus, the above-noted versions of the Water Supply Assessment and the Exclusive Service Areas Report are now considered to be final.

Several comments were made on the Executive Summary and Integrated Report following their publication in June, 1988. These include the following:

- State of Connecticut Department of Environmental Protection comments dated July 26, 1988
- Town of New Fairfield comments dated July 27, 1988
- State of Connecticut Office of Policy and Management comments dated August 1, 1988
- Bridgeport Hydraulic Company comments dated August 2, 1988

Each of these comments, and the manner in which they were addressed, is reviewed in the following pages, with reference made to areas of change in the draft Integrated Report or Executive Summary.

I. State of Connecticut Department of Environmental Protection
Comments dated 7/26/88

Comments related to the Executive Summary:

1. page i - With regard to interconnections, DEP is of the opinion that the WUCC should evaluate the potential for interconnections, especially near Candlewood Lake, rather than developing guidelines and philosophies. As mentioned on page 3.5.11 of the Integrated Report, "the opportunity does exist on a localized basis for small utilities to increase their system reliability with interconnections (particularly for emergency situations)." Yet the Integrated Report only provides one general "example" of interconnecting four to five systems in the Candlewood Neck area. The Housatonic WUCC should develop a comprehensive strategic interconnection plan for the region that assesses the need for and the means to interconnect all necessary systems, large and small.

Response:

The WUCC believes that the development of a comprehensive strategic plan for interconnections must be based on a detailed review of engineering and physical data pertinent to each system being considered. Such a review is well beyond the scope and budgetary capabilities of the WUCC under this present planning process. The WUCC agrees with the need for such a plan, and has added a specific recommendation in this regard on pp. 3.17 and 3.18 of the Executive Summary. In addition, the WUCC suggests that a portion of the funds which have accumulated or will accumulate in 1988 and 1989 which are designated for Coordinated Water Supply plans be set aside for this interconnections study.

2. page iii - first full paragraph - The Housatonic WUCC has not demonstrated the need for use of Class B waters. Consequently, it is premature for the Housatonic WUCC to recommend that state agencies relax existing policy and allow for the potable use of Class B waters.

Response:

Upon review, it is apparent that too broad a position was taken in the draft documents regarding recommendations for use of Class B waters. The WUCC's intent is to recommend that Candlewood Lake be considered as suitable for use as a potable water source - not necessarily all Class B waters. We believe this recommendation is valid whether or not a clear need has been demonstrated for this source prior

to 2030 in terms of a simple balance between supply and demand, and that other considerations must be taken into account in terms of the economics and engineering realities involved in linking different portions of Danbury's water system versus new source development. These points have now been incorporated in both the Executive Summary and the Integrated Report (see changes to pp. iii and 3.28 in the Executive Summary and to p. 3.9.6 of the Integrated Report).

3. page iv - second bullet - With presumably many small systems experiencing difficulties meeting demand during peak periods or during below normal ground water conditions, developing a comprehensive plan with specific recommendations for interconnecting troubled systems is a more appropriate goal than "encouraging and expediting interconnections wherever financially and physically feasible."

Response:

See response to Comment No. 1.

4. page 2.1 - Exclusive Service Areas - Note that an evaluation of the ability of a water utility to provide a pure and adequate supply of water to the existing and exclusive service area is being conducted as part of the review and approval of the individual water supply plans. Consequently, exclusive service area boundaries may be modified based on this evaluation. The report should reflect this possibility.

Response:

Text has been added to p. 2.1 to address this comment.

5. page 3.7 - top of page - The WUCC should develop specific recommendations and a strategic plan that fosters cooperation. If the potential for cooperation exists, then there is real opportunity for each system to agree to pursue specific measures that would result in a more coordinated approach to managing and operating systems in the Housatonic Water Supply Management Area.

Response:

The WUCC believes that the philosophies, conclusions, and recommendations espoused in Section 3.5 of the Integrated Report, and discussed in pp. 3.16 through 3.20 of the Executive Summary, lay the groundwork for moving toward greater cooperation among utilities. The WUCC believes that the evolution of a strategic plan for cooperation will be an

ongoing effort, and the development of such a program has been specifically identified as an ongoing responsibility of the WUCC (see p. 3.32 of the Executive Summary).

6. page 3.10 - top of page - Include the fact that conflicts may also be associated with ground water sources (i.e., flow and quality impacts on adjacent streams and impacts on other wells in the same aquifer).

Response:

Text has been added to p. 3.10 to address this comment.

7. Table 3-10 - Danbury, Ball Pond Brook Diversion - Add under Arrangements required... "Change in State Policy and Law regarding Class B water use."

Response:

Ball Pond Brook is presently Class B with a goal of A. Thus, we do not believe such a change in State policy or law is required, presuming steps are continuing in an effort to meet this classification goal.

8. page 3.22 - Section 3.37, first sentence - Change "water diversion regulations" to "Water Diversion Policy Act".

Response:

Changed as per comment.

9. page 3.28 - #6 - Lacking any demonstrated need, this recommendation to permit the use of Class B waters for potable purposes is premature and inappropriate.

Response:

See response to Comment #2 above.

Comments related to the Integrated Report:

1. page 3.1.2 - second paragraph, Exclusive Service Areas - Note that an evaluation of the ability of a water utility to provide a pure and adequate supply of water to the existing and exclusive service area is being conducted as part of the review and approval of the individual water supply plans. Consequently,

exclusive service area boundaries may be modified based on this evaluation. The report should reflect this possibility.

Response:

Appropriate text changes have been made to p. 3.1.2.

2. page 3.1.3 - Section 3.1.2, first paragraph, last sentence - The ability to provide an adequate supply of water to existing and exclusive water services areas is under evaluation as a part of individual water supply plan approvals and this evaluation may also influence the content of this report as well as chapter 2, Exclusive Service Areas. This point should be made.

Response:

Appropriate text changes have been made to p. 3.1.3.

3. pages 3.4.3 to 3.4.5 - Class B Waters - According to Section 3.2 and the first paragraph of Section 3.4.2, the "Housatonic Water Supply Management Area does not need large quantities of additional supply to meet the needs presently projected through the year 2030." Only one system, the Craigmoor Division of the Rural Water company, is projected to experience a water deficit. Danbury, the largest system in the water supply management area, apparently has enough supply to satisfy projected needs. Consequently it is inappropriate to consider Class B waters such as Ball Pond and Candlewood Lake as potential sources of supply when there is no demonstrated need for water and other, more desirable options exist. Recommending a modification of water quality classifications to allow for the potable use of Class B waters is premature and unwarranted.

At a minimum, the entire discussion of Class B waters should be preceded by a very clear statement indicating that the WUCC projects that the region will not need to consider the use of either Ball Pond or Candlewood Lake at least until 2030 because existing sources are sufficient to satisfy projected needs.

Response:

Some changes have been made to p. 3.4.6 to indicate that not all of the anticipated supply improvements have come on line as of September, 1988. The Class B discussion has been clarified to indicate it is specific to Candlewood Lake, with the need for this source (or Ball Pond Brook) dependent on the outcome of detailed engineering studies as

to the best means by which supply can be supplemented to the Margerie portion of the Danbury system.

