PLAN OF CONSERVATION AND DEVELOPMENT

EFFECTIVE DATE: XXXX

Table of Contents

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Town Of Durham, Connecticut

Plan of Conservation and Development

Vision Statement

This Plan of Conservation and Development is a living document created by citizens who are actively involved in Durham and who want to promote compatible growth and protect the natural environment. It is the overriding desire that this Plan maintains and enhances those aspects of Durham's rural character that contribute to its high quality of life. This Plan, as required by state statute, will guide the conservation and development of land for the next ten years.

Chapter 1.0
Introduction

The Town of Durham's Plan of Conservation and Development (hereafter, "POCD") is crafted under the auspices of the Planning and Zoning Commission. The document serves as a blueprint for Durham's near- and long-term future. The town's first POCD was developed in 1981, consistent with mandates under Section 8-23 of the Connecticut General Statutes. These provisions were enacted to provide towns with a mechanism for creating and updating a planning tool following the adoption of the state's first Plan of Conservation and Development in 1979. Towns throughout the state are required to review and update their plans every ten years. Durham's POCD was updated in 1992 and again in 2003. The 2016 edition represents a comprehensive review and update orchestrated by the Planning and Zoning Commission with input from town officials, boards and agencies, and citizens. It also reflects information and insights gleaned from two visioning meetings (conducted in 2014 and 2016) and six (6) planning workshops.

Durham's Plan of Conservation and Development serves as a working framework reflecting needs, policies, actions, and priorities that will help to guide community leaders in making decisions that affect land-use management, development and protection of Durham's Main Street, housing considerations, historical and archeological resources, open space, energy and environmental conservation, transportation and traffic improvement, community facilities development, agriculture, economic development, and proposed land use. The POCD is intended to serve as a cohesive tool linking varied land-use matters, guiding principles, and the best interests of the residents of the town of Durham. The POCD is available to all citizens and is intended to guide those bodies tasked with planning for the harmonious, consistent, and orderly development of the town.

This updated Plan of Conservation and Development represents many hours of effort and the contributions of numerous stakeholders throughout the town of Durham over the course of several years. Each commission, organization, and committee in town with interests in one or more sections of the comprehensive Plan had the opportunity to provide input to the document through multiple planning workshop meetings as well as information-gathering public hearings. The Planning and Zoning Commission's Town Planner was instrumental in updating the numerous maps, charts, and statistical presentations that comprise the backbone of a number of the chapters. Commission members worked together to ensure that the document flows smoothly and that the sections are consistent with the overall mission of the Commission. Finally, through the formal public hearing process, all residents have had the opportunity to review and offer final input to the Planning and Zoning Commission before acceptance and adoption.

As detailed in the preamble to the town's Zoning Regulations,

"[the Durham Planning and Zoning Commission] has kept constantly in mind the individual characteristics of the town of Durham. Throughout its history, the town's economic welfare has been primarily dependent on agriculture, local trade, and local industry. In recent years, due to the universal use of the automobile and because of the industrial growth of the surrounding territory, Durham has become important as a place of residence for the families of workers employed outside the town. Due to its lack of abundant water supplies, adequate railroad service, and the absence of outstanding natural resources, it is doubtful that this will ever become a sizable industrial city.

Our thinking is, therefore, based on protecting and encouraging the factors that have made Durham a stable community: agriculture, local industry, and trade and the very important fact that Durham is a desirable place to live, with a comparatively low tax rate, thus attracting substantial, tax-paying permanent residents. [The regulations] are, therefore, aimed at:

(1) Stabilizing the values and attractiveness of our residential sections;

(2) Encouraging, with a minimum of restrictions, the traditional Yankee ingenuity that has developed our local industries;

(3) Making it possible for suitable outside industries to locate in Durham;

(4) *Providing space for commercial and service establishments to serve our growing town;*

(5) *Giving protection to businesses that are long established even though they do not conform to the zoning requirements of the district in which they are located;*

(6) *Maintaining healthy agriculture in the town;*

(7) *Permitting the orderly and economic growth of the town for the immediate and long-range benefit of its citizens; and*

(8) *Preserving, insofar as it is possible, the essential character of this country town."*

It is the undisputed and clear intention of the majority of Durham's residents to sustain and retain the traditional rural character of the town that many have called their home for, in some instances, a number of generations. With the Conservation Commission playing a leadership role, the town of Durham has acquired a number of significant parcels of open space land. This has the benefit of helping to control the overall rates of development throughout town while simultaneously protecting many of the town's most prized and beautiful natural resources. Going forward in Durham's planning and development, there is a need to balance a variety of uses and needs. The future identity of Durham needs to be a careful blend of its small town heritage and natural resources with an improved quality of new development that incorporates and protects these resources.

The overall theme running through the goals and objectives detailed in each section of the Plan reflects a community desire to maintain Durham's small town character and protect its natural beauty while, at the same time, allowing an appropriate scale of development to expand the tax base and accommodate demand for new residences and businesses.

The forces of conservation and development can sometimes appear to run counter to one another and create the potential for conflict as the town grows. In the Plan, the Planning and Zoning Commission has attempted to resolve some of the conflict by clarifying which resources and attributes are critical to conserve or protect and what types of development are acceptable and desirable to pursue.

There is an overwhelming community concern for preserving the charm, rural ambiance, and character of Durham's unique Historic District. A section of the Plan is devoted entirely to issues surrounding the Historic District. Country roads through outlying sections of town are also important, along with their many attractive features, including historic homes, barns, and farms. There is similar concern for the protection of natural resources in Durham for their intrinsic value and for the aesthetic amenity that they represent. These include various ridge tops and scenic vistas, the Coginchaug River, Allyn Brook, and various other waterways, flood plains, and wetlands as well as forest land and farmlands already protected through a variety of conservation measures. There is also a keen desire to maintain the scenic vistas of such features and to enhance public access to the enjoyment of these features.

As detailed in the Plan, the rate of population growth in Durham has slowed in recent years and school census has actually declined. As development proceeds, subdivision and construction should be guided by policies that incorporate conservation of natural and rural features as well as energy considerations into the project designs to the extent possible. There is little question that the town's tax base needs to be expanded and diversified in manners other than through strictly residential tax revenues. What would represent unacceptable development in these areas is a quality of development that exacerbates traffic congestion, detracts from an attractive community appearance, infringes upon protected residential neighborhoods, or obliterates natural resources and scenic features. Thoughtful, careful economic development that wisely expands the tax base in designated areas can appropriately complement Durham's overall revenue base.

The objective of the Planning and Zoning Commission, through design, adoption, and implementation of this Plan of Conservation and Development, is to provide a tool for planning for the compatible growth of the town and a corresponding protection of the natural environment, resources, and valued rural character of the community. This document is intended to guide the conservation and development of land in the town of Durham for the next ten years.

Chapter 2.0
Population and Housing

2.1. Introduction

In order to identify trends in housing demand that occur over time it is important to understand the population characteristics of Durham. This information provides the basis to identify future town needs with regard to a variety of issues such as housing, schools, infrastructure, transportation, community facilities, recreation, and other municipal services. The following section, based primarily on statistics from the U.S. Bureau of the Census and the Connecticut Department of Labor, will provide the variety of population characteristics unique to Durham.

2.2. Population Trends and Projections

Population growth in Durham was slow during the first part of the 1900s, and the town even experienced a slight decline between 1910 and 1920. The population increased rapidly after World War II, increasing by more than 308% from 1940 to 1970. From 1970 through 2010 the population grew slower than the post-war period, but quicker than earlier in the century, at a rate greater than 10% each decade. Durham's population is projected to continue to grow through 2025 faster than the regional and state projected rates. The following table shows Durham's population growth from 1970 to 2010, including projections through 2025, and compares it with regional and state trends.

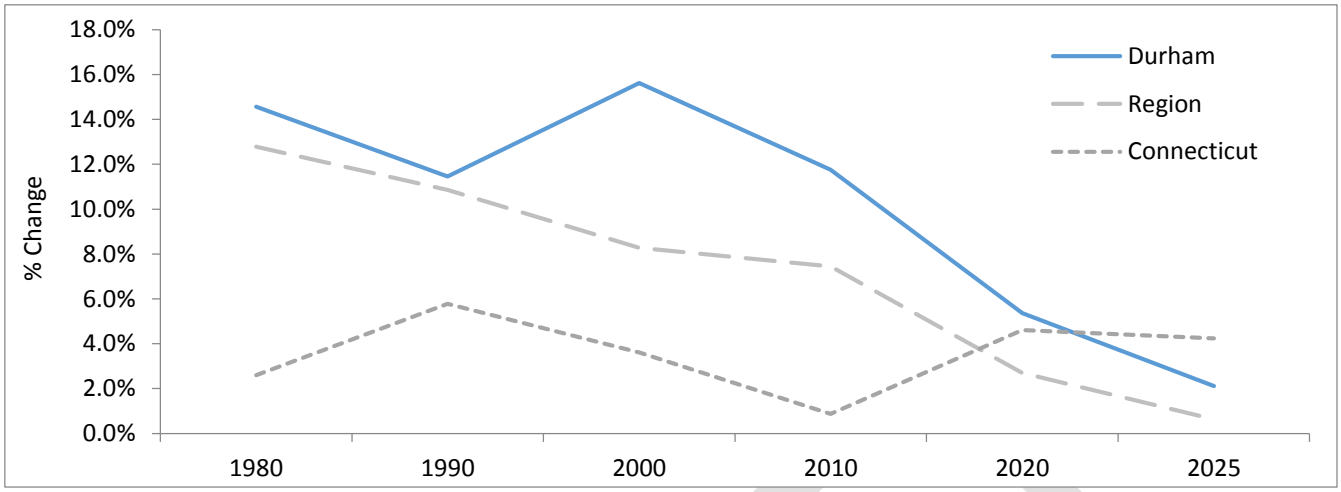
Table 1. POPULATION GROWTH TRENDS AND PROJECTIONS

Year	Durham		Region		Connecticut	
	Persons	**% Change**	Persons	% Change	Persons	% Change
1910	**997**		-		1,114,756	
1920	**959**	**-3.8%**	-		1,380,631	23.9%
1930	**1,044**	**8.9%**	-		1,606,903	16.4%
1940	**1,098**	**5.2%**	-		1,709,242	6.4%
1950	**1,804**	**64.3%**	-		2,007,280	17.4%
1960	**3,076**	**70.5%**	-		2,535,243	26.3%
1970	**4,489**	**45.9%**	121,466		3,029,074	19.5%
1980	**5,143**	**14.6%**	136,998	12.8%	3,107,576	2.6%
1990	**5,732**	**11.5%**	151,880	10.9%	3,287,116	5.8%
2000	**6,627**	**15.6%**	164,449	8.3%	3,405,565	3.6%
2010	**7,406**	**11.8%**	176,685	7.4%	3,435,400	0.9%
2020	**7,803**	**5.4%**	181,455	2.7%	3,593,860	4.6%
2025	**7,968**	**2.1%**	182,587	0.6%	3,746,181	4.2%

Source: 1970-2010: U.S. Bureau of the Census
2020-2025: Connecticut State Data Center, Population Projections

Figure 1 below shows the historical and projected population growth for Durham, the Lower Connecticut River Valley Council of Governments (RiverCOG) Region and the State between 1980 and 2025. Durham's population growth has consistently been much greater than the State average, especially between 1990 and 2000. By 2020, population growth is expected to flatten for the town, region, and state. It is important to note that the 5-year gap between 2020 and 2025 represents only half of a decade, thereby representing minimal relative growth.

Figure 1. HISTORICAL & PROJECTED POPULATION GROWTH



Based on the 2010 Census, Durham is the 9th most populous town in the RiverCOG region. The town's population is similar to that of Old Lyme and Haddam. Since 1980, the RiverCOG Region has consistently grown at a faster pace than the State, averaging about 1323 new residents each year. If population projects are proven correct, the RiverCOG region will become home to 477 new residents each year until 2020. Similarly, Durham will welcome about 40 new residents each year, between 2010 and 2020.

The population distribution table below notes the age cohorts of Durham residents between 1980 and 2010. The table also includes population projections for 2020 and 2025. The percentages show many significant trends, one of which is a consistent decrease in the school-age population between 1980 and 2010, continuing into the next decade. In 1980, the school age population was 37% of Durham's total population. By 2010, the school age population decreased to 28% of the total population. By 2025, it is expected that the school-age population will decrease further to only 19%. The same trend is expected for the 20-39 year age cohort. In 2010, the 20-39 year age cohort was half the size it was in 1980, contributing to 16% of the town's total population. This group is projected to remain between 16-18% of the town's total population until 2025. Keep in mind that these are individuals of child-rearing age, essentially impacting the town's school-age population.

The 40-59 year old age group has increased in proportion to the town's total population, accounting for 36% of the total population in 2010. Population projections predict a decrease in the relative size of this age cohort, accounting for 30% of the town's total population by 2025. It is important to note that by 2025, these individuals will be nearing or already in retirement. Similarly, the 60-85+ age cohort consisted of 502 individuals in 1980, doubling in size to 1399 individuals by 2010. This age cohort has consistently increased in size relative to the town's total population. By 2025, it is expected that 31% of the town's total population will consist of 60-85+ year olds.

These historical and projected age population statistics are similar to those across the Region and the State, creating a need to provide a greater range of senior services, including transportation, housing, and social services. Schools and child-care facilities should also expect a potential decline in the school-age population in coming years. "Table 1" shows a steady increase in town total population (equaling an increase of 11.8% between 2000 and 2010), meanwhile "Table 2" shows a 9% decrease in 0-39 year olds during the same time period. Not only has the population in Durham grown older, a result of an aging baby boomer population, but many individuals older than 40 have relocated to Durham between 2000 and 2010. This trend is expected to continue throughout 2025.

Based on the population projections in "Table 1" and the availability of land, Durham can expect an increase of nearly 600 persons during the next ten years and an increase in demand for single family

homes. A shift from rental units to owner-occupied units is expected to continue, while average household size decreases each decade.

Table 2. DURHAM AGE DISTRIBUTION

Age	1980	%	1990	%	2000	%	2010	%	2020	%	2025	%
< 5 years	323	6.3%	425	7.4%	454	6.9%	370	5.0%	223	2.9%	279	3.5%
5-9 years	442	8.6%	400	7.0%	548	8.3%	532	7.2%	281	3.6%	270	3.4%
10-14 years	558	10.8%	421	7.3%	591	8.9%	628	8.5%	503	6.4%	366	4.6%
15-19 years	556	10.8%	470	8.2%	436	6.6%	556	7.5%	696	8.9%	581	7.3%
20-24 years	303	5.9%	328	5.7%	212	3.2%	276	3.7%	624	8.0%	614	7.7%
25-29 years	356	6.9%	310	5.4%	239	3.6%	218	3.0%	312	4.0%	461	5.8%
30-34 years	500	9.7%	477	8.3%	428	6.5%	265	3.6%	95	1.2%	275	3.5%
35-39 years	484	9.4%	596	10.4%	630	9.5%	468	6.3%	237	3.0%	153	1.9%
40-44 years	321	6.2%	573	10.0%	647	9.8%	674	9.1%	452	5.8%	368	4.6%
45-49 years	297	5.8%	450	7.9%	611	9.2%	736	10.0%	688	8.8%	544	6.8%
50-54 years	279	5.4%	292	5.1%	572	8.6%	692	9.4%	803	10.3%	728	9.1%
55-59 years	222	4.3%	253	4.4%	391	5.9%	574	7.8%	769	9.9%	796	10.0%
60-64 years	177	3.4%	225	3.9%	241	3.6%	456	6.2%	650	8.3%	731	9.2%
65-69 years	125	2.4%	189	3.3%	184	2.8%	353	4.8%	488	6.3%	593	7.4%
70-74 years	83	1.6%	142	2.5%	172	2.6%	191	2.6%	379	4.9%	452	5.7%
75-79 years	61	1.2%	92	1.6%	114	1.7%	151	2.0%	289	3.7%	334	4.2%
80-84 years	29	0.6%	45	0.8%	86	1.3%	133	1.8%	144	1.8%	240	3.0%
85+	27	0.5%	44	0.8%	71	1.1%	115	1.6%	170	2.2%	183	2.3%

Source: 1980-2010: U.S. Bureau of the Census
2020-2025: Connecticut State Data Center, Population Projections

2.3. Income

Income can be used as a measure of local wealth and economic stability, especially in comparison to the Region and the State. By dividing the income distribution into two parts, median household income provides a boundary with half of households having greater income, and half of households having lower income. Median household income often includes the earnings of two workers, and should not be used as a basis for individual income. In 2010, Durham's median household income was significantly higher than those of surrounding counties and the State. Compared to nine adjacent towns, Durham's median household income was second highest, following Madison. In 2010, Durham's median household income was $37,677 greater than that of the State.

In 2010, Durham's median family income was 31% greater than the State's. Compared to nine adjacent towns, Durham's median family income ranked third, with only Madison and Guilford possessing higher family incomes. Median family income differs from household income by including two or more people related by birth, marriage, or adoption residing in the same residence. Whereas household income includes all people who occupy a housing unit regardless of relationship. The difference seen in median household and family incomes may be attributed to the exclusion of one-person households from the median family income calculation.

Durham's per capita income of $39,579 is defined as the average income of all people over the age of 16 in town during 2010. Durham's per capita income was 7% higher than the State average in 2010 and the fourth highest when compared to nine adjacent towns. Guilford, Madison, and Killingworth all possessed higher per capita incomes when compared to Durham during 2010. When compared to Durham's relatively

high median household and family incomes, the per capita income provides an indication that many non-income earners reside in the town. These non-workers could be stay-at-home spouses or retired from the workforce.

Table 3. MEDIAN, HOUSEHOLD AND PER CAPITA INCOME (2014)

Place	Median Household Income	Median Family Income	Per Capita Income
Connecticut	$69,899	$88,217	$38,480
Hartford County	$65,499	$82,740	$35,307
Middlesex County	$77,931	$100,452	$40,589
New Haven County	$61,646	$80,193	$32,794
Durham	**$117,328**	**$130,375**	**$49,767**
Haddam	$99,010	$111,696	$44,400
Killingworth	$112,344	$127,316	$51,316
Middlefield	$100,694	$111,607	$42,714
Middletown	$61,373	$82,832	$34,226
Guilford	$99,441	$120,061	$52,791
Madison	$108,231	$138,465	$53,221
Meriden	$53,401	$62,426	$27,483
North Branford	$87,408	$102,320	$42,058
Wallingford	$75,533	$96,047	$37,009

Source: U.S. Bureau of the Census, American Community Survey, 2014 5-year estimate

2.4. Employment

In 2010, 72% of Durham's population over the age of 15 was in the labor force (defined as either employed, or currently looking for work). During the same year, only 30.9% of the Region's population was in the labor force. Comparatively, Durham's population consists of more income earners than the RiverCOG Region as a whole. Between 2007 and 2014, Durham's labor force has not changed in size, with 4,260 people currently employed or looking for work as of August 2014.

The unemployment rate in Durham increased from 3.3% in 2007 to 6.7% in 2011. Since 2011, the unemployment rate has decreased to 5.3% in 2014. This gradual increase and decrease in unemployment has been seen throughout the country, as a result of 2007-2008 financial crises. However, Durham's unemployment rates have remained much lower than those of the New Haven Labor Market Area (LMA). The New Haven LMA experienced unemployment as high as 9.5% in 2010, nearly 3 percentage points higher than Durham's.

Table 4. LABOR FORCE PARTICIPATION & UNEMPLOYMENT

Durham	2007	2008	2009	2010	2011	2012	2013	2014
Labor Force	4,286	4,345	4,355	4,276	4,314	4,249	4,190	4,260
Employed	4,143	4,177	4,098	3,994	4,025	3,990	3,946	4,035
Unemployed	143	168	257	282	289	259	244	225
% Unemployed	3.3%	3.9%	5.9%	6.6%	6.7%	6.1%	5.8%	5.3%
New Haven LMA	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Labor Force	307,904	311,181	313,670	319,658	320,906	315,175	311,692	315,760
Employed	293,089	293,169	287,673	289,135	291,381	287,889	286,538	292,973
Unemployed	14,815	18,012	25,997	30,523	29,525	27,286	25,154	22,787
% Unemployed	4.8%	5.8%	8.3%	9.5%	9.2%	8.7%	8.1%	7.2%

Region	2007	2008	2009	2010	2011	2012	2013	2014
Labor Force	94144*	95611*	96520*	100,240	100,543	98,577	97,355	98,444
Employed	90402*	91081*	89844*	92,329	92,995	91,636	90,873	92,646
Unemployed	5272*	6407*	9421*	7,911	7,548	6,940	6,482	5,798
% Unemployed	5.59%*	6.70%*	9.76%*	7.9%	7.5%	7.0%	6.7%	5.9%

* (2007 - 2009) RiverCOG Region Labor Force Statistics do not include Westbrook, CT.
Source: Connecticut Department of Labor, Office of Research, Connecticut Labor Force Data by Place of Residence

2.5. Housing

2.5.1. Policies and Issues

A community's housing stock is important since it affects all town residents, by means of its availability, costs, condition, type, location, age, and other associated factors. It is a primary land use in town and greatly affects the quality of life for local residents. This section will study the characteristics of Durham's housing stock for the goal of ensuring that individual housing needs of Durham are being met. Common housing needs that should be met include provisions for an adequate housing supply in a safe and pleasant living environment.

2.5.2. Housing Characteristics

The number of households has been increasing at a faster rate than the population as household size continues to decrease, as noted in "Table 5". Average household size has decreased each decade since 1980 in Durham, the Region, and the State. Meanwhile, the number of housing units has increased significantly each decade between 1950 and 2010.

Table 5. AVERAGE HOUSEHOLD SIZE

	1980	1990	2000	2010
Durham	**3.72**	**3.24**	**2.99**	**2.84**
RiverCOG Region	N/A	N/A	2.52	2.47
Connecticut	3.15	2.76	2.59	2.73

Source: U.S. Bureau of the Census

Single family detached households have consistently been the primary household type in Durham. As of 2010, 92.1% of Durham's housing units were owner-occupied, the highest proportion in the past 70 years. The rental market in Durham consists of 7.9% of all occupancies, a number that has continued to decrease since 1950.

Table 6. DURHAM HOUSING STOCK

	1950	1960	1970	1980	1990	2000	2010
Number of Occupied Housing Units	527	830	1194	1535	1862	2277	2610
Number of Housing Units	573	903	1231	1579	1927	2349	2694
Owner-Occupied Housing Units	346	652	997	1352	1688	2072	2403
(Percent of Total)	65.7%	78.6%	83.5%	88.1%	90.7%	91.0%	92.1%
Renter-Occupied Housing Units	181	178	197	183	174	205	207
(Percent of Total)	34.3%	21.4%	16.5%	11.9%	9.3%	9.0%	7.9%
Vacant	46	73	37	44	65	72	84
(Percent of Total)	8.0%	8.1%	3.0%	2.8%	3.4%	3.1%	3.1%

Source: U.S. Bureau of the Census

"Table 7" shows the number of housing units in each household, with only 5% of dwellings having two or more units. The lack of multiple-unit households and a primarily owner-occupied market is a contributing factor to the relatively high home values and rental fees in the town.

Table 7. NUMBER OF UNITS IN STRUCTURE - DURHAM HOUSING STOCK

Number of Units	1970	%	1980	%	1990	%	2000	%	2010	%
Total Units	1231		1579		1927		2349		2655	
1 Units	1104	90%	1392	88%	1782	92%	2226	95%	2518	95%
2 - 4 Units	110	8.9%	149	9.4%	88	4.6%	92	3.9%	84	3.2%
5 - 9 Units	11	0.9%	22	1.4%	33	1.7%	25	1.1%	40	1.5%
Over 10 Units	0	0.0%	0	0.0%	2	0.1%	6	0.3%	13	0.5%
Mobile	6	0.5%	*	*	1	0.1%	0	0.0%	0	0.0%
Other	0	0.0%	16	1.0%	21	1.1%	0	0.0%	0	0.0%

*Included with single unit dwellings
Source: U.S. Census Bureau

Residential housing permit approvals help to illustrate the area housing market. "Table 8" shows the number of housing permits issued every other year, between 1990 and 2012. Between 1990 and 2006, residential housing permits were regularly issued, in Durham and adjacent communities. Following 2006, the number of authorized residential housing permits was reduced drastically from previous years. In 2008, Durham approved only 5 housing permits when only two years prior, 38 permits were issued in one year. By 2010, nearly every other adjacent municipality experienced an enormous reduction in number of housing permits issued. This decrease in residential housing permit approvals can be attributed to the financial crisis of 2007-2008. After the market collapse, homeowners lost significant value in their homes and were not likely to further extend themselves for remodeling or building purposes. Also, between 2008 and 2012, while home values declined, the cost of building remained constant, making new construction a very costly endeavor. The shift in home values is illustrated in Tables 9 and 10.

Table 8. RESIDENTIAL HOUSING UNIT PERMITS AUTHORIZED FOR CONSTRUCTION

	1990	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012
Durham	**24**	**36**	**45**	**24**	**43**	**63**	**55**	**46**	**38**	**5**	**6**	**5**
Guilford	37	68	112	103	139	88	73	72	57	42	22	29
Haddam	29	33	38	27	27	36	40	70	51	28	19	15
Madison	56	82	128	79	100	166	46	51	45	21	17	20
Middlefield	7	10	17	13	18	15	12	9	4	1	7	9
Middletown	83	97	135	127	254	179	191	229	213	172	28	20
North Branford	175	57	53	62	54	23	39	64	4	2	4	1
Wallingford	105	190	145	166	196	136	151	158	59	31	63	41

Source: Connecticut Department of Housing, DECD

2.5.3. Housing Market

The median sales price and number of units sold also help to illustrate the local housing market and ties it into the economic state of the region. This helps to define the affordable housing strategy for the community, but many uncontrollable factors make this a difficult task. When in the housing market, the buyer's actual affordability and availability of housing not only depends on housing income, but also construction and land costs, interest rates, regulatory compliance, and the regional economy. Therefore, many factors driving the housing market are beyond the control of the buyer and local government.

The following tables show the median sales price of housing in the region and the number of homes that sold during the period between 2007 and 2011. Between 2008 and 2010, home prices in Connecticut dropped by an average of 28%. In Connecticut, the 2008 median home sale price of $290,000 dropped to $206,500 in 2010. This phenomenon is not likely due to a shift in buyer preferences, or a greater demand for cheaper homes. This drastic slide in home sale prices was a direct effect of the 2008 market crash. Similarly, median home sale prices in Durham dropped an average of 23% between 2008 and 2011. Prior to 2008, Durham home prices were 12% higher than the State median. By 2011, Durham home prices were 17% higher than the State median. This is an indicator that Durham's housing market was slightly less affected by the market crash than other areas in Connecticut.

Since 2009, the number of homes purchased has increased in Durham, Meriden, Middletown and North Branford. This increase in the number of units sold may be attributed to low interest rates and a decrease in home prices. Many buyers were able to secure competitive financing to fund the purchase of homes up until 2012. Another explanation for the increase in home sales prices is that many homeowners were no longer able to afford their homes; homes that were originally purchased during the mid-2000's at the height of the market. These trends have been seen across the country as a result of the 2008 market collapse.

Table 9. MEDIAN SALES PRICE & HOUSING UNITS SOLD

Place	2007	2008	2009	2010	2011
Connecticut	$ 245,000	$ 290,000	$ 265,000	$ 206,500	$ 213,200
Durham	**$ 308,100**	**$ 327,000**	**$ 358,000**	**-**	**$ 249,500**
(Housing Units Sold)	102	60	45	-	94
Killingworth	$ 325,000	$ 366,500	$ 319,000	$ 254,100	-
(Housing Units Sold)	117	71	29	39	-
Middlefield	$ 265,000	$ 288,000	$ 250,000	$ 212,500	-
(Housing Units Sold)	74	43	20	43	-
Meriden	$ 179,000	$ 206,000	$ 188,000	$ 139,400	$ 39,500
(Housing Units Sold)	855	345	295	497	580
Middletown	-	-	$ 240,500	$ 192,000	$ 175,000
(Housing Units Sold)	-	-	242	330	500
North Branford	$ 285,000	$ 310,000	$ 249,900	-	$ 231,000
(Housing Units Sold)	152	86	68	-	153

Source: Connecticut Office of Policy and Management, Real Estate Sales Database

"Table 10" shows the median home sales price adjusted for inflation, based on 2007 dollars. Again, Durham's average home sales price exceeds the State median between 2007 and 2011. After accounting for inflation, the effects of the 2008 market collapse are more visible than they were in "Table 9". The median Durham home sales price of $249,500 is $108,500 less than two years prior. This collapse in home values was seen throughout the State and nearby towns. The absence of annual sales prices for certain years is due to reporting standards. Each town is required to report home sales prices to the Connecticut Office of Policy and Management for four consecutive years. At the time of publication, home sales prices have risen and stabilized from where they were in 2011. Still, home values have not exceeded their original values seen in 2009.

Table 10. MEDIAN SALES PRICE ADJUSTED FOR INFLATION

Base Period: 2007	2007	2008	2009	2010	2011
Connecticut	$ 245,000	$ 301,571	$ 265,053	$ 210,568	$ 219,703
Durham	**$ 308,100**	**$ 340,047**	**$ 358,072**	**-**	**$ 257,110**
Killingworth	$ 325,000	$ 381,123	$ 319,064	$ 259,106	-
Middlefield	$ 265,000	$ 299,491	$ 250,050	$ 216,686	-
Meriden	$ 179,000	$ 214,219	$ 188,038	$ 142,146	$ 143,755
Middletown	-	-	$ 240,548	$ 195,782	$ 180,338
North Branford	$ 285,000	$ 322,369	$ 249,950	-	$ 238,046

Source: Connecticut Office of Policy and Management, Real Estate Sales Database

The estimated home values in Durham, the RiverCOG Region, and the State are prepared in "Table 11". This data was retrieved from the American Community Survey's 5-year estimates. Therefore, these estimates are moving-averages of estimated home values in (2005-2009), (2006-2010), (2007-2011), (2008-2012) and should only be referenced in comparison over the years. Durham's median home value was 15% greater than the Regional average and 22% greater than the State average in 2012. Out of all owner-occupied units in Durham, the majority are categorized with a value between $300,000 and $499,999, representing 60% of the housing stock. The percentage of homes exceeding $499,999 has dwindled between 2009 and 2012. During 2009, 14% of homes were valued at $500,000 or more. By 2012, only 9% of owner occupied homes were valued at $500,000 or more. Within the Region, homes exceeding $499,999 have consistently made up 15% of total households. Only 6% of Durham's homes were valued at less than $200,000 in 2011. Eighteen percent of homes in the Region, and 23% of homes in the State were valued below $200,000 in 2011.

Table 11. ESTIMATED VALUE OF OWNER-OCCUPIED HOUSING UNITS

	Durham				RiverCOG Region				Connecticut			
	2009	2010	2011	2012	2009	2010	2011	2012	2009	2010	2011	2012
Owner-occupied units	2373	2423	2360	2443	53079	54325	54318	54160	922187	939984	937339	929560
Median (dollars)	$359,700	$354,300	$355,000	$350,800	$318,100	$325,300	$313,300	$303,000	$295,800	$296,500	$293,100	$285,900
Less than $50,000	0	0	17	13	754	863	1034	1127	12508	13644	15295	17515
$50,000 to $99,999	0	18	17	23	995	923	925	1057	19504	18668	19347	21595
$100,000 to $149,999	75	80	45	52	2784	2458	2384	2299	60601	56161	56379	60303
$150,000 to $199,999	137	94	65	63	6210	5589	5410	5759	123655	122274	123823	129791
$200,000 to $299,999	546	597	538	589	14386	15257	15445	15985	253927	267519	271204	272261
$300,000 to $499,999	1279	1278	1412	1461	19926	20816	20901	20124	271648	280008	275823	262321
$500,000 to $999,999	324	343	242	216	6581	6842	6820	6259	133515	134075	129633	121757
$1,000,000 or more	12	13	24	26	1443	1577	1399	1550	46429	47635	45835	44017

Source: American Community Survey (2009 to 2012), Selected Housing Characteristics, DP04

2.5.4. Market Affordability

Based on Market Affordability, housing in Durham represents a good value. Housing is considered affordable if monthly housing costs are equivalent to less than 30% of an area's median household income. Using this measure a household earning Durham's 2014 median household income of $117,328 per year could conceivably afford ~~a~~ monthly housing cost of $2,933.20. Using an Affordability Analysis Tool developed by RiverCOG,a home costing up to $354,400 would be considered affordable under very modest assumptions (household income equal to or exceeding Durham's 2014 median household annual income, a finance rate of 3.875% for 30 years with a 20% down payment, no PMI, utility costs of $600 per

month and $10,000in taxes annually). This short analysis fails to consider households whose income totals less than Durham's 2014 median household income; this group statistically represents one-half of Durham's households. Because this group is so large, it is clear that there is a need for Affordable Housing. Affordable Housing includes government-assisted units, CHFA-financed units, or deed-restricted units that must remain as affordable housing (see Section 2.2.6.).

2.5.5. Rental Market

The majority of Durham residents live in owner-occupied housing units. In 2000, 8.7% of households were living in rental housing, and another 3.1% were vacant units. By 2010, the percentage of renters decreased to 7.7%, while vacancies remained constant at 3.1% (vacant units include seasonal properties). In 2000, 24.3% of the region's households were rented properties. That proportion decreased to 22% by 2010. The percentage of rental properties in the State decreased slightly from 31.2% to 30% between 2000 and 2010. Killingworth is the only nearby town with a similarly small rental market, with only 4.7% of its properties being renter-occupied in 2010. Home ownership increased in both Durham and the Region between 2000 and 2010; while decreasing in nearby Guilford, Haddam, Killingworth, Madison, Middlefield, and Wallingford.

Table 12. HOUSEHOLD OCCUPANCY & VACANCY STATUS

Place	Owner Occupied		Renter Occupied		Total Vacant Units		Total Housing Units	
	2000	2010	2000	2010	2000	2010	2000	2010
Connecticut	62.8%	62.2%	31.2%	30.0%	6.1%	7.9%	1385975	1487891
RiverCOG Region	65.1%	66.1%	24.3%	22.0%	10.6%	11.9%	72844	81081
Durham	**88.2%**	**89.2%**	**8.7%**	**7.7%**	**3.1%**	**3.1%**	**2349**	**2694**
Guilford	79.8%	77.6%	13.7%	13.2%	6.6%	9.2%	8724	9596
Haddam	82.0%	80.2%	13.7%	11.6%	4.3%	8.2%	2822	3504
Killingworth	91.9%	90.5%	4.2%	4.7%	3.8%	4.8%	2283	2598
Madison	77.8%	74.9%	10.4%	11.7%	11.8%	13.4%	7386	8049
Middlefield	79.8%	79.0%	14.7%	14.5%	5.5%	6.5%	1740	1863
Middletown	48.3%	50.3%	45.9%	43.3%	5.8%	6.4%	19697	21223
North Branford	82.4%	83.1%	15.4%	13.6%	2.2%	3.3%	5246	5629
Wallingford	70.1%	69.4%	26.4%	25.8%	3.5%	4.8%	17306	18945

Source: U.S. Bureau of the Census, General Housing Characteristics, DP-4 (2000), QT-H1 (2010)

Estimated gross monthly rent between 2009 and 2012 is highlighted in "Table 13". Again, these estimates are products of the American Community Survey, and are averages spanning a 5 year time span. These estimates are useful in comparison across years.

Median monthly rent in Durham increased 25% between 2009 and 2012, while the State median rent increased by only 8%. In 2012, a rental unit in Durham cost 55% more than the average rental unit in the State of Connecticut. This gap in rental costs has widened since 2009, when Durham rental costs were only 34% costlier.

By 2012, only 23% of Durham's rental units cost less than $1,000 a month. During the same year, 45% of rental units in the State cost less than $1,000 a month. Rental costs in Durham have consistently exceeded the state averages. Very few affordable rental options exist in Durham, with only 33 units available with rent less than $1,000 a month.

Table 13. ESTIMATED GROSS MONTHLY RENT (2009 - 2012)

DURHAM	2009		2010		2011		2012	
Occupied Rental Units	171		137		166		146	
Median (dollars)	$ 1,292		$ 1,291		$ 1,733		$ 1,620	
Less than $200	15	9%	0	0%	0	0%	0	0%
$200 to $299	0	0%	16	12%	15	9%	19	13%
$300 to $499	10	6%	0	0%	0	0%	0	0%
$500 to $749	0	0%	13	9%	0	0%	0	0%
$750 to $999	51	30%	21	15%	22	13%	14	10%
$1,000 to $1,499	56	33%	52	38%	19	11%	23	16%
$1,500 or more	39	23%	35	26%	110	66%	90	62%

CONNECTICUT	2009		2010		2011		2012	
Occupied Rental Units	387435		401653		404729		412501	
Median (dollars)	$ 958		$ 982		$ 1,020		$ 1,044	
Less than $200	12845	3%	11979	3%	10740	3%	9458	2%
$200 to $299	13978	4%	14023	3%	13845	3%	14377	3%
$300 to $499	25582	7%	24648	6%	24638	6%	24247	6%
$500 to $749	57119	15%	54456	14%	47371	12%	45726	11%
$750 to $999	101874	26%	103274	26%	98641	24%	96306	23%
$1,000 to $1,499	124650	32%	134569	34%	142154	35%	148550	36%
$1,500 or more	51387	13%	58704	15%	67340	17%	73837	18%

Source: American Community Survey (2009 to 2012), Selected Housing Characteristics, DP04

The cost of rent varies depending on whether persons or families pay market rent or are on a public assistance program. Market rent is the rent paid for private or Connecticut Housing Finance Authority (CHA) financed developments that rent on the open market. Subsidized rent is rent paid to subsidized developments provided through HUD, the Department of Economic and Community Development's Bureau of Housing, and CHFA-financed developments that rent below market rates.

The standard used to determine affordable rent is generally a maximum of 30% of a family's gross income. Public assistance levels vary with income and the different programs that state and federal agencies offer. Generally, to qualify under many tenant-assisted housing programs, applicants' incomes cannot exceed 50% to 80% of the median income for the region. Most of Connecticut's assistance programs require income to be less than 50% of the median to ensure the programs help households with the lowest incomes whenever possible.

As an example, "Table 3" shows the median household income for Durham was $105,417 in 2010. A family earning 50% of that would have an annual income of $52,708, or $4,392 per month. Using 30% of monthly household income for housing expenses, they could afford up to $1,317 for rental expenses. The median rental cost in Durham was $1,291 as noted in "Table 13". This example proves that rental housing is available in Durham for those individuals earning 50% of the town's median income.

2.5.6. Affordable Housing

The previous sections of this chapter tend to show that housing in Durham is less affordable than many other municipalities in the area, since the housing stock is primarily based on single family detached units, with few alternatives. In the past, the state has taken initiatives to promote affordable housing through

public acts such as the *Affordable Housing Land Use Appeals Procedure (P.A. 407/C.G.S. 8-30(g)*). This section of the statute mandates special procedures for court appeals when a municipality denies or imposes substantial restrictions on developments that have at least 30% of their unit's set-aside for affordable housing. These applications can only be denied when the public interest (e.g.: public safety or environmental protection) outweighs the need for affordable housing.