4. Table 3.4.3 - Danbury, Ball Pond Brook Diversion - Add under Arrangements Required... "Change in State Policy and Law regarding Class B water use."

Response:

See response to Comment No. 7.

5. page 3.5.2 - second paragraph - A comprehensive feasibility study of interconnections for utilities around Candlewood Lake is needed.

Response:

Such a study is now a recommendation of the WUCC and is included on p. 3.5.23 of the Integrated Report.

6. page 3.5.11 - See Executive Summary comment #1.

Response:

See response to Comment No. 1.

7. page 3.4.1 - Alternative Water Resources for Future Supply Needs - To assist the Housatonic WUCC evaluate water quality, water quantity, habitat and land use constraints and conflicts associated with potential sources of supply, DEP has attached preliminary draft comments on individual water supply plans that relate to source development. These constraints should be summarized and appear in Table 3.4.1 under "Items To Be Addressed Prior to Use of Potential Source" as well as in Table 3.4.2 under "Arrangements Required for Development of Supply Source."

Response:

The additional constraints and conflicts noted by DEP have been included in this Appendix, with a reference provided in footnotes to Tables 3.4.1 and 3.4.2. The WUCC felt it inappropriate at this time to include these comments in the main text or tables of the report, since not all individual plans have as yet been reviewed by DEP.

II. Town of New Fairfield Comments dated July 27, 1988

1. ADEQUACY OF PRESENT SUPPLIES

From a regional viewpoint, it is satisfying that the Draft Executive Summary of the Housatonic Water Supply Management Area finds so little need for new supplies, while showing the necessity to protect existing future resources.

Response:

None required.

2. SUPPLY PROTECTION PRIORITIES

The draft summary bears out substantially the opinions New Fairfield has expressed to WUCC several times during the course of your study. Analysis of numerous portions of the draft bears out New Fairfield's position that Candlewood Lake, designation Class B, is greatly to be preferred over Ball Pond Brook, also Class B, as a potential future water resource for Danbury.

We concur, and always have, that Danbury's completion and utilization of the West Lake Diversion, adding 800-900,000 gpd to Danbury's yield, is number one on any priority list. At the same time, we think omission of obvious other sources within Danbury from tables and priority consideration is an error.

Those internal sources ought to be higher in priority than either Candlewood Lake or Ball Pond Brook, if only because the majority of them are currently being used to a small part of capacity and are class AA, while one unutilized one has only to be tapped to be AA, and another was used in the past.

Were Danbury to complete the West Lake project, that alone would restore the SURPLUS shown in Table 3-3 to the level of year 2000, from that shown in the Table for year 2030!

The draft text speaks of intended interconnections of the Danbury Water Department (DWD) with Bridgeport Hydraulic, which now serves some Danbury customers. If they develop the Sugar Hollow Aquifer jointly, either 500,000 gpd (Army Corps figure) or 1,000,000 gpd, DWD, figure would be added.

Even the smaller Sugar Hollow Yield, 500 gpm, plus West Lake, would return the year 2030 surplus to within 1,000,000 gpd of the 1991 projected level, while any approach to the DWD figure would, of course, far exceed the present projected 1991 level, carrying it nearly all the way back to 1986 levels!

However, another source comes up to 522,000 AA gallons per day. There are seven (7) functioning Danbury residential developments with a surplus, year 2030, projected for unutilized capacity 50 years from now. Each of these units has a surplus over 30,000 gpd, of which the three (3) largest are 205,000, 85,400, and 60.6. Likewise, there are quite a few with a median yield above 25,000-28,000.

WUCC and State policy make clear that 50 years from now a large number of these presently private utilities will be integrated into DWD within Danbury.

Thus far, we have not referred to any wells that Danbury lists among unused supplies; nor has mention been made of the formerly used booster reservoir that existed on the city-owned 528 acre Tarrywile Tract, formerly called the Parks property.

Looking only to its own internal resources, Danbury would have no trouble bringing year 2030 surplus back to 1986 levels, and then some. CLEARLY, IT IS COMPLETELY PREMATURE FOR DANBURY TO MAKE ANY ATTEMPT FOR DECADES AHEAD, TO DIVERT BALL POND BROOK, IF EVER. Certainly, such an application ought not to be considered prior to Danbury application to complete the West Lake Diversion and to utilize sources mentioned above.

Response:

This comment raises several points, with responses to each point as follows:

- Paragraph 1 - The classification of Candlewood Lake is Class B, while that of Ball Pond Brook is Class B with a goal of A.

- Paragraphs 2 and 4 - Although West Lake improvements are needed, such improvements will not improve the supply situation in the Margerie portion of Danbury's system.

- Paragraphs 3, 7, and 8 - The comments apparently all refer to the reported estimated yields for small systems which may someday be interconnected with Danbury. However, the WUCC has noted the serious concerns with the estimated yields for those small systems, and the difficulties involved in incorporating their sources into a larger system (see p. 3.2.6 of the Integrated Report). This point is also made on p. 3.4.7 as a key reason why sources in addition to those shown to be needed by a simple balance of estimated yields and system demands should continue to be

protected as potential potable resources. Overall, the WUCC does not believe it is prudent to assume that any large system in the Management Area will have its supply capabilities enhanced through interconnection with small systems.

- Paragraphs 5 and 6 - The interconnection referred to with Bridgeport Hydraulic (which does not serve any Danbury customers) is noted in the Integrated Report as a concept worthy of pursuing - it is premature to say that it is "intended." In any case, if such an interconnection were established, it would provide an economical means of transferring water and strengthening not only Bridgeport Hydraulic and Danbury's systems, but also that of the Ridgefield Water Supply Company. Given this shared use by three major systems, the projected increment associated with the Sugar Hollow Aquifer would have a fairly small impact on overall safe yields available to each system. However, response to emergency conditions would be greatly enhanced for all three.

- Paragraph 9 - Danbury has on line, or available for use, all existing supplies which can feasibly be utilized. The Parks Pond noted in the comment has been previously investigated, and rejected for development for the following reasons:

  - minimal safe yield
  - need for remote treatment facilities
  - outside of present distribution system

3. DANBURY'S "HUB" DESIRE

Through Mr. Buckley, Danbury has stated its desire to be "the hub" of water supply for all public utilities within the Housatonic Region. Mr. Buckley previously has described this "hub" idea as his "vision".

The desire to implement such ideas or visions may underlie the study group comment on page iii ".. Utilities may wish to develop new sources for reasons other than safe yield shortfalls, such as economics, location within the system..".

The study group comments on page ii "...The WUCC recommends that the State encourage these sorts of cooperative actions by simplifying or modifying several existing requirements. These recommendations include greatly simplifying (or eliminating) diversion permit requirements for interconnections..."

It must be made clear and specific that simplifying, modifying, or eliminating diversion permit requirements applies only to INTERCONNECTION OF DISTRIBUTION LINES BETWEEN PUBLIC WATER UTILITIES. It must be made clear it has no application to diversion permit requirements that exist for use of new sources of water.

Response:

The statement on Page iii is not directly related to Danbury, but has been included to demonstrate the WUCC's concern that future water supply be more than just a question of balancing supply and demand numbers, but also be reflective of the economic realities which face water utilites in terms of source location and transmission and treatment needs. Please also note the portion of the response to the previous comment, which noted the inefficiencies involved in incorporating the water sources of a number of small systems as they are taken over by, or interconnected with, a larger system. The statement on Pg. ii relative to diversion requirements is specific to interconnections between public water supply utilities.

4. DANBURY VS. NEW MILFORD

Included in your summary is the statement that Danbury in the future would treat Candlewood water, to supply the New Milford Water Company's future deficit.

The configuration of Candlewood is such that it conceivably can be tapped at some point in any of the five lake communities. Completion of Super Route 7, (surely somewhere around year 2000), accompanied by development of an industrial complex of over 300 acres in the Boardman Zone of New Milford, may well put an entirely different aspect on Danbury's "outlook" of New Milford Water Company needs.

Either for its own economics, or for earlier environmental orders from EPA or the State, the New Milford Water Company may provide its own water treatment plant. In that case, it would prefer the far shorter line tapping the Lake close to its plant, and any need to provide profits for DWD.

Response:

The New Milford Water Company has demonstrated the means by which it will satisfy projected demands through 2030 without a link to the Danbury system. Such a link is discussed in the Integrated Report and Executive Summary only as a positive means to strengthen emergency and backup capabilities of both systems, and should be kept as a

possible project for future consideration regardless of supply development.

5. PRIORITY CHANGES

Your priority list (West Lake Diversion completion - #1) places Ball Pond Brook number 2. Candlewood number 3. We believe the last two priorities should be reversed and should be below Danbury internal supplies mentioned in section 2 of this letter.

Possibly because the Executive Summary Draft limits itself to supply, it has not taken into account a highly important environmental consideration that would place Candlewood higher in priority than Ball Pond Brook. That consideration is the Still River which needs more volume of water to be upgraded. Candlewood can safely yield a much greater volume than Ball Pond Brook.

Response:

The priorities are listed in the order shown due to the State's present classification of Ball Pond Brook as Class B with a goal of A and of Candlewood Lake as Class B. Thus, if a source were needed and if Ball Pond Brook had reached its goal of Class A, it would have to be developed before Candlewood Lake. Please note that the WUCC is recommending a change in the State's posture in this regard, as discussed in the response to DEP's comment 2 above. Diversion of water, other than indirectly via water use and waste discharge, is not considered in this effort.

6. DANBURY'S NON-POTABLE WATER NEEDS

More water has to enter the Still River, whether it first goes through the DWD, or whether there is a direct diversion from the lake to the Still River, from the Hayestown area. June 30th, 1988, there was a direct observation made by a member of the Selectmen's Advisory Committee of water conditions in the river on Main Street, near the junction with White Street.

Much of the river bed was dry, above water. Other above water parts were damp. The only flow seen at that point was a trickle a few inches deep in a flow only two to three feet wide. Clearly, with that kind of situation, or anything approaching it, the State can never meet its mandate to make the Still River swimmable and fishable. Neither can the new expanded sewer plant

operate satisfactorily, no matter what level of available technology it uses.

Wasting potable water instead of completing the West Lake diversion project is no answer; diversion of Candlewood water from the Hayestown area does not run into state Class B prohibitions-- although we certainly favor having the state eliminate those antiquated prohibitions.

It seems evident enough that total absence of any need whatsoever for Danbury to divert Ball Pond Brook waters outweighs anything else. It is noteworthy that so far (July 17) in the drought of 1988, DWD has not found it necessary to issue a single restriction on usage.

Response:

See previous responses.

7. HEALTH ASPECTS

Nevertheless, in addition to the need to supply water to the Still River, there are reasons to favor priority of Candlewood Lake over the Brook, in the event the State lifts its ban on Class B water. There are health reasons.

P.C.B.'s:

Both the lake and the brook, happily, fall far below EPA standards for PCBs. However, the Housatonic River Study, conducted by Dr. Charles R. Fink, showed no PCB sediments at the Rocky River intake that sends water from the river up to the lake. The same study, however, placed PCB sediment content in Ball Pond low, though it was at a level seven times greater than the next of the seven entrophic lakes studied. Dr. Fink pointed out that the source of the PCB found in the sediments in Ball Pond was unknown and hard to explain. Whether that content continues, or increases, is unknown, as is the source. On the other hand, the Housatonic PCB situation is well known, and on the way to elimination.

BLUE-GREEN ALGAE:

Dr. Norvell's Ball Pond study showed heavy blue-green algae growth that could only be handled by massive alum treatment every five years. DEP expressed much worry over this situation, both in an inter-department memo and in response to HRRS inquiry, if potable water were to be needed for a waste treatment plant. Thus, untreated Ball Pond waters would infuse blue-green algae

into Danbury's interconnected DWD system; treated water would infuse chemicals on a large scale. The lake waters have far lower detriment in either case.

Response:

Danbury has conducted a continuing monitoring program of the water in Ball Pond Brook. This program has never shown the presence of PCBs.

Danbury is presently studying the question of blue-green algae in Ball Pond. Although conclusive results are not yet available, it appears that the algae are only a problem in water bodies which are deep enough to become stratified. Margerie Reservoir is not subject to stratification, and the algae should not present a problem if Ball Pond waters are diverted to Margerie Reservoir.

8. RISK HAZARDS

This chapter of the Draft Executive Summary lists categories of hazards, some neutral or benign, and two, categories D and E, which are harmful, in evaluating various water resources.

Table 3-8 evaluates Ball Pond Brook. In New Fairfield, it lists 96 under category D, and 4 under Category E. In Danbury, it lists 100 under D, zero under E.

Table 3-9 evaluates Candlewood Lake. New Fairfield shows zero under D and zero under E. Danbury shows 7 under Category D and 4 under E. This is still another consideration for the #2 and #3 priorities of Ball Pond Brook and Candlewood Lake to be reversed. In addition to many other advantages, Candlewood Lake has negligible risk hazards as compared with the Brook.

Response:

After review, it was found that Table 3-9 (which evaluates both Candlewood Lake and Ball Pond Brook) was in error. These errors have been corrected, and the table now shows similar land use risks associated with either resource.

III. State of Connecticut Office of Policy and Management Comments dated August 1, 1988

1. In Table 3.2.3 and Table 3.2.4, the data provided for Bethel Consolidated Water Co. is footnoted as being for the years 1990, 2005 and 2035, while every other utility has data provided for the years 1991, 2000 and 2030. The figures for the Bethel Consolidated Water Co. should be adjusted to be consistent with the other utility figures.

Response:

The values shown are consistent with those shown in Bethel Consolidated's individual plan.

2. The meaning and implication to the potential water supply sources of Table 3.4.1 and priority water supply sources of Table 3.4.2 is unclear. Public Act 88-324 looks to the areawide planning process to identify the groundwater resources for which either the utility or DEP should be undertaking future level A and level B mapping. It is not clear which, if any, of the sources discussed are so identified by this areawide plan.