Municipalities are exempt from the *Affordable Housing Land Use Appeals Procedure* if 10% or more of all units are dedicated as government-assisted units, CHFA-financed units, or deed-restricted units that must remain as affordable housing. Recent (2010) data indicates that 2.08% of Durham's housing stock falls into these classifications (Note: As of 2015 only 18.3% of Connecticut's municipalities were in compliance with the 10 percent threshold).

In 2010, the majority of Durham's affordable housing units were government assisted units. Of all affordable units, 37.5% were classified as CHFA/USDA-assisted mortgages. The existence of affordable housing in nearby towns is minimal, with Guilford at 2.25% and Middlefield at 2.36%.

Table 14. AFFORDABLE HOUSING UNITS (2010)

Place	Estimated Units	Gov't Assisted Units	Tenant Rental Assistance	CHFA/USDA Mortgages	Deed Restricted Units	Total Assisted Units	Percent Affordable
Connecticut	1487891	87480	44504	29652	5868	167504	11.26%
RiverCOG Region	74101	3747	1626	1102	95	6570	8.9%
Durham	**2694**	**34**	**1**	**21**	**0**	**56**	**2.08%**
Guilford	9596	168	6	42	0	216	2.25%
Haddam	3504	22	1	21	0	44	1.26%
Killingworth	2598	0	2	10	5	17	0.65%
Madison	8049	90	1	10	29	130	1.62%
Middlefield	1863	30	1	12	1	44	2.36%
Middletown	21223	2859	1467	614	25	4965	23.39%
North Branford	5629	62	7	62	0	131	2.33%
Wallingford	18945	482	140	310	35	967	5.10%

Source: Connecticut Department of Housing

2.5.7. Incentive Housing Zones

One alternative that may be considered by the town is the establishment of an *Incentive Housing Zone ("IHZ")*.While *C.G.S 8-30 (g)* requires that an applicant set aside 30% of the units as affordable housing (with 15% set-aside for households making 60% of the median income and the remainder for households making 80% of the median income) an *Incentive Housing Zone* only requires that 20% of the units be set aside as affordable housing; these being "affordable" to households making 80% of the median income. In an IHZ, the town may recover technical review fees and enact architectural and landscaping requirements; requirements that may not be able to be enforced in the case of an 8-30 (g) application.

2.5.8. Fair Housing

Fair Housing programs ensure that equal housing opportunities are granted to all persons regardless of race, color, religion, gender, sexual orientation, marital status, lawful source of income, familial status, national origin, ancestry, age or mental or physical disability. Under the State of Connecticut's *Fair Housing Action Plan Guidelines*, the Town of Durham is currently categorized as a *"Rural-Limited Affordability"*

community. Municipalities that fall into this category are encouraged to take actions that: (a) increase affordability and (b) promote variety in housing stock. Other strategies that may be considered include:

- Training
- Outreach
- Complaint Processing and Monitoring
- Infrastructure Development
- Local Financing of Housing
- Counseling and Other Services to Promote Diversity
- Encouragement of Private Activity

2.6. Goals

- The general housing plan for Durham should be consistent with the land use, economic, environmental, and other goals formulated in the various sections of the Plan of Development. This should provide for a variety of housing opportunities for Durham's current and future residents. A wide range of policies and programs could be established to benefit housing availability and affordability while providing a pleasant living environment and preserving the town's important historic and natural resources.
- The town should consider investigating the potential for affordable housing units for seniors. Durham's current housing stock will not be able to support its aging population without first making adjustments and changes. The demand for subsidized senior housing developments may exceed the supply as senior residents shift out of their homes. In the past subsidized senior housing was received with town-wide acceptance when twenty-four units were constructed on Higganum Road.
- The town should consider investigating the potential for affordable housing units that welcome young families. First-time homebuyer programs are currently available through CHFA, including down payment assistance programs and competitive financing rates.
- The town should consider policies and programs to diversify the existing housing stock. Currently, Durham zoning allows the conversion of single-family homes into multi-family homes and accessory apartments as a special permit. Multi-family dwellings, senior and disabled dwellings, and rooming and boarding houses may also be allowed by special permit.
- The town should consider implementing a means to increase its stock of Affordable Housing.
- The town should consider adopting a Fair Housing Plan.
- In recognition of the fact that technology now enables 20% of the nation's workforce to work from their home on a full-time basis and up to 37% at least several days per week, the Durham Planning and Zoning Commission shall consider the expansion of the maximum permissible area permitted for home occupation permits.
- In order to increase the affordability of the town's housing stock, the Durham Planning and Zoning Commission should consider evaluating the current lot size requirements for both residential and multi-family homes.
- In order to increase the affordability of the town's housing stock, the Durham Planning and Zoning Commission shall also consider zoning regulations that make cluster developments a more attractive and viable option.
- In order to assist our residents in caring for their family members in an affordable way, the Durham Planning and Zoning Commission should evaluate allowances for accessory residential buildings.

Chapter 3.0
Transportation

3.1. Introduction

The primary goal for the transportation network is to provide for the safe and efficient movement of persons, goods, and services in a way that is economically and energy efficient, while preserving the natural resources and historical character of the town. This goal is achievable through the incorporation of a diverse combination of transportation policies that the town should encourage. Attaining this goal will preserve the high quality of life that Durham residents have come to enjoy.

Currently, Durham residents are primarily dependent upon the automobile for transportation. Most residents who are destined for work, shopping, and recreation can travel an extensive network of state roads (Routes 17, 68, 77, 79, 147, and 157) that radiate through most sections of town. The most highly traveled of these, Route 17, bisects Durham. Its high use can be attributed to its junctions with Interstate 91 in New Haven to the south and Route 9 in Middletown to the north. This provides the link for most work-related trips. In addition, commercial areas that have emerged along Route 17 account for many local, non-work related trips.

3.2. Road Systems

The regional highway network provides a hierarchy of service functions that address the need for mobility and access to land-based activity. As a result, a hierarchical road network has evolved that corresponds to the travel needs of the population. These range from expressways, designed to allow a great deal of mobility, to local streets that permit direct access.

Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. Basic to this process is the recognition that individual roads and streets do not serve travel independently. Rather, most travel involves movement through a network of roads. It becomes necessary to determine how this travel can be channeled within the network in a logical and efficient manner. Functional classification defines the nature of this process by defining how a particular road or street should serve the flow of trips through a highway network.

In urban areas, principal arterials are highways that serve major centers of activity, the highest traffic volume corridors and the longest trip desires. They should carry the major trips entering and leaving the urban area, and most of the urban area through movements. In addition, significant intra-area travel (i.e., between the central business district and the outlying residential areas) should be served by this class of roadway.

The urban main arterial network is intended to interconnect and augment the principal arterial system. It should provide service of trips of moderate length, with more emphasis on land access than the higher system, and offering a lower level of traffic mobility. Such facilities may carry local bus routes and provide intra-community continuity, but ideally should not enter identifiable neighborhoods. Main Street (Route 17A) in Portland is an example of such a roadway.

The urban collector street system provides land access and traffic circulation within residential neighborhoods, commercial, and industrial areas. It differs from the arterial system in that collector streets may provide access to residential neighborhoods. Conversely, the collector street also collects traffic from local streets in residential, commercial, and industrial areas and directs it to the arterial system. In the

central business district, the collector system may include a street grid that provides the basis for traffic circulation.

The local street system contains all roads not found on the higher systems. It provides direct access to abutting properties and access to higher road classifications. It offers the lowest level of mobility and usually contains no bus routes. Through traffic is discouraged.

The functional classification of roads in rural areas follows the same hierarchy as in urban areas. Principal arterials provide corridor service for trips that are primarily inter-regional or interstate, connecting urban areas such as Middletown and Meriden and providing an integrated, statewide network.

The rural main arterial system links cities, larger towns, and major traffic generators and inter-regional trips. However the system offers travel characteristics (speed and degree of uninterrupted travel) that are inferior to the higher system.

Rural collectors generally serve travel of intra-regional importance where travel distances are typically shorter than those on arterial routes. Major collector roads link the larger outlying communities and serve traffic generators of intra-regional importance.

Minor collectors link locally important traffic generators, such as neighborhood stores, with outlying rural areas and collect traffic from local roads.

Local roads in rural areas serve primarily to provide access to adjacent land and to accommodate short travel. This network comprises all roads not given a higher classification.

3.2.1. Arterials in Durham

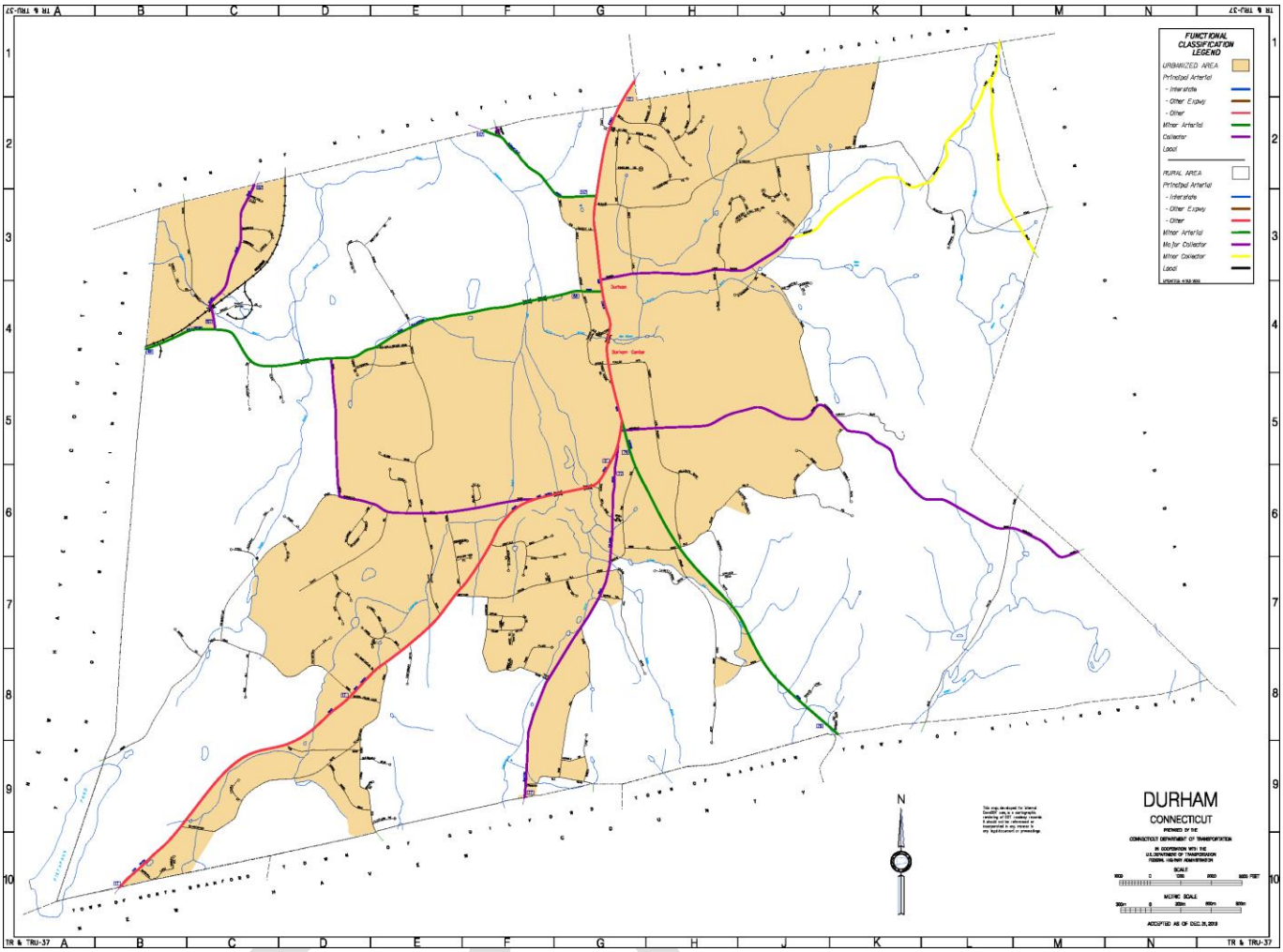
The state roads, specifically Route 17, Route 68, Route 147, and Route 79, are arterial roads. These arterial roads (1) serve the vast majority of the vehicles entering and leaving the Town, (2) serve the longest trips, and (3) serve travel between suburban centers. The arterial roads can provide access to abutting land but such access should be controlled because the primary responsibility of the road is to service major traffic movements.

3.2.2. Collectors in Durham

The collector roads distribute trips from the arterials to the ultimate destinations, which may be collector or local streets. The collector also collects traffic from local streets and channels traffic to arterials. The collector provides both direct access to abutting land as well as access to local streets. Route77, Route 157, Higganum Road, Parmelee Hill Road, Pent Road, Foot Hills Road, Johnson Lane and Maiden Lane, are classified as collectors.

3.2.3. Local Streets in Durham

The local streets provide direct access to abutting land areas (neighborhoods) and access to collector streets. Vehicular traffic movement through these areas should be deliberately discouraged. All other roads not classified on the prior map are designated as local.



3.3. Travel Patterns to Work

The 2013 American Community Survey (ACS) commuting flow data for Durham is shown in the tables below. Nearly sixty percent of Durham residents work in six municipalities. For residents of Durham, 13.8% work in Durham, 13.5% in Middletown, 10.2% in Wallingford, 7.9% in New Haven, 6.0% in Meriden and 5.4% in Hartford. For workers in Durham, 26.1% live in Durham, 10.9% in Meriden, 6.6% in North Branford and 5.1% live in Haddam. Data is subject to sampling variability.

Commuting Flows - Durham Residents to Workplaces		
Live	**Work**	**Commuting Flow**
Durham	Durham	645
Durham	Middletown	531
Durham	Wallingford	402
Durham	New Haven	312
Durham	Meriden	238
Durham	Hartford	215
Durham	North Haven	182
Durham	Madison	118
Durham	Berlin	98
Durham	Hamden	94

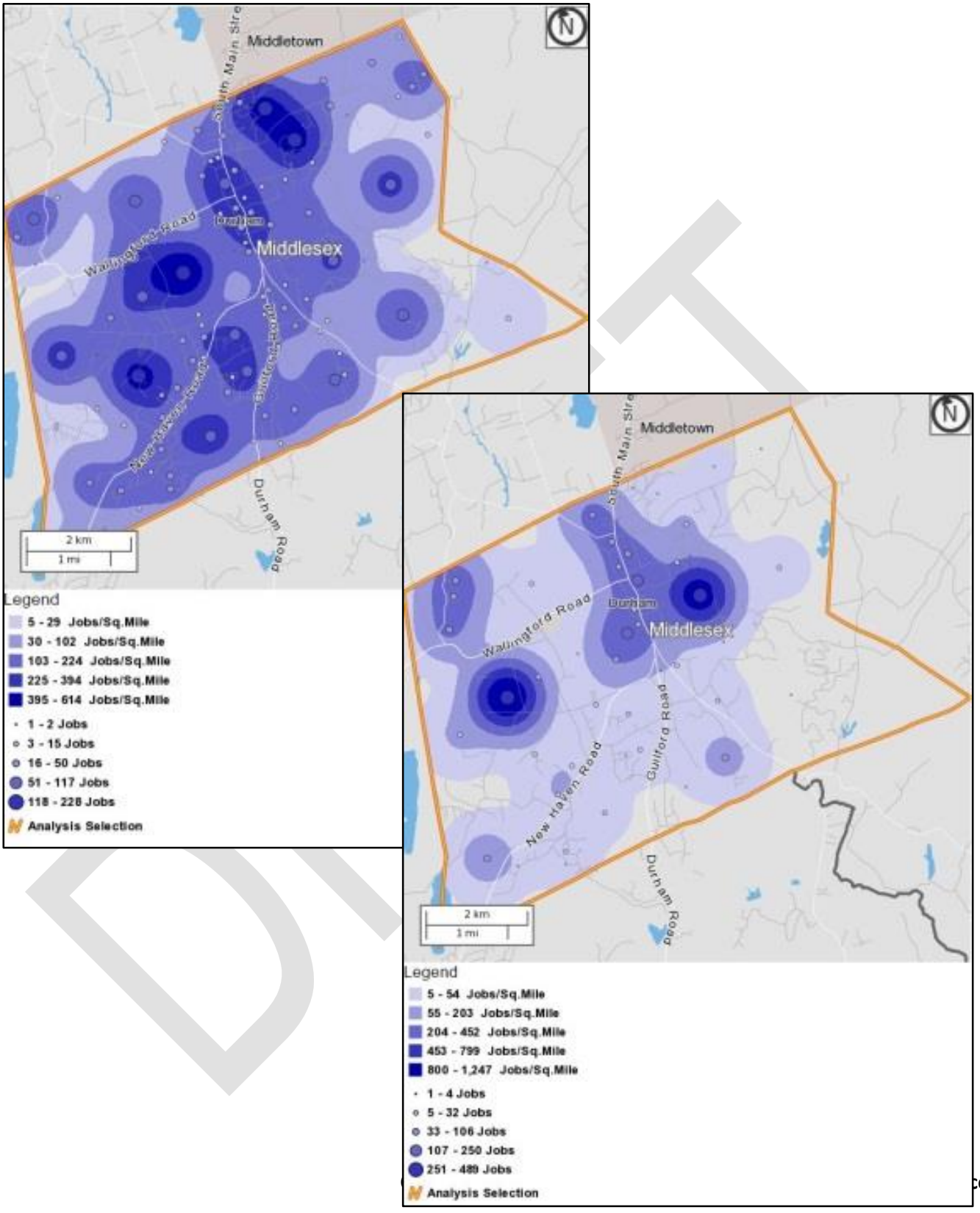
Commuting Flows - Durham Residents to Workplaces		
Live	**Work**	**Commuting Flow**
Durham	Stratford	84
Durham	Windsor	79
Durham	Farmington	66
Durham	Cheshire	66
Durham	Branford	62
Durham	Cromwell	58
Durham	East Haven	54
Durham	Rocky Hill	52
Durham	Middlefield	51
Durham	Other Towns * (31)	340
TOTAL		**3,947**

Source: US Census Bureau, 2009-2013 American Community Survey.

Commuting Flows - Non-Durham Residents to Durham Workplace		
Live	**Work**	**Commuting Flow**
Durham	Durham	546
Meriden	Durham	228
North Branford	Durham	139
Haddam	Durham	106
Wallingford	Durham	99
Middletown	Durham	95
Middlefield	Durham	93
North Haven	Durham	63
Tolland	Durham	57
Newington	Durham	54
Guilford	Durham	52
Branford	Durham	47
New Britain	Durham	42
Bristol	Durham	35
Clinton	Durham	33
Southington	Durham	30
Windsor	Durham	28
Portland	Durham	28
West Hartford	Durham	26
Hartford	Durham	21
Bridgeport	Durham	20
Chester	Durham	20
Cheshire	Durham	20
Other Towns (18)	Durham	211
Total		**2,093**

Source: US Census Bureau, 2009-2013 American Community Survey.

Commuting Flows - Durham Residents to Workplaces



Source: US Census Bureau Longitudinal Employer Household Dynamics, On the Map Tool.

3.4. Roadway Capacity and Traffic Volume

3.4.1 Level of Service (LOS)

Level of Service (LOS) is a qualitative measure that incorporates speed, travel time, traffic interruptions, freedom to maneuver, safety driving comfort, and convenience. The Level of Service is determined by the road's Volume-to-Capacity Ratio (V/C). A V/C Ratio of between 0.90 and 0.99 suggests a roadway is approaching capacity, whereas ratios of 1.00 or greater are roadways that are over-capacity. Capacity analysis represents a good indication of identifying roads projected to be congested if current roadway conditions continue without the necessary improvements.

Level of Service "A" represents free flow; with individual drivers virtually unaffected by the presence of others in the roadway. Freedom to select desired speeds and maneuver within traffic is extremely high. Level of Service "B" is in the range of stable flow; however, the presence of other drivers begins to be noticeable. Freedom to select desired speeds is relatively unaffected; however there is a slight decline in the freedom to maneuver within traffic. Level of Service "C" is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual drivers becomes significantly affected by interactions with others in the roadway. Level of Service "D" represents high density stable flow. Speed and freedom to maneuver are severely restricted, and the driver experiences a poor level of comfort and convenience. Level of Service "E" represents operating conditions at or near the capacity level. All speeds are severely reduced. Freedom to maneuver within traffic is extremely difficult, and is accomplished by forcing a vehicle to "give way" to accommodate such maneuvers. Comfort and convenience levels are extremely poor and driver frustration is generally high. Level of Service "F" is used to describe breakdown flow. Queues form in these locations and the traffic flow is characterized by stop-and-go waves.

CAPACITY RATIO TABLE (arterial roadways)

Level of Service	Volume/Capacity Ratio (V/C)
A	0.00 - 0.60
B	0.61 - 0.70
C	0.71 - 0.80
D	0.81 - 0.90
E	0.91 - 1.00
F	Greater than 1.00

Source: Transportation Research Board, Highway Capacity Manual, Special Report 209, 1994

The principal objective of capacity analysis is to estimate the maximum amount of traffic that a given facility can accommodate. Capacity analysis would be limited, however, if this were its only focus. Traffic facilities generally operate poorly at or near capacity, and facilities are rarely designed or planned to operate in this range. Capacity analysis is also intended to estimate the maximum amount of traffic that a facility can accommodate while maintaining prescribed operational facilities.

Capacity analysis is a set of procedures used to estimate the traffic-carrying ability of facilities over a range of defined operational conditions. It provides tools for the analysis and improvement of existing facilities, and for the planning and design of future facilities.

In general, the capacity of a facility is defined as the maximum hourly rate at which vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time under prevailing roadway, traffic, and control conditions (i.e., traffic signals, stop and yield signs, etc.). The time period used in most capacity analysis is fifteen minutes, which is considered the shortest interval during which stable flow exists.

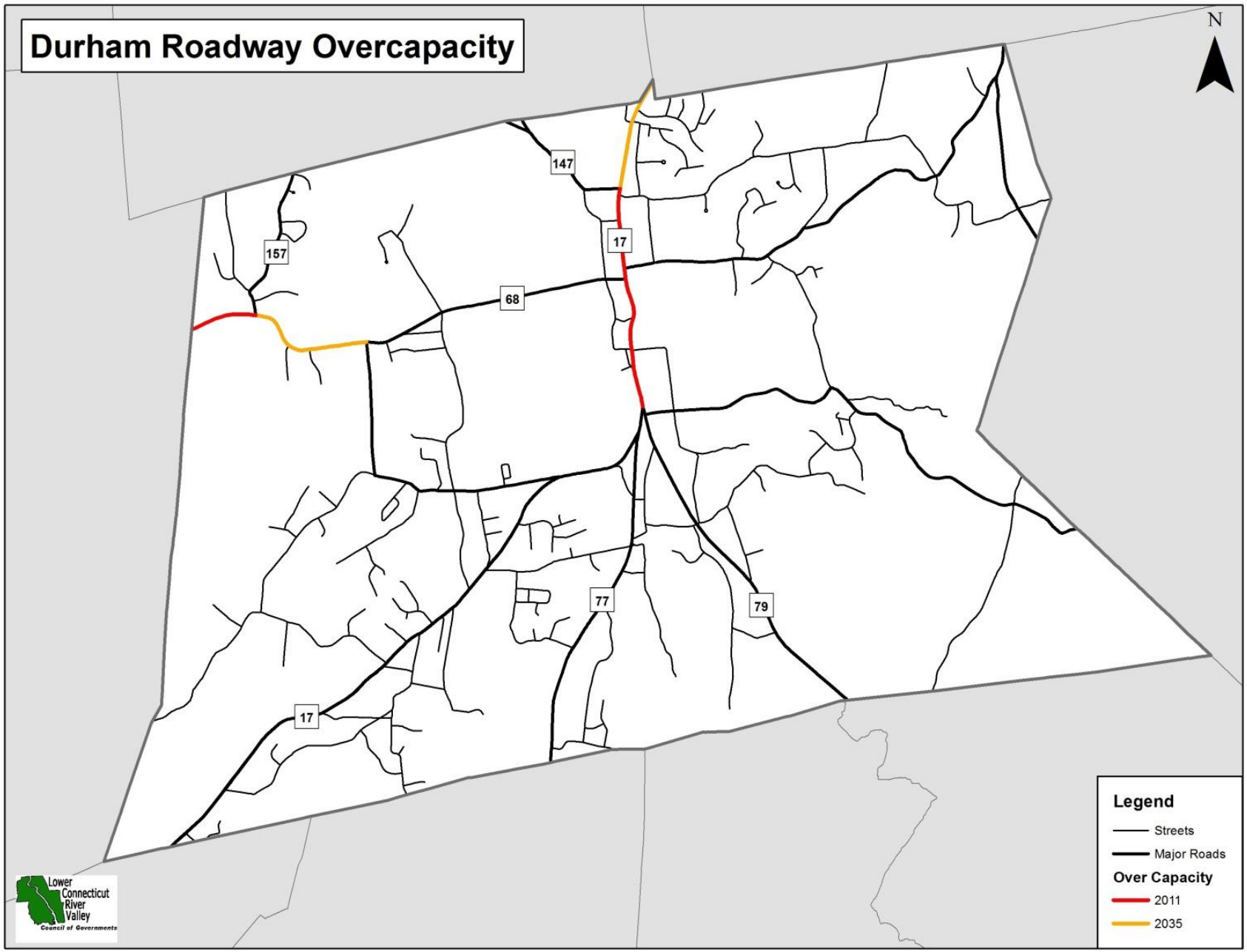
3.4.2 Volume-to-Capacity Ratio (V/C)

The capacity of a roadway is determined by calculating the roadway's Volume-to-Capacity Ratio (V/C). A V/C Ratio of between 0.90 and 0.99 suggests a roadway is approaching capacity; whereas a ratio of 1.00 or greater indicates that the roadway may be over-capacity. Volume-to-Capacity Ratios (V/C) have been calculated and projected for several state roadways that traverse the Town of Durham, and are shown in the following table. Roadway segments that are currently or projected to have Volume-to-Capacity Ratios equal to or greater than 1.0 are shaded.

Volume-to-Capacity Ratio (V/C) - State Roadways in Durham, Connecticut

State Route	Segment	Mile Segment		2011 V/C	2035 V/C
17	North Branford/Durham T-L to Howd Road	10.78	10.93	0.23	0.29
17	Howd Road to Stagecoach Road	10.93	11.31	0.24	0.31
17	Stagecoach Road to Saw Mill Road	11.31	12.97	0.42	0.54
17	Saw Mill Road to Parmalee Hill Road	12.97	13.41	0.38	0.48
17	Parmalee Hill Road to Route 77	13.41	14.34	0.32	0.4
17	South of Route 77 to North of Route 77	14.34	14.98	0.37	0.48
17	Route 77 to Route 79	14.98	15.15	0.62	0.79
17	Route 79 to Route 68	15.15	16	1.03	1.32
17	South of Route 68 to North of Route 68	16	16.58	1	1.29
17	Route 68 to Route 147	16.58	17.11	0.94	1.21
17	Route 147 to Middletown T-L	17.11	17.29	0.87	1.11
68	Wallingford T-L to Route 157	19.07	19.51	1.13	1.45
68	Route 157 to Pent Road	19.51	20.34	0.78	1
68	Pent Road to Route 17	20.34	22.09	0.52	0.66
77	Guilford T-L to Route 17	11.56	13.85	0.34	0.43
79	Killingworth T-L to Route 17	11.98	14.34	0.62	0.8
147	Route 17 to Maple Avenue	0	0.23	0.49	0.63
147	Maple Avenue to Cherry Hill Road	0.23	0.29	0.6	0.77
147	Cherry Hill Rd to South of Durham/Middlefield T-L	0.29	0.75	0.72	0.92
147	Cherry Hill Road North of Route 147 Intersection	0.75	0.92	0.44	0.57
157	Route 68 to Powder Hill Road	0	0.15	0.29	0.37
157	Powder Hill Road to Durham/Middlefield T-L	0.15	1.02	0.17	0.22

Source: CTDOT 2011 Capacity Status


Durham Roadway Overcapacity
N
147
17
157
68
77
79
17
Legend
Streets
Major Roads
Over Capacity
2011
2035
Lower Connecticut River Valley
Council of Governments

3.4.3. Vehicle Miles of Travel (VMT)

Vehicle Miles of Travel (VMT) and delay are also useful when identifying congested roadways. CTDOT estimates VMT based on Series 29 modeling techniques in the Congestion Screening and Monitoring Report. In 2000, the VMT for the region was 2,979,542. This is projected to reach 4,261,972 by 2040. Statewide VMT increases generally fluctuate between one and three percent per year.

3.4.4. Traffic Volume

The following shows the most recent traffic volumes for Durham. Statistics for state roads were obtained from CTDOT's 2014 traffic log. The road segments with the highest volumes are Route 17 between Route 79 and Route 68 and Route 17 between Route 68 and Route 147, with an Average Daily Traffic Count (ADT) of 15,800 and 15,900 respectively.

Traffic Volume – State Roads

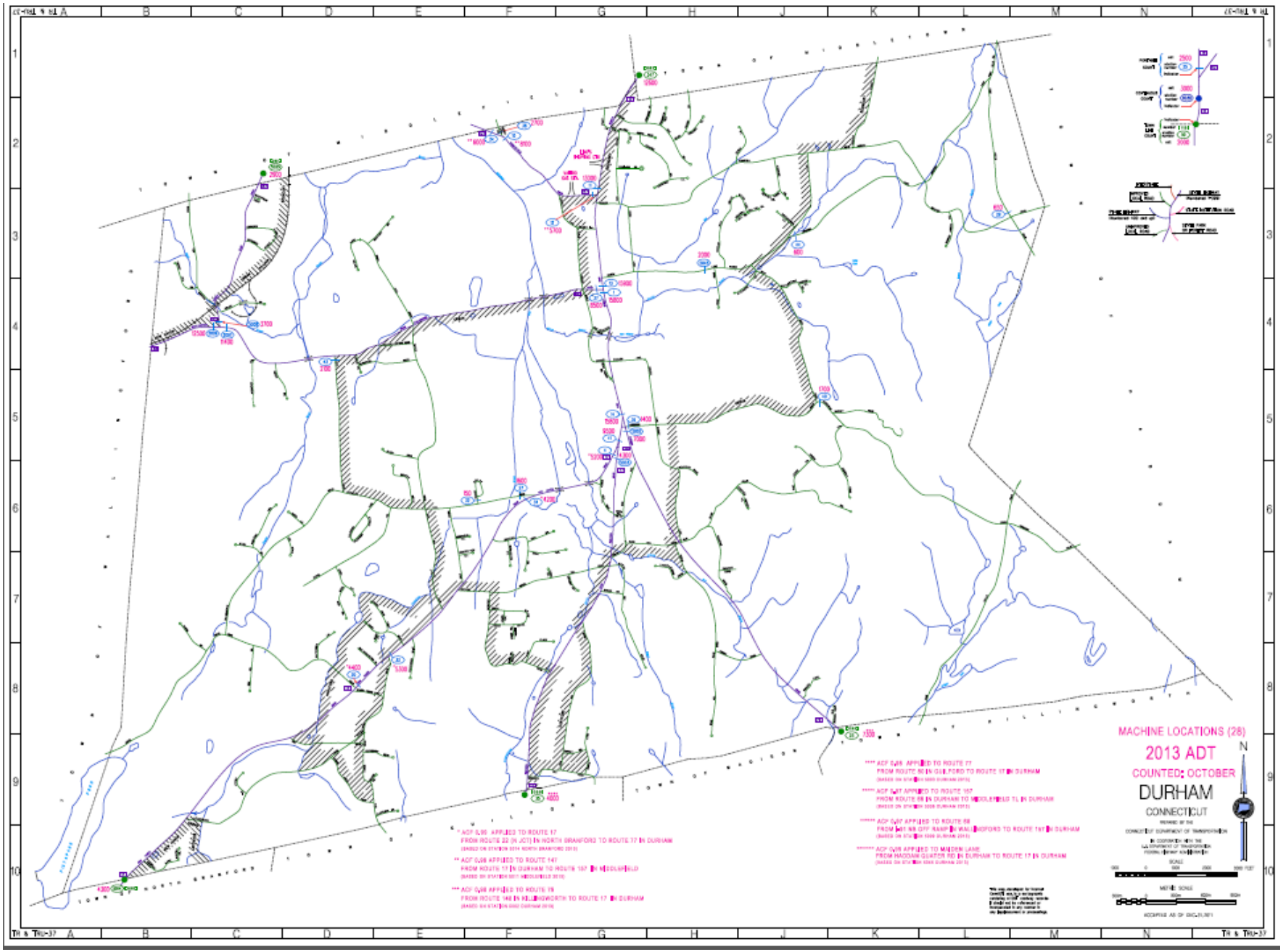
Route	Segment	2014 Average Daily Traffic
17	North Branford/Durham town line to N. Jct Stagecoach Road	4,400
17	N. Jct Stagecoach Road to Saw Mill Road	5,300
17	Saw Mill Road to Parmelee Hill Road	4,200
17	Parmelee Hill Road to Route 77	5,200
17	Rte 77 to Rte 79 NB	9,500
17	Rte 79 NB to Rte 68	15,800
17	Rte 68 to Rte 147	15,900
17	Rte 147 to Durham/Middletown town line	12,800
68	Wallingford/Durham town line to Rte 157	12,500
68	Rte 157 to Pent Road	11,400
68	Pent Road to Rte 17	8,500
77	Guilford/Durham town line to Rte 17	4,200
79	Killingworth/Durham town line to Rte 17	7,200
147	Rte 17 to Maple Avenue	5,700
147	Maple Avenue to Cherry Hill Road	8,100
147	Cherry Hill Road to Durham/Middlefield town line	6,000
157	Rte 68 to Powder Hill Road	3,700
157	Powder Hill Road to Durham/Middlefield town line	3,100

Traffic Volume – Local Road

Route	Segment	2012 Average Daily Traffic
Bear Rock Road	Between Maiden Road and Higganum Road	450
Maple Avenue	North of Route 68	1,350
Old Farms Road	South of Stagecoach Road	300
Sand Hill Road	West of Route 79	1,100
Saw Mill Road	Between Route 17 and Parmelee Hill Road	800
Skeet Club Road	South of Elihu Drive	1,650
Tuttle Road	North of Brewster School	850

Traffic Volume – Local Roads

Route	Segment	2010 Average Daily Traffic
Foot Hills Road	North of Haddam Quarter Road	650
Higganum Road	East of Bear Rock Road	1,700
Higganum Road	East of Route 79	1,500
Johnson Lane	East of Maiden Lane	650
Maiden Lane	West of Wheeler Road	2,100
Parmelee Road	West of Route 17	1,800
Pent Road	South of Route 68	2,300
William Road	North of Parmelee Road	150


MACHINE LOCATIONS (28)
2013 ADT
COUNTED: OCTOBER
DURHAM
CONNECTICUT
N

3.5. Crash Data

The Connecticut Crash Data Repository indicates that there were four hundred forty three (443) crashes in Durham between 2012 and 2014. There were two (2) fatal crashes; one hundred thirty seven (137) injury crashes and three hundred four (304) property damage crashes. Eighty-eight (88) occurred on local roads and three hundred fifty-five (355) on state roads.

3.6. Public Transit

Durham presently contracts with the Estuary Transit District for a “Dial-A-Ride” service known as 9 Town Transit. The regular fare is $3.00, seniors are $1.50 and children and transfers are free. Service is available on a first come first serve basis Monday through Friday between 6:00 a.m. and 6:00 p.m.

Individuals wishing to travel outside the off-route shuttle service area or those who require door-to-door assistance may request transportation to or from anywhere within the towns of Chester, Clinton, Deep River, Durham, East Haddam, Essex, Haddam, Killingworth, Lyme, Old Lyme, Old Saybrook and Westbrook. Limited service is available to the Middletown bus terminal, Middlesex Hospital and Saybrook Road medical complexes. Reservations are required and may be obtained by contacting Customer Service. Service is available to the general public with no age or disability restrictions.

Durham also contracts with the Middletown Transit Authority (MAT) for “Dial-A-Ride” service that provides curb-to-curb transportation for elderly and disabled residents. This service can be used for medical appointments, shopping, banking and other destinations and is available five days a week between 8:30 a.m. and 4:00 p.m. The fare is $2.50 each way and registration is required.

3.7. Ridesharing

Ridesharing techniques, such as car and vanpooling, became popular during the fuel shortages of the mid-and-late 1970's and continued through the 1980's; primarily to save money. Ridesharing should still be considered a viable transportation alternative to the single occupancy personal automobile since it reduces congestion, increases air quality, and is still more cost effective than driving alone.

The Connecticut Department of Transportation has developed a family of commuter services designed to meet the needs of commuters and employers. CTrides is the network of employer and employee support programs that endorse a variety of alternatives to driving alone; such as carpooling, vanpooling, riding the bus and train or telecommuting, resulting in improved air quality, reduced traffic congestion and a better quality of life for all.

CTrides is also people reaching out to persons with the belief that what they offer can improve quality of life by putting more choice, control, and benefits into the hands of the residents of this state. CTrides also seeks to improve commuter mobility to help sustain the growth and vitality of our economy and make Connecticut more competitive in the employment marketplace.

Durham should consider placing an emphasis on carpooling by promoting employer ridesharing incentives for employees such as flexible work hours, transit subsidies, or organizing a formal rideshare program. Promoting ridesharing and providing areas for commuter parking could also help lessen congestion.

3.8. Main Street Issues

The preservation of the historical character of Main Street and the health and safety of Durham residents and others as they travel through the center of town are critical. Single-occupancy vehicles are the primary mode (84%) of transportation in Durham, and there is a need for residents to carpool and "share the road" with other residents. To this end, the town should implement features that are consistent with the Connecticut Department of Transportation Complete Streets Policy No. EX.O.-31and in accordance with Connecticut General Statutes 13a-153 f (a)(d) and Public Act 09-154.

The town should consider limiting high traffic commercial development within the Historic District. The high volume of traffic generated by commuters has created major congestion during the peak A.M. and P.M. travel times on Main Street and throughout town. The excessive speed of traffic outside of commuting hours is problematic, as it creates difficulties in entering and exiting residential driveways and hazards at all crosswalks for pedestrians. There is extensive use of the sidewalks throughout the day, evening, and weekends. This activity is a positive element and enhances the character of Durham Main Street. However, the sidewalks themselves are in disrepair and not continuous throughout the historic corridor.

Main Street is subject to seasonal fluctuations in traffic, particularly during summer months when it becomes the main arterial from the beach and shoreline. Research has demonstrated that coordination of traffic signals is effective in reducing delays, stops, fuel consumption, and vehicular emissions of pollutants. The coordination of traffic signals on Main Street is encouraged, particularly since Main Street was classified as "over-capacity" during peak hours in the Connecticut Arterial System Study.