The need for clarity as to which groundwater resources are most important and in need of further definition relative to aquifer protection areas is important, as the State Policies Plan for the Conservation and Development of Connecticut has designated some of the generalized areas shown as stratified drift aquifers as appropriate for urban development. Such a designation would be in conflict with water supply source protection. Identification of needed aquifers and the related areas that would need to be protected is required so as to decide either:

a) to modify state, regional and local plans and regulations that influence land uses so they promote groundwater protection, or

b) to determine if the existing land uses and/or needs for economic development and affordable housing make such groundwater protection unmanageable or incompatible. As a result, alternative water sources should be considered.

Response:

It is the WUCC's intent that all resources listed in Table 3.4.2 be considered as potential future potable supply sources that may be implemented prior to 2030 for one reason or another, as noted on Page 3.4.6.

The WUCC believes that all sources listed in Table 3.4.1 should be protected to the greatest extent possible as current or potential sources either pre- or post-2030. This does not necessarily preclude urban designations, but will require that such urban development be done in recognition of the fact that aquifer protection is a goal for the area, with prohibitions against clearly detrimental (Category E) land use.

3. The WUCC recommends that all of the alternative water supply sources listed in Table 3.4.2 continue to be protected as potential supplies. It would be more appropriate for the WUCC to look to the protection of potential sources of supply which only have a water quality goal of GA or GAA, rather than to also include sources which have a goal of B. In this regard, it would be more appropriate for the WUCC to include in Table 3.4.2 such potentials as the West Aspetuck River Diversion, the Shepaug River diversion, the Wolf Pit Brook Diversion and the Pootatuck Aquifer, rather than Candlewood Lake.

Response:

The utilities in the WUCC feel strongly that, should additional sources be required, both Ball Pond Brook (Class B with a goal of A) and Candlewood Lake (Class B) be given a higher priority than the sources listed in the comment due to economic and system implementation considerations.

Exclusive Service Areas

1. In Section 2.3 it should also be stated that not all portions of an exclusive service area will develop to a density requiring public water supply. An exclusive service area is where a specific water utility is responsible for the planning and provision of public water supply if the need should arise.

Response:

This comment has been incorporated in the text of Section 2.2 of the Executive Summary.

2. I had previously examined the exclusive service areas proposed by the water utilities in the Housatonic Water Supply Management area against the categories on the Locational Guide Map of the
State Policies Plan for the Conservation and Development of

Connecticut 1987 - 1992 (C & D Plan). Portions of the south central, east central and northeastern areas of the Town of Bethel are in the Long Term Urban Potential category and have not been assigned to an exclusive service area. The present exclusive service area in the Town of Bethel would provide for very little expansion in the public water supply service area to accommodate future growth in the community.

It is realized that the Areawide Supplement does recognize this situation and does discuss this difference. However, I again urge the WUCC to reconsider the exclusive service area boundaries within the Town of Bethel in order to achieve greater consistency between areawide water supply planning and areawide land use planning by regional and state agencies. Both the C & D Plan and the planning work of the Housatonic Valley Council of Elected Officials recognize approximately the same area of Bethel as having a potential for growth to occur to a density where it can be expected that services, such as public water supply, may need to be provided in the future.

Response:

The Bethel-area water utilities believe that their exclusive service area boundaries are consistent with the present planning of local officials, and do not feel it is necessary to expand these exclusive service areas at this time. The WUCC suggests that this topic be reviewed as appropriate at future reconvenings of the Council, particularly if local plans are changed.

Executive Summary

Table 3-3 and Table 3-4 - same comment regarding Bethel Consolidated Water Co. as in item #1 under comments on the Integrated Report.

Response:

See previous response.

IV. Bridgeport Hydraulic Company Comments dated August 2, 1988

The only major comment concerns Section 3.2.2.2 in the Integrated Report regarding consumption. It is not clear in the tables and text if the term "consumption" should be "average daily demand". The text does indicate that the larger utilities have included non-revenue usage in the consumption figures. For clarity, BHC would suggest the use of the term average daily demand when comparisons are made to safe yield. Consumption should refer to customer usage. Additionally, there does not appear to be any mention of peak demand which can result in significant short-term transmission problems during hot spells as we have witnessed this summer in Connecticut.

Response:

Appropriate text has been added in Section 3.2.2 in response to these comments regarding consumption and to Section 3.2.4 regarding peak demands.

DRAFT COMMENTS: HOUSATONIC WUCC

INTEGRATED REPORT AND EXECUTIVE SUMMARY, MAY 1988

Chapter 3.8:

The following information has been provided by DEP to DOHS as part of the Individual Water Supply Plans Review Process. Since, for the most part, this information has not yet been forwarded to the utilities, it is being provided here so that the potential conflicts can be reflected in Section 3.8: Impacts of the Plan on Other Uses of Water Resources.

Comments reflect information available at the time of review. Detailed analysis of these and any other potential conflicts will be required as part of DEP's Diversion Permitting Process.

BETHEL CONSOLIDATED WATER COMPANY:

East Swamp Aquifer:

Water Quality Conflicts:

East Swamp is a tributary to Limekiln Brook, which presently receives treated wastewater from Danbury's Sewage Treatment Plant (STP). By 1991, the Town of Bethel's STP will be abandoned and Bethel's flow will be redirected to the Danbury facility. This regional facility must meet stringent limits to assure Limekiln Brook and the Still River will meet Connecticut's Water Quality Standards. The limits are established by the assimilative capacity of the receiving stream and to a certain extent, the available dilution. Additional reductions in streamflow in Limekiln Brook will mean additional levels of treatment at the regional facility. Presently, construction costs for this new facility have been estimated at $45 million. Therefore, there is little potential for establishing new diversions which would further reduce flows during seasonal low flow events in the Limekiln Brook Watershed.

Habitat Conflicts:

According to the Natural Diversity Data Base, there are records of the Bog Turtle, Clemmys muhlenbergi, from the Limekiln Brook Subregional Drainage Basin (1983). This species is being considered for Federal listing. "It inhabits open-canopied swamps, tussocky marshes and wet meadows traversed by clear slow-moving streams with muddy bottoms" (Rare and Endangered Species of Connecticut and Their Habitats, Connecticut Geological and Natural History Survey, 1976). The East Swamp Regional Drainage Basin also has great potential for supporting this species.

There is concern about any activities that will affect the hydrology (including the water level) of Limekiln Brook, East Swamp and associated wetlands. Changes in the hydrology of the area could create significant habitat modifications which may render the area unsuitable for Bog Turtles. Any proposed activities that will affect the hydrology of this area should address this consideration.

It is recommended that the Department of Environmental Protection be contacted before these areas undergo exploration as alternative sources of ground water supply. At such time, the Natural Resources Center will be able to provide additional information regarding specific concerns.