3.9. Local Bridge Program

The Local Bridge Program is administered by the State of Connecticut Department of Transportation (CTDOT), and is concerned with bridges that are municipally-owned and longer than six feet in length. Annually, the Department of Transportation prepares a list of eligible deficient bridges for each municipality. Municipalities may submit an application under the Local Bridge Program for funding to make improvements to these bridges. Under the program, grants are given to qualifying projects on a sliding scale ranging from 10% to 33% of the total project cost. Low-interest loans are also available to municipalities for up to 50% of the project cost. Some local bridge projects may qualify for federal funding under the Federal Off-System Program. If so, a municipality can receive up to 80% of the total project cost from federal funds, with the remaining funds being supplied by the Local Bridge Program; effectively requiring no funds to be expended by the municipality.

The primary difference between the Local Bridge Program and State Bridge Program is that CTDOT inspects state bridges that are more than twenty feet in length biannually; whereas the local bridges spanning between six and twenty feet are inspected once, as mandated by Public Act 87-584. CTDOT does not intend to inspect the local bridges again unless mandated by the Legislature. As a result, the Local Bridge Program eligibility list remains static. Bridges not on the list may be eligible for funding, if the municipality can prove that the bridge is deficient by the guidelines in the Federal Highway Administration's "Recording and Coding Guide for the Structural Inventory and Appraisal of the Nations Bridges," dated December 1995. Municipalities can submit this information to CTDOT for review and approval. If found deficient and approved for eligibility, CTDOT will include the bridge on the list of eligible bridges and establish a priority ranking for the bridge. The ranking and available funds determine funding authorization annually. If not authorized in one fiscal year, the municipality must resubmit project applications for consideration in the next fiscal year.

3.10. Rail

Rail freight passes through Durham on a rail line in the town's northwest corner. The rail line is owned by the State of Connecticut from MP 15 (Reeds Gap) north to Middletown and by Tilcon Inc. south to New Haven. The Providence & Worcester Railroad (P&W) operates on the lines owned by Tilcon. The Connecticut Central Railroad operates on the lines owned by the state and has rights to operate south to New Haven in order to interchange traffic with Conrail.

The P&W replaced 7.8 miles of 107 lb. rail with 115 lb. rail along its Middletown Branch. This results from the fact that the rail joints were bent from inadequate support and the heavy weight of gravel cars operating over the line. P&W also has a policy to maintain operating speeds of 40 mph on its lines, but cannot do so on the Middletown Branch because of the joint problem. A 40 mph operating speed is necessary on this line to build enough momentum to climb grades without adding another engine.

Rail transport of both passengers and freight should be encouraged since rail transport is less polluting and more economically efficient than other forms of surface transportation. There is currently no passenger service in the region and approximately seventeen miles of active freight service.

The P&W Railroad operates freight service in the region on rail line rights of way owned by CTDOT. Service originates in Middletown, with three stub-end radial access lines to Cromwell, Portland, and Middletown. The main line runs southwest through Middletown, Middlefield, and Durham to Reeds Gap. From Reeds Gap to North Haven, the line is owned by Tilcon and operated by the Providence & Worcester Railroad, and from North Haven to New Haven, it is owned by Conrail. P&W has trackage rights to reach New Haven and interchange traffic with Conrail on the Northeast Corridor. From Middletown north to Hartford, P&W has upgraded the line.

3.11. Bicycle and Pedestrian Plan

3.11.1 Bicycle Facilities

Bicycling has traditionally been considered a form of recreation, but, in recent years, it has come to be seen as an alternative form of transportation. The number of active bicyclists nationally and in Durham has been growing over time. There is now a greater emphasis on extending bicycle facilities and developing them into a network, rather than only in isolated sections of a community. Because of the large number of state highways that traverse and intersect within Durham, the town can play a central role in this network.

In October 2015, the Connecticut Department of Transportation (CTDOT) began the process to update the *2009 Connecticut Statewide Bicycle and Pedestrian Transportation Plan* and the *2009 Statewide Bicycle Map.* When this update is completed, the town should consider its adoption. Emphasis has been placed on integrating bicycle facilities with other modes of transportation and making existing transportation facilities more bicycle-friendly. The two major types of bicycle activities are on-road and off-road.

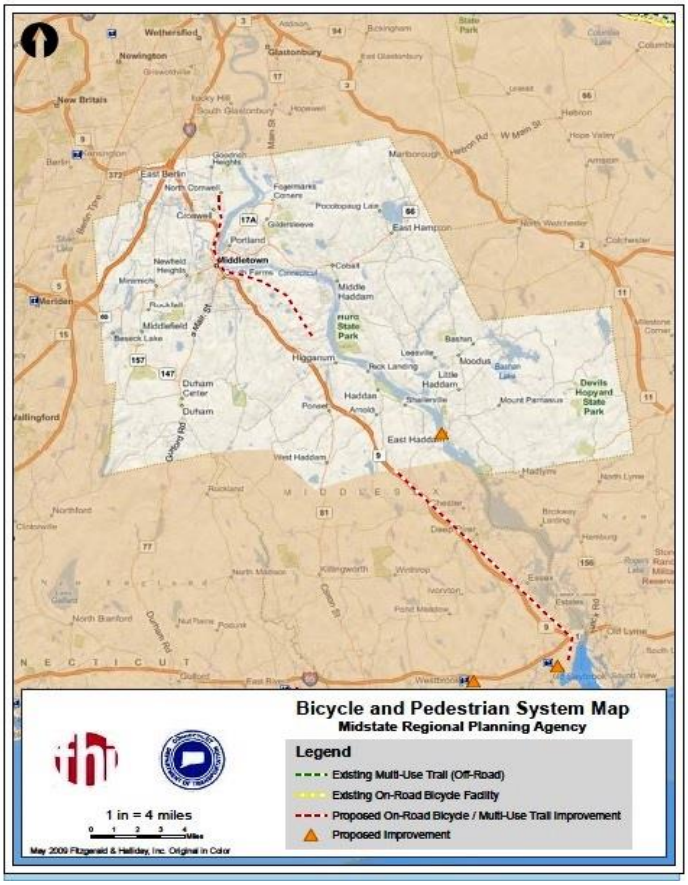
3.11.2. On-Road Bicycle Facilities

On-road bicycle facilities are shared with motor vehicle traffic and may include lanes specifically designated for bicycles or shared lanes. Although the Connecticut Statewide Bicycle and Pedestrian Transportation Plan does not specifically designate any of the roads in Durham as on-road bicycle routes, the town should advocate for bicycle-friendly accommodations being considered in design and for implementation where state and local roads are planned for reconstruction or improvement. This would be especially true if such state and local roads are designated as bicycle routes. Obviously, it would need to be determined if such bicycle improvements constituted a disproportionate segment of the total cost and were, therefore, cost-

prohibitive. These accommodations could include the construction of paths that are dedicated to bicycles and other non-motorized vehicles, increased roadway shoulder widths, and traffic controls. Specific criteria for improvements might include the following:

- An exclusive bike lane can be designated if five feet of roadway can be dedicated to this purpose. Bicycle lanes should always be one-way facilities and carry traffic in the direction of adjacent motor vehicle traffic.
- If the pavement width is insufficient for exclusive bike lane(s), bicyclists can be accommodated in the shoulder (desired width: four feet) or wide curb lanes (minimum 12 feet).
- Pavement in the bike lanes or shoulder areas should be smooth and free of irregularities.
- Manhole covers and drainage grates should be located outside of cyclists' path to the extent possible or available bicycle-friendly designs should be utilized.
- Bicycle facilities should be designated with appropriate signs and pavement markings. Improving bicycle facilities and increasing bicycle use is a national and state priority and funding for bicycle projects is available under numerous federal programs administered by ConnDOT through the regional governments. ConnDOT has published a statewide plan for development of these facilities.

Support of bike friendly shared roadways, bike lanes, wide shoulder lanes, shoulder bikeways, signed bicycle routes, off road multi-use paths, trails, and greenway corridors for bicycle and pedestrian use should be a priority for recreational, personal business, and commuting purposes. Benefits from such projects include more than reduced roadway congestion, environmental and personal-user benefits. Several studies have shown an increase in the value of properties located near trails and greenways; which can result in increased local tax revenues. Resident and visitor facility users patronize local businesses such as food, lodging, and other recreation-orientated establishments. Surveys also show that trails and greenways improve the quality of life in a region and quality of life factors are important in business and corporate relocation and retention decisions.



Education and enforcement will also help to achieve regional bicycling and pedestrian goals. It is important to remember that bicyclists and motorists most often have to share the same roadways. To insure the safety of both users it is beneficial promote bicycle safety to bicyclists and motor vehicle operators. This can be accomplished through a variety of methods; including education and enforcement.

3.11.3. Off-Road Bicycling Facilities

Off-road bicycling facilities include bike parks, bike paths, and multi-use trails; these may or may not be shared with pedestrians, in-line skaters, and other non-motorized forms of transportation. The Connecticut Bicycle Map, revised by CTDOT in 2009, shows state highways recommended for bicycle routes within the state. The map shows roads

designated as “least suitable” through “most suitable” in five varying degrees for cycling, cross state bicycle routes, and other pertinent information for cyclists. Although the Connecticut Statewide Bicycle and Pedestrian Transportation Plan does not designate any locations in Durham as off-road bicycle routes, the town should advocate for the construction of off-road bicycle parks and trails in appropriate locations. Mountain biking, the sport of riding bicycles off-road over rough terrain on specially designed bikes, has become a very popular activity. The town currently permits mountain biking on the trail located on its open space parcel on Pisgah Mountain. The town should identify and publicize other locations in Durham where mountain biking activities are supported.

3.11.4. Sidewalks and Crossways: Ensuring Safe Pedestrian Access

Every trip starts and ends with walking, yet many streets have no sidewalks or inadequate or absent controls to allow pedestrians to cross safely. Sidewalks and crosswalks are both a matter of convenience and safety for pedestrians.

In addition to serving adjacent land uses, sidewalks should connect facilities, such as schools, public buildings, parks and other recreational areas, as part of an integrated network. Continuing the extension of existing sidewalks in key locations will encourage more pedestrian trips and allow these trips to be made more safely.

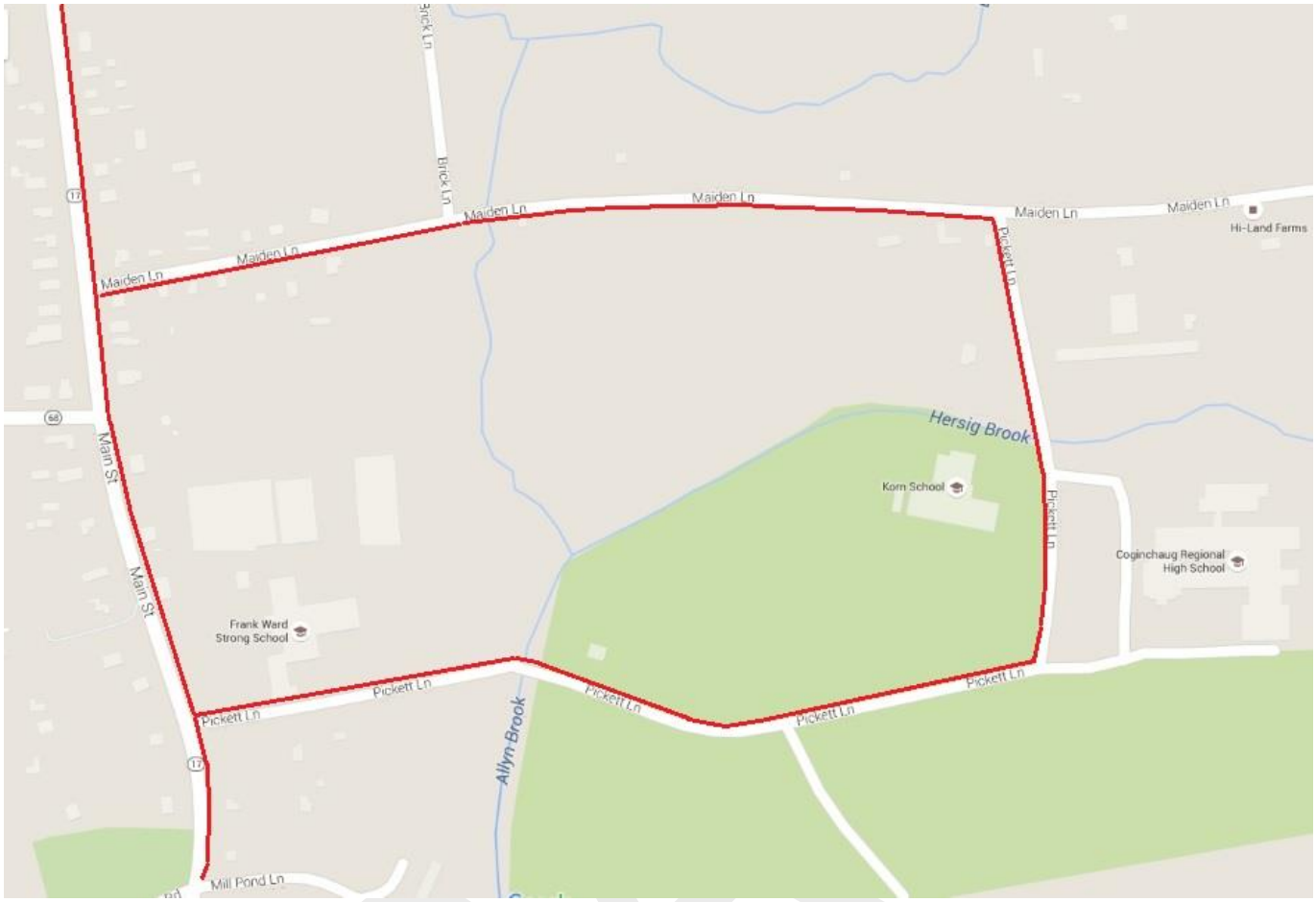
Sidewalks exist in some parts of the town; one of the most frequently used is the sidewalk that runs along the east side of Main Street (Rt. 17) in the town’s Historic District. This sidewalk was recently upgraded (along with appropriate lighting); however, the sidewalk along the west side of Main Street is in poor condition and should be similarly upgraded and illuminated.

Crossings require additional safety elements. Although a number of crosswalks exist on Durham’s Main Street (Rt. 17), the high volume of vehicular traffic (20,000 cars per day or more) poses complexities to safe crossing.

Many of Durham’s sidewalks and crossings are not easily accessible, due to differences in the elevation of the sidewalk and the neighboring roadway (curb height). Unless corrected, this impediment may limit the ability to travel for some persons, particularly those in wheelchairs or having other disabilities. The town should form a committee to identify obstacles to access for persons with disabilities and advocate that the transportation system be modified to accommodate wheelchair access.

In order to promote safe, healthy, and enjoyable non-motorized transportation options for the town’s residents, the implementation of the following sidewalks and bicycle/ pedestrian pathways is encouraged:

- The addition of crosswalks across Route 17 (multiple locations)
- Sidewalks along both sides of Route 17 (Main Street) from the Route 17/ Route 79 intersection north to the Middlefield town line
- A bicycle and pedestrian loop that runs from Tour 17 (Main Street) easterly along Maiden Lane, then southerly and westerly along Picket Lane, and finally returns to Route 17 (Main Street) as shown on the following map.



Proposed Bike Ped Loop

3.12. Traffic Studies

3.12.1. Route 17 Corridor Study (1994)

The former Midstate Regional Planning Agency (MRPA), in cooperation with Maguire Group Connecticut, Inc. and its sub-consultants Fitzgerald & Halliday, Inc. and VN Engineers, conducted a corridor study along Route 17 in Durham and Middletown in 1994. The Route 17 corridor study area was defined from the North Branford/Durham town line to the Route 9 entrance ramp in Middletown.

In September of 1994 the former Midstate Regional Planning Agency also produced a Regional Transportation Plan for the Midstate Region. This plan defined the Route 17 Corridor from the Route 17/Route 77 intersection north, as a roadway that was approaching over-capacity. It concluded that if the trend continued without making physical improvements, the capacity constraints would worsen and extend to adjacent roadways.

These studies resulted in a Master Plan to guide local and state officials in designing short-and long-term traffic improvements to lessen congestion along the corridor. A ten-member advisory committee consisting of local officials, business owners, and residents from each town helped develop the study's goals and provided additional insights regarding the issues along the corridor.

The objective of the corridor study was to produce two products, a Transportation Master Plan and an Access Management Plan, and included management strategies and major transportation improvements required to accommodate future travel demands along the corridor. The Access Management Plan was

developed to preserve the existing capacity and extend the life of the roadway through capacity and operational improvements; such as design changes, land use controls, curb cut management and signal revisions.

The overall goal of the corridor studies was to provide direction for future transportation and land use planning with a focus on improving both safety and efficiency throughout the Route 17 corridor. A more refined set of goals and objectives was developed with information from the corridor Advisory Committee (AC). These corridor-specific goals included:

1. Provide a safe and efficient transportation system
    - Maintain acceptable traffic flow (level of service) along corridor and improve safety for various transportation modes
    - Plan for appropriate access to current and future land uses

2. Sustain quality of life
    - Minimize disruption to natural, social, and aesthetic environments

3. Be feasible and affordable
    - Minimize construction and maintenance costs
    - Maintain consistency with regional goals and plans

4. Additional goals developed by the AC:
    - Explore alternate modes of transportation (especially pedestrian and bicycle alternatives to use of single-occupancy vehicles)
    - Improve safety, circulation, and signage for pedestrians and bicycles
    - Improve traffic signalization and signal coordination
    - Investigate traffic-calming strategies
    - Discourage use of inappropriate alternate routes (short-cuts) to avoid Route 17 traffic
    - Manage speeds and high volumes throughout the corridor
    - Investigate strategies to improve access and circulation
    - Implement comprehensive curb cut planning
    - Evaluate parking impacts and opportunities for on-street parking and traffic calming to benefit local businesses

Several specific problems, issues, and areas of concern were also noted by the AC for Durham. These included:

- Alignment problems and safety concerns noted in Coe Road vicinity
- Route 17/79 intersection safety concerns due to roadway geometrics
- Main Street high traffic volumes and many curb cuts compromise safety
- Any proposed improvements on Main Street must consider its historic character
- Route 68 to Route 147 turning lanes; "cut-throughs"; general safety concerns
- Traffic signal sequencing and coordination (several locations in the corridor)
- A portion of the state-owned right-of-way accessing 4-5 houses, north of Old Cemetery Road, is not being adequately maintained by the state

The Route 17 corridor team and AC addressed the goals and issues presented above as an integral part of study tasks related to data collection, analysis, and selection of alternatives.

3.12.1.1. Existing Conditions

Connecticut State Route 17 is a primarily a north-south arterial serving Durham, Middletown, and the south-central part of the state. In busier areas along the corridor, such as the intersection of Route 147 in Durham, additional lanes are provided to accommodate turning vehicles in areas that typically experience heavier traffic volumes.

Under current conditions, drivers experience frequent delays, especially during peak commute hours. Several factors contribute to congestion and delays. While volume is part of the problem, congestion in certain areas has been traced to conditions such as inadequate signage or signalization, lack of turning lanes, or poor driveway and side street alignments that hamper free traffic flow. Implementing minor physical improvements and/or roadway and access management strategies can ease many of these types of congestion factors. Addressing these strategies was a primary focus of this study.

The analysis showed many intersections are operating at a poor level of service in either the morning or evening peak period, or both. In Durham, Routes 79 and 68 operate poorly due to the delay that vehicles experience due to the high volumes of traffic that are sharing lanes. The Route 17 intersection with Fowler/Maple Avenue operates poorly northbound in the a.m. peak period, and southbound in the p.m. peak period; likely a result of inadequate lane capacity to meet the demand of commuter traffic. The Route 17 intersection with Haddam Quarter and Route 147 operate very poorly, and vehicles entering these intersections experience significant delays. The Route 17 intersection with Maiden Lane operates at a poor level of service due to vehicle delays encountered while waiting to enter the flow of traffic on Route 17.

3.12.1.2. Environmental Constraints

Transportation improvements frequently have the potential to impact the natural and built in environment. The most significant environmental resources along the Route 17 corridor in Durham are historic resources and wetlands. Durham's Main Street is listed on the National Register of Historic Places as a historic district. Most of the architecture is 18th century colonial. There is a stone arch bridge over Allyn Brook that was preserved when the modern bridge was rehabilitated. Other historic homes can be found near Route 79 and farther south on New Haven Road.

Allyn Brook is a natural resource located near Old Cemetery Road. There are also several small stream crossings and wetland areas along Route 17. To the west of Route 17, there is a large wetlands called the Durham Meadows. Four animal and one plant species at Durham Meadows are on the state's list of rare, endangered, or threatened species.

3.12.1.3. Problems and Needs

Following an analysis of existing corridor conditions based on the available data sources, field observation, and information from the Advisory Committee, several distinct areas have emerged as particular areas of concern. Specific problem areas were identified based on safety, geometrics, pedestrian movement, land use and zoning, levels of service, access issues, and other pertinent factors. Where multiple problems were confirmed at a single location or area, or where roadway and/or access problems were considered particularly severe, the sites were determined to require a detailed alternatives evaluation.

Three such areas were identified in Durham, including the primary business areas. The three areas are:

1. Routes 17/79/77
2. Main Street from the Routes 17/79/77 Intersection to Route 147/Haddam Quarter Road (includes Fowler/Maple, Route 68 and Maiden Lane intersections)
3. Route 147 and Haddam Quarter Road Area

Within these business areas, multiple intersections exhibit capacity and/or geometric problems however, each individual intersection should not be viewed in isolation of other nearby conditions. To achieve a more meaningful analysis the more densely developed areas in Durham were considered as a single area, for purposes of developing potential alternative scenarios. Other areas along the corridor have also been identified as having specific safety or access problems. The relative need for improvement may be just as great in these areas, and they were also the subject of future analysis.

3.12.1.4. Future Traffic Flow

An analysis of anticipated future conditions in the Route 17 corridor was performed to identify problems and needs that are likely to occur or persist in the future. Daily trip generation figures from CTDOT's state transportation model, based on factors such as population and employment, were consulted to estimate rates of growth in traffic. Presently, traffic growth is anticipated at a 1.5% growth rate per year in this study area until the year 2020. This is equivalent to a 30% increase in traffic from 1997 to 2020.

Future traffic volumes, turning movements, and patterns of vehicular use were estimated and characterized using the peak hour traffic counts taken in May and June 1997 as a baseline condition. Data was adjusted utilizing CTDOT's 2020 forecasts estimating future traffic volumes, turning movements, and levels of service. Further analysis of these figures with respect to current local zoning and developable acreage within Durham and Middletown provided the maximum development scenario. This scenario considered the localized effects of projected traffic increases if each parcel within the area were developed to its full potential under current regulations.

The Connecticut Department of Transportation model produced daily trip estimates for different trip purposes based on such factors as population, employment, vehicles per household, and regional and state transportation plans. Projected variables such as population and employment were compiled by the State Office of Policy and Management (OPM), and were added to the model to project daily traffic flow. Future estimated turning movement volumes for both the morning and evening peak hours were obtained from CTDOT for the year 2020.

3.12.1.5. Future Level of Service

A capacity analysis was done at the eleven key intersections in Durham using the projected p.m. peak hour traffic volumes. A roadway's capacity reflects its ability to accommodate a moving stream of traffic. The capacity of an intersection is defined in terms of Level of Service (LOS), which is based on the average stopped delay per vehicle and expressed in an alphabetic scale of "A to F".

Six of the intersections with Route 17 were identified as having a poor Level of Service. These included Route 17 and Route 79, Fowler/Maple Avenue, Route 68, Maiden Lane, Haddam Quarter Road, and Route 147. In general, an intersection experiencing a poor level of service under existing conditions, will continue to deteriorate further if no improvements are implemented.

Results for future year 2020 show that two additional intersections will experience poor LOS's in future years. These intersections include School House Lane/Howd Road and Old Cemetery Road in Durham. There are also intersections identified as currently having a poor LOS for one or more movements (turning

or through); these are expected to function poorly for additional movements in the future; and include Route 79, Fowler/Maple Avenue, Route 68, Maiden Lane, Haddam Quarter Road, and Route 147.

3.12.1.6. Intersection Improvement Options

A series of suggested improvements directed at improving traffic flow along the corridor were identified. Where a poor LOS was shown based on projected traffic volumes, additional turning or through lanes, or adjustments to signalization has been suggested to improve LOS.
At some intersections it was not necessarily high traffic volume that was responsible for the inefficiencies in turning movements and traffic flow. For example, a poor LOS was identified at several un-signalized intersections; not because of the volume of traffic at these intersections, because of the inability of traffic from the side streets to safely enter the main traffic flow on Route 17 in a reasonable amount of time. At these locations, a traffic signal warrant analysis was suggested (School House Lane/Howd Road, Old Cemetery Road, and Maiden Lane). A traffic signal was installed in 2014 at the intersection of Route 17 (Main Street) and Pickett Lane.

3.12.1.7. Alternative Improvement Concepts

A broad range of Alternative Improvement Concepts for solving safety, congestion, access, and other transportation- related problems in the corridor were identified and evaluated during the corridor study process. These improvement strategies address both the general concepts and the detailed intersection-level options. The list of alternative transportation improvement strategies investigated included:

1. Route 17 Bypass:

Several residents and members of the Advisory Committee believed a Route 17 bypass road would alleviate traffic congestion along the Main Street section of Durham. This concept was discussed and potential routes were evaluated, including a bypass from Route 17 south of Route 79 to Route 68.

The greatest need and benefit of this bypass would be during peak travel hours. It was estimated that upwards of 50% of peak hour vehicles could potentially use this bypass. Even at that rate, volumes of traffic using this road would not be very high. The construction of a new Route 17 bypass would also have significant impacts to the natural and built environment. Wetlands, schools, and residents would be adversely affected by the construction of the road. Based upon cost estimates from other areas of the state, a Route 17 bypass road would cost several million dollars. It has been concluded that a Route 17 bypass road was not a feasible alternative. A broader area may need to be studied to determine the regional need for a bypass. Durham may also consider facilitating the use of local, bypass roads by commuters to reduce peak hour traffic on Main Street.

2. Full Four-Lane Construction of Route 17:

A complete widening of Route 17 to four lanes was discussed. The projected traffic growth of 30% over the next twenty years could be readily accommodated by essentially doubling the capacity of Route 17. However, the expansion to four lanes was not considered, due to its significant adverse effects on town character and impacts to other natural and built resources.

3. Intersection Improvements:

The focus of the study concentrated on impacting moderate-to-large scale improvements at selected intersections. These improvements would solve most of the capacity and safety problems in the corridor, while minimizing impacts to businesses, wetlands, and the historic character of Durham. A series of intersection widening and realignments was the primary alternative being pursued in the Route 17 Corridor Study.

4. Access Management:

Access management is the process that provides controlled access to land development while maintaining an adequate flow of traffic on adjacent roadways.

The frequency of traffic accidents was greatest along Route 17 where there are conflicts between land access (driveways and curb cuts) and through traffic. Proper management of these access points can reduce conflicts and the number and severity of accidents. There are many driveways along sections of Route 17. A goal of access management is to close some driveways while maintaining property access. A reduction in the number of curb cuts must be accomplished without limiting a property owner's ability to conduct business. Moderate upgrades to intersections, a reduction in the number of curb cuts and the implementation of other mechanics of access management were determined to be the recommended options to improve traffic conditions along Route 17.

5. Travel Demand Management:

Travel demand management includes transit and ridesharing strategies that can decrease overall traffic and improve LOS. Given the primarily rural/suburban nature of the corridor, an improvement in ridesharing would be the most practical option to better manage travel demand. The creation of strategically located commuter lots would be a start toward allowing peak hour travelers to coordinate trips. There are currently no commuter lots in Durham. A site(s) located south of Durham on Route 17, 77, and/or 79 would be a preferred location for the construction of a commuter lot.

6. Land Use Planning:

Route 17 is affected by the land development activities that surround it. Growth in land development in the region contributes to increased traffic on Route 17 and the adjacent streets. Local planning and zoning efforts should be directed at managing growth within the corridor and surrounding areas that may affect the Route 17 corridor. The purchase of open space and strict adherence to protection of environmentally sensitive areas also serves as prudent land management, reducing vehicles using local roads more than would otherwise occur.

3.12.1.8. Recommendations from the 1994 Route 17 Corridor Study

As discussed above, access management was determined to be the recommended solution. An access management plan was produced as part of the corridor study. Access management techniques can be applied to existing development, contingent on approval by the individual property owners. However, it is usually more beneficial to apply access management techniques to developing or redeveloping areas. To give legal status to the guidelines recommended in the plan, the proposed changes would have to be adopted in the site plan review guidelines, zoning, and subdivision regulations.

The Access Management Plan (AMP) would create a Route 17 Corridor Overlay Zone in Durham that would incorporate access spacing standards into the land use planning and roadway design process. The plan contains guideline regulations to address the land use and access conditions that may develop in town. Provisions in the guideline regulations include: 1) Applicability, 2) Plan conformance, 3) Access spacing, 4) Number of driveways, 5) Property and subdivision access, 6) Shared access, 7) Outparcels, phased development, and multiple parcels, 8) Reverse frontage, 9) Flag lots, 10) Nonconforming access, 11) Variance procedures, and 12) Site plan review guidelines. If adopted, the regulations would help to maintain capacity on Route 17, provide reasonable access to abutting property, and preserve the character of the corridor. It would also increase safety by reducing traffic conflicts and provide a roadway access framework for future land development decisions.

3.12.1.9. Specific Intersection Improvements

Section 3.13.1.12 lists the recommended intersection improvements, selected for the problem areas with respect to criteria including cost, safety, traffic flow, and impacts to the environment and Historic District. These criteria were considered in selecting a recommended improvement alternative for each intersection. Recommended intersection improvements essentially comprise the Durham section of the Corridor Plan.

Moving from south to north, the intersection of Coe Road and Route 17 was proposed to be realigned to improve safety. The intersection of Route 17 and 77 was proposed to be improved and could be combined with other improvements at the 17/79 intersection. At the Route 17/79 intersection, the realignment of the two state roads to create a four-way intersection has been proposed. While improving traffic flow and safety, this concept also offers the opportunity for curb cut closures that will further improve safety.

The signalized intersection of Maple Avenue and Fowler Avenue with Route 17 is in the heart of Durham and its Historic District. Congestion is significant during the morning and evening rush hours. With 30% growth projected over the next twenty years, this intersection will remain a bottleneck. A trade-off of continued rush hour traffic congestion with conservation of Durham's historic character has been recommended. While moderate improvement alternatives could add left turn lanes both north and south, and improve the Level of Service conditions along Route 17, the consensus of members of the Advisory Committee was not to change the width or character of this intersection. Committee members also recommended adding raised, cobblestone-type sections to the crosswalks and speed bumps on Maple Avenue between the library and town hall.

The junction of Route 17 with Old Cemetery Road could be altered by closing Old Cemetery Road. Access for residents will continue to be provided via Maple Avenue; and the dangerous entry/exit to Route 17 would be eliminated by this proposal.

The intersection of Route 68 with Route 17 in Durham was noted as another significant area. Concerns from the Advisory Committee regarding impacts to historic properties and changes to the rural character of the town resulted in a recommendation of minor widening to formalize existing turn lanes. Again, the trade-off of not adding full travel lanes that would provide capacity during peak hours results in a less efficient level of service for the traveling public.

The offset intersections of Route 147 and Haddam Quarter Road could be relocated to create a four-way intersection with Route 17. This could solve the problem of safety and traffic congestion caused by the close proximity of these two signalized intersections. The design could be done without significant impact to business properties; however some wetland impact may occur. Access management measures including curb cut closures and consolidations could be employed with this concept.

3.12.1.10. Other Improvement Recommendations

As was previously mentioned increased rideshare and transit use would alleviate congestion along the corridor by reducing the number of single-occupancy vehicles (SOV). An increase in transit service and more aggressive marketing could help to reduce the number of SOVs. Ridesharing could be increased through a program to help employers advertise in the Commuter's Register to promote ridesharing or staggered work hours. Another way to promote ridesharing would be through the construction of a commuter lot along the Route 17 corridor. One potential site could be near the junction of Routes 77/79, where commuters from the shoreline communities could park and ride to share their commutes, or potentially farther south on Route 17.

Recommendations addressing bicycle and pedestrian travel have also been formulated for the corridor. Route 17 could be made more bicycle friendly by adding pavement markings and signing the corridor as a designated bicycle route. Where applicable, the shoulder could also serve as a safer area for bicycle traffic, if designated as such.

Pedestrian activity is a concern in the center of Durham. Sidewalks should be constructed on the west side of the street in Durham Center and designated crosswalks placed in safe locations. Removable crosswalks signs should be placed in areas of high pedestrian traffic and also used for any special events. Crosswalks should be installed for traffic calming in the Historic District and at the Notre Dame Church and Durham Pharmacy. Pedestrian phases should be added to all existing and future traffic signals.

3.12.1.11. Signal Warrant Analysis

A Signal Warrant Analysis should be performed at the intersection of Route 17 and Maiden Lane. If a signal is deemed necessary, it should be coordinated with the signal at Route 68. Signal Warrant Analysis should also be performed at the intersection of Route 17 and School House Lane.

3.12.1.12 Transportation Projects Recommended by the Route 17 Corridor Study

- State and Local Road Improvements
- Coordinated computer traffic signal system on Main Street
- Selected widening, curb cut controls, and use of traffic control signals
- Intersection realignment and construction of a left-turn lane at Route 77 and Route 17
- Realign Route 68 at Maiden Lane
- Realign Haddam Quarter Road at Route 147 with Route 17
- Reconstruction of Skeet Club Road (Route 157) at Railroad Bridge
- Pent Road and Route 68 Improve Line-Of-Sight
- Realign Route 17 at Route 79 and Higganum Road
- Realign Route 17 at Coe Road
- Close access to Route 17 from Old Cemetery Road
- Widen pavement on Route 17 at Route 68

Upgrade Local Bypass Roads

- Pent Road
- Parmelee Hill Road
- Meeting House Hill Road
- Saw Mill Road
- Tuttle Road
- Sand Hill Road
- Maple Avenue
- Fowler Avenue
- Cherry Lane

Drainage Related

- Guire Road over Herzig Brook
- Parmelee Road Bridge over Parmelee Brook
- Coe Road over Parmelee Brook
- Creamery Road over Coginchaug River

- Stagecoach Road over Parmelee Brook

Access Management

- Incorporate access management into zoning regulations
- Close curb cuts and provide rear access at Route 17/147/Haddam Quarter Road

Other

- Reconstruct “S” curve 2000’ east of Cherry Lane on Higganum Road
- Guide rail barrier replacement
- Conduct feasibility study of commuter lot near Routes 17/77/79
- Remove crosswalk at Maiden Lane
- Install additional crosswalks in Historic District
- Install tinted concrete sidewalks on Main Street

3.13. Transportation Projects Recommended by the Regional Plan of Conservation and Development

The following list of projects is taken from chapter 6 of the 2015-2014 Long Range Regional Transportation Plan of the Lower Connecticut River Valley Council of Governments (LCRVCOG), which is the Metropolitan Planning Organization (MPO) for the region.

- Road/bridge improvements on, Higganum Road, Cherry Hill Road, Foot Hills Road, Johnson Lane, Maiden Lane, and Parmelee Hill Road, RT17, RT 77, RT 79, RT 147, RT 157
- Route 17 intersection improvements at RT 68 (widen for bypass), and intersection improvements at RT 147/Haddam Quarter Road (realignment)
- Route 157 intersection improvements at RT 68
- Parmelee Hill Road intersection improvements at Tuttle Road, realignment and reconstruction
- Route 147 Intersection improvements at Cherry Hill Road and Maple Avenue
- Route 17 intersection improvements at Route 79, Fowler Avenue, realign Coe Road, realign Route 77, and realign Route 79 to create a four-way intersection at Higganum Road
- Evaluate the potential for a bypass route to maintain the town’s character and address the inter regional; traffic north/south traffic patterns
- Old Cemetery Road close access to Route 17 to connect to existing driveway and create parking near the historic bridge
- Route 17 bicycle route signs and pavement markings
- Route 17 pedestrian access improvements such as sidewalk extension to Route 147/Haddam Quarter Road and between Route 79 and Old Cemetery Road (west side), Maiden Lane crosswalk removal, textured crosswalks in the historic district, and removable crosswalk signs when heavy pedestrian use is expected.

3.14. Goals

- The town should advocate that where state and local roads are planned for reconstruction or improvement, bicycle-friendly accommodations should be considered in the design.
- The town should pursue the development of bike parks, bike paths, multi-use trails, and off-road bicycle parks in appropriate locations.
- Roadway and Subdivision regulations should be updated to include requirements for Pedestrian and Bicycling trails and routes for non-motorized vehicles.
- Promote bicycle safety to bicyclists and motor vehicle operators.
- The town should promote itself as a "central hub" for bicyclists. Durham can be seen as a "gateway" to much of the region's beauty and activity due to the large number of state highways that intersect in and traverse the town. This can also facilitate tourism.
- The town should implement features that are consistent with the Connecticut Department of Transportation Complete Streets Policy No. EX.O.-31 and in accordance with Connecticut General Statutes 13a-153 f (a)(d) and Public Act 09-154.
- The sidewalks along the west side of Main Street should be widened and upgraded with appropriate illumination and features that facilitate wheelchair access. Where sidewalks within the town are not continuous, options should be developed for their interconnection.
- In order to promote safe, healthy, and enjoyable non-motorized transportation options for the town's residents, implementation of the following sidewalks and bicycle/ pedestrian pathways is encouraged:
    - The addition of crosswalks across Route 17 (multiple locations)
    - Sidewalks along both sides of Route 17 (Main Street) from the Route 17/ Route 79 intersection north to the Middlefield town line
    - A bicycle and pedestrian loop that runs from Route 17 (Main Street) easterly along Maiden Lane, then southerly and westerly along Picket Lane, and finally returns to Route 17 (Main Street)
- The town should form a Complete Streets Committee that will serve as an advocate for Bicycling/Pedestrian-related issues and identify obstacles to access for persons with disabilities.
- In order to preserve its historical character, the town should consider limiting high traffic commercial development within the Historic District.
- The town should maintain the existing roadway network, while preserving the historic, aesthetic, and environmental resources located along Durham's streets.
- The town should promote energy-efficient transportation alternatives to the single occupancy vehicle, through ridesharing and similar initiatives.
- The town should promote flexible roadway and land use design standards to reduce adverse aesthetic and environmental impacts to the community and prevent traffic congestion within the community.
- The town should cooperate with federal, state, and regional agencies, interest groups, and the public in the transportation planning process.

CHAPTER 4.0
Historic District

4.1. Introduction

Durham today, retains much of the old New England charm that, in colonial times, moved stage riders on the Boston-New York route to remark about its exceptional beauty. The town's many fine Colonial and Victorian homes are enhanced by the natural beauty of the Coginchaug Valley. These homes situated along Durham's long, tree-lined streets and around the handsome 18th century Town Green reflect the history and culture of a unique, rural Connecticut village. The neighborhood around the Town Green and along Main Street is a source of community pride and lends a sense of place and identity to Durham.