BETHEL WATER DEPARTMENT:

Potential well sites and the possible creation of a lake in the East Swamp for recharge of the aquifer:

Habitat Conflicts:

Again, according to the Natural Diversity Data Base, specimens of Clemmys muhlenbergii, the Bog Turtle, have been collected from the Limekiln Brook area. The Bog Turtle is proposed for Federal Endangered and Threatened Species Listing (Federal Register, December 30, 1982). this species is also included on the Connecticut Species of Special Concern--Animal List (Connecticut Geological and Natural History Survey, October 1985). At present the status of this Bog Turtle population is not known.

There is concern about any activities that will affect the hydrology (including the water level) of Limekiln Brook, East Swamp and associated wetlands. Changes in the hydrology of the area could create significant habitat modifications which may render the area unsuitable for Bog Turtles. Any proposed activities that will affect the hydrology of this area should address this consideration.

It is recommended that the Department of Environmental Protection be contacted before these areas undergo exploration as alternative sources of ground water supply. At such time, the Natural Resources Center will be able to provide additional information regarding specific concerns.

Other Conflicts:

Additional concerns regarding future sources for the Bethel Water Department are outlined in DEP staff memo's included as Attachment 1.

CANDLEWOOD SHORES ESTATES:

DEP has not had the opportunity to conduct a detailed review of Individual Water Supply Plans for this water system.

DANBURY WATER DEPARTMENT:

Water Quality Conflicts:

As noted previously, a regional advanced wastewater treatment plant is scheduled to be built for the Danbury-Bethel area to address existing problems with attaining water quality goals for the Still River. Any proposed new source development for the Danbury system which may modify base flows in the Still River would raise serious concerns regarding resource use conflicts.

Significant increases in water use within the Danbury system, and the resulting increases in wastewater loads would also have to be evaluated in relation to the assimilative capacity of the Still River.

Other Conflicts:

Additional resource concerns are highlighted in correspondence included as Attachment 1. as noted in this correspondence, resource use options are limited and potential impacts associated with the proposed uses must be studied with regard to competing and conflicting uses.

HERITAGE VILLAGE WATER COMPANY:

Based on modeling and experience in the Pomperaug River Basin, there are concerns involving potential resource conflicts within this river basin. Information regarding the potential impact of the Company's wells on base flows during critical dry periods should be developed in order to properly evaluate the water supply situation in this area. A detailed analysis of the potential impacts of the proposed wells on the Pomperaug River and competing water uses will be required under the Diversion Permitting process for proposed new sources of supply.

Due to the potential resource conflicts in utilizing water from the Pomperaug River and adjacent aquifer, DEP cannot fully evaluate the cumulative impact the HVWCo wells will have upon the river system without evaluating the Woodbury, Woodlake, and any other water companies drawing water from the Pomperaug River watershed. DEP has not yet had the opportunity to review the Individual Water Supply Plan for the Woodbury Water Company.

LAKE WAUBEEKA:

Potential Well sites located on Parcel D:

Habitat Conflicts:

According to the Natural Diversity Data Base, their records indicate the presence of a Bog community at the southern end of Sugar Hollow Pond in Danbury. Bogs are considered critical habitat in Connecticut due to their limited distribution in the state. These habitats are very sensitive to changes in water levels.

NEWTOWN WATER COMPANY:

Proposed increased use of the South Main Street well field derived from the Pootatuck River Aquifer:

Water Quality Conflicts:

Based on modeling and experience in the Pootatuck River Basin, there are concerns involving the maintenance of water quality within this river. Information regarding the potential impact of the Company's wells on base flows during critical dry periods should be developed in order to properly evaluate the potential for water use conflicts in this area.

RIDGEFIELD WATER SUPPLY COMPANY:

Great Swamp Aquifer:

Water quality conflicts:

Use of this aquifer could have an impact on stream dilution available for the Ridgefield Publicly Owned Treatment Works (STP) discharge to the Norwalk River. The Water Compliance Unit has recently set effluent limits for the STP based on a 7Q10 streamflow of 0.5 cfs from the Great Swamp drainage area. The small amount of dilution available has resulted in extremely stringent effluent standards (NH_3 as N - 1.6 mg/l) requiring high levels of advanced treatment. The hypothetical well yield of the Great Swamp aquifer of 0.5 mgd or 0.6 cfs could virtually dry up the river during low flow conditions leaving sewage effluent as the major source of streamflow to the Outpost Inn Pond.

Due to the resource use conflicts in utilizing the Great Swamp aquifer, the water company should give high priority to investigating the Upper Titicus aquifer and the Sugar Hollow aquifer. Source protection measures for these two aquifers should be considered immediately.

Other conflicts:

According to the Natural Diversity Data Base, there are several areas of concern associated with potential sources of supply for the Ridgefield Water Supply Company:

Great Swamp: Great Swamp is a Natural Areas Inventory Site. According to a 1982 field investigation, this calcareous swamp reportedly has some areas of suitable Bog Turtle habitat. To date, no turtles have been collected or observed here. It is none the less a large swamp and provides habitat for many species of birds (Places to Look for Birds, DEP 1972). The swamp is described as a Red Maple swamp with some dense shrubs areas. The presence of Purple Loosestrife indicates some disturbance.

Pumping Station Swamp: Pumping Station Swamp is a Natural Areas Inventory Site. It is a calcareous swamp dominated by Red Maple. Bog Turtles are a Connecticut "Species of Special Concern" and appear on the Federal List of species proposed to be listed as endangered or threatened. Field investigations conducted in 1985 indicate that suitable habitat still exists, though no turtles were seen.

North Street and Route 116 area: The Bog Turtle was collected from this area in the 1970's.

Rippowam Ledges: The ledges here are a breeding locality for the Slimy Salamander, Plethodon glutinosus. Only three populations are currently known to exist in Connecticut. As it uses the ledges along side the wetland, immediate conflicts are not foreseen.

RURAL WATER COMPANY:

Insufficient locational information was provided in this utility's water supply plan. As a result, a detailed review of potential conflicts associated with proposed sources was not possible.

WATERTOWN FIRE DISTRICT:

Additional Wells at the Hart Farm Wellfield (should additional supply be needed in the 50 year planning period):

Instream Flow Conflicts:

There is a potential resource issue associated with the diversion of low flows in the Nonewaug River to the Hart Farm Wellfield, which will require detailed analysis through the Diversion Permitting Process.

WOODLAKE MUNICIPAL TAX DISTRICT:

Refer to earlier comment (Heritage Village) regarding potential resource conflicts in the Pomperaug area.

WOODBURY WATER COMPANY:

Refer to earlier comment (Heritage Village) regarding potential resource conflicts in the Pomperaug area.

UTILITY CONFLICTS:

Bethel Consolidated, Bethel Water Department and Ridgefield Water Supply Company:

These utilities have all proposed additional sources in the Great Swamp area. Significant resource/use conflicts have also been noted in this area. The Coordinated Planning Process should address this issue.

Heritage Village Water Company, Woodlake Municipal Tax District, and the Woodbury Water Company:

These utilities have all proposed additional sources in the Pomperaug area. Potential resource/use conflicts have also been noted. The Coordinated Planning Process should address this issue.