Unfortunately, periods of rapid urban development have usually meant sacrificing historic and architectural landmarks to make room for new land uses. In the last sixty years alone, it is estimated that Connecticut has lost, due to fire, negligence, population increase, shopping centers, and new highways, well over 50 percent of its historic sites and structures.

Durham has maintained its unique sense of place and care needs to be taken to ensure appropriate development so as to prevent similar losses today. A number of structures have already been lost including the well-known Swathel Tavern that in its day served George Washington, General Lafayette, and Silas Deane. In the late 1960s concerns existed that other valuable buildings might be lost unless a mechanism with appropriate controls was implemented. To this end, on June 25, 1973, electors of the town of Durham passed the Historic District Ordinance, which created the Historic District and the Historic District Commission; with an effective date of July 17, 1973.

The town's Historic District is the "Face of Durham." It largely defines our town, and serves as an attraction to the writer, the artist, the photographer, the architect, the historian, and the general tourist who is becoming more aware of the architectural and historic past.

4.2. Historic District Commission

The town has an active Historic District Commission (HDC) comprised of residents whose homes are located both in the district ("in-district members") and outside the district ("out-of-district" members). The purpose of the Historic District Commission is to preserve and protect Durham's architectural and historic heritage. In this way, future generations will also be able to experience the old New England atmosphere that, since colonial times, has made Durham an enjoyable and attractive place to live. By retaining elements of its past Durham acts as an inspiration to the present and future.

The Historic District Commission offers the following benefits to the town:

- Protects the heritage of hundreds of years of historic and architectural achievements.
- Stabilizes and enhances real estate values, both within the Historic District and throughout the entire town.
- Provides assurance to residents, property owners, and those contemplating purchases of property that nothing can be built or altered in a way that might detract from the historic and architectural qualities that have made the district attractive.
- Assures the permanence of the town's architectural heritage and encourages the owners of the properties located within the district to improve the appearance of their properties and increase civic pride in the district.

- Encourage residents to seek additional improvements such as better traffic and parking conditions, improved conditions for pedestrians and cyclists, more shade trees, cleaner streets, more attractive, period-appropriate lighting, etc.
- Lessens the chance of deterioration in the future.
- Focuses attention on the Historic District and increases its importance to its residents and the community.
- Provides a sense of place and identity, and encourages a sense of community and personal interaction.

4.3. Certificates of Appropriateness

The Historic District Commission regularly conducts architectural reviews for appropriateness of materials and construction practices used during alteration or new construction of buildings located within the district in accordance with C.G.S Section 7-147a. An Application for Certificate of Appropriateness (APCOA) is has been submitted to the Commission and a Public Hearing is held prior to deliberation by the Commission. If approved, a Certificate of Appropriateness (COA) is granted by the Commission. The Commission cannot consider interior arrangement, usage, or the color of exterior paint.

4.4. Analysis of Land-Use Pattern, Planning, and Architecture in the Historic District

The physical-spatial development of Durham is, as in the case of its history, inseparable from certain key socioeconomic factors. The architecture, planning, and land use pattern of Durham are closely related to the town's history.

4.4.1. Land Use Pattern and Planning

The existing land use pattern in Durham is the result of two basic influences: 1) the plan implemented by the early settlers and 2) the agricultural economic base of Durham during the 18th and 19th centuries. The street system, the location of the Town Green and Old Burial Ground, and the clustering of houses along Main Street all date back to the first few years of the 18th century when the settlers designed the "Town Plan." Within this layout, Durham's agricultural economic base functioned successfully for over 200 years.

Land in Durham was originally distributed according to the "mode adopted in Guilford." A settler had a home lot of six or eight acres upon which he lived, while the principal part of his land was elsewhere in Durham, sometimes at a distance. The settlers' houses were clustered in the center of the Town around the Green for mutual protection, while their fields were located in the outlying sections. Some settlers lived on their farms and hence gave up the protection of close quarters.

As Durham grew from a population of 34 in 1708, to 1,076 in 1776, the six- to eight-acre individual lots were subdivided as more and more houses were clustered onto Main Street. During this same period, a group of wealthy planters emerged who either through inheritance or success as agriculturalists assembled large tracts of land. These "estates" tended to have large homes and, in some cases, cottages for tenants who were hired by the owner as laborers.

The Elnathan Chauncey Homestead, which covered most of the area east of Main Street, from Higganum Road to Allyn Brook, is Durham's best existing example of a Colonial planter's estate. A tenant cottage (the Lincoln Grant House), which was once occupied by a laborer, is located a short distance from the large, rambling Chauncey Homestead (Lylean B. Field House).

Another estate that covered a large area west of Main Street from Wallingford Road to Talcott Lane was the John Swathel Estate. The ornate Colonial home which stands on Maple Avenue attests to the life style

of this planter. Much of the land that was once within this estate was subdivided for residential development.
The land use pattern along Main Street also reflects the agricultural economy of early Durham. The open fields behind these houses were once used for crops and livestock by the residents. The Squires-Scranton House (corner of Main Street and Talcott Lane), which still has an adjoining barn and garden in the rear, most approaches the pattern of land use in the 18th and 19th centuries.

The open spaces that once existed between the Colonial homes on Main Street have been gradually filled in by later construction. The fields behind these homes that were originally used for agricultural purposes, now lie fallow, at most serving as grazing or pasture land for a small number of livestock. Development has found its way into these areas.

As discussed earlier, the original Durham plan laid out by the settlers in the first few years of the 18th century has survived remarkably intact over the years. Two elements of this plan that are particularly noteworthy are the Town Green and the Old Burial Ground. Both were laid out as public areas from land donations by the early proprietors. The Green is an excellent example of 17th century Connecticut town planning. It is the focal point of the Town and was originally used for military exercises, as a common grazing area, and as a location for civic buildings such as meeting houses, churches, and schools. Its function as a civic area survives to this day with the Town Hall, Post Office, and Library all situated near the Green. In the fall, the Green serves as the location of the Durham Fair and in spring and summer serves a popular farmers market.

The Old Burial Ground contains an interesting collection of tomb stones dating back to 1712. The stones are primarily brownstone and most were quarried and produced in Durham.

4.4.2. Architecture

Most of the architecture in Durham is of the Colonial period. However, as will be shown, there are a number of very valuable 19th and early 20th century buildings.

The houses of the Colonial Period generally reflect the agricultural economy and the isolated location of Durham. The size and ornamentation of these homes varied according to the financial position of the owner, with the largest and most ornate homes belonging to the wealthiest planters. In general, Durham's Colonial homes, although large in size, generally lacked the fine Georgian and Baroque details that are found in other areas of the state, such as Wethersfield. This seems to be due to the fact that Durham was isolated and lacked the economic base and size to support the skilled artisans needed to create the more avant-garde designs. Three Colonial-style homes that are the exception to this rule, and that portray interesting Georgian detailing include the Elizar Hall House, the John Swathel House, and the Elizur Goodrich House.

The significance of religion in the lives of Durham's early citizens is evident from the number of religious buildings constructed. In addition to the Episcopal Church and the United Church, the Town Hall and the Durham Grange buildings also served as churches. With the exception of the Episcopal Church, all of these structures are in the Greek revival style. The United Church is the town's best example of this style.

The Episcopal Church is one of Durham's outstanding 19th century Victorian structures. It is a Country Gothic building patterned after the designs of Richard Upjohn. Another good example from the Victorian Periods (Mid-Century and Post Civil War) is the Squires-Scranton House, a large Italianate building with an interesting Italianate barn.

Durham's best examples of early 20th Century architecture are the Public Library and the Ronald Conway House. The library, built in 1901, is Prairie style, after the buildings of Frank Lloyd Wright. The Elmer Crowell House is a good example of the Bungalow style common during the 1900-1930 period.

Two clusters of buildings that are outstanding for their consistent architectural quality and pleasing arrangement are: the buildings around the Town Green and the buildings in the vicinity of the United Church. The traditional communal Green and the well-kept Colonial, Greek revival, and Federal buildings around it create a picturesque composition of early Connecticut architecture and planning. The United Church and the houses adjacent to it are the town's greatest concentration of the Greek revival style. The Colonial Houses near this concentration make a pleasant and varied arrangement.

One of the problems facing Durham's 18th and 19th century architecture is neglect. There are a number of old buildings in Durham that are in danger of becoming structurally unsound or unsightly due to deterioration. It would be unfortunate to lose these buildings, many of which, if faithfully repaired and restored, could make fine contributions to the town's collection of architecture. Unfortunately, once such a building is lost to demolition, it can never be replaced.

It takes only a few deteriorating buildings to seriously impair the character of an area. The greatest care should be taken now to protect the valuable 18th and 19th century buildings in Durham, particularly those buildings in the two clusters.

4.5. Goals

- The Historic District Commission, in conjunction with the town, shall endeavor to educate both existing and new Historic District property owners on the importance and need to file an *Application for Certificate of Appropriateness* (APCOA) and receive a *Certificate of Appropriateness* (COA) prior to making alterations or additions to their properties.
- The Historic District Commission shall work to encourage owners of properties located within the district to maintain the appearance of their property to assure the permanency of the district's architectural heritage.
- The Historic District Commission shall work with the town and property owners within the district to install architecturally appropriately enhancements such as street lighting, sidewalks and shade trees.
- The Historic District Commission shall encourage community events on the Town Green and within the district to build support for historic preservation efforts and to cultivate pride and a desire to protect our heritage.
- The Historic District Commission shall encourage the preservation of historic residential properties in their use as private homes.
- The Historic District Commission shall preserve the overall character of the Historic District to ensure Durham remains a unique place, attractive to both residents and businesses.
- The Historic District Commission shall support the present commercial interests in the Historic District while sustaining the historic structures and small town New England character.
- The Historic District Commission shall consider the establishment of a consistent style of signage for businesses located within the district.
- The Historic District Commission shall encourage town or private acquisition of threatened structures to prevent destruction, including demolition by neglect.

Chapter 5.0
Environmental Protection and Conservation

5.1. Introduction

Woodlands, meadows, farms, wetlands, ponds, and streams collectively comprise the open space that plays such a large role in depicting the character of Durham. Almost all of us are delighted that these lands provide a refuge for a diverse population of animals and plants that otherwise would not exist in more densely developed habitat. Many citizens also enjoy the recreational opportunities open space provides - hiking, fishing, hunting, skating, golf, and other sports. We should also be aware of the important and essential relations that exist between open space preservation and water supply, water and air quality, and flood mitigation that affect our health, safety, and welfare. These factors are sufficient reasons to conserve open space, but there is also an economic benefit. A recent study has determined that most developed land is more costly to tax payers than undeveloped open space; as the town spends more on services than a resident pays in taxes. The protection of open space can benefit landowners in the form of lower taxes and increased land values.

A principal objective of this plan is to conserve and protect the scenic, cultural, archeological, recreational and environmental features that are important assets of Durham; both for ourselves and for posterity. The plan must also strike a suitable balance between conservation and development.

Several policies have been developed to serve as a framework for attaining this objective; the foremost being to direct development to areas most suitable for growth, and away from areas the public has the greatest interest in preserving. This requires thoughtful planning and consideration of the property rights of landowners; policies that are embodied in the towns zoning regulations. Attaining this objective also requires that the town's Conservation Commission identify areas that warrant preservation. These areas may include:

- Natural areas that are a haven for wildlife, particularly those areas that are the habitat of rare or endangered plants and animals.
- Wildlife corridors for species that prefer larger habitats to allow for the migration and interbreeding of these species.
- Farmland that represent a small vestige of Durham's agricultural heritage.

A second objective of this plan is to protect the town's water resources; including streams, ponds, and aquifers, that are existing or potential sources of drinking water. This objective can be effectively achieved by the town's Inland Wetlands and Watercourses Agency (IWWA) and the Connecticut Department of Energy and Environmental Protection (DEEP) enforcing stringent regulations when issuing permits for wetlands activities and water diversions. The Planning and Zoning Commission also has a major role in the protection of water resources, through the enforcement of zoning regulations that protect the town's aquifers and flood-prone areas.

A third objective of this plan is to provide passive and active recreational facilities for a growing population. The recreational use of existing public open space should be maintained, and, where possible, expanded. Development has already impacted hiking trails throughout Durham. The maintenance of a comprehensive system of linked trails is encouraged through subdivision review and regulations, granting of conservation easements or deeded rights-of-way, and selected land purchases. Opportunities for swimming and skating are limited and should be expanded. The Conservation Commission and Recreation Committee should jointly identify recreational needs and suitable areas for meeting these needs, and public support will be necessary to obtain the required funding.

A fourth objective of this plan is to preserve small, but unique cultural and natural features throughout the town. These include archeological sites of significant historical and/or scientific interest; major historic buildings or sites, such as cemeteries; geologic features, such as fossil locations or rock outcrops that have significant educational or scientific value; and unique biologic features such as large specimen trees. Many mechanisms exist to project these features, including the establishment of the Historic District, subdivision regulations that provide for conservation easements, and public or private purchases. Many of these features have been identified, but inventories are needed to provide more comprehensive information.

5.2. Groundwater

To determine the availability of groundwater for an area, one must first understand the elements that can influence aquifers and drainage areas. A *groundwater budget* is an accounting of the inflow, outflow, and net change in storage of aquifers within a drainage area. *Groundwater recharge* equals the total precipitation minus evapotranspiration and overland runoff. *Groundwater discharge* equals the base flow of watercourses in that drainage area, plus water leaving the area as groundwater. Changes in groundwater storage are indicated by a rise or fall in groundwater levels. Ideally, groundwater discharge should not exceed groundwater storage. The following discussion provides a rough estimate of the groundwater budget for the Durham-Middlefield half-basin. Its purpose is to obtain a basic understanding of the water flow into and out of this basin.

The Coginchaug River basin drains about 79% of the town's total surface area. This basin is approximately 31.3 square miles or 873 million square feet in area. Precipitation in the basin area is approximately 50 inches per year, for a total of 3.64 billion cubic feet of water per year. *Evapotranspiration* represents the water that is lost to the air by direct evaporation from the surface and from plant activity. Evapotranspiration is estimated to "consume" about 50% of the annual precipitation. This amounts to 1.82 billion cubic feet of water per year. *Overland runoff* is the water which moves along the surface directly to a water body. Estimates for this factor vary between 3% and 10% of the total precipitation. An average value of 6% was chosen for this calculation. This results in a runoff of about 0.22 billion cubic feet per year. Average annual recharge to the aquifers represents approximately 44% of the annual precipitation.

The gaging station at Rockfall on the Coginchaug River has recorded an average base flow of 48.5 cubic feet per second or 1.53 billion cubic feet per year. Allowing for a small amount of groundwater underflow, it appears that the total groundwater recharge is about the same as the total groundwater discharge. This suggests that the change in groundwater storage is nearly zero annually.

To estimate the storage capacity of the bedrock aquifer in Durham, the volume of the aquifer must be calculated. The area of Durham and hence, the underlying bedrock, is 23.68 square miles or 661 million square feet. The bedrock aquifer thickness is about 250 feet, the depth to which most water-bearing fractures are thought to exist. The volume of the bedrock aquifer is then, approximately 218 billion cubic feet. The storage capacity of this aquifer is simply the product of the total aquifer volume and the porosity of the rock. An average porosity of 1% is reasonable. Consequently, the storage capacity of Durham's bedrock aquifer is about 2.2 billion cubic feet of water.

The demand for water in Durham will increase as the population increases. In 2010 there were about 7,406 people living in Durham. Assuming that each person uses, in various ways, 75 gallons per day, about 27.1 million cubic feet of water would be pumped from the bedrock aquifers each year. This represents slightly more than 1.7% of the total groundwater recharge and slightly less than 1.3% of the total amount of water stored in the bedrock. These withdrawals can be considered insignificant, especially since most of this water will be returned to the aquifers through septic systems. Durham's inhabitants, therefore, are unlikely to run out of groundwater resources. However, this analysis does not account for groundwater that is or may be become contaminated in the future.

Connecticut contains two major types of water-bearing materials: unconsolidated deposits and bedrock aquifers. An *aquifer* is a geologic deposit or formation that contains sufficient saturated permeable materials to yield usable quantities of water to wells. The entire state is underlain by either sedimentary or crystalline (igneous or metamorphic) bedrock which is discontinuously covered by unconsolidated stratified drift or till deposits.

Stratified drift is the most productive source of groundwater for individual wells or wells that would serve a community or public water system. The highest yields are generally obtained from the thick coarse-grained deposits located near larger brooks and rivers. The most promising aquifer is the Coginchaug River Aquifer located north and south of Wallingford Road and west of Main Street. This aquifer was identified as a potentially good source by the 1965 Geraghty & Miller Study of Water Availability for the former Midstate region. The site contains relatively thick coarse-grained deposit, which due to its location close to the town's population center, could be tapped for public purposes relatively easily and inexpensively.

5.2.1. White Farm Stratified Drift Area

The former Durham Agricultural Fair Association wells located on the White Farm were transferred to the Town of Durham and currently serve as the source of public water supply for the Durham Center Water System, which is owned by the Town of Durham and operated by the Connecticut Water Company. The water system currently meets all water quality requirements established by the Connecticut Department of Public Health. The wells at White's Farm are expected to be abandoned once the town has been connected to the Middletown water system. This is anticipated to occur in 2018-2019. See Section 7.1 entitled Public Water Supply for more information.

5.2.2. Clark Farm Stratified Drift Area

The Clark Farm (an area west of Route 17 and south of Howd Road) is considered to be a potentially productive aquifer. A detailed seismic study of the valley was conducted, confirming the shallow depth to the water table and the depth to bedrock. This study revealed a relatively narrow, steep-walled valley that trends north-northwest to south-southeast and is filled with sediments down to depths of approximately 90 feet; however, the southern part of the site contains a thicker wedge of sediments than was predicted.
Cross sections depict an asymmetrical bedrock surface, with a steeper slope on the west section and a shallower slope on the eastern side of the brook. This asymmetry may reflect the more resistant basalts which dip eastward at an angle of about 15 to 20 degrees to the west of the fault.

Because the sediment that fills the valley near the Clark Farm is probably stratified silt and sand, and because the water table is at or near the surface, an aquifer of considerable dimension is believed to exist in the area. Estimates were made of the amount of water that could be stored in this aquifer. The average cross-sectional area was computed to be at least 100,000 square feet. Based on the depth to bedrock, the linear extent of an aquifer having depths of 50 feet or more was measured conservatively to be 3,000 feet. Using a value of 0.25 for the specific water yield of a silt and sand aquifer, the total volume of water in this aquifer is at least 75 million cubic feet, or over 550 million gallons. Should the town require additional water, further study of this area would be warranted.

5.3. Drainage Basins

5.3.1. Drainage Basins

The Coginchaug River basin drains 11,979 acres or 79% of the town's total land area. The only other basins of importance are the Sumner Brook and Hammonassett River basins. The following table presents a breakdown of the drainage basins which are located partially or entirely within the town of Durham:

State #	Name	Total Basin Size (Acres)
4001	Sumner Brook	755
4002	Unnamed	30
4802	Coginchaug River (Upper Reach)	11,979
4802.1	Sawmill Brook	2,513
4802.2	Parmelee Brook	2,940
4802.3	Coginchaug River	3,234
4802.4	Allyn Brook	3,242
4803	Coginchaug River (Lower Reach)	111
5106	Hammonassett River	2,022
5113	Pistapaug Reservoir	158
5204	Unnamed	104

5.4. Watershed Areas

There are five (5) watersheds located partly or entirely in the Town of Durham. As the table below shows, all are classified as AA waters:

Watershed	Classification	Acres
Laurel Brook	AA	75
Fowler Brook	AA	627
Hammonassett River	AA	2,022
Pistapaug Reservoir	AA	158
Sawmill Brook	AA	2,513
Total		5,395

The above watersheds constitute approximately 5,395 acres or 35% of the town's total land area. The Fowler Brook watershed should be reclassified to "A" since the brook is no longer used as a source of water supply for the Durham Center Water System, and the area of influence for its wells will likely be reclassified to "GAA." All of these areas are zoned for residential uses and do not represent a conflict with the water quality goals of the Connecticut Department of Energy and Environmental Protection.

Every five years the Office of Policy and Management (OPM) updates a statewide "Conservation and Development Policies Plan." OPM includes "potential future water supplies" as "conservation areas" and coincides with those areas currently classified as "A" and proposed to be brought to an "AA" designation. Over 2,500 acres in Durham fall into this classification and are located within the Sawmill and Parmelee Brook watersheds.

5.5. Surface Waters

Surface waters are important resources that support numerous uses, including water supply, recreation, fishing and sustaining aquatic life. The water quality conditions needed to support these uses are identified in the Connecticut Water Quality Standards (WQS). In order to protect these uses, the town requires acceptable environmental conditions (physical, chemical and biological) to be present in its surface waters. Although Durham has numerous ponds, brooks and rivers, two of its major surface water features, the Coginchaug River and Miller's Pond, are discussed more completely in the following narratives.

5.5.1. The Coginchaug River

The Coginchaug River constitutes the major surface water feature of the Town of Durham. The river is a regionally significant fishing stream, and the flood plains and marshes along the river are used extensively for hunting and other recreational activities.

As the Coginchaug River flows to the north from Guilford, its initial section is narrow, slow-moving, and modified from its natural course and vegetative composition on many areas. It meanders through a narrow valley between sedimentary and metamorphic rock near the Eastern Border fault. Areas that contain natural vegetation have a riparian zone with red maple, alder, green ash, cottonwood, elm, willow, dogwood and viburnum mixed with more upland species of sugar maple and black cherry. This riparian zone ranges from narrow 10-foot banks to more common 50-foot banks and occasionally wider forested or shrubby area. In the southern portion of the stretch, significant amounts of the riparian zone have been artificially removed. In the northern portion of this section the vegetation comprises shrubs and trees or open areas and is much broader and more expansive.

The substrate in this section is mostly shallow, silty bottom with little or no rock or vegetation in the water and little or no emergent vegetation along the edges. Fishes were seen in pools near road crossings. No mussels or suitable habitat for them were seen. In the areas surveyed, the water depth ranged from several inches to several feet.

The state-owned Durham Meadows area has been known as an important birding area for many years. In addition to having many interesting migrant birds, it also provides nesting habitat for water-associated birds. The following threats to the area were noted:

- Pollution through addition of animal feces: animals grazing within the stream bed; stables, barns, and manure storage areas easily eroded into the stream.
- Pollution through addition of fertilizer/herbicides: backyard gardens right along edge; cultivated fields of corn and squash close to the river edge; golf courses maintenance.
- Siltation through erosion: animals walking through the areas; lack of tree/shrub cover increasing the runoff into the stream; fields mowed directly to the water's edge without any buffer; new development within the watershed (across Route 77) with removal of vegetation on several steep slopes.
- Alteration of water temperature: removal of tree/shrub layer along the stream causing increased water temperatures.
- Exotic species take-over of native vegetation: small Phragmites patches.

Most of the public visual and physical access points to the river are created by roads, either their crossings of the river or their proximity to the river. At the Durham Meadows Wildlife Management Area, there is an area for vehicular parking that can be used by fishermen and hunters to access the meadows. There is also a small trail network leading from Route 17 into the wetlands. This site is one of the most popular access points along the Coginchaug.

As the Coginchaug moves past the Durham Meadows Wildlife Management Area, access becomes extremely limited. The land is often very wet, making casual hiking difficult. However, the area is used extensively by hunters, trappers, and fishermen. At Route 68 and the river, there is limited parking, which is used primarily by fishermen. From this point, the river continues its flow northward, towards the Town of Middlefield.

5.5.2. Miller's Pond

Located in off of Foothills Road in Durham, Millers Pond has been in the state's domain since 1955. The park consists of the original 30 acre pond and 170 acres of woodlands. There are numerous trails, and the lake is very popular with area fishermen. The pond is unique in that its principal source of water comes from large springs, which create a body of unpolluted water that is excellent for small mouth bass and trout.

5.6. Water Quality

The following information was assembled by the Connecticut Department of Energy and Environmental

Protection (DEEP) to help the Town of Durham better protect its watercourses. DEEP regularly conducts water monitoring across the state.

5.6.1. Water Quality Classifications

Water Quality Classifications have been compiled by the Connecticut Department of Energy and Environmental Protection (DEEP). The following table summarizes the designated uses and discharge limitations for both Inland Surface Waters and Groundwater:

Inland Surface Water Classifications	**Groundwater Classifications**
Class AA	**Class GAA**
Designated uses: existing or proposed drinking water supply, fish and wildlife habitat, recreational use (may be restricted,) agricultural and industrial supply.	Designated uses: existing or potential public supply of water suitable for drinking without treatment; base flow for hydraulically connected surface water bodies.
Discharges restricted to: discharges from public or private drinking water treatment systems, dredging and dewatering, emergency and clean water discharges.	Discharges limited to: treated domestic sewage, certain agricultural wastes, certain water treatment wastewaters.
Class A	**Class GA**
Designated uses: potential drinking water supply; fish and wildlife habitat; recreational use; agricultural and industrial supply and other legitimate uses including navigation.	Designated uses: existing private and potential public or private supplies of water suitable for drinking without treatment; base flow for hydraulically connected surface water bodies.
Discharges restricted to: same as allowed in AA.	Discharges restricted to: as for GAA and discharge from septage treatment facilities subject to stringent treatment and discharge requirements, and other wastes of natural origin that easily biodegrade and present no threat to groundwater.
Class B	**Class GB**
Designated uses: recreational use: fish and wildlife habitat; agricultural and industrial supply and other legitimate uses including navigation.	Designated uses: industrial process water and cooling waters; baseflow for hydraulically connected surface water bodies; presumed not suitable for human consumption without treatment.
Discharges restricted to: same as allowed in A and cooling waters, discharges from industrial and municipal wastewater treatment facilities (providing Best Available Treatment and Best Management Practices are applied), and other discharges subject to the provisions of section 22a-430 CGS.	Discharges restricted to: same as for A (Note; same treatment standards apply), certain other biodegradable wastewaters subject to soil attenuation.

With the exception of the Coginchaug River north of Wallingford Road, all watercourses in Durham have been designated as either Class “A” or “AA” waters. The Coginchaug River north of the Wallingford Road is classified as “B”, and is likely to remain in that classification in the near future.

5.6.2. Total Maximum Daily Loads

Total Maximum Daily Loads (TMDLs) are pollution reduction budgets developed for impaired water bodies in order to meet desired water quality standards. If the pollution budget is achieved through the recommended pollution reduction measures, then the water body is expected to meet the desired standards.

5.6.3. Water Quality Monitoring

The following information was assembled by the Connecticut Department of Energy and Environmental Protection (DEEP) to help the Town of Durham better protect its watercourses. DEEP regularly conducts water monitoring across the state. Regular monitoring for targeted pollutants in storm water provides an indication of potential water quality impacts, and helps identify pollutant sources. Annual monitoring has been conducted since 2004 at six (6) different locations throughout the town.The Connecticut Department of Energy and Environmental Protection (DEEP) used this information to evaluate the quality of the storm water and the potential impacts to surface waters.

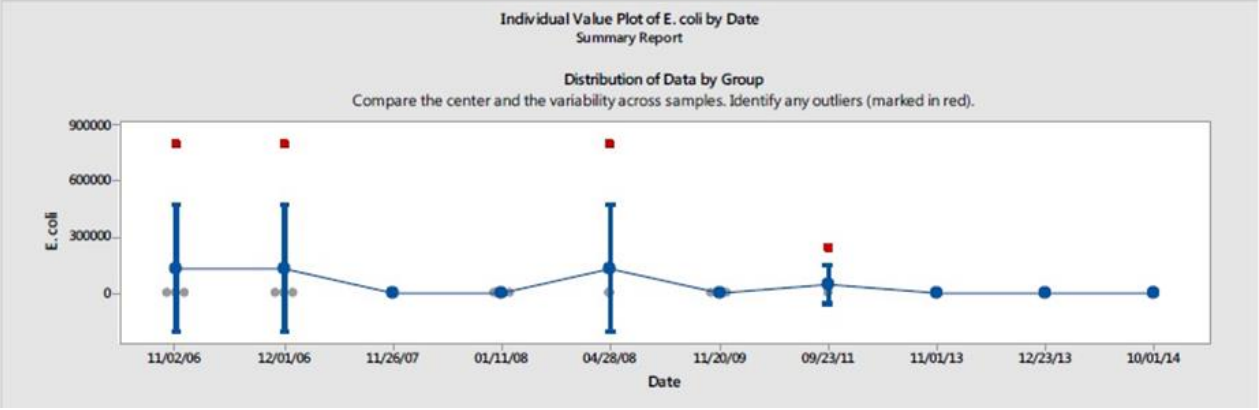
In the associated charts, individual sample results are shown in grey, while the averages of the samples collected on a particular day are shown in blue, with a line connecting the averages for the various sample dates. The bars show the statistical range of samples for each day, with the red squares showing results which were considered to be outliers (very different from other samples collected that day). The chart on the graph lists the sample dates and some basic statistics.

5.6.4. Bacteria

Escherichia coli (*E. coli*) is a bacteria that lives in the intestines of humans and other warm-blooded animals and is used to indicate the presence of fecal matter in surface waters. Some strains of *E. coli* and other pathogens found in fecal material cause serious illness to people coming in contact with them. For this reason, high amounts of bacteria will cause authorities to close beaches for swimming. Bacterium is measured as the number of colony forming units (CFU's) per 100 ml of water. Any result that was reported as "too numerous to count" is included on the chart as 800,000 CFU/100 mL.

To support recreational uses of surface waters, the DEEP Water Quality Standards indicate that the average amount of *E. coli* found in a freshwater water body should be less than 126 CFU/100 mL and that a single sample tested for *E. coli* should be less than 235 CFU/100 mL at designated swimming areas; and less than 410 CFU/100 mL in all other areas.

Results of annual stormwater monitoring under MS4 permit for *E.coli* (CFU/ 100 mL of sample)
Town of Durham



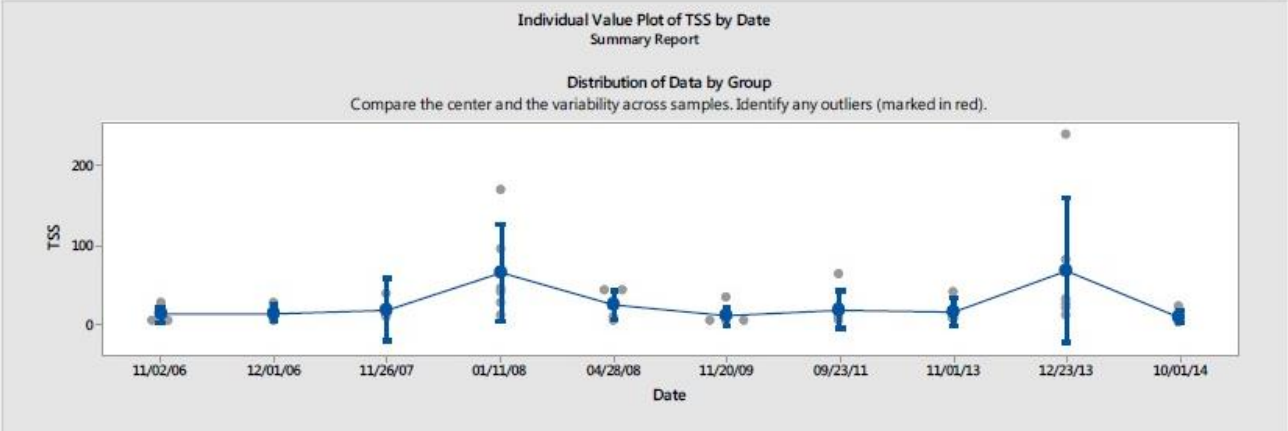
5.6.5. Total Suspended Solids

Total Suspended Solids (TSS) is a measurement of the amount of solids (including sand and silt) found in the storm water sample. High concentrations of TSS can lower water quality in the receiving stream by transporting various pollutants to the waterbody where they can directly affect aquatic life or affect aquatic life by absorbing light, reducing photosynthesis, and by making the water warmer. TSS can also clog fish gills and smother fish eggs and suffocate the organisms that fish eat. TSS comes from erosion and is found

in agricultural, urban and industrial runoff. TSS can be reduced by protecting land from erosion and allowing storm water time to settle before discharging to surface waters. Turbidity greater than 5 NTU over in-stream conditions will requires additional investigation. While there is not a fixed statewide criterion for turbidity, lower results are better for the health of the surface waters in town. Areas with higher levels of turbidity may be places to consider additional storm water controls.

Currently, there is not a water quality based target for TSS in storm water, but TSS is a general indicator of water quality; lower amounts of TSS are better. For comparison purposes, the average TSS reported by all towns is 48 mg/L. Areas within the Town of Durham that have elevated TSS levels may be places to consider additional storm water management efforts.

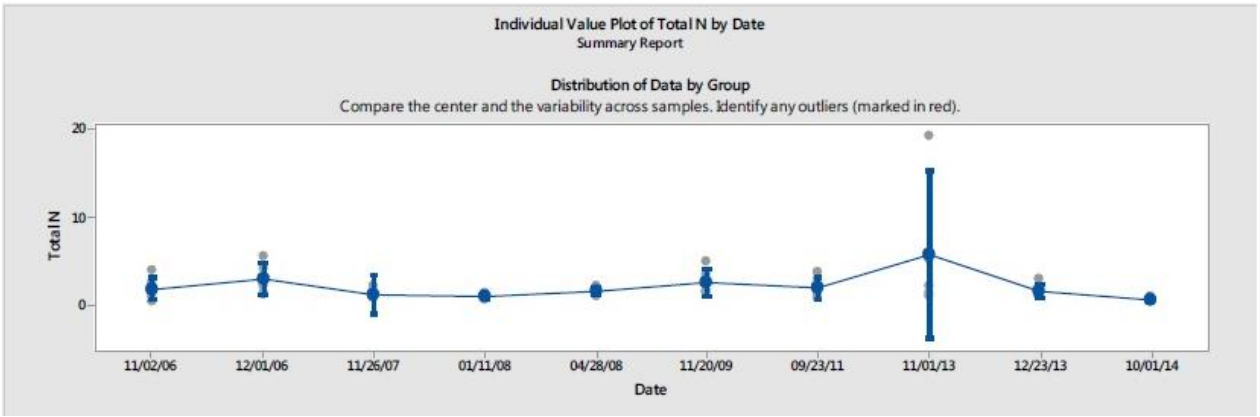
Results of annual stormwater monitoring under the MS4 general permit for TSS (mg/L)
Town of Durham



5.6.6. Total Nitrogen

High amounts of nitrogen can lead to excessive growth of water plants and algae, which reduces the amount of oxygen available to species living in these waters. Animal waste, failing septic systems, leaves, litter and fertilizers are common sources of high nitrogen. The responsible use of fertilizers, regular maintenance of septic systems and proper disposal of pet waste will help reduce nitrogen. Areas within the Town of Durham that have elevated nitrogen levels may be places to consider additional storm water management activities.

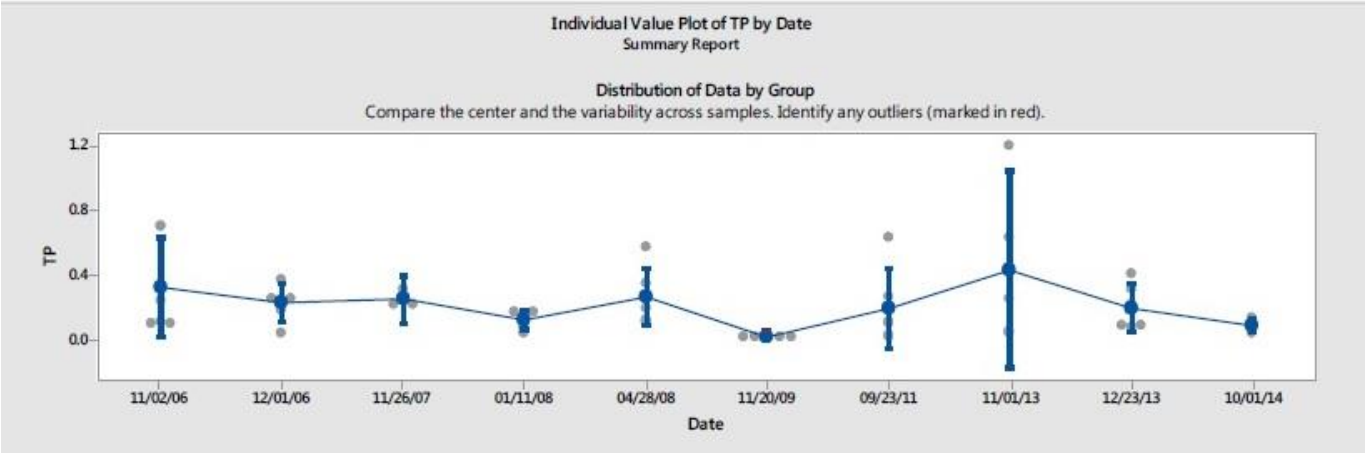
Results of annual stormwater monitoring under MS4 general permit for total nitrogen (Total N mg/L)
Town of Durham



5.6.7. Total Phosphorus

Phosphorus is an important nutrient necessary for growth in plants and animals in freshwater. Too much phosphorus in the water can throw off the balance of aquatic ecosystems causing excessive growth of water plants and algae blooms, which reduces the amount of oxygen in the water, potentially harming fish and other species. These algae blooms may contain toxic forms of algae, which can be harmful to people and animals coming into contact with these blooms. Sources of high phosphorus can include unlawful discharges, fertilizers, litter, leaves, erosion and animal waste.

Results of annual stormwater monitoring under MS4 permit for total phosphorus (mg/L)
Town of Durham



5.7. Impaired Waters

The Connecticut Section 303d Waters List (CTWL) provides for the State's evaluation of surface water bodies for restoration and protection strategies, in accordance with the requirements of Section 303 of the Federal Clean Water Act (CWA). The CWA is the primary Federal law that protects our nation's surface waters, including lakes, rivers, and coastal areas. Through passage of the CWA, the United States Congress established a national goal of restoring and maintaining the chemical, physical and biological integrity of the Nation's waters by achieving and maintaining *"water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water wherever attainable"* and preventing the discharge of toxic substances in toxic amounts (CWA Section 101).