STATE OF CONNECTICUT
INTERDEPARTMENTAL MESSAGE

February 23, 1988

TO: Carolyn Hughes, ~~Senior~~ Principal Environmental Analyst
DEP/Natural Resources Unit, 165 Capitol Avenue, Hartford, CT 06106

FROM: Tom Morrissey, Principal Sanitary Engineer T. MORRISSEY
DEP/Water Compliance Unit, 122 Washington Street, Hartford, CT 06106

SUBJ: Bethel Water Company
Comprehensive Water Supply Plan

****

The Water Compliance Unit has completed a review of the Bethel Water Supply Plan, August 26, 1987. This review focused on the adequacy of Bethel's water supply system safe yield and it's relationship to future water supply needs.

Surface Supplies

Surface water reservoirs, according to FGA estimates, have the potential to provide up to [redacted] or approximately 25% of Bethel's total water supply during a critical dry event. Unfortunately, FGA did not follow the guidelines for estimating the safe yield of surface water reservoirs as outlined in the Standard Methodology for the Calculation of Safe Yield or in the Individual Water Supply Plan Guidance Handbook. FGA should develop a mass curve analysis for these reservoirs which incorporates hydrologic data from 1950's and 1960's. Since there would be little or no stratified drift in these watersheds, I would suggest using data from the USGS Hubbard Brook Gauging Station. In addition to the mass curve analysis, the return frequency of the critical dry period for these watersheds should be calculated and adjusted if the critical period does not correspond to the 1 in 100 year event.

Groundwater Supplies

Ground water supplies comprised 75% of the total safe yield of the Bethel Water Supply System. This water is derived solely from the East Swamp Aquifer. FGA contends that the water available from the East Swamp Aquifer during a critical dry period exceeds the projected [redacted] safe yield of these wells. The critical dry period was defined as 36 month period from 1964 through 1966. The projected 7Q10 low flow for East Swamp Brook as it flows into Limekiln Brook is 1.5 MGD while the 30Q2 flow from East Swamp Brook is approximately 2.7 MGD. These flows correlate to a 1 in 10 and a 1 in 2 year drought event respectively, and are not much larger then the estimated safe yield of Bethel's Wells. It is very unlikely the the yield from East Swamp

aquifer during a 1 in 100 year drought exceeds the estimated safe yield of these wells. FGA suggests that some portion of groundwater extracted from East Swamp Aquifer will be returned to the aquifer via Sympaug Brook. Maps of stratified drift deposits suggest there might be a connection comprised of stratified drift deposits tying the two aquifers together. However, for the purpose of establishing a safe yield for Bethel's Wells, Bethel would have to document that connection and determine the important hydrogeological characteristics of the deposits in the connection in order to calculate the potential contribution from the Sympaug Basin. Regardless, the Bethel Sewage Treatment Plant which does discharge to Sympaug Brook is scheduled to be abandoned and Bethel's sewage shall be diverted to Danbury's POTW. This will significantly reduce the flow in Sympaug Brook during low flow events.

Hydrologic and hydrogeologic information regarding East Swamp Aquifer was taken from Connecticut Water Resources Bulletin #21. Hydraulic conductivity used in FGA's analysis was 150 feet per day which is extremely high for stratified drift deposits in Connecticut. This information may or may not be applicable to the conditions which exist in East Swamp and since these wells do represent 75% of Bethel's water supply a long term pump test should be performed to establish specific information for this area. The pump test should be designed to provide data regarding aquifer storage properties, hydraulic conductivity, water table contours, drawdown levels, and most importantly, induced infiltration from East Swamp Brook.

Future Sources

Bethel has identified several locations for potential new source development, again, East Swamp seems to provide the best opportunity. This underscores the need to establish specific information regarding aquifer/streamflow relationships. Unfortunately, East Swamp is tributary to Limekiln Brook which presently receives treated waste from Danbury's POTW. By 1991, Bethel's POTW will be abandoned and Bethel's flow will be redirected to the Danbury facility. This regional facility must meet stringent limits to assure Limekiln Brook and the Still River will meet Connecticut's Water Quality Standards. The limits are established by the assimilative capacity of the receiving stream and to a certain extent, the available dilution. Additional reductions in streamflow in Limekiln Brook will mean additional levels of treatment at the regional facility. Presently, construction costs for this new facility has been estimated to be 45 million dollars. Therefore, there is little potential for establishing new diversions in the Limekiln Brook Watershed which would further reduce flows during seasonal low flow events.

Attached, please find a memo regarding water resource conflicts within the Danbury Water Supply Planning Area where we foresee the potential for significant water resource conflict. As part of the revised safe yield analysis, FGA should provide all the calculations and data used in their analysis. This would include actual flow records, precipitation data, well logs, pump test data, etc. This not only provides documentation for the analysis but it will expand our understanding of the existing and potential water resources in the area.

STATE OF CONNECTICUT
INTERDEPARTMENTAL MESSAGE

November 6, 1987

TO: Caroline Hughes, PEA
DEP/Natural Resource Center, 165 Capitol Avenue, Hartford CT 06106

FROM: Thomas Morrissey, PSE T.M.
DEP/Water Compliance Unit, 122 Washington Street, Hartford CT 06106

SUBJ: Danbury Area Water Supply Plans

****

As an addendum to the comments the WCU has passed on to you regarding the Bethal and Danbury Water Supply Plans, we would like to offer the following general comment.

The Still River and Candlewood Lake are the major water resources in the greater Danbury Area. Both waterbodies are currently rated as Class B water resources although Candlewood Lake is managed as if it were a Class A resource. Most of the tributaries in the headwaters of the Still River are currently utilized for water supplies by the City of Danbury. The main stem of the Still River receives wastes from publicly owned treatment works (POTWs) in Bethal and Danbury and water quality in the Still has been severely degraded by the assimilation of wastes discharged from these facilities. Recently, the WCU has implemented a clean-up program which will improve water quality in the Still River to its adopted goal of Class B. Cost estimates for the construction of a new regional treatment facility are extremely high running from 25 to 35 million dollars. In addition to these treatment facilities, there are numerous industrial discharges and several sanitary landfills which also discharge waste to the the Still River system. An essential component of the DEP clean-up program is the maintainance of a base flow throughout the entire Still River system. This flow, otherwise known as 7Q10 low flow, is comprised of water from stratified drift aquifers adjacent to the river and flows from its major tributaries.

As part of the Individual Water Supply Planning Process, water utilities must identify sources of supply to meet their potential demand for a fifty year planning horizon. Several utilities, including Danbury and Bethal, have identified tributaries to the Still River and Candlewood Lake as their future water supply sources. Due to the existing water quality in the Still River and the proposed plan to clean-up the main stem of the river, we should carefully consider any proposals with will undermine this effort and associated expense.

Candlewood Lake because of its classification can not be diverted directly for use as a water supply. Danbury has submitted some preliminary proposals to divert water from Ball Pond Brook which is a tributary to Candlewood Lake. These proposals, because of the potential impact to aquatic habitats and Margerie Reservoir, have not been favorably received.

As in the Quinnipiac River Basin, water use conflicts associated water supply needs, aquatic habitat and waste assimilation exist in the Still River and Candlewood Lake Watersheds. These conflicts must be carefully considered as we review the individual water supply plans in this area. I have enclosed several memos regarding some of the conflicts outlined above.

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

230 Plymouth Road
Harwinton, CT 06791
July 10, 1987

BALL POND DIVERSION

RECEIVED
JUL 17 1987
WATER COMPLIANCE
Dept. of Environmental Protection

Richard W. Nixon
Chairman, Selectman's Advisory Committee
34 Short Woods Road
New Fairfield, CT 06812

Dear Mr. Nixon:

Don Mysling (Technical Assistance Biologist) and I were pleased to meet with you and Mr. Fred Benedikt on July 8, 1987 to discuss the proposed diversion of Ball Pond Brook, New Fairfield. As I understand, the City of Danbury proposes to divert up to 3.9 MGD of surface water from the brook to Marjorie Reservoir. No water would be diverted during late spring - summer (May 15 - Sept. 3).

Ball Pond Brook is a valuable trout stream which is stocked by the Dept. of Environmental Protection each spring. Candlewood Lake is one of the most important fisheries resources in our state. During summer hot spells, trout in Candlewood Lake are able to survive by holding in cold, oxygenated water at the mouth of Ball Pond Brook.

Without detailed information regarding this project, I can only speculate on what, if any, impacts may occur. However, impacts to fisheries could include:

1) reduced over-winter survival of yearling-adult trout.
2) reduced survival of wild brook and brown trout eggs, buried in gravel redds through the winter.
3) blocking upstream spawning movements of trout and other species, if a dam is built.
4) increased nutrient loading to Candlewood Lake, if nutrient-rich Housatonic River water must be used to replace Ball Pond Brook water.

The above impacts could be very serious. But, until an environmental assessment of the project is carried out, it will not be possible to clearly define the nature and extent of all potential effects. We will sample Ball Pond Brook this summer to assess the existing fish population. However, additional information should be obtained on 1) fish habitat characterization under various flow regimes (low flow study), 2) nutrient levels of Ball

Pond Brook vs. the Housatonic River at C L & P's Rocky River plant, and 3) the relative contribution of Ball Pond Brook's discharge to Candlewood Lake's volume.

Thank you for meeting with us at the D.E.P. Western District Hdqts. Please feel free to contact me or Don Mysling should you need additional information.

Sincerely,

Robert D. Orciari
District Fisheries Supervsor

RDO:md
cc: A. Cantele, Western District
J. Moulton, Fisheries
T. Morrissey, Water Compliance
R. Gilmore, Water Resources

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

March 26, 1987

William Buckley, P.E.
Director of Public Works
City of Danbury
155 Deer Hill Avenue
Danbury, CT. 06810

Dear Mr. Buckley:

The Water Compliance Unit of Connecticut Department of Environmental Protection (DEP) has evaluated alternatives to upgrade the Danbury publicly owned treatment works (POTW) as proposed by the City of Danbury and their consultant Greiner Engineering Sciences. Planning for this project began in 1978 when DEP issued an order to Danbury to improve treatment efficiencies at their POTW. Danbury commissioned Greiner Engineering Sciences (formerly Cahn Engineers) to begin studying this problem. This work resulted in the completion of a preliminary facilities plan in March, 1983. After several revisions including review by the Environmental Protection Agency's (EPA) advanced waste treatment review committee, DEP approved the plan in September, 1985. The study recommended upgrading the Danbury POTW to eliminate water quality violations in the Still River as a result of the Danbury discharge. In January, 1986, DEP contacted Danbury officials to advise them of changes in the EPA's national ammonia toxicity criteria and how these changes would affect the proposed ammonia limits for the new regional POTW. In July, 1986, Danbury requested time and money to update the existing facilities plan and in February, 1987, Danbury proposed a number of alternatives to be investigated as part of that update. The Department concurred on investigating the following alternatives:

a. Breakpoint chlorination;

b. RBC's;

c. Activated sludge;

d. Fluidized Bed Reactor; and,

e. Replacing stone media in the trickling filter with plastic media;

The Department does not support further study of the following alternatives:

1) A direct discharge of effluent from Danbury's POTW to either Lake Lillinonah or Lake Zoar; or,

2) Providing more dilution water for the Danbury discharge by transferring water from Candlewood Lake through Marjorie Reservoir down Padanaram Brook into the river just above the discharge or by pumping water directly from Lake Lillinonah through a pipeline discharging to the Still River in the vicinity of the Limekiln Brook.

Phone:
165 Capitol Avenue • Hartford, Connecticut 06106

The following is a brief outline of DEP's position on why these alternatives are not technically and environmentally feasible.

A direct discharge of treated sewage to Lake Lillinonah was one alternative investigated by the approved facilities plan and was found to be non-feasible due to high costs. Cost estimates for constructing the gravity outfall to Lake Lillinonah were 15% more expensive than the advanced waste treatment facility alternative. The potential environmental and political constraints associated with constructing miles of pipeline through wetlands in Brookfield and New Milford were discussed but not incorporated as part of the cost estimate. A direct discharge to Lake Zoar would require pumping to transport the Danbury effluent along a pipeline right-of-way through Newtown. While Danbury's consultant did not explicitly show cost estimates in the report, this proposal was rejected due to high construction costs and potential delays related to the procurement of miles of easement through Newtown. Again, political constraints, legal fees, state and federal inland wetland permits, diversion permits and the Environmental Impact Reports associated with these proposals were not investigated or included as part of the cost estimate outlined in the facilities plan.

The direct discharge proposals are based upon the assumption that Danbury will maintain secondary treatment levels at the POTW and the costs of obtaining the appropriate permits, developing the right-of-way and constructing a sewer outfall to the Housatonic River would be less than the costs associated with upgrading the POTW to advanced waste treatment levels. DEP has, on several occasions, advised Danbury officials on the fallacious nature of this assumption. The Still River assimilates organic wastes because of the turbulent advective movement the stream provides. Turbulence in the water column affects waste assimilation processes by transporting pollutants to organisms which oxidize the organic portion of the wastes for energy and by facilitating the rate at which oxygen is entrained in the water column. The concentration of dissolved oxygen is a major factor in determining the type and diversity of aquatic life the river will support. Unlike most riverine systems, Lake Lillinonah and Lake Zoar are impoundments created by construction of the Shepaug and Stevenson Dams, respectively, and are used primary for hydropower production. During low flow periods, water elevations in the impoundments are controlled to maximize power production. As inflow diminishes, the frequency of power generation decreases and the advective component of transport characteristic of rivers, approaches zero. Table 1 is a summary of the daily power generation records (net MegaWatt Hours) at the Shepaug Station from April 1980 through March 1981. During the period from August 16 to August 24, Northeast Utilities (NEU) produced very little power and the flow releases from the impoundments were minimal. Table 2 is a listing of the daily flow records from the Housatonic River above Lake Lillinonah at Gaylordsville. Inflow to the lake averaged 87 cubic feet per second (cfs) from August 18 to 23. Daily evaporation from the surface of the lake would effectively reduce inflow by approximately 20 cfs or roughly negate the additional inflow from the Still River. Impoundment elevations for this period of time declined from 199.00 feet above mean sea level to 197.3 feet MSL. These data indicate that flow through the impoundments was very limited during this low flow period effectively reducing turbulent mixing in the lake necessary for the assimilation of organic wastes.