Some water bodies in Durham have been classified as Category 4a. These water bodies are considered "impaired"; because an established TMDL exists, and a pollutant has been identified as the cause of the impairment. The following table provides test results for several of the water bodies in Durham:

Waterbody Segment ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation
CT4605-00_01	Allyn Brook (Durham)-01	Mouth at confluence Coginchaug River DS (north) of Route 68 crossing, US to INLET of Allyn Millpond at confluence of Fowler and Herzig Brooks in Allyn Brook Park (Allyn Millpond is US of Route 17 crossing and completely contained in this segment), Durham.	1.10	Insufficient Information	Not Assessed
CT4605-01_01	Herzig Brook (Durham)-01 (Brook names may cause confusion follow basin 4605-1)	Mouth at INLET of Allyn Millpond at confluence of Fowler Brook in Allyn Brook Park, US to HW US Johnson Lane crossing, Durham. (local	2.70	Fully Supporting	Not Assessed

Waterbody Segment ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation
CT4605-05_01	Fowler Brook (Durham)-01	Mouth at Allyn Millpond portion of Allyn Brook, between Pickett Lane and Fowler Avenue, US to confluence with Birch Mill Brook, just US of Higganum Road crossing, Durham.	0.82	Not Assessed	Insufficient Information
CT4606-00_01	Sawmill Brook (Durham)-01	Mouth on Coginchaug River, DS of Route 147 crossing of Coginchaug River, US to AA groundwater proposed withdrawal point, near Salted Lane, Durham.	1.53	Not Assessed	Not Assessed
CT4606-00_02	Sawmill Brook (Durham)-02	AA groundwater proposed withdrawal point, near Salted Lane, US to confluence with Asmun Brook, Durham.	0.54	Not Assessed	Not Assessed
CT4606-00_03	Sawmill Brook (Durham)-03	Confluence with Asmun Brook, US to confluence with unnamed tributary, US of Route 68 crossing, Durham.	0.90	Not Assessed	Insufficient Information
CT4606-00_04	Sawmill Brook (Durham)-04	Confluence with unnamed tributary .6 mile US of Route 68 crossing (In segment_03), US (south) to HW .4 mile US of Howd Road crossing (after crossing Howd Road brook runs parallel to road to HW), Durham. (Segment includes Carey Lowe Dam pond)	2.00	Insufficient Information	Not Assessed
CT4607-00_02	Coginchaug River-02	From downstream side of Route 3 crossing, US to downstream side of Route 66 crossing (just US of Veterans Memorial Park), Middletown.	0.75	Fully Supporting	Not Supporting
CT4607-00_03	Coginchaug River-03	From downstream side of Route 66 crossing (just US of Veterans Memorial Park), US to Starr Mill Pond dam, Middletown.	0.60	Fully Supporting	Not Supporting
CT4607-00_04	Coginchaug River (Middletown/Middlefield)-04	From Starr Mill Pond Inlet, Middletown, US (past Wadsworth Falls) to Strictland Road crossing, Middlefield.	4.19	Fully Supporting	Not Supporting
CT4607-00_05	Coginchaug River (Middlefield/Durham)-05	From Strictland Road crossing, Middlefield, US to Meeting House Hill Road crossing, Durham.	4.95	Not Assessed	Not Supporting
CT4607-00_06	Coginchaug River-06	From Meeting House Hill Road crossing, Durham, US to headwaters (US of Route 72 crossing, between Bluff Head and Broomstick Ledges), North Guilford.	3.59	Fully Supporting	Not Supporting
CT4607-02_01	Unnamed Tributary to Coginchaug River (Durham)-01	Mouth on Coginchaug River, just DS of Route 77 crossing, US to HW, US of Crooked Hill Road crossing, Durham.	0.78	Not Assessed	Insufficient Information
CT4607-03_01	Chalker Brook (Durham)-01	Mouth on Coginchaug River, DS of Route 77 crossing, US to Arrigonis Pond Number 3 outlet, Durham.	0.41	Not Assessed	Insufficient Information
CT4607-05_01	Parmelee Brook (Durham)-01	Mouth on Coginchaug River, DS of Parmelee Hill Road crossing, US to confluence with unnamed tributary, just US of Saw Mill Road crossing (water class changes from A to AA), Durham.	1.94	Fully Supporting	Insufficient Information

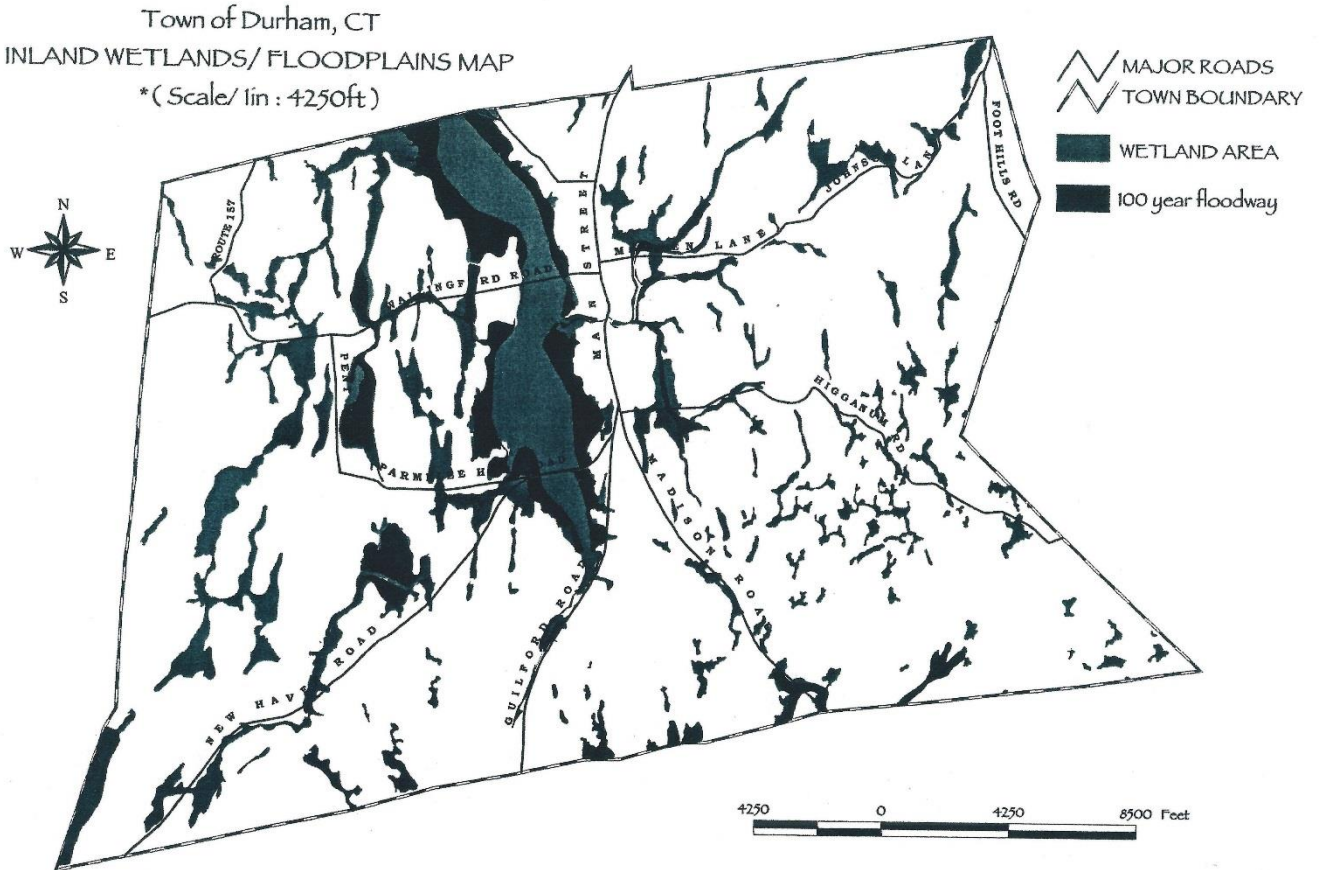
5.8. Inland Wetlands

The term “Inland Wetland” is customarily applied to all areas designated under Sections 22a-36 to 22a-5, inclusive, of the General Statutes of Connecticut; also known as “The Inland Wetlands and Watercourses Act.” As defined in this Act, wetlands are defined as soils designated as *poorly drained, very poorly drained, alluvial* or *floodplain* by the National Cooperative Soils Survey of the U.S. Department of Agriculture’s Soil Conservation Service. *Poorly drained soils* occur on land areas where the water table either interrupts or lies near the surface from the late fall to early spring. This land is nearly level or gently sloping. *Very poorly drained soils* occur in either level or depressed land areas. The water table lies at or above the surface at

almost all times during the year. Finally, *alluvial* and *floodplain soils* occur along stream belts occupying nearly all level areas subject to stream flooding. Alluvium (water transported sediments) is the inorganic component of these soils. "Watercourses" means rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs and all other bodies of water, natural or artificial, vernal or intermittent, public or private, which are contained within, flow through or border upon this state or any portion thereof, 22a-28 to 22a-35, inclusive. Intermittent watercourses shall be delineated by a defined permanent channel and bank, and the occurrence of two or more of the following characteristics: (a) Evidence of scour or deposits of recent alluvium or detritus; (b) the presence of standing or flowing water for a duration that is longer than a particular storm incident; (c) the presence of hydrophilic vegetation.

Wetlands serve a variety of functions that make them valuable components of a community. They serve an important function in their capacity to control flooding by acting as "sponges"; adsorbing precipitation and thereby reducing runoff into streams and river channels, and decreasing the potential for flooding downstream. Another important function of wetlands relates to the quality of surface water and groundwater. Wetlands can improve water quality in a number of different ways. The soils can physically absorb the contaminants, removing them from the water. In addition, vegetation can remove nutrients and other contaminants through their root systems.

Wetland areas left in their natural state can be as important to a community as open space. As open space, the wetlands can be part of an effort to preserve or maintain the rural character of the community. They can also be significant wildlife habitats. Very often, wetland areas support very diverse species of flora and fauna. Wetland areas are generally very productive in this regard; offering food and shelter to animals. Of the nine sites identified by DEEP as areas of special concern, five (5) are associated with wetlands and/or watercourses.



Approximately 2,679 acres or 17% of Durham is classified as an inland wetland or watercourse. When a 200 foot buffer is added in "AA" watersheds and a 100 foot buffer in all other watersheds, approximately 4,709 acres or 31% of the town is impacted. It is generally accepted that the above-mentioned buffer areas are desirable to protect the resources; therefore, extensive encroachment is undesirable. Another feature that is often found adjacent to inland wetlands and watercourses, and that should remain undisturbed to the maximum extent possible, are slopes of 15% or greater, even when they extend beyond buffers.

All of the wetlands shown on the map above are regulated under the Act by the Durham Inland Wetlands and Watercourses Agency (IWWA). Before an activity such as removal or deposition of material, obstruction, construction, alternation or pollution can be undertaken in one of these areas, or within 100 feet, a permit must be granted by the Agency. The Agency may deny a permit; or impose conditions or limitations designed to carry out the preservation and conservation policies of the Act.

5.9. Flood Hazard Areas

Floodplains are the lowlands along watercourses that are subject to periodic flooding. A "100-year flood" is a flood that has a one percent probability of occurring in a given year. Similarly, a "500-year flood" is one with a 0.2 percent probability of occurring in a given year. A floodway is the channel of the waterway plus those areas within the floodplain that convey the floodwaters. Floodways are subject to water being carried at relatively high velocities and forces.

The Coginchaug River influences a broad floodplain extending over three miles in length, and up to nine-tenths of a mile in width. All other tributaries in Durham tend to be much narrower and confined by steep slopes.

The Flood Insurance Rate Map shows areas of special flood hazard and the risk premium zones applicable to the town, as well as base flood elevations. The Flood Boundary and Floodway Map delineate the 100-year and 500-year floods and floodway boundaries. The 100-year map has significance in terms of its application for flood plain management. The 500-year flood was shown to indicate other areas of lower flood risk, however, regulatory measures are not mandatory within these areas.

Durham's Flood Hazard Area Zoning Regulations prohibit development in the floodway and severely restrict development in the associated flood hazard areas. In recent years there appears to have been an increase in the frequency of flooding; and in many cases, into areas exceeding the 100-year floodplain.

5.10. Soils-based Development

In a community that lacks municipal sewers, the development potential of any parcel is dictated by the ability of its soils to accept and to renovate effluent discharges. This factor, in addition to zoning, controls the density and character of Durham's development. Since the 1970s, the town has adopted a *Sewer Avoidance Policy* that requires the provision of long-term, on-site sewage disposal, and prohibits practices which might lead to failures which are only able to be remediated through the installation of municipal sewers.

The soils throughout Durham reflect its bedrock and surficial geology, which create many of the limitations to the installation of on-site septic systems. Two noteworthy limitations include bedrock which is located at or near the surface, and the presence of inland wetlands or watercourses.

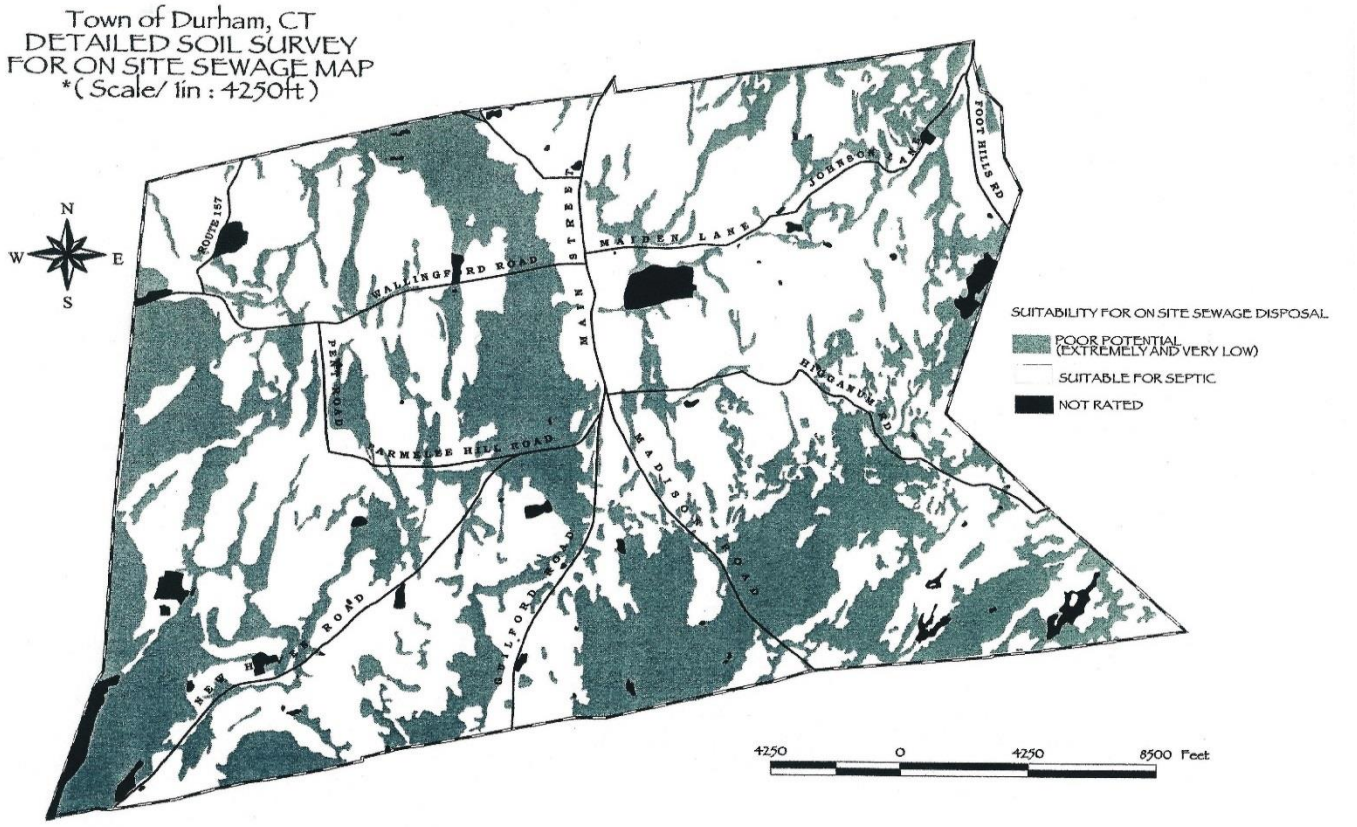
It should be noted that, because the soil mapping process is not precise enough to be used on a lot-by-lot basis, there are soils included in Category #1 that may be buildable on a very low density basis; particularly those having bedrock conditions. Overall, slightly less than half of Durham's soils can be considered unsuitable for building. The majority of its soils are buildable with some limitations; only a small percentage would be considered as buildable with no limitations.

Soils with Slight or Moderate Limitations for On-Site Septic Systems

Soil#	Name	Symbol	Limitation
lA	Penwood	PnA	slight
lB	Penwood	PnB	slight
6XB	Canton	CcB	moderate
6XC	Canton	CcC	moderate
7A	Hartford	HfA	slight
7B	Hartford	HfB	slight
32B	Charlton	CbB	slight
32XB	Charlton	CcB	slight
37B	Cheshire	CsB	slight
37C	Cheshire	CsC	moderate
37XB	Cheshire	CsB	moderate
37XC	Cheshire	CsC	moderate
60A	Hinckley	HkA	slight
60C	Hinckley	HkC	moderate
62A	Manchester	MgA	slight
62C	Manchester	MgC	moderate
65A	Agawam	AfA	slight
65C	Agawam	AfC	moderate
67A	Windsor	WvA	slight
67B	Windsor	WvB	slight
69A	Agawam	AfA	slight
69B	Agawam	AfB	slight
70A	Merrimac	MyA	slight
70B	Merrimac	MyB	slight
138A	Branford	BoA	slight
138B	Branford	BoB	slight
138C	Branford	BoC	moderate

Septic Capabilities Inventory			
Category	**Description**	**Acres**	**% of Town**
1	Soils with extremely low or very low capabilities (Unbuildable)	6,214	41%
2	Soils with low or medium capabilities (Buildable with proper testing, design and siting)	8,032	53%
3	Soils with high or very high capabilities (Easily buildable)	909	6%
Total		15,155	100%

The following map depicts the latest interpretation of the suitability of soils to support septic systems on a long-term basis. This map should not be used for lot-by-lot interpretation; but rather, should be viewed as a planning tool to access Durham's overall capacity.



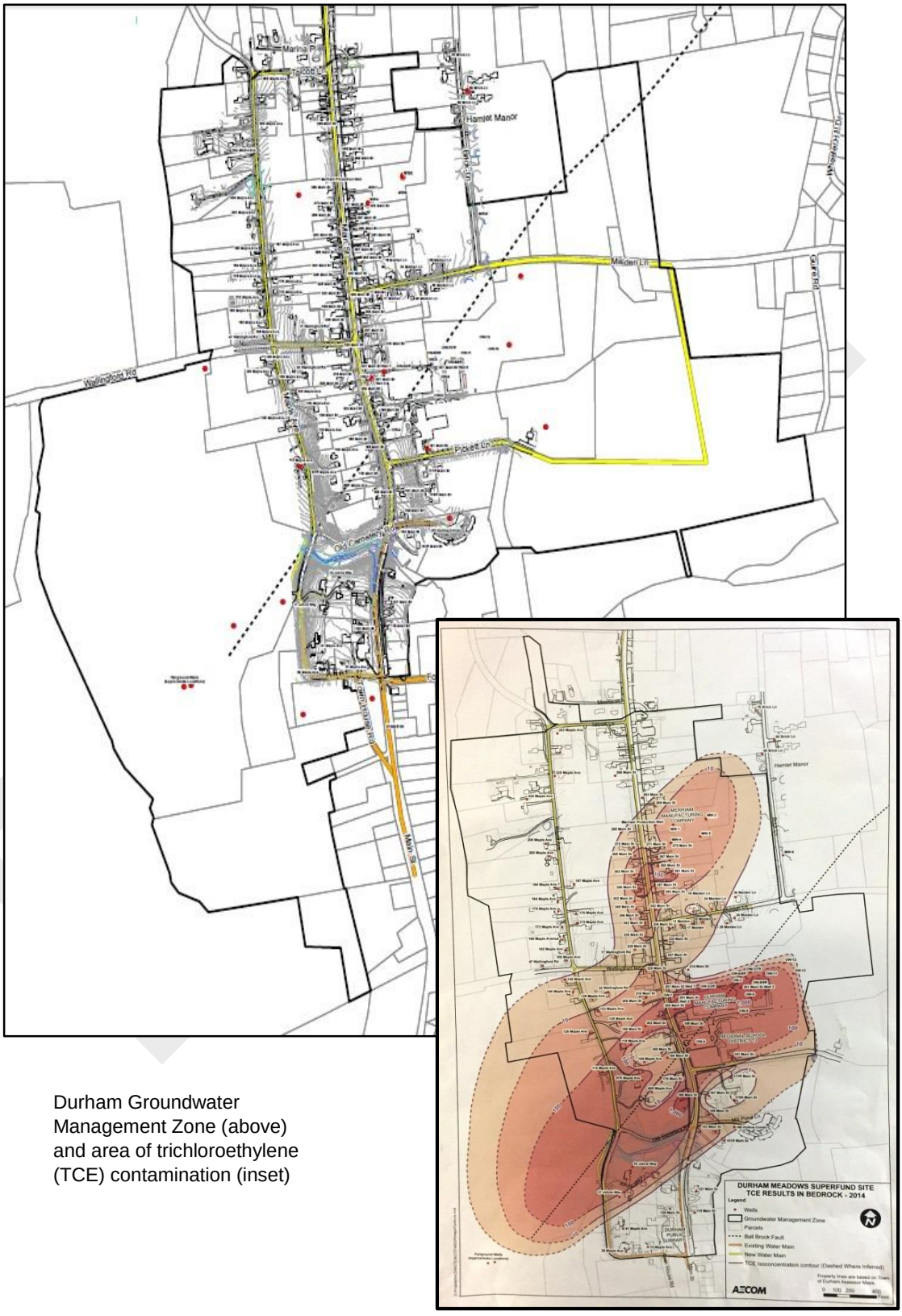
5.11. Durham Meadows Superfund Site

The Durham Meadows Superfund Site (EPA ID: CTD001452093) is located in Durham, Connecticut. Manufacturers of metal cabinets, boxes and other items improperly stored or disposed of materials which contaminated the soil and groundwater. In 1982, the Connecticut Department of Energy and Environmental Protection (CT DEEP) detected volatile organic compounds (VOCs) in some private water wells. These VOCs included trichloroethylene (TCE), tetrachloroethylene (PCE) and 1,1,1-trichloroethane; and breakdown products, such as 1,1-dichloroethene, 1,1,-dichloroethane and vinyl chloride.

The *Record of Decision* (ROD) for the Durham Meadows Superfund Site was published in September 2005. This ROD required the development of an alternative water source to serve the properties impacted by the contamination or potential contamination associated with the Superfund site. In 2013 the Environmental Protection Agency (EPA) awarded a contract for investigative work in support of the ROD and to design the cleanup activities for the area. The ensuing design included an assessment to ensure that the cleanup would address the likely expansion of the contaminated aquifer (which may not be associated with the Superfund site).

An exhaustive water supply was performed by the City of Middletown to demonstrate their ability to provide the required volumes of water to serve the initial service area, and the six (6) potential future service areas during the subsequent fifty-year period. The final design for the initial service area is complete, and the project is expected to be bid in the spring of 2016. Construction is estimated to begin in late 2016 or early 2017 and is expected to be completed within two (2) years.

To address the future expansion of the contaminated aquifer, the town passed a Groundwater Management Zone (GMZ) Ordinance in 2016, which will largely prevent the withdrawal and usage of groundwater within the GMZ area by requiring that properties within the zone be connected to the public water once it becomes available. Initially, this connection and well-closure services will be offered free-of-charge to properties within the GMZ.



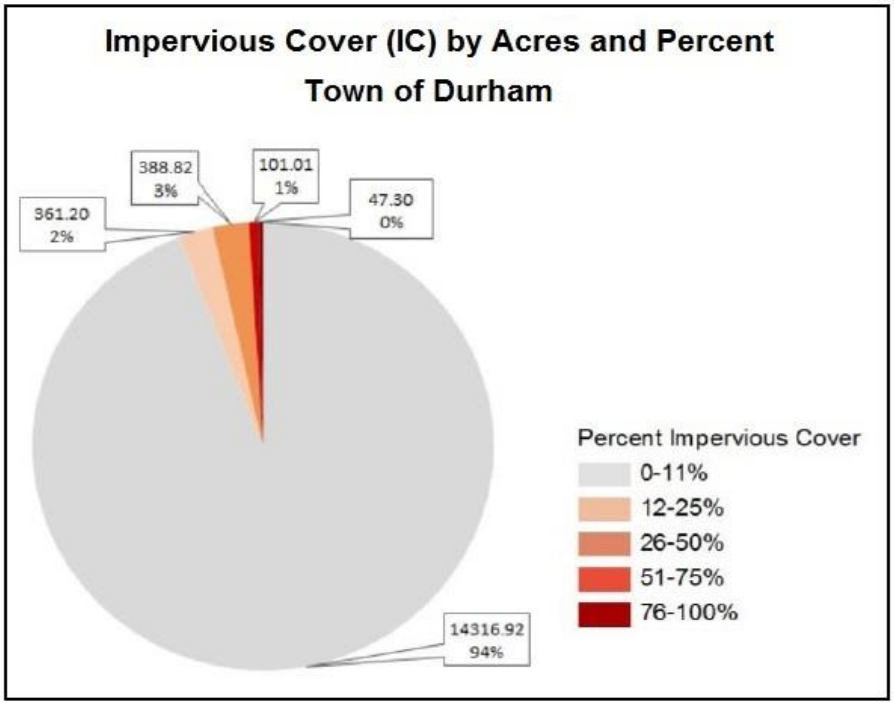
Durham Groundwater Management Zone (above) and area of trichloroethylene (TCE) contamination (inset)

5.12. Impervious Cover and Nonpoint Source Pollution

5.12.1. Impervious Cover

Impervious Cover (IC) refers to hard surfaces across the landscape such as roads, sidewalks, parking lots and roofs. Studies have focused on the amount of hard surfaces to evaluate the impacts of storm water runoff from these hard surfaces on water quality and found that IC affects both the quantity and quality of storm water. IC forces rain to runoff the land, carrying pollutants quickly and directly to lakes and streams; instead of soaking into the ground and being filtered by the soil. In general, the higher the percentage of IC in a watershed, the poorer the surface water quality. Research in Connecticut strongly suggests that aquatic life will be harmed when the IC within an area exceeds 12%. Storm water pollution from IC is a likely cause of impairment for water bodies.

The following chart shows the amount of area within the Town of Durham that contains IC. Data is grouped by acres and percent IC. According to the chart, approximately 898 acres or 6% of the town exceeds the 12% recommended maximum for Impervious Cover. While all levels of IC can contribute storm water to streams, it is important to note that land with IC's greater than 12% are likely to be contributing enough storm water to streams to have a negative impact on their water quality. Durham should aim to make storm water improvements in areas having IC greater than 12% to reduce the amount of storm water pollution reaching its surface waters and consider the development of regulations which encourage the use of non-impervious surfaces.



Source: Connecticut Department of Energy and Environmental Protection

5.12.2. Nonpoint Source Pollution

Nonpoint source pollution, unlike pollution from point sources, is diffuse in its origin and in the manner that it enters ground and surface waters. It originates from a variety of human activities that take place throughout Connecticut, affecting many different uses of water resources. These activities serve to increase the volume of runoff and often contribute pollutants to the runoff that may end up in surface waters or infiltrate into the groundwater. If nonpoint source contributions are high enough, surface or groundwater impairments may occur. Pollutant loadings from many nonpoint sources are closely linked to rainfall,

thunderstorms, or snowmelt and are, therefore, unevenly distributed in time and space, depending on weather conditions.

5.12.2.1. Categories and Sources of Nonpoint Pollution

Nonpoint sources are organized into several major categories, based on the types of activities that generate them. More specific sources of nonpoint pollution within the major categories are many and varied. The types of pollutants that a nonpoint source may generate are often specific to the activity, e.g., pesticides and fertilizers associated with agricultural activity or oil and grease associated with highway runoff. While chemical, physical, and biological pollutants number in the tens of thousands, general groups of pollutants are useful for describing nonpoint source problems, such as metals or pathogens. In Connecticut, three general land cover or land use categories have been useful to classify specific nonpoint sources. One category, comprised primarily of forests, wetlands and surface waters, is generally labeled as "Forested". This category is typically assumed to be a low-contributor of nonpoint pollution and is not covered here. The land cover categories that are of concern include "Urban and Suburban", and "Agricultural". Other nonpoint sources outside of these categories also exist and are discussed in the "Other Sources" category which follows.

- Urban and Suburban Sources. Nonpoint sources in urban and suburban areas include contaminated runoff from impervious surfaces such as roadways, sidewalks, parking lots and roofs, storm water runoff, and turf grass runoff that may contain pesticides and fertilizers. As a watershed becomes developed, impervious surfaces increase in area, causing an increase in the rate and volume of storm water to surface water bodies. This increased volume of storm water runoff can cause an increase in the frequency and severity of flooding, accelerated stream channel erosion, reduction in the base flow of streams, and adversely affect aquatic life in streams. In addition to changes in volume distribution, runoff can carry a variety of pollutants including suspended sediments and solids, nitrogen, phosphorus, hydrocarbons, heavy metals, bacteria, and road salts. Also, spills of hazardous substances during transport or from holding tanks are a serious hazard because many highways and urban areas are near Connecticut's surface waters. Other urban and suburban-related pollutants include road de-icing agents that can contaminate both surface and groundwater drinking water supplies and failing septic systems that may be sources of pathogens and nutrients.

- Agricultural Sources. Agricultural uses that generate nonpoint pollution include both irrigated and non-irrigated crops, specialty crops, pastures, feedlots, animal holding and waste management areas, and washing and water processing areas. Typical pollutants generated from agricultural activities include nutrients, pesticides, sediment, and pathogen indicators. Water quality problems generally occur when agricultural operations use improper management techniques or implement inappropriate land uses. Harm to surface waters may be caused by erosion and sedimentation, poor waste management practices, overuse of fertilizers and pesticides, alteration of wetlands and watercourse, and loss of riparian vegetation. Pollutants may be windblown, but primary transport mechanisms are with runoff or through infiltration into the groundwater.

- Other Sources of Nonpoint Pollution. Construction activities that disturb land surface and are not properly managed can result in erosion and sedimentation of a surface water resource. Suspended sediments increase turbidity, reduce light penetration, abrade or fill aquatic habitat, blanket food sources, and commonly transport nutrients and other pollutants. Over fertilization at construction sites sometimes occurs when attempting to re-establish vegetative cover and improperly disposal of materials and liquids (e.g. lubricants, paints, solvents) on the ground or in holes can result in leaching of pollutants to groundwater or surface water bodies. Atmospheric deposition results from all types of precipitation and "dryfall." The most well-known form of atmospheric deposition is acid rain. Pollutants may be deposited directly onto surface waters or onto land where it is washed into surface or ground waters. Agricultural fields, landfills, fossil fuel burning, highways, and urban areas all generate airborne pollutants that may subsequently be deposited on the Earth's surface.

Of special concern in Connecticut are atmospheric deposition of nitrogen, that are estimated to contribute at least 15% of the nitrogen being discharged to Land Island Sound, and mercury, which has contaminated some species of fish to the degree that consumption advisories have been issued. A multimedia (air, land, water) analysis is essential to the resolution of atmospheric deposition relationships to water quality impacts. Natural sources, primarily water birds such as geese and gulls, can contribute unacceptable levels of nutrients, organic matter, and bacteria to many lakes, pond, rivers, and estuaries.

From a local regulatory point of view, the Town can directly manage the impacts of development under the "suburban" category of sources of nonpoint pollution and construction under the "other" category. Standard development can disrupt the water cycle and impact stream form and function. Many studies are finding a direct relationship between the intensity of development in an area - as indicated by the amount of impervious area and the degree of degradation of its streams. These studies suggest that aquatic biological systems begin to degrade at impervious levels of 12%, or at even lower levels for particularly sensitive streams. As the percentage of imperviousness climbs above these levels, degradation tends to increase accordingly. Previous studies on residential development in Durham have shown that, on average, for each lot developed, 2.3 to 2.5 acres of land is necessary on a gross basis. This intensity of development is below the maximum recommended 12 percent impervious surface. Construction-related sedimentation has been and continues to be a major concern and enforcement issue. The posting of bonds, periodic inspection, and enforcement proceedings help control this nonpoint source of pollution. Further watershed impervious analyses are warranted to assure that the 12 percent imperious surface target not be exceeded now or in the future. Durham does not at this time have an extensive piped storm water collection system and relies on the natural waterways to carry storm water away from developed areas.

5.12.3. Strategies for Coping with Polluted Runoff

Water resources can be protected by considering the location, extent, drainage, and maintenance of impervious surfaces on the town, watershed and individual site levels. Natural resource planning, site design and use of best management practices form an effective three-tiered approach to the problem.

- Plan development based on the town's natural resources. Preventing pollution through planning is by far the least expensive and most effective way to protect Durham's waterways. To this end, a working knowledge of Durham's natural resources is critical to guiding appropriate development. A natural resource inventory is an essential first step. Identifying important natural resources and setting protection priorities provides a framework within which the impacts of proposed or existing development can be evaluated. Formal inclusion of these priorities in town plans and procedures is also important.

  Broad resources protection strategies applied at the town or watershed level, such as buffer zone and setback requirements, are recommended. With regard to impervious surfaces, local officials should consider a "budget" approach that sets an overall limit for key areas, and above that limit requires increases in pavement on one site to be compensated for with decreases on another site (or some other acceptable method of compensation). This technique might be appropriate, for instance, in a watershed where analyses show a threat to critical water resources from future growth.

- Minimize impacts through Site Design. The site planning stage offers the best chance for local officials, designers and builders to work together to reduce polluted runoff from a site. Evaluate site plans with an eye to minimizing both impervious areas and disruption of natural drainage and vegetation. Cluster development, which reduces the total area of paved surfaces and increases open space, should be considered. Are the proposed sidewalks, roads and parking lot sizes absolutely necessary, or could they be reduced? Brick, crushed stone or pervious pavement are

often a viable alternative in low traffic areas. Are curbing and piping necessary, or could drainage be directed to vegetated swales? Designs that reduce grading and filling and retain natural features should be encouraged. In addition to protecting waterways, such designs can often be less expensive and more pleasing to the eye.

5.12.4. Best Management Practices (BMPs)

Best management practices (BMPs) include a whole range of methods designed to prevent, reduce, or treat storm water runoff. Choosing the correct BMPs is often highly site-specific, and may include the following:

- Reduce storm water velocity: This is the basic idea behind both detention basins, which are meant to slow and hold storm water before releasing it; and retention basins, which are designed to hold the water permanently until it infiltrates into the ground. In both cases, pollutant removal takes place through settling of particles and through chemical and biological interactions in the standing water or in the soil. As with any device, these BMPs must be correctly designed in order to work properly. For instance, basins must be large enough to treat runoff generated by the combination of local climate and site configuration.

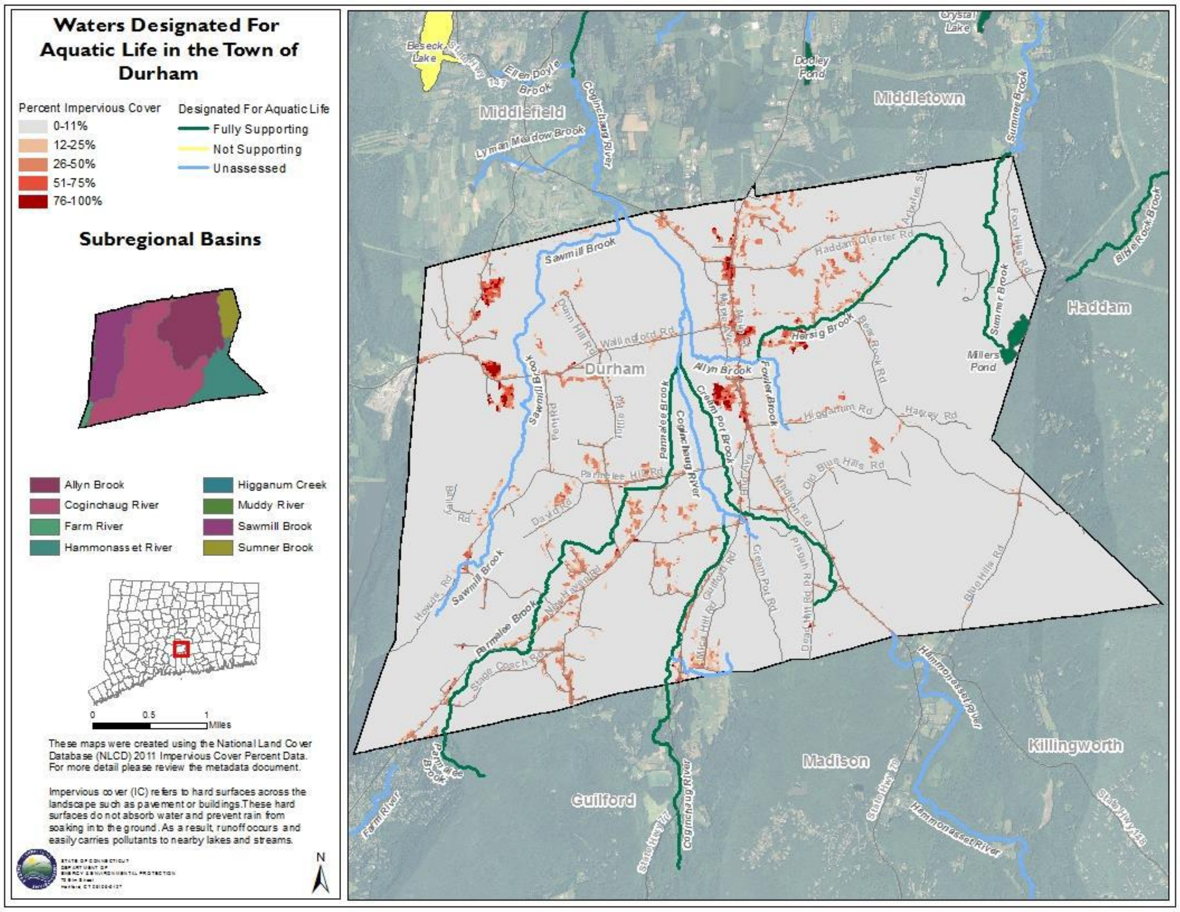
- Avoiding direct connections: Break up the "expressway" of polluted runoff by using grass swales, filter strips or other forms of vegetative BMPs wherever possible in place of curbing and piped drainage. In many cases, these methods are most effective when used in combination with structural BMPs like detention ponds.

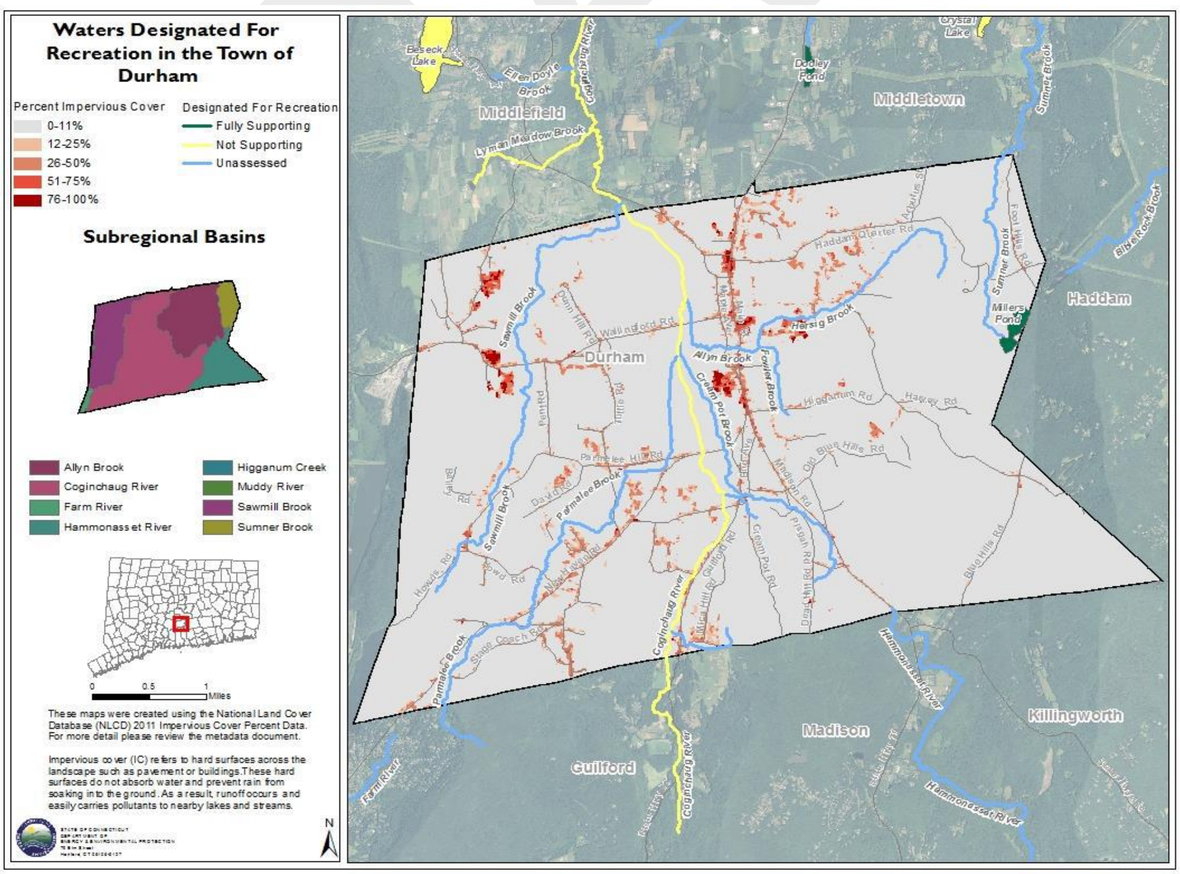
- Ensure that regular maintenance is performed: Most structural BMPs require regular maintenance to retain peak pollutant-removal efficiency. Maintenance ranges from the frequent, but simple (sweeping parking lots, cleaning storm drains) to the infrequent, but complex (sediment removal from detention/retention ponds), but in all cases it must be budgeted and planned.

- Enforcement and Education: It's important to make sure that contractors are following through on agreed-upon designs and methods. Don't underestimate things like storm drain stenciling and hazardous waste disposal days, which can reduce pollution, raise public awareness, and help to engender support for all Durham's water protection activities.

5.12.5. Water Health to Support Aquatic Life and Recreational Uses

The following maps show the health of the waters in Durham to support Aquatic Life and Recreational Uses; as well as the areas of Impervious Cover (IC). Green means that water quality will fully support the specified use. Yellow means that water quality is poor and that the specified use is not met. Blue means that there is not enough information to know whether or not water quality is good or bad to support the specified use. IC is shown in red on the maps. Dark red areas indicate a higher percentage of IC, lighter red areas have less IC, while the grey areas indicate very little or no IC.


Waters Designated For Aquatic Life in the Town of Durham
Percent Impervious Cover
0-11%
12-25%
26-50%
51-75%
76-100%
Designated For Aquatic Life
Fully Supporting
Not Supporting
Unassessed
Subregional Basins
Allyn Brook
Coginchaug River
Farm River
Hammonasset River
Higganum Creek
Muddy River
Sawmill Brook
Sumner Brook
0
0.5
1
Miles
These maps were created using the National Land Cover Database (NLCD) 2011 Impervious Cover Percent Data. For more detail please review the metadata document.
Impervious cover (IC) refers to hard surfaces across the landscape such as pavement or buildings. These hard surfaces do not absorb water and prevent rain from soaking into the ground. As a result, runoff occurs and easily carries pollutants to nearby lakes and streams.
N
Middlefield
Middletown
Durham
Haddam
Madison
Guilford
Killingworth
Beseck Lake
Dooley Pond
Crystal Lake
Millers Pond
Sawmill Brook
Coginchaug River
Allyn Brook
Fowler Brook
Parmalee Brook
Sumner Brook
Hersig Brook
Lyman Meadow Brook
Hammonasset River
Farm River
Bible Rock Brook


Waters Designated For Recreation in the Town of Durham
Percent Impervious Cover
0-11%
12-25%
26-50%
51-75%
76-100%
Designated For Recreation
Fully Supporting
Not Supporting
Unassessed
Subregional Basins
Allyn Brook
Coginchaug River
Farm River
Hammonasset River
Higganum Creek
Muddy River
Sawmill Brook
Sumner Brook
0
0.5
1
Miles
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Sumner Brook
Hersig Brook
Lyman Meadow Brook
Hammonasset River
Farm River
Bible Rock Brook

5.13. Cultural Resources

5.13.1. Historical Sites – Dams

The town has a number of historical dam sites, on tributaries such as Allyn Brook and Cream Pot Brook. The lower dam at Miller's Pond was constructed prior to 1704, and in 1707 the town granted the right to several men to dam the stream along the ledges of the Arrigoni Pond to establish a saw mill. The Office of State Archeology has on file the ruins of at least ten industrial mills along the Coginchaug River.

A failure of the dam on Allyn Brook in 2008 caused sediments retained by this dam to be transported downstream, contributing to flooding of the the surrounding lands, and dividing the brook's flow into two parts; one north through the White's Farm cornfield to Route 68, the other south through the Durham's Fairgrounds parking area. The DEEP, through its *Wetlands Habitat and Mosquito Management* (WHAMM) Program completed channel restoration work in 2012 and habitat restoration work in 2015.

5.13.2. Archeological Resources

Durham is rich in archeological resources. Approximately 10,000 years ago, the geological and glacial forces ceased making dramatic changes in Durham's land forms. The land forms we see today are very similar to how they looked after the last glacier retreated. Following in the glaciers' wake was the regeneration of a great forest where Native Americans (Paleo-Indians) lived and hunted. Over thousands of years, these native residents of Durham wrought only small changes on the landscape.
State Archeologist Dr. Nicholas Bellantoni and others have found that "The Coginchaug Meadows and river drainages" contain evidence of prehistoric Native American occupation in the area for over 8000 years (14 plus sites). Archaic period natives are thought to have inhabited the Coginchaug area from 8000 to 1000 years ago and their more recent descendants occupied the area from 1000 to 200 years ago. Here they camped, hunted, fished, and foraged. While no extant tribes exist in the area today, Native American presence is demonstrated by the word "*Coginchaug"* itself; which translates into English as "a long swamp" or "at the place where they cure fish."

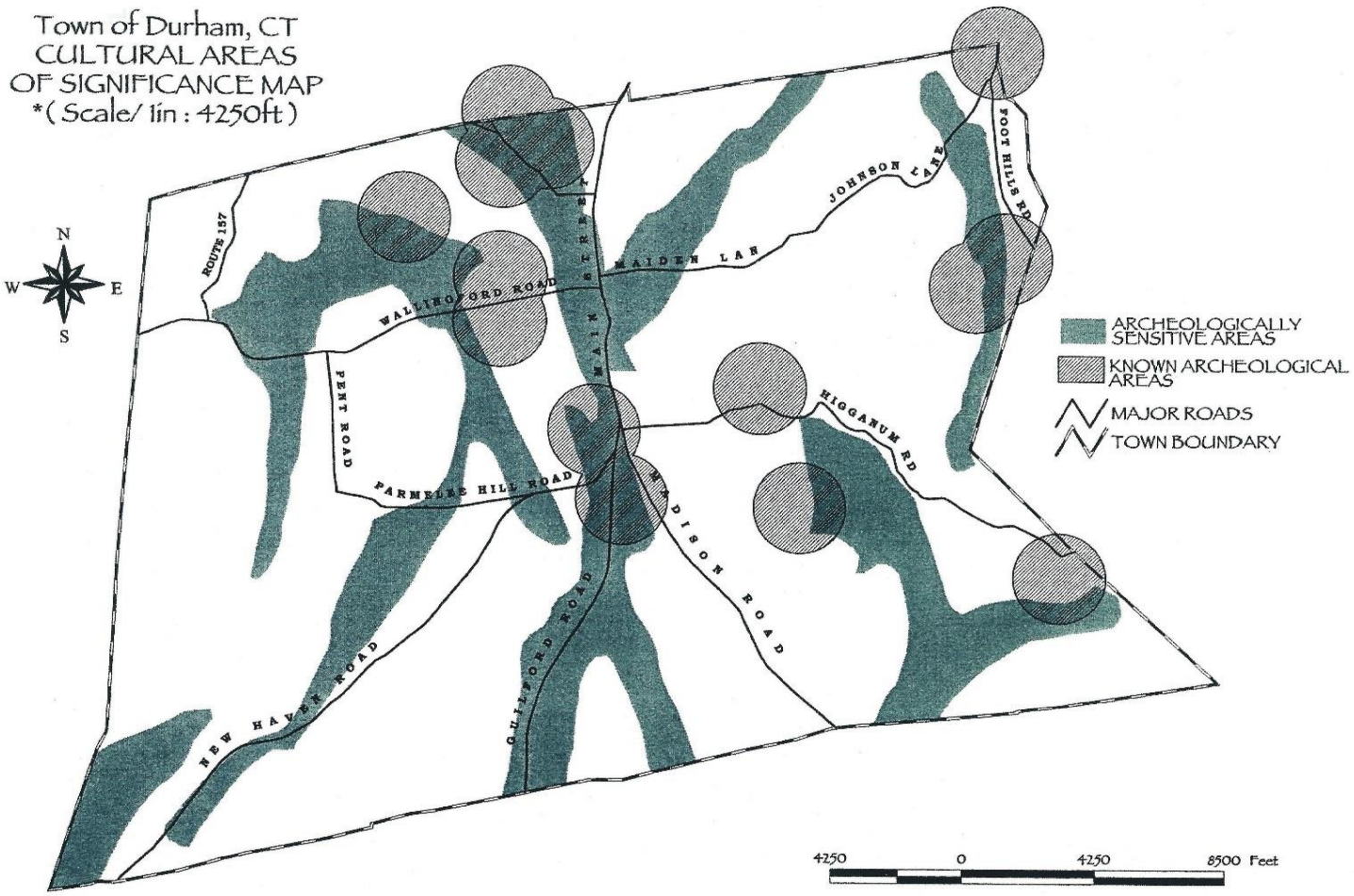
The State of Connecticut archaeological site files and maps show 14 known archaeological sites. The 14 sites are but a smattering of those that undoubtedly exist in Durham, and the area to the north and west of the United Churches alone, within the property of several private homes fronting Main Street, contains lithic, midden, and subsurface architectural material of pre-contact through late nineteenth century date. As a result, the town has a great potential for sites that have the integrity to yield important information concerning the past.

The 14 known sites include: six sites in the highlands that represent Native American encampments dating to over 5,000 years ago; five sites that are Indian camps and villages along the Coginchaug River dating to 2,000 - 1,000 years ago; one site that represents the remnants of a cache of stone blades from over 2,000 years ago; one Indian site that dates to the 17th century and indicates contact between Native Americans along the Coginchaug River and European traders; and an 18th century historic "pest house," or small-pox hospital. Of these sites, only two have been reported as destroyed; the remainder should be preserved.

The properties in the Durham Historic District, by virtue of their unique states of preservation, and the fact that most represent places of continuous private dwelling in a primarily agricultural community, preserve important remains of rural life in seventeenth through early twentieth century New England. Many of the properties on Main Street retain both visible and subterranean evidence of earlier structures, of both permanent and temporary nature, along with the extensive remains of debris middens, and primarily subterranean evidence of earlier home-farming and animal husbandry practices. The debris middens reveal much information concerning the trade and diet of an early American agricultural community (material includes bones, mollusc shells, Chinese export ceramics, colonial salt-glazed stoneware, etc.). Native American remains in the area also reveal evidence of Archaic period and later activity. The presence

of burials, of both native and early settler populations, is probable in the area. Most of the area that has remained residential should preserve subsurface botanical and microbotanical material providing evidence of earlier dietary habits and farming practices.

The archeological remnants of 8,000 years of human occupation and industrialization of the areas are still embedded in below-ground artifacts as well as features of early American settlements, including ruins of stone dams and mill buildings. The Office of State Archeology has on file over a dozen Native American sites. These sites are extremely fragile and endangered by modern land use activities. The preservation of open space and public educational opportunities will serve to conserve these physical components of the history of the Coginchaug area.

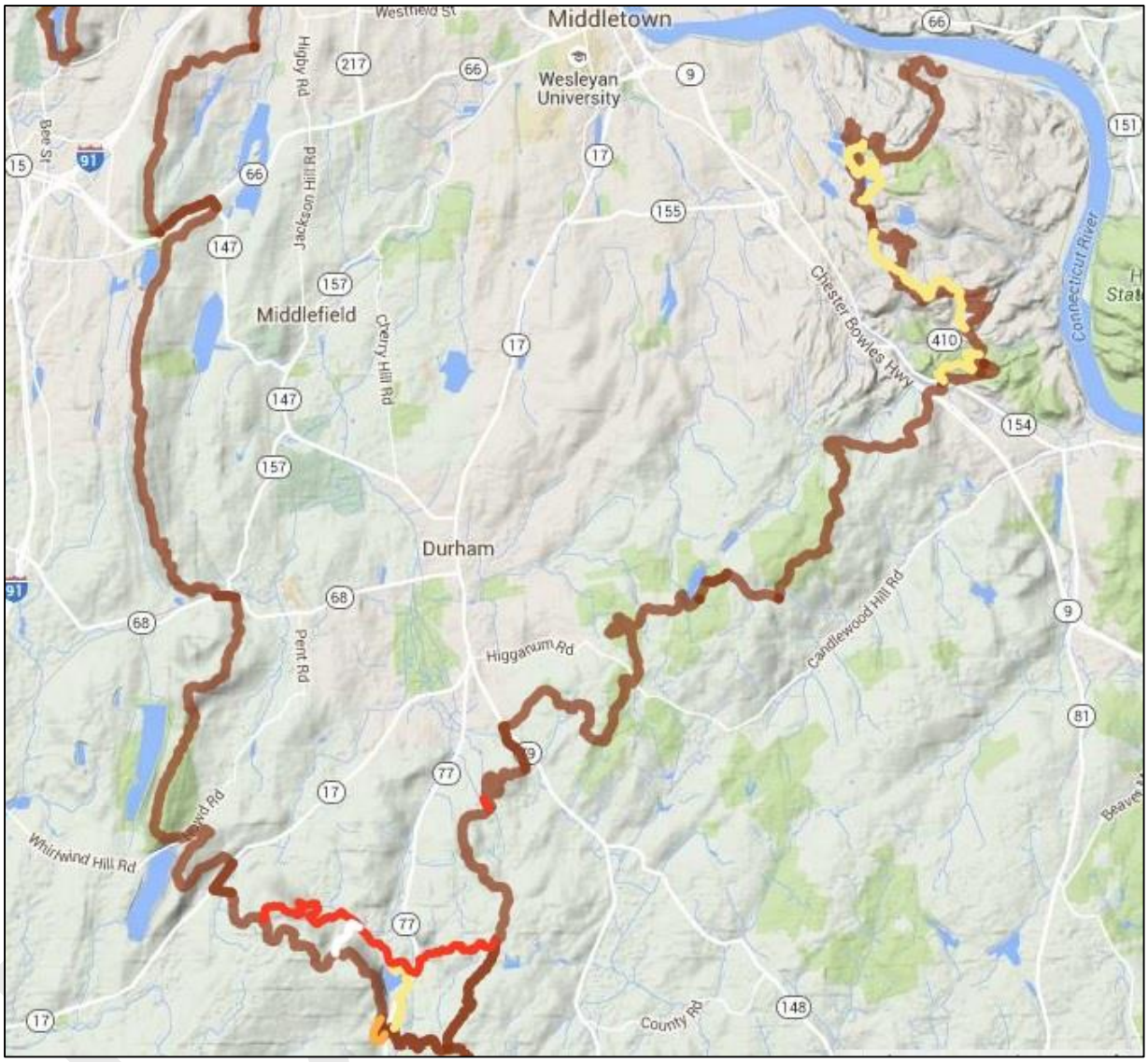


5.14. Trails in Durham

The New England National Scenic Trail (NET; the former Blue Trail) is a 215-mile hiking trail route that has been in existence for over half a century. The NET travels through 41 communities in Connecticut and Massachusetts, and comprises primarily the historic Mattabesett, Metacomet, and Monadnock (M-M-M) Trail systems. The trail crosses private, state-owned, and town-owned properties in Durham.

The NET travels through classic New England landscape features: long-distance vistas with rural towns as a backdrop, agrarian lands, un-fragmented forests, and large river valleys. The trail also travels through colonial historical landmarks and highlights a range of diverse ecosystems and natural resources: mountain ridges and summits, forested glades, wetlands and vernal pools, lakes, streams and waterfalls.

Since the federal designation in 2009, there have been some noteworthy changes to the historic route, including a 4-mile extension to Long Island Sound in Connecticut and a 22+ mile eastward deviation from the historic Metacomet-Monadnock Trail in Massachusetts. A map showing sections of the trail as they traverse Durham and its neighboring communities is shown below.



The New England National Scenic Trail through Durham

5.15. Open Space

The overall intent of planning for open space and recreation is to create an environment that continuously enriches the lives of the Town's present and future populations. It is the preservation of those key parcels of land which gives the Town its character or uniqueness and if withdrawn from their present natural state would have a negative effect on the quality of human experience.

Our mental and physical well-being is related to the provision of adequate open space, and although this relationship warrants further study, there are certain benefits that may be vital to the continued welfare of our growing population. It has been suggested that high urban densities tend to create sensory overloads; thus requiring the "release and compensation" vehicle that outdoor recreation and open space can provide.

On the other hand, it has been firmly established that pollution of our air, drinking water, aquatic life, and water-oriented recreation areas is a source of illness that can be controlled through the preservation of open space adjacent to these critical areas. The following table shows the inventory of Durham's Open Space and Recreational Land by category. Most of the areas listed are used for conservation, agricultural, and low-intensity recreational uses.

Open Space and Recreational Land	
Municipal - Town of Durham	**Acres**
White Farm	110.7
Coginchaug Campus	11.7
Town Green	1.0
Brewster School Site	5.77
Dunn Hill Road Property	138
Pent Road Property	214
Parmelee Brook Property	80
Gulielmetti Property	29
(4) Parcels adjacent to Durham Meadows	30
Chalker Brook Property	1.13
Wagon Wheel Recreation Area	4.1
Various Conservation Easements	400+
Howd Road Property (Formally Wallingford Water Company)	158
Pisgah Mountain and Pest House	75.9
Pisgah Valley	103
Wimler Farm (development rights)	281.73
Park Place Open Space	8.82
Haddam Quarter Road/Brick Lane	7.73
Subtotal	**1,260.58**
Regional School District #13	
Frank Ward Strong, Korn, Coginchaug School Campus	67
Frederick Brewster School	14.53
Standard Property	9
Subtotal	**90.53**
Water Company (Wallingford)	
Pistapaug Pond and Howd Road	283.15
(South Central) Route 79	89.7
Subtotal	**372.85**
State of Connecticut	
Durham Meadows	475
Tri Mountain State Park	14
Cockaponset State Forest and Miller's Pond State Park	1,161
Greenbacker-Reskin Farm (Development Rights only)	405
Rowe Farm (development rights only)	74.02
Subtotal	**2,129.02**
Land Trusts (Madison and Middlesex CT Forest and Park Association)	
Cream Pot Road Property (Whitney, 3 Parcels)	73.87
Indian Lane Property (2 Parcels)	7.61
Guilford Road Property	15.42
Field Properties	108.91
Subtotal	**205.81**

Private Recreational Land	
Camp Farnum	73.97
Durham Fair Grounds	45
Lyman Golf Course	119.4
Wheeler Hill Recreation Area	4.9
Subtotal	**243.27**
Total	**4,302.06**

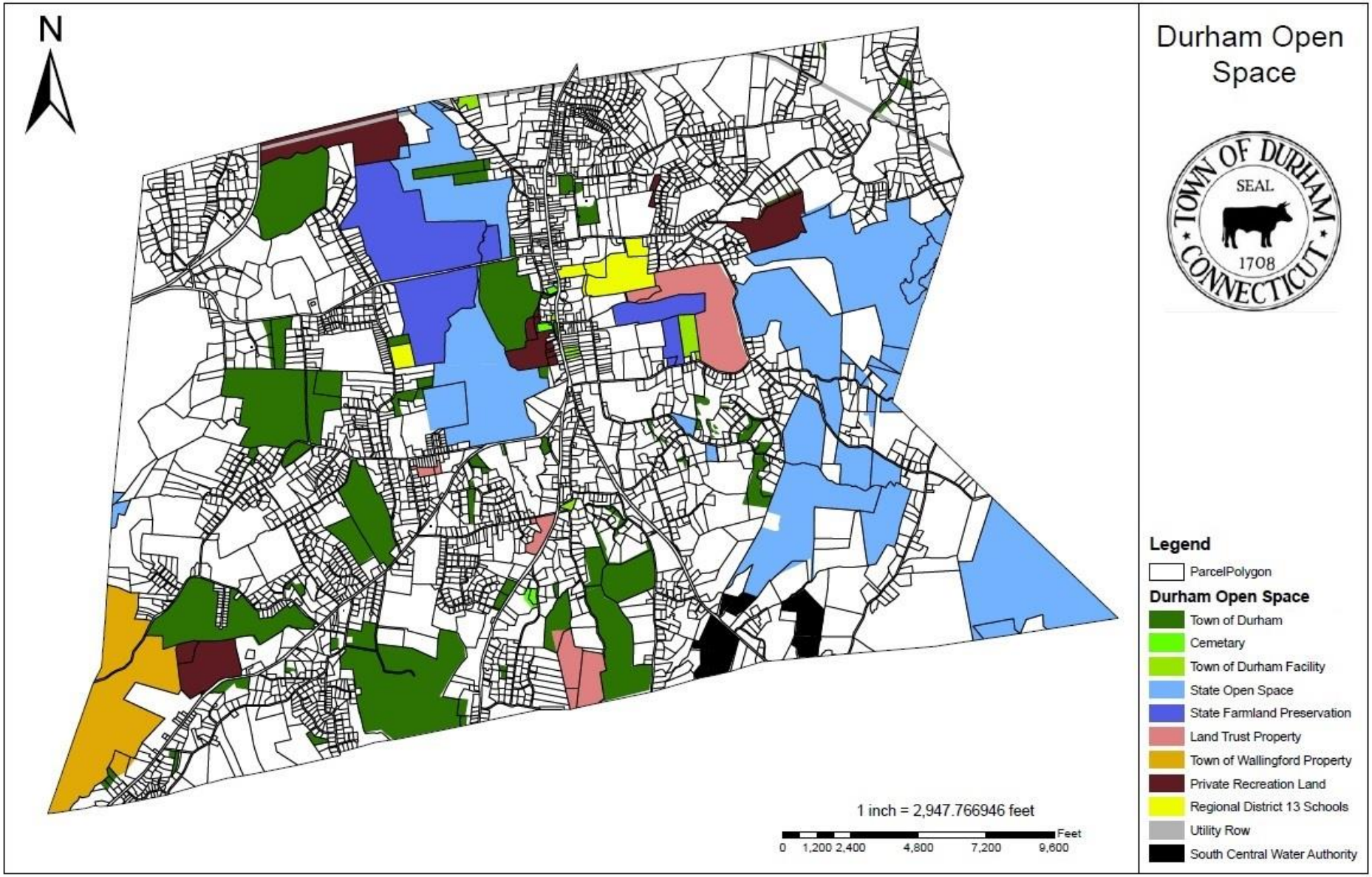
From the table above, we see that open space constitutes more than 4,300 acres or 28.3% of the land in Durham. Land listed in the table as private recreational land cannot be considered as “permanent” open space. The Lyman Golf course has probably the highest degree of permanency, since it is an economically viable open space use, and one-half of an 18-hole golf course. Land owned by the Wallingford Water Company outside of the Pistapaug Reservoir Watershed could be disposed of for non-watershed protection uses. Much of the area is shown on the soils map as having extremely low and very low potential for on-site sewage disposal. The pace of town open space acquisition has slowed over the past several years. A focus of the Conservation Commission has been to develop a relationship with the Middlesex Land Trust as a potential partner for the acquisition of open space parcels. There is also renewed interest on the part of the electorate to support open space acquisitions. An aggressive capital reserve fund should be established and funded on an annual basis, along with a priority list of properties for acquisition.

5.15.1. An Integrated Approach to Land Acquisitions

The town currently requires a mandatory open space "set-aside" of 10% as part of every subdivision application. Lands granted to comply with this 10% requirement are often of poor quality and fragmented. For wildlife habitats, large, contiguous parcels of natural open space are preferable to more numerous, smaller, disconnected areas. An integrated approach (sometimes known as a greenway or greenbelt system) helps to prevent habitat fragmentation. During subdivision conveyance or potential open space acquisitions, preference should be given to areas that abut currently protected open space or conservation land to facilitate the contiguous expansion of these habitats.

5.15.2. Fee-in-Lieu-of Open Space

Open spaces and conservation lands require maintenance. Fields need mowing, fences need to be repaired and parking facilities need to be improved or plowed of snow to facilitate access by those who enjoy these areas. State statutes allow communities to accept monetary fee-in-lieu-of actual open space set-asides, when the land would have little value as open space and would not positively contribute to an overall open space plan. These funds can be placed in a dedicated fund for open space purchases or maintenance and improvement efforts. The town should consider enacting regulations that facilitate these fee-in-lieu-of open space options.


N
Durham Open Space
TOWN OF DURHAM
SEAL
1708
CONNECTICUT
1 inch = 2,947.766946 feet
0 1,200 2,400 4,800 7,200 9,600
Feet
Legend
ParcelPolygon
Durham Open Space
Town of Durham
Cemetary
Town of Durham Facility
State Open Space
State Farmland Preservation
Land Trust Property
Town of Wallingford Property
Private Recreation Land
Regional District 13 Schools
Utility Row
South Central Water Authority

5.15.3. Costs/Benefit Study of Open Space

In 1995 the Southern New England Forest Consortium, Inc. (SNEFCI), a non-profit forest conservation organization established in 1985 to promote wise conservation ethics and the productive use of the region's forest and natural resources, conducted a comprehensive study of the fiscal contribution of developed land verses forest, farm and open space land. Durham was one of four towns in Connecticut studied, along with four towns in Massachusetts and three towns in Rhode Island. The study clearly demonstrated that the protection of open space plays an important role in a community's long-term fiscal well-being. The development of residential, commercial and industrial uses is an essential component of any community; however, it is equally important to not overlook the value open space provides by balancing the tax base through positive net tax revenues. In addition to its significant financial contribution, open space provides an astounding assortment of benefits, including: scenic resources, wildlife habitat, recreational opportunities, clean air and water, flood control, and is the basis for the tourism, farm, and forest products industries that create jobs and generate millions of dollars in economic activity on an annual basis.

Methodology. A Cost of Community Services Study (COCS) examines disaggregated town revenues and expenditures at a specific point in time. It serves as a simple method of determining the costs and financial contributions of various types of land-use. The American Farmland Trust has described in detail the steps to be taken in carrying out Cost of Community Services studies, and the manner in which each step is to be carried out. The five steps described in this methodology are as follows and are described in further detail below:

Five Steps in the Cost of Community Services Studies

- Meet with Local Officials and Define Land-Use Categories
- Collect Data
- Allocate Revenues by Land-Use
- Allocate Expenditures by Land-Use
- Analyze Data and Calculate Ratios

Meet with Local Officials and Define Land-Use. The first step is to meet with local officials. At the outset, a meeting was held with local officials in each town to introduce and explain the methodology and objectives of the COCS and to identify the goals of the study. It also afforded the opportunity to discuss with officials how best to allocate property records. Most importantly, the meetings were a means to generate the support of local officials - an essential component of any successful COCS.

Definitions for each type of land-use depend in part upon state legislation and regulations, and in-part on the community's definitions and the assessor's allocations. Study codes differ somewhat in their definitions of land-use. Property records were easily sorted when computerized records were available. When records were not available in such a format, such as in the towns of Becket, Litchfield, and Hopkinton, local assessors were again contacted to provide the most consistent definitions possible.

Collect Data. The data sources at the town level include financial statements, annual town reports, assessor records, community monographs, and other local data. The annual reports were an excellent source of data with respect to ongoing and upcoming projects. They also gave insight into the type of programs that have been instituted to preserve open space and limit municipal spending without diminishing the quality of services.

Extensive interviews were conducted with local officials, and, based on these interviews, revenues and expenditures for each town were disaggregated among the defined land-use categories. A host of town offices were contacted during the data collection process, including the planning and zoning boards, selectmen, assessors, public works departments, building departments, police and fire departments, and school superintendents. In each interview, the official was questioned to find the most accurate and appropriate technique to allocate an expense or revenue.

Allocate Revenues by Land-Use. The information obtained during interviews with community officials and review of published community data was used to allocate each line item in a town's financial statement among the land-use categories of residential, commercial/industrial, and farm/forest/open space. An empirical distinction could have been made between commercial and industrial properties, but was not necessary since it would not have had a material effect on the ratios, nor would it have enhanced the final results. Although most municipal records do not allocate revenues and expenditures by land-use, some items were readily allocated. For example, education, parks and recreation, and human services expenditures are costs that may be allocated completely to residential parcels with confidence. Government grants and investment income, on the other hand, are more difficult to allocate. When it was unclear as to how a revenue/expense should best be allocated, the advice of local officials was sought and the disaggregation was made at his or her discretion. When as official could not allocate a revenue/expense or when the item was most properly allocated across all land-use categories, "fall-back" ratios were employed.

Fall-Back" Ratios. Fall-back ratios are a tool used to allocate general costs and revenues. General overhead line items such as the expenditures for the town administrator, the local planning board, and town selectmen cannot be attributed to one particular land-use. To allocate such items, weighted ratios that account for the proper share of assessed value for each land-use category in the town are calculated. As previously mentioned, computer files facilitated the process of sorting records, based on size and state use codes.

Once parcel records were grouped by land-uses, fall-back ratios were calculated by dividing the total assessed value of each land use category by the town's total property tax assessment for all categories. The general revenue/expense item was then multiplied by these ratios to allocate the item by land-use. Two sets of fall-back ratios were calculated to disaggregate among the categories; a set that allocated among all three categories and another that made an allocation only between residential and commercial/industrial uses. As an example, property tax revenues were generally allocated using fall-back ratios.

Allocate Expenditures by Land-Use. As mentioned above, disaggregation of expenditures was based on interviews with local officials, and in the absence of an estimate, fall-back ratios were employed. Local official's often allocated general overhead items, such as the ones mentioned above, using the fall-back method.

Analyze Data and Calculate Ratios. The financial costs and benefits to a town from each type to land-use can be estimated by comparing town expenses and revenues for each land-use category, providing the answer to the questions: "For every dollar of revenue raised by a particular land-use category, how much was spent in town services in order to support that land-use?" The radios provide an estimate, for a given fiscal year, of the cost and financial contribution to the town of each defined land-use category.

In order to ensure that all allocations were made correctly and that all factual information was accurate, the preliminary findings were presented to the town officials and attending residents to review, discuss, and address any additional issues that were not covered over the course of the study. In general, the town members accepted the assumptions, methodology, and results that are presented here.

Results and Conclusions. The statewide average expense/revenue ratios shown below indicate that commercial/industrial properties provide the greatest fiscal benefits to the towns, with an average cost of $0.27 for every dollar that they contribute in tax revenues. Over 152 studies using this methodology have been conducted between 1986 and 2009 in twenty five states throughout the United States. Besides the nine (9) conducted in Connecticut between 1995 and 2002; thirteen (13) were conducted in Massachusetts between 1992 and 2009 thirteen (13) in New York between 1989 and 2003; three (3) in Rhode Island in 1995. The average median cost per dollar of revenue raised to provide public services was $1.16 for Residential, $0.35 for Commercial/Industrial and $0.29 for Working and Open Land.

The following table summarizes the final expense/revenue ratios determined for the nine towns selected in the State of Connecticut.

Summary of Expense/Revenue Ratios in Connecticut Towns

Town	Residential	Commercial/Industrial	Open Space
Bolton	$1.05	$ .23	$ .50
Brooklyn	$1.09	$ .17	$ .30
Durham	**$1.07**	**$ .27**	**$ .23**
Hebron	$1.06	$ .47	$ .43
Lebanon	$1.12	$ .16	$ .17
Litchfield	$1.11	$ .34	$ .34
Pomfret	$1.06	$ .27	$ .86
Windham	$1.15	$ .24	$ .19
Town Average	$1.12	$ .27	$ .37

The existence of open space parcels in each of towns provided a clear benefit to local financial stability. Although assessed at a fraction of its highest and best use, open space still provided a positive contribution to the town's finances, as do the commercial/industrial properties. Unlike commercial/industrial properties, however, the presence of farm, forest, and open space properties do not carry the drawbacks mentioned above (although there may be some attraction for new residents seeking to build a home in a rural setting). In addition, the ratios do not capture other values that open space may bring to a community, such as: recreational opportunities, wildlife habitat, air and water quality preservation, and privacy. Although these values are not addressed in the AFT methodology, based on these ratios alone it is possible to make a strong case for farm, forest, and open space land as a financially sound asset to these communities.

5.16. Built Environment

The built environment describes the environment in which people live and work on a daily basis. Its components can impact our resident's Quality-of-Life.

5.16.1. Light Trespass and Glare

One negative aspect of the built environment is light trespass and glare that is often generated from non-residential buildings. While the town currently has regulations regarding light trespass and glare, they apply primarily to new non-residential construction or major renovations to existing buildings. The town and Regional School District #13 should consider updating exterior lighting to comply with state and local regulations. Other properties that may be out of compliance should be identified and technical assistance made available to assist the property owners in voluntarily making the necessary adjustments to bring the site into compliance.

5.16.2. Noise

Another negative aspect of the built environment is noise. While the town passed a noise ordinance in 2000 that was subsequently approved by the DEEP, this ordinance contains exemptions for fair and school events. Noise pollution from trash collection at non-residential properties has a negative environmental impact. New commercial sites are reviewed with this issue in mind, collection areas are required to be screened and hours of collections are limited. Existing sites with collection areas should also be screened.

5.17. Goals

- The town should consider funding a capital reserve dedicated to acquiring open space on an annual basis.
- The town should develop and maintain a list of priority properties for acquisition.
- The town should consider enacting subdivision regulations that facilitate fee-in-lieu-of open space for the maintenance and acquisition of open space parcels. This would allow funds to build for open space acquisition or improvement in situations where the acceptance of open space land is not warranted or desirable.
- The town should use various existing local, regional and statewide land trusts to accept and steward permanently protected forest, farm, and open space resources.
- The town should consider local tax abatements such as Public Act 490 and zoning incentives for new or expanded commercial/industrial development that permanently preserves and allows for management of important open space resources.
- During subdivision conveyance or potential open space acquisitions, preference should be given to areas that abut currently protected open space or conservation lands to facilitate the contiguous expansion of critical habitats.
- The town should continue to comply with the requirements of the Department of Energy and Environmental Protection with respect to storm water management.
- The town should consider adopting of an impervious cover limitation of no more than 12% of any parcel.
- The town should consider requiring the establishment of vegetative buffers along waterfronts.
- The town should consider conducting a series of workshops to educate town officials and property owners of the importance of comprehensive watershed management stressing the potential adverse impact of certain land uses on water quality;
- The town should consider revising its land use regulations to insure that future development within the watershed is compatible with existing and proposed water quality standards established by DEEP for surface and ground water.
- The town should continue to maintain best management practices to control erosion and reduce sediment delivery to the river.
- In order to increase their usage and the safety of our residents, the town should consider increased vehicle parking and signage at entrances to the town's hiking and bike trails.
- The town and Regional School District #13 should consider updating exterior lighting systems to comply with state and local regulations.
- The town should consider the development of regulations which encourage the use of non-impervious surfaces.
- The town should consider making storm water improvements in areas having IC's greater than twelve percent (12%).

Chapter 6.0
Economic Development

6.1. Introduction

Durham is a rural and suburban residential community with limited commercial and industrial development within its town borders. Existing commercial and industrial development is largely located along Route 17 from the Middlefield town line to the North Branford town line; along Route 68 from the Wallingford town line to the intersection of Route 68 and Route 17 in the town's center; and along Skeet Club Road.

Economic development contributes numerous benefits to the community, including jobs, taxes, and participation in charitable activities. Economic development provides residents and visitors alike with enjoyable places to shop, enjoy a meal, or purchase everyday necessities such as food, medicines, and fuel. And economic development can attract new residents, homebuyers, public safety volunteers, and even other businesses.

The town's limited commercial and industrial development results in a heavy reliance on residential property taxes to fund the increasing demand for services. This, coupled with decreasing levels of state assistance, has had a significant impact on the mill rate and taxes over the past ten years. This impact is predicted to become increasingly significant until and unless economic conditions in Connecticut dramatically improve.

6.2. Strengths and Limiting Factors

The town of Durham is centrally located in the state of Connecticut and may be readily accessed via major interstate highway I-91. The bi-directional exit off of I-91 (Exit 15) is clearly identified ("Durham") to direct people to the town's center. The town is well known statewide for its annual agricultural fair, which draws attendees from across the Northeast. The town is served by both heavy rail and bus service.

The town's zoning regulations allow for Residential (R), Commercial (C), Industrial (I), and Design Development District (DDD) uses.

A lack of municipal water infrastructure throughout most of the town and a lack of municipal sewers throughout all areas of the town are significant deterrents to more intensive commercial and industrial development. With the 2015 approval of a new municipal water supply line from Middletown to Durham, many of the properties along Route 17 will become more attractive for retail, commercial, and light industrial development. The town's lack of a natural gas distribution line is also a deterrent to industrial manufacturing.

6.3. Economic Development Commission

For many years, the town's Economic Development Commission (EDC) has provided advocacy for existing businesses and worked to attract new businesses to the town. Commission members serving on the EDC are appointed by the Board of Selectmen.

6.4. Infrastructure Improvements to Stimulate Economic Development

Commercial and industrial land uses often require water and sewer infrastructure. Durham's dependence on septic systems and private wells has contributed to its evolution as a bedroom community. Although the provision of a new water supply along Route 17 has the potential to bolster economic development in this area, Durham will continue to be passed over by many commercial or manufacturing enterprises that require greater infrastructure.

Elected officials and the EDC should take an active role in encouraging additional infrastructure investment in locations where commercial and industrial development is appropriate and a financial return on taxpayer investment can be demonstrated. Town staff and the EDC should explore alternative funding sources for the construction of infrastructure.