Nevertheless, assuming that optimum conditions for waste assimilation exists in the Housatonic lakes and this system was a turbulent river flowing at 87 cfs into which a 12.5 MGD effluent stream is discharged and is completely mixed instantaneously, the ammonia concentration in that effluent would have to be 5.0 mg/l NH_3 as N or less to avoid chronic ammonia toxicity. Unfortunately, Lake Lillinonah and Lake Zoar are not free flowing rivers. They do not provide turbulent mixing or transport typical of a riverine system. In addition, these impoundments are extremely important recreational resources which would require even higher levels of protection than normally provided in river systems designated for waste assimilation. Therefore, secondary treatment efficiencies would not adequately protect the Housatonic Lakes from water quality impairment. Advanced waste treatment followed by sand filter polishing would probably provide a level of protection consistent with the existing use of those resources.

The indirect impacts associated with moving the Danbury discharge must also be considered. Presently there are eleven industries which discharge directly to the Still River, ten are in Danbury. Diverting the Danbury discharge from the Still River would probably result in revisions to their present discharge limits. Aquatic habitat in the Still River below Limekiln Brook would also be impaired by this diversion.

The two pumping proposals outlined in Alternative 2 are similar in that Danbury proposes to augment Still River flow in lieu of providing the level of treatment necessary to improve Still River water quality to minimum acceptable levels. Clearly, this proposal is not consistent with the EPA national policy which states that low flow augmentation can not be used in place of best available treatment technology (BAT). BAT would include advanced waste treatment. EPA recently applied this policy during the wasteload allocation study for the French River which is located in northeastern Connecticut. In addition to providing advanced waste treatment (effluent ammonia limits of 2.0 mg/l NH3 as N) at the Dudley-Webster regional POTW, Massachusetts must provide an additional 22 cfs for low flow augmentation. EPA would not consider higher flows to offset the AWT effluent limits.

Even if Danbury was successful in overcoming EPA's national policy and proceeded with these alternatives, an additional 44 cfs would be needed to meet instream ammonia toxicity criteria assuming the effluent ammonia limit remained at 3.5 mg/l NH3 as N, the limit recommended by the existing facilities plan. 170 cfs would be needed to dilute the discharge if their limit was relaxed to 10 mg/l NH3 as N and if Danbury maintained secondary treatment levels approximately 300 cfs would be needed to effectively dilute their effluent to minimum protection levels.

Taking water via pipeline from Lake Zoar would involve the same political, environmental and cost constraints addressed in the Lake Zoar direct discharge discussion. In addition to those problems, Danbury would need to construct a pumping system capable of lifting at least 44 cfs against a head of approximately 100 feet, the pipeline would have to convey twice as much water as the direct discharge scenario and would require reinforced pipe capable of withstanding stresses associated with pressurized piping systems. These costs would be in addition to those associated with providing advanced waste treatment.

Transferring water from Lake Candlewood (a class B resource) through Marjorie Reservoir (a class AA drinking water resource) down Padanaram Brook (a class A and B/A resource) would degrade the quality of water in the resources below Candlewood Reservoir. In Connecticut use of Class B waters for drinking water purposes is not allowed pursuant to Connecticut General Statue 22a-417, Public Health Code Regulations and state policy. Even if Danbury were to overcome the potential problems associated with contaminating their primary water supply reservoir, significant quantities of water would have to diverted in order to maintain a secondary treatment facility. 300 cfs through Marjorie Reservoir and down Padanaram Brook would result in significant changes to these resources.

Institutional conflicts with this proposal are massive. NEU would have to seek a modification of their existing hydropower license from the Federal Energy Regulatory Commission (FERC). FERC requires an extensive environmental impact report subject to review and approval of federal, state and local agencies. As part of this process, FERC is required to grant intervener status to all parties who request it, this would force FERC to consider any and all spurious requests regarding the operation of Lake Candlewood - Rocky River Hydropower facility. NEU personnel have indicated this proposal would cost their company thousands of dollars in known expenses and could mean millions of dollars in unknown expenses (i.e. loss of generation, further limitations on facility operation, etc.).

Clearly, these proposals lack credibility. DEP has advised Danbury officials of these concerns on several occasions and we hope this will help you to understand the basic engineering principles underlying our reservations. Pursuing these alternatives will only postpone the implementation of improvements at the Danbury POTW necessary to overcome the severe water quality problems which have persisted in the Still River since the initial order was written in 1978.

Should you have any questions please contact me at 566-2588 or -3245 so that I may arrange for the appropriate members of my staff to respond.

Sincerely,

Richard J. Barlow

Richard J. Barlow
Director
Water Compliance Unit

RJB:TM:jdc

cc: Robert Kleffman, Grenier Engineering

STATE OF CONNECTICUT
INTERDEPARTMENTAL MESSAGE

TO: Denis Cunningham, Assistant Director
DEP/Water Resources Unit, 165 Capitol Ave., Hartford, CT.

FROM: Thomas Morrissey, Scientific Programmer TEM.
DEP/Water Compliance Unit, 122 Washington Str., Hartford, CT.

SUBJ: PROPOSED BALL POND DIVERSION

I have reviewed the preliminary diversion application from the City of Danbury to divert up to 3.9 million gallons per day (MGD) from Ball Pond Brook below Ball Pond in New Fairfield, Ct. The application failed to address the following concerns:

1) Ball Pond Brook is one of two natural stream tributaries to Lake Candlewood and is a very important fisheries habitat. The final application should assess the impact this diversion would have during high, average and low flow conditions in the stream itself and in Candlewood Lake.

2) A Phase I Diagnotic/Feasibility Study of Ball Pond was completed by the Water Compliance Unit in 1979 with an EPA 314 Clean Lakes Grant. During the one year study, it was observed that Ball Pond supports a significant population of the blue green algae, Osceillatoria rubescens. This algae strongly influences the pond's water chemistry, especially its dissolved oxygen and nutrient characteristics and may be introduced into Margerie Reservoir potentially effecting the quality of that water as a water supply source. The DEP/WCU has made specific recommendations to the town of New Fairfield regarding methods to minimize this problem, subsequent to conducting feasibility studies on alum treatments. To date, no action has been taken on these recommendations.

3) It may be wise for Danbury's consultant to evaluate the Safe Yield of this system using several gaging stations and in particular Hubbard Brook. This would act as a sensitivity analysis of their initial evaluation.

4) Given the importance of Ball Pond Brook as a resource and the seasonal nature of the algae blooms, Danbury should evaluate a resource management approach to minimize impacts this diversion may have upon the brook and Margerie Reservoir.