6.5. Economic Strategies Plan (ESP)

The town, in conjunction with the Economic Development Commission, should consider developing an *Economic Strategies Plan* (ESP). The development of such a plan may require the services and tools of a third-party consultant and the town should consider allocating funds for this purpose. This plan could outline (in greater detail) the actions that must be taken to accelerate economic development and describe the recommended timeline for implementation of these actions. The ESP should describe any needed changes in local infrastructure, land-use regulation, and current economic development efforts. For the plan to remain relevant, it should be revised periodically as it will be important to reconcile the plan to clearly reflect changes in the local and regional development climate. Goals and times for completion should be updated, revised, or removed as necessary. It should be the responsibility of the Economic Development Commission or their designee to ensure that the plan remains current following its development.

The following elements should be incorporated in the *Economic Strategies Plan*:

- An inventory of existing businesses and their services and product lines.
- A determination of the types of businesses and industries Durham wishes to attract.
- A plan to target the businesses and industries identified above.
- Desired utility and infrastructure improvements in targeted areas.
- Proposed revisions to commercial and industrial zoning regulations.
- Programs that encourage the full utilization of existing retail, commercial, and industrial space.
- A media campaign and website that will encourage persons from outside the town to come to Durham for shopping, recreation, day-trips, and other activities (e.g., *"ShopDurham.com"*).
- Methods for identifying and targeting opportunities in tourism and agri-tourism.
- A calendar of regularly scheduled events that foster economic activity.

6.6. Marketing Durham

The town should continue to market Durham's high quality-of-life and central location to attract compatible businesses. The town should devote resources (co-op student or search agency) to identify and search for appropriate businesses that might wish to move to Durham.

The town should ensure that the process of opening a business is as simple and friendly as possible. In conjunction with the EDC, the town should create an informational pamphlet for people interested in opening new businesses in Durham. This pamphlet should include a narrative of the approval process as well as a checklist of the required permits.

A very attractive flyer has been developed that publicizes the advantages of locating businesses and industries in Durham. This document should be updated and placed on the town's website, distributed to local chambers of commerce, CBIA, and other business networking groups.

In a manner that does not infringe on trademarks, the town should more fully utilize the public's awareness of its identity as a leading agricultural community.

6.7. Support for Home-based Business

Small, home-based businesses are an emerging economic-development generator. Many Durham residents have and will continue to start home-based businesses. Information on assistance for small

businesses should be made readily available to those seeking it.

In recognition of the fact that technology now enables 20% of the nation's workforce to work from their home on a full-time basis and allows 37% of the nation's workforce to work from home on a part-time basis (at least several days per week), the Planning and Zoning Commission shall consider the expansion of the maximum permissible area allowed for home occupation permits.

6.8. Business Incubation Facilities

As they grow, small, home-based businesses often require transitional facilities with a limited amount of support services. Facilities such as these are a perfect fit in many of Durham's commercial and industrial areas. The town should facilitate the creation and promotion of such facilities and aggressively market their presence in Durham.

6.9. Medical, Retiree, and Senior Care

Facilities that can provide care for our senior citizens and retirees should also be considered as a strategic business for the town; this type of facility can increase the tax base without a concomitant increase in town services. Often, such facilities have highly specialized medical equipment that, because of its high value, can generate significant taxes.

6.10. Consider Retail and Small-commercial Expansions

Historically, Durham residents have made major purchases (automobiles, appliances, electronics, building materials, etc.) in surrounding towns. Other than purchases at small convenience stores, gasoline stations, and small restaurants, Durham residents primarily shop outside of Durham.

Retail and limited commercial development that does not alter the character of the town and that improves the quality-of-life for its residents should be encouraged.

In conjunction with the Economic Development Commission, the Planning and Zoning Commission should evaluate the desirability of permitting mixed uses or adaptive reuse of structures (and/or a portion therein) throughout the town. An important part of commercial expansion may be the re-use of a portion of some buildings as offices. Modern office facilities would attract businesses that would have little impact on the environment and would require little in the way of industrial infrastructure, but would create jobs and increase the tax base. Companies involved in financial services, insurance, real estate, software development, and data processing are examples of "low-impact" enterprises that should be encouraged.

6.11. Inventory of Industrial and Commercial Parcels

The town should develop a detailed inventory of all vacant land zoned for industrial or commercial use and place this information on file at the Connecticut Economic Resource Center (CERC). An immediate second phase would be to inventory all developed parcels, including non-conforming uses, and again to make this information available to CERC. These inventories should be maintained and updated regularly. The owners of these properties should be contacted and provided information that would be useful if they decided to investigate selling, leasing, or developing their property. The town should also participate in site finder services provided at the regional and statewide level.

As current commercial and industrial zoned land is developed, additional property, where appropriate, should be considered for rezoning, specifically adjacent to existing commercial and industrial zones along major thoroughfares (Routes 68, 17, 77, 79 and 147).

While it may be necessary to expand non-residential zoned areas, there must continue to be an emphasis on efforts to limit sprawl and associated traffic congestion, protect residential areas from incompatible

forms of development, and concentrate capital infrastructure in areas where there will be the greatest return on any tax dollar investment.

6.12. Survey of Local Businesses

The town's EDC should conduct a survey of local businesses as to their various needs and provide technical and financial assistance through town, regional, and state resources.

6.13. Tax Strategies

The town should continue to utilize tax abatement as an incentive to encourage expansion or relocation of businesses into the community on a case-by-case basis. There have been general guidelines adopted for qualifying for the tax abatement program.

6.14. On-going Support

The First Selectman and Economic Development Commission should meet at least quarterly to assure close communications on projects and policy changes.

6.15. Business and Labor Data

DURHAM LABOR FORCE (2007-2014)

	2007	2008	2009	2010	2011	2012	2013	2014
Labor Force	4286	4345	4355	4276	4314	4249	4190	4260
Employed	4143	4177	4098	3994	4025	3990	3946	4035
Unemployed	143	168	257	282	289	259	244	225
Durham (%) Unemployment	3.34%	3.87%	5.90%	6.59%	6.70%	6.10%	5.82%	5.28%

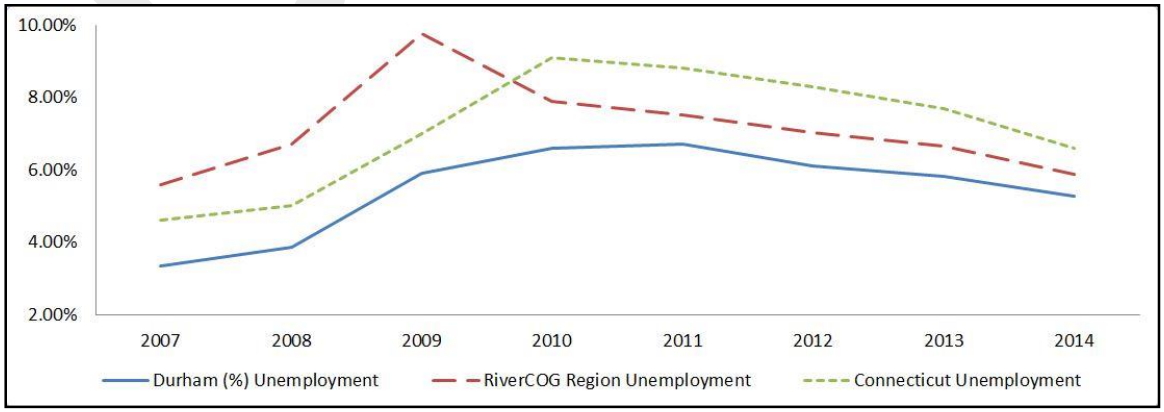
Source: Connecticut Department of Labor, Office of Research, Bureau of Labor Statistics

DURHAM BUSINESS SIZE BY EMPLOYEES (2014)

Employees	Number of Businesses
Establishments with 1 to 4 employees	82
Establishments with 5 to 9 employees	35
Establishments with 10 to 19 employees	18
Establishments with 20 to 49 employees	11
Establishments with 50 to 99 employees	3
Establishments with 100 to 249 employees	2
Establishments with 250 to 499 employees	1
Total Number of Establishments	**152**

Source: Connecticut Department of Labor, Office of Research, Bureau of Labor Statistics

UNEMPLOYMENT STATISTICS



Source: Connecticut Department of Labor, Office of Research, Bureau of Labor Statistics

DURHAM BUSINESS SECTORS AND WAGES 2010 - 2014

Year	2010	2011	2012	2013	2014
Total Jobs:	1,749	1,873	1,849	2,013	2,027
Total Wages:	$ 77,561,621.78	$ 79,242,403.23	$ 81,578,679.40	$ 93,501,346.93	$ 98,959,257.10
Manufacturing Jobs:	288	315	299	308	317
(%) Manufacturing Jobs:	16.5%	16.8%	16.2%	15.3%	15.6%
Total Manufacturing Wages:	$ 21,819,856.00	$ 21,909,985.00	$ 22,102,719.00	$ 25,362,440.00	$ 28,622,161.00
Manufacturing (%) of Total Wages	28.1%	27.6%	27.1%	27.1%	28.9%
Construction Jobs:	255	267	363	467	471
(%) Construction Jobs:	14.6%	14.3%	19.6%	23.2%	23.2%
Total Construction Wages:	$ 12,463,093.00	$ 12,399,319.00	$ 16,950,412.00	$ 22,062,371.00	$ 23,507,708.00
Construction (%) of Total Wages	16.1%	15.6%	20.8%	23.6%	23.8%
Wholesale Trade Jobs:	87	87	94	105	103
(%) Wholesale Trade Jobs:	5.0%	4.7%	5.1%	5.2%	5.1%
Total Wholesale Trade Wages:	$ 6,975,579.00	$ 5,848,972.00	$ 6,380,162.00	$ 7,983,061.00	$ 8,182,851.00
Wholesale Trade (%) of Total Wages	9.0%	7.4%	7.8%	8.5%	8.3%
Retail Trade Jobs:	109	101	61	93	99
(%) Retail Trade Jobs:	6.2%	5.4%	3.3%	4.6%	4.9%
Total Retail Trade Wages:	$ 1,945,551.00	$ 1,735,108.00	$ 1,155,060.00	$ 1,649,766.00	$ 1,586,132.00
Wholesale Trade (%) of Total Wages	2.5%	2.2%	1.4%	1.8%	1.6%
Professional, Scientific, and Management Jobs:	98	87	81	56	72
(%) Professional, Scientific, and Management Jobs:	5.6%	4.6%	4.4%	2.8%	3.5%
Total Professional, Scientific, and Management Wages:	$ 5,912,811.00	$ 4,964,946.00	$ 4,348,038.00	$ 3,995,258.00	$ 5,037,716.00
Professional, Scientific, and Management (%) of Total Wages	7.6%	6.3%	5.3%	4.3%	5.1%
Finance, Insurance, and Real Estate Jobs:	59	56	50	45	30
(%)Finance, Insurance, and Real Estate Jobs:	3.3%	3.0%	2.7%	2.2%	1.5%
Total Finance, Insurance, and Real Estate Wages:	$ 1,947,819.00	$ 2,119,426.00	$ 2,103,803.00	$ 2,062,016.00	$ 1,412,807.00
Finance, Insurance, and Real Estate (%) of Total Wages	2.5%	2.7%	2.6%	2.2%	1.4%
Service Jobs:	471	590	525	563	579
(%) Service Jobs:	26.9%	31.5%	28.4%	28.0%	28.6%
Total Service Wages:	$ 8,862,101.00	$ 12,380,446.00	$ 10,557,991.00	$ 12,063,218.00	$ 12,447,239.00
Service Job (%) of Total Wages	11.4%	15.6%	12.9%	12.9%	12.6%
Government Jobs:	95	92	94	99	96
(%) Government Jobs:	5.5%	4.9%	5.1%	4.9%	4.8%
Total Government Wages:	$ 3,124,174.00	$ 3,262,410.00	$ 3,136,474.00	$ 3,312,854.00	$ 3,487,526.00
Government (%) of Total Wages	4.0%	4.1%	3.8%	3.5%	3.5%
Education Jobs:	286	277	282	276	261
(%) Education Jobs:	16.4%	14.8%	15.3%	13.7%	12.9%
Total Education Wages:	$ 14,510,637.78	$ 14,621,791.23	$ 14,844,020.40	$ 15,010,362.93	$ 14,675,117.10
Education (%) of Total Wages	18.7%	18.5%	18.2%	16.1%	14.8%

DURHAM GRAND LIST SUMMARY
Ten Year Period between 2003 and 2013

Category	2003	% of Total	2013	% of Total	Change (%) 2003-2013
Residential	$371,971,291.00	89.00%	$505,318,101.00	77.30%	-11.7%
Commercial	$17,888,830.00	4.30%	$19,286,470.00	2.90%	-1.4%
Industrial	$12,274,830.00	2.90%	$18,324,880.00	2.80%	-0.1%
Public Utility	$864,990.00	0.20%	$398,230.00	0.10%	-0.1%
Vacant Land	$10,142,440.00	2.40%	$12,599,264.00	1.90%	-0.5%
Use Assessment (PA490)	$3,090,229.00	0.70%	$96,240,830.00*	14.70%	14.0%
Apartments	$1,606,240.00	0.40%	$1,617,280.00	0.20%	-0.2%
Total	**$417,838,850.00**	**100.00%**	**$653,785,055.00**	**100.00%**	0.0%

** Before the application of reduction factors Source: Durham Assessor's Records*

RIVERCOG REGION MUNICIPALITIES
Comparison of Grand List & Mill Rates (2014)

Municipality	2014 Grand List	2014 Mill Rate
Chester	$ 401,505,810	25.32
Clinton	$ 1,360,687,926	26.77
Cromwell	$ 1,092,940,150	31.38
Deep River	$ 444,413,390	26.28
Durham	**$ 655,272,174**	**33.74**
East Haddam	$ 765,983,830	28.68
East Hampton	$ 1,020,465,935	27.78
Essex	$ 944,905,200	21.08
Haddam	$ 789,208,938	31.20
Killingworth	$ 655,959,250	25.23
Lyme	$ 488,816,630	17.75
Middlefield	$ 357,643,085	33.67
Middletown	$ 2,659,806,854	32.60
Old Lyme	$ 1,467,480,240	20.62
Old Saybrook	$ 2,054,282,600	18.81
Portland	$ 702,723,556	32.34
Westbrook	$ 1,072,778,656	22.51

Source: Connecticut Office of Policy and Management, 2014 Grand List Year

6.16. Goals

- The town, in conjunction with its Economic Development Commission and a third-party consultant, should consider developing a comprehensive economic development plan ("Economic Strategies Plan") that focuses on enhancing economic drivers, including - but not limited to - tourism, high-value manufacturing, research and development, retirement/senior care, agriculture, and professional services. These and other economic drivers are critical to the town's vitality and prosperity.

- Elected officials and the EDC should take an active role in encouraging additional infrastructure investment in locations where commercial and industrial development is appropriate and a financial return on taxpayer investment can be demonstrated.
- The town should continue to market Durham's high quality-of-life and central location to attract compatible businesses and should devote resources to identify and search for appropriate businesses.
- The town should ensure that the process of opening a business is as simple and friendly as possible. This includes the creation and distribution of an informational pamphlet for people interested in opening new businesses in Durham and a flyer that publicize the advantages of locating businesses and industries in Durham. All information should be available directly from the town's website.
- In a manner that does not infringe on trademarks, the town should more fully utilize the public's awareness of its identity as a leading agricultural community.
- The town should support home-based businesses and advocate for the creation of a small-business transitional facility.
- The Planning and Zoning Commission shall consider the expansion of the maximum permissible area allowed for home occupation permits.
- Medical, retiree, and senior-citizen care should be considered as a strategic business for the town as it can increase the tax base without a concomitant increase in service demands.
- In conjunction with the Economic Development Commission, the Planning and Zoning Commission should consider evaluating the desirability of permitting mixed uses in or adaptive reuse of structures (and/or a portion therein) throughout the town.
- The town should consider the feasibility of establishing a centralized municipal parking area along its Main Street.
- The town should promote agriculture as an important and growing part of the local economy.
- The town's EDC should conduct a survey of local businesses as to their various needs and provide technical and financial assistance through town, regional, and state resources.
- The town should continue to utilize tax abatement as an incentive to encourage expansion or relocation of businesses into the community on a case-by-case basis.
- The First Selectman and Economic Development Commission should meet at least quarterly to assure close communications on projects and policy changes.
- In order to enhance the town's tax base, the Durham Planning and Zoning Commission should consider identifying areas where light industrial businesses might be located in the future.
- The Durham Planning and Zoning Commission shall assist the Economic Development Commission and its consultants in attracting commercial establishments identified in the 2016 Visioning Charrette (grocery store, etc.).

Chapter 7.0
Community Facilities

7.1. Public Water Supply

7.1.1. Existing Municipal Water System

The Durham Center Water System was original founded in 1899 to serve the properties located along Cherry Lane, Fowler Avenue and Main Street. In 2003 the town acquired the assets and service territory from the Aquasource Water Company, and shortly thereafter abandoned the original water sources and tanks. Numerous upgrades were made to the system during the following years and reliability and water quality were substantially improved. Wells were developed on the White Farm property, and a treatment / booster station was constructed near the Durham Fairgrounds. The system presently serves approximately 70 residential connections and 15 non-residential connections; providing water to an estimated 289 persons. The town currently contracts with the Connecticut Water Company to operate the system, as its Certified Operator.

The town also contains two other water systems, which are associated with its housing developments. These include Lexington Place (15 condominium units near Green Lane) and Mauro Meadows (24 elderly housing units near Higganum Road). There are four other water systems located in the town; and while these are considered to be public supply systems, they do not have the ability to expand their customer base. They include the Mill Pond Elderly Housing Association (24 units east of Main Street and north of Allyn Brook) and the Blue Trail Acres Association (20 single family dwellings on Barbara Lane and Camera Road with 36 units located in North Branford).

7.1.2. Proposed Municipal Water System

The September 2005 *Record of Decision* (ROD) for the Durham Meadows Superfund Site was published. The ROD required an alternative water source for the properties impacted by contamination or potential contamination associated with the Superfund site. In 2013 a consulting contract was awarded by the Environmental Protection Agency (EPA) to perform investigative work in support of the ROD and design cleanup activities for the area. The ensuing design included an assessment to ensure that the cleanup would address the likely expansion of the contaminated aquifer (which may not be associated with the Superfund site).

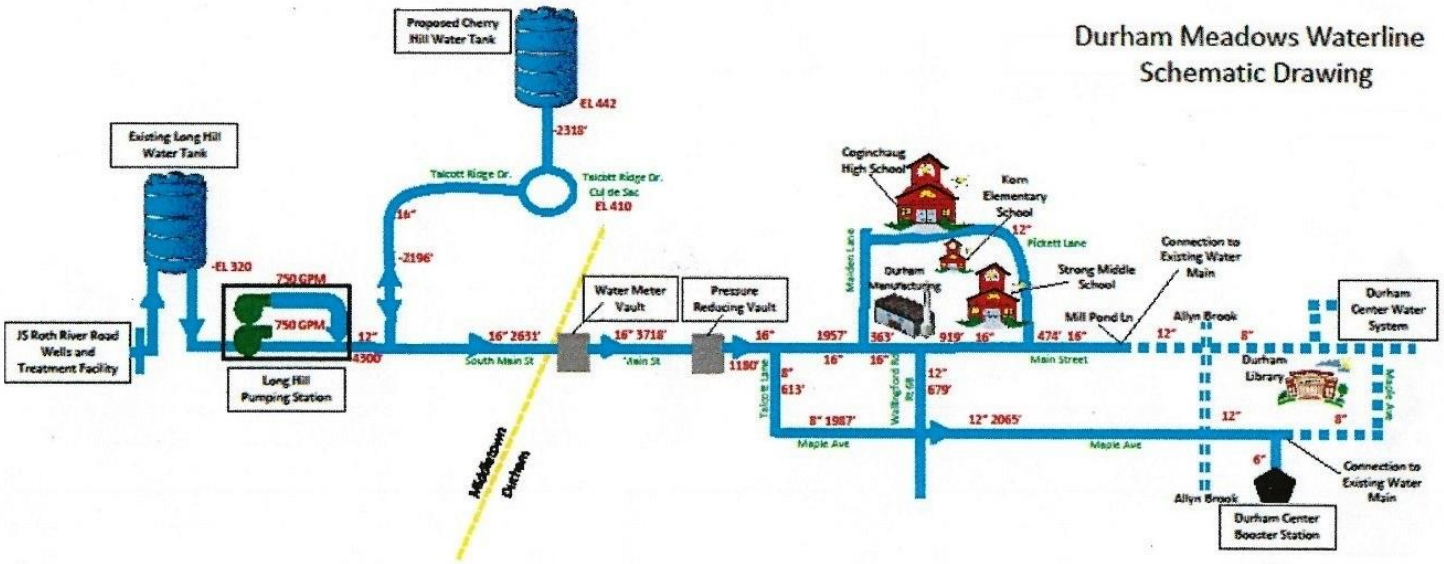
The design calls for municipal water to originate from the system operated by the City of Middletown, Connecticut to be pumped to a newly-constructed water tank that would be located above the Talcott Ridge Drive cul-de-sac in Middletown. From this tank, a 16 inch diameter main distribution line would proceed southerly along Route #17 to Allyn Brook; where it would connect to the Durham Center Water System's distribution system. A 12 inch diameter main distribution line would loop through Pickett Lane to Maiden Lane and return to Route 17. A 12 inch diameter main distribution line would serve Wallingford Road to Maple Avenue, and travel south towards the Durham Center Booster Station that would be connected to the system through a 6 inch tap. An 8 inch diameter main distribution line would loop through Talcott Lane and Maple Avenue and connect with the line on Wallingford Road. Once the system is operational, the wells located at the White's Farm site would be taken out of service, as both the EPA and DEEP believe that the groundwater contamination from the Superfund Site will migrate towards the White's Farm Well Field area, once pumping from the aquifer subsides. The design also includes additional water volumes for fire protection.

The initial service area provides water to 128 properties. The connections extend from 327 Main Street to 119 Main Street; all of Maple Avenue and Alcott Lane; Maiden Lane out to 114R; 17, 22, and 47 Wallingford Road; 10 and 17 John's Way; the three schools on Pickett Lane; and a connection to the Fairgrounds. Of

the 128 properties up to seven will have curb stops provided; and two additional curb stops will be installed near the large open parcel on Maple Avenue. In addition, there is expected to be an additional 45 curb stops installed between the Durham/Middletown town line and the water line connection at 327 Main Street. Connection to the system requires the express permission of the property owner. The cost of connecting to the water system would be borne by the remediation project, and not the property owner.

The City of Middletown performed an exhaustive water supply study to demonstrate their ability to provide the required quantity of water to service the initial service area and the six (6) potential future service areas for the next fifty years. The final design for the initial service area has been completed, and the project is expected to be bid in the spring of 2016. Construction is estimated to begin in late 2016 or early 2017 and construction is expected to be completed within two (2) years.

To address the future expansion of the contaminated aquifer, the town passed a Groundwater Management Zone (GMZ) Ordinance in 2016, which will largely prevent the withdrawal and usage of groundwater within the GMZ area by requiring that properties within the zone be connected to the public water once it becomes available. Initially, this connection and well-closure services will be offered free-of-charge to properties within the GMZ.



7.1.3. Future Service Areas

The following six (6) areas have been identified as potentially requiring public water to alleviate future contamination. Extending the water main from Middletown would allow potable and fire flow water to be directed to these portions of the town and enhance and stabilize property values in these areas. At the current time, no detailed engineering has been completed for this expansion.

<u>The Royal Oak Park Area</u>

This is a subdivision that lies north of Durham Heights and east of Main Street, between Oak Terrace and Acorn Drive in Middletown. There are mostly aesthetic issues related to the hardness, iron and manganese in the potable water in this area. This area includes an estimated 112 properties; of which 109 are residential and 3 are undeveloped.

The Woodland Drive Area

This is a subdivision that lies east of Main Street and west of Durham Heights, between Oak Terrace and Haddam Quarter Road. This area was included because it would allow for looping of the proposed water main, and provide an independent route for water to be conveyed to the south, should there be addition issues along Main Street. As of this writing, there has not been any report of contamination in this area, however, aesthetic issues related to hardness, iron and manganese in this area have been identified. The Woodland Drive Area (Area G) includes approximately 55 properties; of which 50 are residential and 5 are undeveloped.

Durham Heights Area

This is a subdivision that lies east of Main Street, between Oak Terrace and Haddam Quarter Road. Many homes in this area had documented bacterial contamination. Most no longer have bacterial issues; however, many homeowners still complain about aesthetic issues related to water hardness, iron and manganese. The homes which had been affected (Area F) includes approximately 95 properties; of which 92 are residential and 3 are undeveloped.

The Parsons Area

This area lies north of Middlefield Road and along the west side of Main Street (Route 17). Volatile Organic Compounds (VOC's) have been detected in some wells. Not all of the contamination in this area can be attributed to the former Parsons Manufacturing Company. The Parsons area includes approximately 37 properties; of which 28 are residential and 8 are designated commercial or industrial. One property is undeveloped.

Maple Avenue / North of Talcott Lane

This area is north and west of the Durham Meadows Superfund Site; close to the intersection of Middlefield Road and Maple Avenue. Contamination in this area may be related to the Superfund Site; or may be related to the MTBE (Methyl Tertiary-Butyl Ether) area of the former Parsons Manufacturing Company. The area includes approximately 22 properties; of which 21 are residential and one is undeveloped.

Effluent plume from closed Durham and Middlefield Landfill

About three-quarters (3/4) of a mile to the west of Route 147, straddling the Durham and Middlefield town line, is the DMIAAB Transfer Station & Recycling Center and its original closed landfill. There is an effluent plume emanating from the closed landfill that has polluted the wells of eight (8) adjacent properties. The towns of Durham and Middlefield jointly operate a small water system that supplies potable water to these properties. These properties could potentially be connected to the public water supply from Middletown.

7.2. Sewer Avoidance Policy

In rural communities such as Durham, public sewer systems can be an extremely expensive means of handling domestic waste water for treatment; and could eliminate the basis of soil-based zoning regulations.

In order to insure that sewer networks are not required, all areas of the town have been identified as *Sewer Avoidance Areas.* In addition, the town has a *Sewer Avoidance Policy* that includes the adoption of local health regulations related to septic system construction. To assure the long-term viability of on-site septic and water supply systems, the town has a professional staff that conducts soil tests, review proposed system designs and inspects new and existing septic systems.

The town has taken an aggressive educational approach toward encouraging residents to have their systems pumped on a regular basis. Septic tank waste is transported by licensed cleaners/haulers to a nearby sewage disposal facility. The town has no plans to provide public sewers and there are no Department of Energy and Environmental Protection (DEEP) orders for pollution abatement measures.

7.3. School Facilities

Public education for the residents of Durham is provided by Regional School District #13 (RSD#13). This regional school district is comprised of the towns of Durham and Middlefield. The district operates the Coginchaug Regional High School, Strong Junior High School, and Korn and Brewster Elementary Schools; these being located in the town of Durham. The district also operates the Lyman and Memorial Elementary Schools; these being located in the neighboring town of Middlefield.

7.3.1. Current and Projected Enrollment

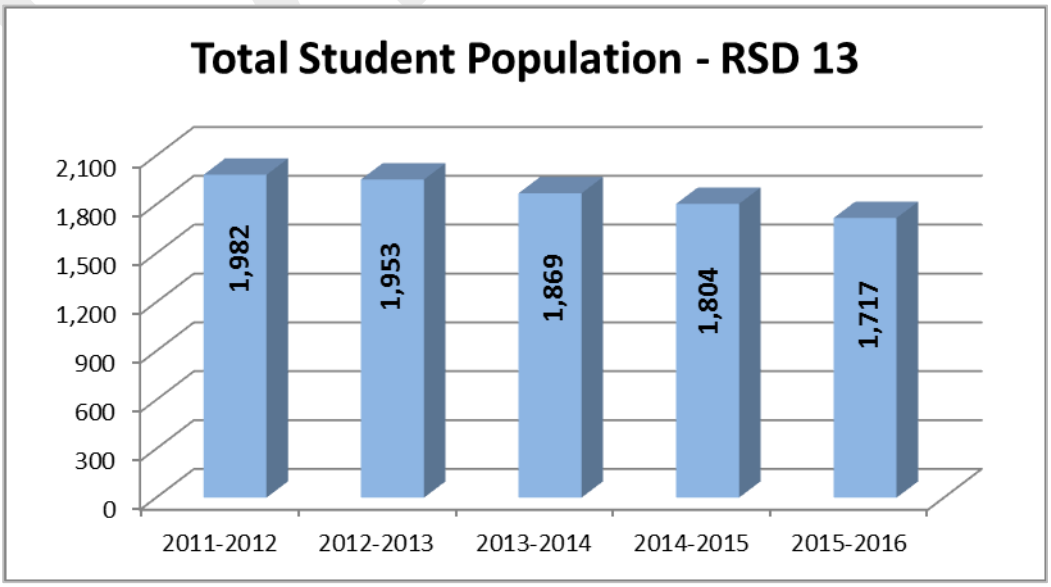
Regional School District #13 (of which Durham is a part) is in the midst of a prolonged trend of declining enrollment. The decrease in enrollment is currently reflected most profoundly in the elementary schools; where enrollment in grades K-6 has dropped from a high of nearly 1,200 students in the 2008-09 school year to 830 students in the 2015-16 school year. As a consequence, there are more classrooms than needed to accommodate the educational needs of our students.

The following table shows the district's current and projected enrollment. These projections are based on the "RSD#13 Comprehensive School Enrollment Study" prepared by Milone & MacBroom in January of 2014. An earlier study was conducted by H.C. Planning Consultants, Inc. in May of 2012. The two studies indicated similar reductions in enrollment.

REGIONAL SCHOOL DISTRICT #13 CURRENT AND PROJECTED ENROLLMENTS

School	Coginchaug	Strong	Memorial	Lyman / Korn / Brewster
Grades	9-12	7-8	5-6	Pre K-4
2015-16 Enrollment	556	318	566	577
2025-26 Estimated Enrollment	340	202	202	547
Site Acreage	69	(2*)	20	15 (2*) 20

*Located on the 69-acre campus with Coginchaug Regional High School.

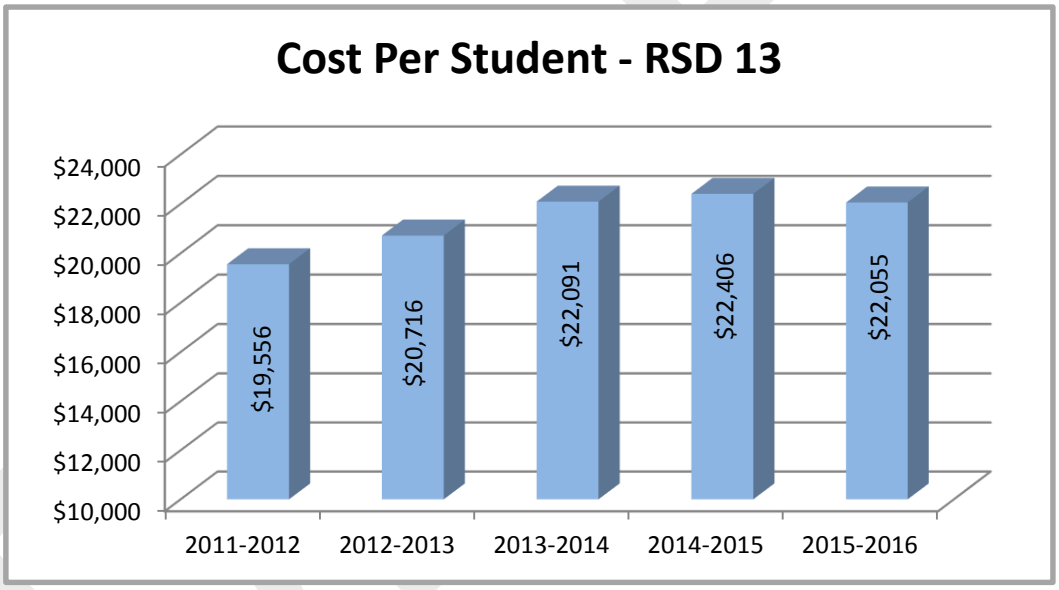


As a result of these Projections, in September of 2014, RSD#13 commissioned Drummey Rosane Anderson Inc. to conduct a *Facilities Utilization Study*. Many alternatives were considered, and the RSD#13 School Board selected Plan "C3"; which called for the closing of the Korn and Lyman schools and the implementation of various improvements at the Brewster, Memorial and Strong schools. These improvements were proposed to minimize the impact of the Korn and Lyman school closings. Under the plan, Korn School would be closed in 2016, while Lyman would be closed in 2019. Grants that were issued by the State of Connecticut for various improvements made to these schools may prevent the conveyance of the Korn School property to the town(s) ahead of the current amortization schedule, unless the state legislature approves an accelerated conveyance schedule.

In 2014, a committee was formed to study the possible re-use of the closed school buildings. The committee included the First Selectmen of both Durham and Middlefield, members of the RSD#13 Board of Education and the public.

7.3.2. Education Costs

Education currently represents nearly 80% of the town's budget and, as such, is a major driver of its taxes. Controlling costs in the face of decreasing enrollment can be challenging. As the following chart shows, after a period of increasing per-student costs, the district has taken steps to control these costs. The town and Board of Education should continue to work together to identify and implement efficiencies.



Amounts for 2011-2015 based on June 30 year-end audits; 2015-2016 based on approved budget

7.4. Municipal Facilities

7.4.1. Library Facilities

The Durham Public Library is located at the intersection of Main Street and Maple Avenue in the town's Historic District. The original 1,800 square foot building was dedicated in 1902, and is an outstanding example of Early Prairie or Chicago School architecture. In 1985 an additional 5,628 square foot of space was constructed, and in 1997 an additional 7,000 square feet was added to bring the building's size to nearly 14,000 square feet. Both of these expansions preserved the architecture of the original structure; so as to blend with the historic fabric of Main Street. The building has adequate parking, and has become a meeting place for many of Durham's Boards and Commissions, as well as many other organizations. The library provides modern services and programs for its users, and is expected to have adequate facilities to serve the town's needs in the foreseeable future.

7.4.2. Cemetery Facilities

Historically, it has been the policy of the town to provide cemetery plots to residents who desire them. Because space limitations at the Durham Center Cemetery on Main Street, the town purchased 3.00 acres of land on the west side of Mica Hill Road in the southern end of town in 1970, and an additional 1.84 acres in 1988, for a total of 4.84 acres. Considering past utilization trends, the site will be adequate for many decades to come.

7.4.3. Refuse Disposal/Recycling

Durham and the neighboring town of Middlefield jointly own a 22 acre site along the east side of Cherry Hill Road, north of the intersection of Route 147 (Middlefield Road). The site had been used as a landfill for solid waste and bulky waste until 1989. In 1990, a Transfer Station was constructed for the compaction of solid waste; for transport to the *Materials Innovation and Recycling Authority* (MIRA/ formally CRRA) facility located in Hartford, Connecticut. The transfer station is managed by the Durham-Middlefield Interlocal Agreement Advisory Board (DMIAAB).

The site accepts waste from residents, commercial refuse collectors and landscaping companies. Users are required to provide proof of residency and purchase a sticker that must be affixed to the windshield of the vehicle. In 2012, a 50-foot long weigh scale was installed to provide accurate weights of bulk materials brought into or out of the facility.

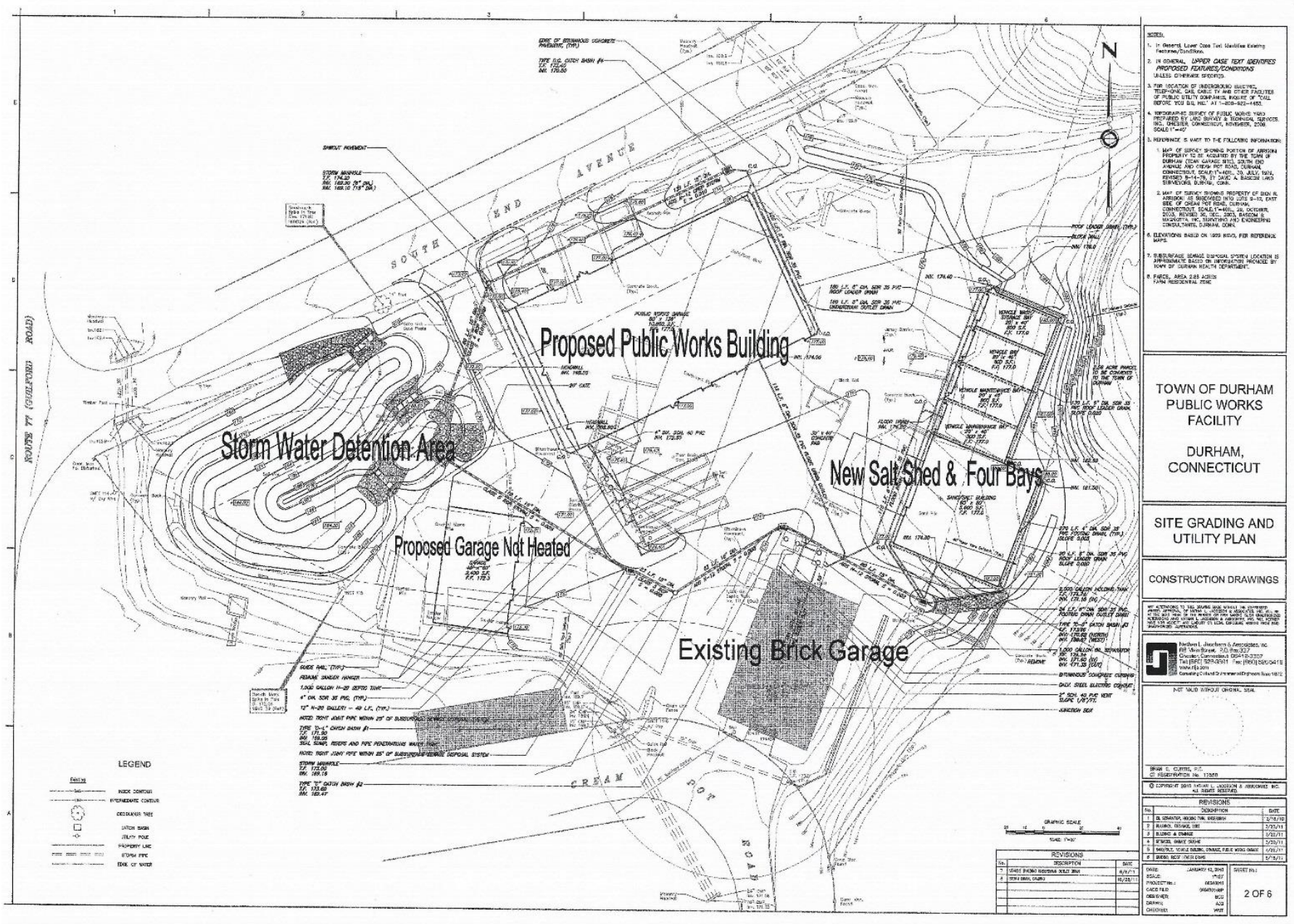
All materials which are brought to the site are eventually removed for recycling or disposal. The facility currently recycles plastics, motor oils, electronics and cardboard and grinds brush on-site, converting it to mulch. Through a series of site improvements, public education and increased the hours of operation, the towns have achieved a high level of participation in recycling. Paints and other hazardous wastes may be safely disposed of through the town's participation in the Regional Council of Government's Hazardous Waste Collection Program.

In September of 1999, the towns jointly purchased an additional 2.75 acres of adjacent property, having frontage on Old Indian Trail in Middlefield. The current facilities are expected to be adequate for the foreseeable future; and could be expanded if necessary by utilizing this property.

7.4.4. Highway Maintenance Center

The Town of Durham currently operates a Highway Maintenance Center, which is located between South End Avenue and Cream Pot Road. This 3.48 acre site contains a 4,000 square foot brick garage for the storage and maintenance of town vehicles and highway equipment. A 5,200 square foot wooden storage building is used to house smaller equipment. In 2012 a new building containing four (4) 20' x 40' bays was constructed for vehicle maintenance, washing and storage; and a new 80' x 80' salt shed was constructed. The center is equipped with a 4,000 gallon double-walled diesel fuel storage tank to facilitate on-site re-fueling. A 2,000 gallon holding tank is used to collect run-off from the site's drains, and a storm water management basin was constructed for compliance with Department of Energy and Environmental Protection regulations.

In 2012, the site was evaluated for its ability to accommodate future needs. It was determined that the site could accommodate an additional 80' x 136' (10,800 square feet) garage. This building could provide additional vehicle bays, kitchen, bathroom and sleeping facilities, and an office area. The septic system design for this structure has already been completed; and the building could be served by the site's existing water well. In addition, the site could accommodate another 2,400 square feet building. If these additional buildings were constructed, the facility would meet the needs of the town in the foreseeable future.


Proposed Public Works Building
Storm Water Detention Area
New Salt Shed & Four Bays
Proposed Garage Not Heated
Existing Brick Garage
SOUTH END AVENUE
CREAM POT ROAD
ROUTE 77 (GUILFORD ROAD)
N
LEGEND
TOWN OF DURHAM
PUBLIC WORKS
FACILITY
DURHAM,
CONNECTICUT
SITE GRADING AND
UTILITY PLAN
CONSTRUCTION DRAWINGS
REVISIONS
DESCRIPTION
DATE
2 OF 6

7.4.5. Town Office Building

The town's governmental functions are administered at the Town Hall, which is located at 30 Town House Road, near the Town Green. The building was originally constructed in 1849 as a church, and during the 1880's transitioned to its current use. Between 2004 and 2006 the building was renovated and made handicapped accessible with the addition of access ramps and an elevator. During the renovation, the third floor of the building was converted into a 2,000 square foot meeting space. The building is currently approximately 8,000 square feet in size; and is anticipated to serve the needs of the town in the foreseeable future.

7.4.6. Public Safety Facility

There has been a long history of needs studies to combine emergency services in a centrally-located complex. The Town of Durham currently owns the land and buildings at #37, #41 and #51 Main Street, and is considering a plan to accommodate the future needs of the Fire Department, Volunteer Ambulance Service, Resident State Trooper, Fire Marshall and Emergency Management Department at a common location. A *Public Safety Facility Renovations Planning Committee* was formed and tasked to create of a set of biddable building plans to develop the complex. In 2013, the town approved funding for the firm of Silver-Petrucelli & Associates to produce schematic designs for the project. If the project is completed, it could reduce annual operating expenses for the public safety service providers and encourage participation in these volunteer services, which protect the town's residents and businesses.

7.5. Fire Protection

Fire protection for the Town of Durham is provided by the 55-member Durham Volunteer Fire Department. The town's fire station is located at 41 Main Street in the center of town, and is strategically located to allow easy access to Routes 17, 77, 79, 68, and 147. The fire station was constructed in 1978 is in good structural condition. The three-bay structure has a total area of 9,264 square feet, and the town is considering an addition that would bring the total area to 12,041 square feet. Dispatching is provided through Valley Shore Inc. on a 24-hour basis for emergency calls.

The Fire Department along with the Planning and Zoning Commission has embarked on a program of developing year-round water sources with easy access to facilitate the supply of water for firefighting. As a policy, the Fire Department has endorsed the concept of using manhole structures and feeder pipes to allow ready access to these water sources from the adjacent roadways. All existing water sources have been inventoried; and voids in the network have been identified by using radiuses of 3,000 feet and one mile; with density-of-development and building size being critical factors. As development occurs, opportunities to retrofit existing water sources and develop new ones are explored with applicants. A priority list of needs should be developed for the retrofitting of the existing water sources; many of which may be funded through a Capital Improvement Program.

7.6. Ambulance Service

Ambulance service for the town is provided by the Durham Volunteer Ambulance Corps, Inc., which consists of 25 members. The Ambulance Corps currently occupies a small building located at 205 Main Street that was constructed in 1933 and is located on 0.14 acres of land. There is no possibility of expansion at this location. Because the Ambulance Corps requires space for the storage of two emergency vehicles, medical supplies and training facilities, a larger space is highly desirable. This could be accommodated by relocating the Ambulance Corps to the planned Public Safety Complex. Dispatching is provided through Valley Shore Inc. on a 24-hour basis for emergency calls.

7.7. Police Protection

Police services for the Town of Durham presently consist of one full-time Resident State Trooper. The

trooper is commissioned by Troop F in Westbrook and maintains an office in the Durham Fair House, which is located next to the Town Hall. Built in 1768, the 1,800 square foot Fair House is in good condition, and is leased by the town from the Durham Fair Association. The Resident State Trooper uses approximately 200 square feet of this building as an office. The building is not equipped with a garage for vehicle storage or detention facilities; these are located at the Connecticut State Police Troop F barracks in Westbrook, Connecticut.

7.8. Department of Emergency Management

The Department of Emergency Management is responsible for providing emergency preparedness services to the residents and businesses within the town and provides emergency preparedness information to residents so that they may properly prepare for natural, technological and human-caused disasters.

The department is responsible for responding to threats and instituting measures that will mitigate the effects of a disaster; whether caused by nature, technology or terrorism. When an incident occurs, town government activates its Unified Command. All necessary emergency service departments respond in a coordinated fashion throughout the incident.

The department operates from the centrally located Town Hall. The Town Hall and the Emergency Operations Center (EOC) are equipped with an emergency generator and redundant communications to ensure that the department is able to respond to emergencies even without electrical power or traditional communications.

The department follows many state and federal guidelines when responding to incidents. The following functions are provided by the Emergency Management Department:

7.8.1. Emergency Response Plan

In accordance with federal and state Homeland Security Guidelines, the town has a Town Emergency Response Plan that summarizes town wide response to incidents. This plan is updated annually by the Emergency Management Department and is filed with the State of Connecticut.

7.8.2. Emergency Support Function (ESF)

As per FEMA guidelines it is recommended that town governments structure their emergency management into Emergency Support Functions (ESFs). The ESFs provide a structure for coordinating federal, state and local interagency support during an incident. The town currently supports the following ESFs:

ESF Number	Function
ESF #1	Transportation
ESF #2	Communications
ESF #3	Public Works and Engineering
ESF #4	Firefighting
ESF #5	Emergency Management
ESF #6	Mass Care, Emergency Assistance, Housing, and Human Services
ESF #7	Logistics Management and Resource Support
ESF #8	Public Health and Medical Services
ESF #9	Search and Rescue
ESF #10	Oil and Hazardous Materials Response
ESF #11	Agriculture and Natural Resources
ESF #12	Energy/Utilities
ESF #13	Public Safety and Security
ESF #14	Long-Term Community Recovery
ESF #15	Public Information/External Affairs

7.8.3. Emergency Shelter Operations

The department has a specialized team of volunteers who are skilled in Red Cross Emergency Shelter Management. When activated, this team is able to support Emergency Shelter Operations in multiple locations throughout the town. The Coginchaug Regional High School serves as the town's Primary Emergency Shelter. The Primary Emergency Shelter has been equipped to provide facilities for food, power, water and community meetings during an incident. Secondary Emergency Shelters have been identified in the town's Emergency Response Plan and can be activated as needed.

7.8.4. Durham Animal Response Team (DART)

The department has a specialized team of volunteers who are trained and certified as Animal Emergency First Responders. The Durham Animal Response Team (DART) is made up of certified veterinarians, veterinarian technicians, and volunteers dedicated to responding to large and small animal emergencies both within and outside of the town boundaries. This team is also responsible for managing the Emergency Pet Shelter that is located at the Emergency Shelter.

7.9. Durham Historical Society

The Durham Historical Society is dedicated to preserving the town's history and providing educational programs for children and adults to increase their understanding of the town's past. The society has written and published several books that recount the town's history.
The society owns two historic structures and leases the land and the historic schoolhouse located next to the Town Hall. Although the Historical Society has made significant investment into this schoolhouse, it has identified the following needs:

- Heating/cooling system to provide climate control. During the winter months, heat is particularly important to protect the society's collections.
- Roofing replacement and exterior painting.
- Funds to continue present and future programs, including guest speakers and activities for local school groups and other audiences.

7.10 Durham Activity Center (DAC)

The Durham Activity Center (DAC) was established in 2010 to accommodate recreational, educational and community-building activities. The Activity Center serves as a community and senior center. The Activity Center's *Elderly Nutrition Program* ("Senior Café") provides hot, nutritious lunch-time meals to persons aged 60 and over (and their spouses regardless of age) at low cost. The Town of Durham currently leases the facility, which is located at 350 Main Street.

7.11. Municipal Recreational Land

7.11.1. The White Farm

The town purchased the 110-acre White Farm in 1965. This parcel augments the existing state-owned wetland area of Durham Meadows, and provides the town with an extremely valuable recreational site. The site is used for model airplane flying, dog obedience events, hunting, fishing and several other uses. The steep slope off of Maple Avenue is used for novice hang-gliding, tobogganing and sledding. A portion of this parcel is used for temporary parking during fair events

7.11.2. Skating Pond

During winter months, the town operates a skating pond, which is equipped with a shelter building and area lighting to facilitate its use during evening hours. The idyllic winter scene of skaters at night

welcomes visitors and residents alike. The Durham skating pond is located along the south side of Route 68 (Wallingford Road) on the White Farm open space parcel. The town should consider enhancements and upgrades to the skating pond facility.

7.11.3. Allyn Brook Park

The 67.0 acre school campus along the east side of Main Street contains the Strong School, the Korn School and the Coginchaug Regional High School; all of which are owned by Regional School District #13. The site was augmented in 2002 with the acquisition of the adjacent 9.7 acre Stannard property.

Located between the Strong and Korn schools is Allyn Brook Park; a town-owned 11.7 acre facility, which includes a large shelter building.

It is hoped that the excellent cooperative arrangements which now exist between the Regional School Board and the town's recreational interests will continue, so that a well-planned educational and recreational facility is available for the town's residents.

Major recreational improvements were constructed in 2012 that were related to a school bond issue by the District. These include a new artificial turf field, track, seating facilities around the track and field, a press box with public address system; replacement of the existing four tennis courts, renovations to access points and parking areas, utility upgrades, accessory buildings and drainage improvements. Lighting around the tennis court area was upgraded.

Plans were prepared for practice fields on the adjacent Stannard property, but these were not funded. A proposed shower and locker room was not completed because of insufficient funds. Proposed lighting around the athletic field was not constructed, due to an appeal to the decision to approve the plan, and a later court settlement. The proposed lighting can be constructed following completion of the shower and locker room facilities.

7.11.4. The Town Green

The one-acre Town Green serves as the historic center of the Town. Fair and public gatherings are held on the Town Green throughout the year; and in late spring, summer and early fall a farmers' market is held on a weekly basis. The Selectman's office regulates the posting of signs on the Town Green for various community events.

7.11.5. Open Space near Brewster School

Regional School District #13 owns a 14.53 acre parcel on Tuttle Road; upon which Brewster School is located. The Town of Durham owns an adjacent 5.77 acre parcel to the north of the school property. The town-owned parcel can be used for recreational purposes; however, it may be mutually advantageous for the town and Regional School Board develop the parcels jointly, to create a more valuable recreational complex.

7.12. Town-sponsored Recreational Activities

The town, in conjunction with its Recreation Committee, offers a number of programs designed to improve the quality-of-life for its residents. These include:

Programs	Location
Adult Exercise Programs	Durham Activity Center
Children's Playground, Little People Jr. Counselor Programs	Allyn Brook Park
Men's Basketball, Women's Basketball, Youth Basketball	Strong School
Youth & Adult Self Defense, Youth Night	Strong School
Youth Basketball Program, Youth Night	Korn School
Warm-Up America	Durham Activity Center
Children's Karate Class	Brewster School
Woman's Softball	RSD13 Fields
Youth Soccer	Korn School
Children's Cooking Program	Strong School
Summer Concert Series	Allyn Brook Park
East Egg Hunt	Allyn Brook Park
Holiday Tree Lighting	Town Green

If proper facilities were available (perhaps at Korn School) the Recreation Committee could offer additional programs. The town and its recreation committee should continue to offer programs that prove to be popular; and regularly evaluate new programs that might benefit the town's residents. The town should consider identifying a location for the construction of a men's ball field.

7.13. Goals

- The town, in conjunction with the RSD #13 Board of Education should continue to work together to identify and implement efficiencies that help reduce costs.
- The town should assist the Durham Historical Society in its pursuit of available funding and grants.
- In order to reduce the cost of services for its citizens, the town should consider increasing its participation in regional services and initiate cooperative ventures with neighboring towns.
- The town should consider enhancements and upgrades to its skating pond facility.
- A priority list of needs should be developed for the retrofitting of the existing water sources for fire protection.
- The town and its Recreation Committee should continue to offer programs that prove to be popular; and regularly evaluate new programs that might benefit the town's residents. The town should consider identifying a location for the construction of a new ball field.
- In order to reduce the cost of services for its citizens, the town should consider increasing its participation in regional services and initiate cooperative ventures with neighboring towns.

Chapter 8.0
Agriculture

8.1. Introduction

Agriculture played an important role in the settlement and history of the town of Durham. It remains a strong element of the town's character and continues to enhance the quality of life for our residents. From the early planting of grain and grapes to the production of witch hazel and birch oil in the early 1900s… to the large dairy and poultry farms in the mid-1900s… to the present-day cultivation of Christmas trees and hay, the town's name is synonymous with agriculture. This identity is exemplified through its celebrated annual agricultural fair.

Agriculture links our present with the past through a landscape of fields and pastures, stone walls and weathered barns; it has been shaped by generations of Durham's hard-working families. This landscape, cherished by so many, is often taken for granted. Some of its benefits are obvious: the bounty of fresh fruits and vegetables in the spring and summer months; pumpkins, hay, Christmas trees, and maple syrup in the fall and winter; and milk and dairy products year-round. Other benefits are less obvious: the local revenue and jobs that these farms provide, the recreational and tourism opportunities that they create, and the wildlife habitat and other environmental benefits that they offer.

Durham's fertile farmland is one of the town's primary assets. According to the most recent land-use inventory, Durham has approximately 3,513 acres of agricultural land. This amounts to more than twenty-three percent (23%) of the total land area of the town. Agriculture:

- Preserves the town's heritage
- Contributes to our town's scenic character
- Provides opportunities for economic development
- Provides local produce and other agricultural products to residents and others
- Provides local employment and diversifies our economy
- Offers educational experiences and tourism benefits
- Adds value to our tax base

What Is Agriculture?

Connecticut General Statutes, Sec. 1-1 (q) Except as otherwise specifically defined, the words "agriculture" and "farming" shall include cultivation of the soil, dairying, forestry, raising or harvesting any agricultural or horticultural commodity, including the raising, shearing, feeding, caring for, training and management of livestock, including horses, bees, poultry, fur-bearing animals and wildlife, and the raising or harvesting of oysters, clams, mussels, other molluscan shellfish or fish; the operation, management, conservation, improvement or maintenance of a farm and its buildings, tools and equipment, or salvaging timber or cleared land of brush or other debris left by a storm, as an incident to such farming operations; the production or harvesting of maple syrup or maple sugar, or any agricultural commodity, including lumber, as an incident to ordinary farming operations or the harvesting of mushrooms, the hatching of poultry, or the construction, operation or maintenance of ditches, canals, reservoirs or waterways used exclusively for farming purposes; handling, planting, drying, packing, packaging, processing, freezing, grading, storing or delivering to storage or to market, or to a carrier for transportation to market, or for direct sale any agricultural or horticultural commodity as an incident to ordinary farming operations, or, in the case of fruits and vegetables, as an incident to the preparation of such fruits or vegetables for market or for direct sale. The term "farm" includes farm buildings, and accessory buildings thereto, nurseries, orchards, ranges, greenhouses, hoop houses and other temporary structures or other structures used primarily for the raising and, as an incident to ordinary farming operations, the sale of agricultural or horticultural commodities. The term "aquaculture" means the farming of the waters of the state and tidal wetlands and the production of protein food, including fish, oysters, clams, mussels and other molluscan shellfish, on leased, franchised and public underwater farm lands. Nothing herein shall restrict the power of a local zoning authority under chapter 124.

8.2. Environmental Benefits of Agriculture

Few property owners understand their land or its natural workings better than farmers. Without healthy water and soil, agricultural production ceases. Therefore, most farmers take exceptional care of their land, water sources, forests, and the environment.

8.3. Land-Use Practices that Support Agriculture and Farming

Durham's zoning regulations are relatively "farm-friendly," allowing farming activities to be conducted in most zoning districts. Farm stands are permitted for the sale of products grown or raised on the premises. A popular farmer's market operates on the Town Green, which provides local farmers with an outlet to sell their products. In 2013, the town enacted a "*Right-to-Farm*" ordinance and, in 2015, approved sign regulations that expand the allowable size of signage in farming or agricultural applications. These initiatives have provided tangible benefits for both the town and its agricultural community and should be sustained.

Many of Durham's farms are located on its rural roads and can be difficult for potential patrons to locate. The P&ZC should consider allowing a limited number of small, off-premises directional signs (with the permission of property owners) that would direct potential patrons to these farms. Farmers can also participate with the Connecticut Department of Agriculture (ConnDoAG) and their "*Connecticut Grown"* program that offers standardized DOT-approved directional signs. These signs can help lead patrons from the state highways that run through Durham to these farms (i.e., Routes 17, 77, 79, 68, and 147).

8.4. Repositioning Durham's Agriculture for the Future

Connecticut is a state of small farms. With an average farm size of 85 acres, only two other states have smaller averages. Durham's average farm size is 37.4 acres. To remain viable, some of these farms supply "niche" markets or produce specialty crops. Some have moved to "direct-to-consumer" retail sales or have changed the products they produce. Durham's smaller farms are ideal for the breeding of high-quality poultry, rabbits, fruits, and vegetables.

Durham's reputation as an agricultural community is one of town's primary assets and should be promoted aggressively. With its nearly 100 farms, the town has the potential to benefit immensely from agri-tourism, yet this potential has not been fully realized to date. The town should consider expanding its "*Durham Grown"* campaign to reach persons across the state, many of whom identify the town with its annual agricultural fair. Many residents and families across the state might travel to our centrally located town to spend a day enjoying a program of agriculturally related activities should one be offered. Such a program might include visits to different farms, participation in farming and related educational activities, or meals prepared on the farm using products picked or produced by the participants. Visitors would likely patronize Durham's other businesses during their visit as well.

It is generally accepted that the first few years spent establishing a new farm can be very difficult. In order to nurture new and different agricultural investment, the Planning and Zoning Commission should consider implementing regulations that accommodate the difficulties associated with the establishment of new agricultural enterprises. What might be considered, for example, is the establishment of a new farming operation that can take several years to achieve its business model. In the interim, the business may wish to rely on other farms to supply the majority of their product.

The farm may wish to supplement its agricultural activities with events, educational classes, or the sale of ancillary farm products. It may also wish to construct dining areas where patrons can taste and purchase their products.

This modern agricultural business model can create both opportunities and challenges for municipalities as they differ from the traditional farming model. By sensitively accommodating these new business models, Durham can expand its agricultural base.

8.5. Durham Agricultural Commission

Durham's Agricultural Commission serves as an advocate for farming and agricultural issues. It raises the profile of agriculture in town, helps other town boards and commissions understand the economic and land-use issues that farmers face, and works to preserve farmland. As residential development continues to encroach on farming activity, complaints regarding noise, dust, manure odor, pesticide application, escaped livestock, and other nuisances could increase. In 2013, the town adopted a *"Right to Farm"* ordinance that:

- Recognizes the importance of agriculture to the community,
- Recognizes that the farms existed before the residential development, and
- Protects farmers from nuisance claims arising out of the normal (reasonable) operation of their farms.

8.6. Durham's "Right-to-Farm" Ordinance

Section I: Purpose and Intent

Agriculture plays a significant role in Durham's heritage and future. The town officially recognizes the importance of farming to its rural quality of life, heritage, public health, scenic vistas, tax base, wetlands, wildlife, and local economy. This Right-to-Farm Ordinance encourages the pursuit of agriculture, promotes agriculture-based economic opportunities, and protects farmland within Durham by allowing agricultural uses and related activities to function with minimal conflict with neighbors and town agencies.

It is therefore the declared policy of the town of Durham and the Durham Agricultural Commission to conserve and protect agricultural land and to encourage agricultural operations and the sale of local farm products within the town of Durham. It is the purpose and intent of this ordinance to promote and advance the town's policy and reduce the loss of local agricultural resources by limiting circumstances under which any such operation may be considered a nuisance. Methods of farming that comport with generally accepted farming practices are also deemed consistent with community standards. This ordinance is not to be construed as modifying or abridging state law relative to the abatement of nuisances, but is to be used in the interpretation and characterization of activities and in the considering and implementing enforcement of the provisions of the ordinances of the town of Durham and other applicable state of Connecticut and town regulations, consistent with the provisions of Connecticut General Statute 19a-341. Additionally, the terms of this ordinance may be used in determining whether the methods and practices that may come under review conform to community standards.

Section II: Declaration

The Right-to-Farm Ordinance is hereby recognized to exist within the town of Durham. No present or future agricultural operation conducted or maintained in a manner consistent with generally accepted agricultural practices that is engaged in the act of farming as described in this ordinance shall become or considered a nuisance solely because such activity resulted or results in any changed condition of the use of adjacent land. Agricultural operations may occur provided such activities do not violate applicable health, safety, environmental, or building codes and regulations and shall include, without limitation:

- Odor from livestock, manure fertilizer, or feed;
- Noise from livestock or farm equipment used in normal, generally accepted farming procedures;
- Dust created during plowing or cultivation practices;
- Use of chemicals, provided such chemicals and the method of application conform to practices approved by the Commissioner of Energy and Environmental Protection, or where applicable the Commissioner of Public Health;
- Water pollution from livestock or crop production activities, except the pollution of public or private drinking water supplies, provided such activities conform to acceptable management practices approved by the Commissioner of Energy and Environmental Protection.

The provisions of this ordinance shall not apply whenever a nuisance results from negligence or willful or reckless misconduct in the operation of any such agricultural or farming operation, place, establishment, or facility or any of its appurtenances.

Section III: Definitions

The terms "agriculture" and "farming" shall have all those meanings set forth in Section 1-1(q) of the Connecticut General Statutes, as amended.

Section IV: Dispute Resolution

Residents of Durham may seek assistance from the Agricultural Commission with any complaints or concerns they have with respect to any agricultural operation, place, establishment, or facility located in Durham. Residents of Durham may seek assistance from any other Durham official, board, or commission with respect to any agricultural operation, place, establishment, or facility located in Durham. The Agricultural Commission may provide assistance with any complaint or concern brought to it or any other official, board, or commission. Nothing herein prohibits residents from making complaints to the Connecticut Department of Agriculture and seeking a remedy from said department and any decision of the Department of Agriculture shall be considered determinative of the issues presented to said Department of Agriculture.

Nothing contained in this ordinance shall restrict the powers of Durham's Inland Wetlands Commission, Planning and Zoning Commission, or Building or Health Departments under Connecticut General Statutes. In addition, these boards and departments are encouraged to adopt regulations consistent with this ordinance and to make the permanent preservation of farmland within the town, a criterion in its planning policy decisions.

(Adopted: January 14, 2013)

The State of Connecticut has declared that *"no agricultural or farming operation, place, establishment, or facility, or any of its appurtenances, or the operation thereof, shall be deemed to constitute a nuisance"* provided the operation is following generally accepted agricultural practices (CGS 19a-341).

8.7. Preserving Farmland

The town should continue to support programs that preserve farmland. Section 12-107 of the Connecticut General Statutes (often referred to as Public Act 490) authorizes communities to assess farmland at a lower value when it is actively farmed. P.A. 490 helps farmers by lowering their assessment; this helps maintain the viability of farms under what can be difficult economic conditions.

This simply involves ensuring that the Durham Board of Selectmen, the Office of the Tax Assessor, Boards, and Commissions actively endorse and implement the goals of these State programs. Quoting the CT Department of Agriculture: "*When the legislature passed Public Act 490 in 1963, it included (and continues to this day) in the law's wording that 'it was in the public interest to encourage the preservation of farm, forest, and open space land.'* " It is clearly in Durham's interest as well. The goals set forth by Public Act 490 *(now CGS 12-107a through 12-107f)* should be strongly supported by all Boards and Commissions of the Town of Durham.

The Connecticut Department of Agriculture's *Farmland Preservation Program* purchases the development rights to farms, with a goal of preserving 130,000 acres of farmland statewide. By selling their development rights under this program, farmers receive an infusion of cash to support continued farming and, in return, surrender their ability to develop the property in the future. In addition to purchasing the development rights, the town can protect threatened farmland and ensure its continued agricultural use through the following methods:

- Purchase outright and lease farmland back to the owner or a tenant
- Purchase outright and sell the development rights under the *Farmland Preservation Program*
- Negotiate for agricultural conservation easements with the assistance of the *Connecticut Farmland Trust*
- Resell the land to another farmer, without the development rights
- Convey to organizations, such as food cooperatives or community gardens
- Continue to offer local tax Incentives for preserving farmland

In addition, the Connecticut Department of Agriculture's *FarmLink* program serves as a clearinghouse for the transition of agricultural lands between generations of farmers; with the goal of keeping farmland in production. The *FarmLink* registry connects farm owners with farm seekers.

8.8. Horses

Horses are beneficial to municipalities in a variety of ways. In terms of land use, horse farms and boarding facilities are considered to be a relatively low-impact land use. In terms of aesthetics, neatly fenced and maintained horse farms lend a pleasant vista to residents and visitors alike. In terms of tourism, many who board their horses in Durham live outside the community and travel to Durham on a regular basis where they purchase goods and professional services from our local businesses. Owning and caring for a horse requires a great deal of compassion, time, effort, and money much of which goes back to our community.

Durham is fortunate to have a relatively large horse population, in part due to the availability of boarding facilities and support services. In 2014, the town enacted legislation that exempts all horses (not just those used exclusively in farming) from property taxes. Because of the many benefits associated with the care of horses, the town should promote itself as a preferred location for the boarding and care of horses and consider revising its regulations to further encourage this activity.

8.9. Agriculture-friendly Policies in All Town departments

Durham Zoning Regulations are already relatively farm-friendly, as evidenced by the existence of farm stands, a farmer's market, the Durham Right-to-Farm ordinance and some favorable signage regulations. Another significant event–was the establishment of a new, large-animal, full-body horse crematorium in Durham in 2013. This is a vitally important service for horse-owners and enhances Durham's reputation as an equine-sensitive Town. In 2006, the Durham Animal Response Team (D.A.R.T.) was established to provide assistance to animal owners in the event of any animal emergency, evacuation, or natural disaster. While this is a good foundation, there may still be further improvements that would benefit existing farming operations as well as future ones, with the ultimate goal of stimulating the growth of agricultural activities in Durham and therefore strengthening the overall economy of Durham. This will require ongoing participation by an *agricultural advocate* in the Town's Administrative practices. This role can best be handled by the existing Agricultural Commission.

Durham should also consider amending current zoning regulations regarding on-farm sale of products. Many existing farms would truly benefit economically if they could broaden their outreach to the Public by offering their own and similar agricultural products for sale at their premises. The Durham Agricultural Commission should be actively involved with the Planning and Zoning Commission regarding any changes in regulations affecting agriculture.

Consideration should be given to allowing farms to place signs on Town roads directing tourists to farm locations that welcome visitors.

8.10. Adopting State Initiatives Regarding Taxes on Farm Operations

In 2014, the Town adopted a portion of Public Act 14-33 (now CGS 12-91a), which exempts all horses from Property Tax. Many other towns in Central CT have not taken this action. Also, in 2016, the Tax Assessor determined that hay, grain and bedding for horses would not be subject to Property Tax. These policies make Durham more attractive to horse farmers and horse owners and may stimulate additional equine business in Durham.

Durham has not yet adopted, and could consider, another provision in 14-33 which allows all agricultural entities to receive additional tax exemptions on their buildings. ("Any municipality, upon approval by its legislative body, may provide an exemption from property tax for any building used actually and exclusively in farming..." CGS 12-91c) The Board of Selectmen could consider incorporating this additional tax exemption as policy and actively seek additional opportunities to demonstrate Durham's farm-friendliness.

To improve the financial viability of Durham's farms, the town should consider exempting mechanical farming equipment, such as tractors and implements, from property taxes, regardless of farm status or size.

8.11. Tax Incentives Directed at Agricultural Start-ups

It is well known that State and Municipal governments commonly offer tax incentives to attract new business to their locations. As part of our agricultural initiatives, we recommend that the Board of Selectmen consider the development of an incentive program specifically targeted to agricultural start-ups and relocations.

8.12. Agricultural Education

To encourage and develop the next generation of farmers, the Town of Durham, as well as Regional School District 13, could actively pursue the development of agricultural education programs for youths and adults, including farming-career programs. Durham and/or Regional School District 13 could consider funding for the creation of, or participation in, regional and state agricultural classes and programs.

The Agricultural Commission could actively support local mentoring or internship programs in all parts of the agricultural community in conjunction with our schools and other community and agri-business organizations. In addition, the Agricultural Commission could develop relationships with local farmers to facilitate the implementation of these programs.

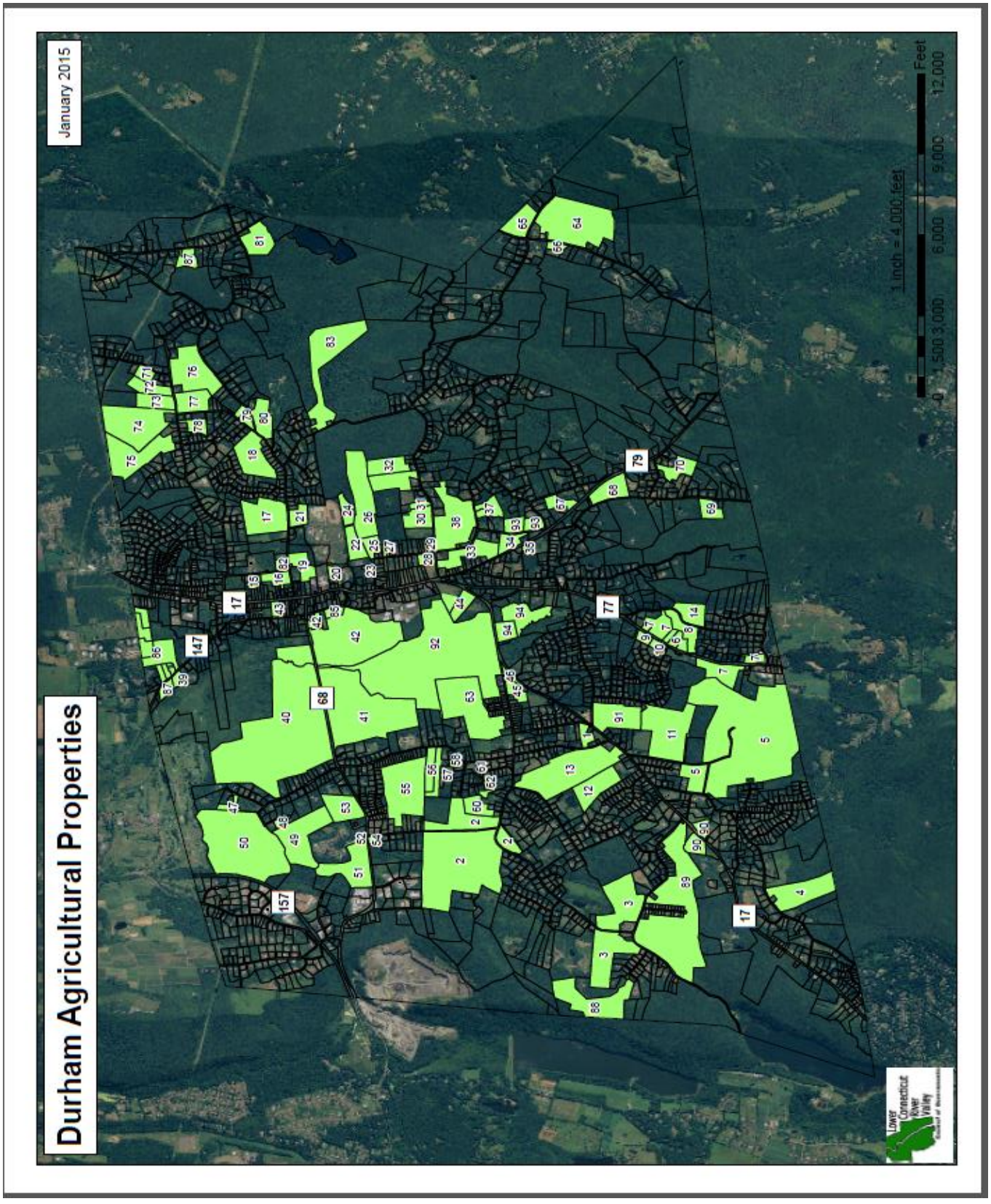
8.13. Advertising and Promotional Programs

Durham can make farm-friendly improvements, but if the Connecticut and Regional business community does not know about them, they will have no impact on Durham's economy. While initiatives like the "Durham Grown" program are commendable, in today's highly competitive business environment, it will take considerably more effort to be heard, far and wide, by established businesses, entrepreneurs and consumers.

As the town continues to make further improvements in its agricultural policies and practices, it could consider forming a relationship with a professional advertising group so that the benefits of establishing an agricultural business in Durham become widely known. Similarly, it might require professional advertising capability to attract more families and individuals to visit Durham to experience the pleasure of its agricultural landscape, products and services.

8.14. Inventory of Durham's Agricultural Parcels

The following map and inventory show the location and sizes of Durham's agricultural land.



Durham Agricultural Properties and Use

Farm ID	Address	Use	Acreage
1	119 Indian Lane	Horse Farm	7.30
2	337 Parmelee Hill Road	Dairy, Hay, Etc.	10.61
2	337 Parmelee Hill Road	Dairy, Hay, Etc., R-903	34.67
2	337 Parmelee Hill Road	Dairy, Hay, Etc., R-903	155.62
3	301 Tri Mountain Road	Tree Farm	49.16
3	301 Tri Mountain Road	Tree Farm	46.81
4	314R Stagecoach Road	Horse Farm	42.63
5	601 Guilford Road	Hay, Woodland	258.35
5	Stage Coach Road	Hay, Woodland	17.90
6	398R Guilford Road	Hay	10.41
7	350 Guilford Road	Hay	8.07
7	350 Guilford Road	Hay	7.80
7	Guilford Road	Hay	4.79
7	Guilford Road	Hay	21.37
8	Guilford Road	Hay	16.34
9	Guilford Road	Hay	4.53
10	Guilford Road	Hay	4.07
11	134R Creamery Road	Hay	67.80
12	New Haven Road (Route 17)	Hay	29.58
13	New Haven Road (Route 17)	Hay	85.45
14	108 Mica Hill Road	Hay	16.76
15	67 Brick Lane	Llamas	3.46
16	36 Maiden Lane	Hay	10.35
17	142R Maiden Lane	Bulls, Hay Pasture	42.91
18	310 Maiden Lane	Hay, Trees	35.31
19	Maiden Lane	Trees	14.66
20	177R Main Street	Class 130R	5.00
21	151R Maiden Lane	Hi Land Farm, Eggs, Hay	10.55
22	56R Fowler Avenue	Hay	14.69
23	54 Fowler Avenue	Farm Stand	1.02
24	Main Street	Hay	9.29
25	2 Cherry Lane	Rivendell Farm, Stable, Hay	9.18
26	Cherry Lane	Class R130, Horse Stable, Hay	75.74
27	24 Cherry Lane	Christmas Trees	2.79
28	Cherry and Higganum Road	Hay	5.74
29	Cherry and Higganum Road	Hay	3.37
30	118 Higganum Road	Miller Farm, Hay	15.96
31	182 Higganum Road	Miller Farm, Horses	3.91
32	Trinity Hills Drive	Jane Mauro / Cl. C112, Hay	19.26
33	179 Cherry Lane	5 Barns, Stable, Hay	25.70
34	271 Cherry Lane	Hay	10.58
35	Route 179 and Cherry Lane	Hay	3.23
37	Hellgate Road	Hay	12.69
38	186 Cherry Lane	Hay	56.18
39	Middlefield Road	Johnson Lane	5.11
40	153 Wallingford Road	Class R109, Dairy	291.25
41	153 Wallingford Road	Class R109, Dairy	142.18
42	Wallingford and Maple	Hay	109.20
42	Wallingford and Maple	Hay	4.94
43	280 Main Street	Hay	5.10
44	65R New Haven Road	Hay	16.46
45	94 Parmelee Hill Road	Hay	8.75
46	94 Parmelee Hill Road	Hay	3.74

47	56 Brittany Place	Stonefield Stables	5.76
48	47 Salted Lane	Barn with loft	3.08
49	385 Wallingford Road	Class R130	52.72
50	Wallingford Road and Conrail	Curtis Woodland Preserve	140.25
51	477 Wallingford Road	Cornfield	41.23
52	Wallingford Road	Farm Stand	2.28
53	385 Wallingford Road	JC Farms; Greenhouse	25.92
54	80 Pent Road	Hay	3.55
55	175R Tuttle Road	Hay	68.95
56	Tuttle Road	Maplewood Farm	11.82
57	Tuttle Road	Barn with Loft	9.76
58	229 Tuttle Road	Livestock	2.96
59	Route 147	Nursery	5.44
60	323R Parmelee Hill Road	Livestock	13.32
61	263 Tuttle Road	Barn with Loft	1.76
62	74 Ernest Drive	Horse Ring	5.08
63	141R Parmelee Hill Road	2 Barns and Poultry	76.64
64	Higganum Road	Livestock	87.62
65	Higganum Road	Livestock, Hay	19.05
66	Higganum Road	Hay	4.46
67	Madison Road	Horses	8.58
68	Madison Road/ Dead Hill Road	Horses	21.07
69	111 Dead Hill Road	Horses	10.79
70	257 Pisgah Road	Hay	16.44
71	Arbutus Street	Hay	7.09
72	Haddam Quarter Road	Horses and Hay	14.04
73	Haddam Quarter Road	Livestock	16.16
74	348R Haddam Quarter Road	Corn, Hay	62.14
75	Haddam Quarter Road	Hay	49.58
76	Johnson Lane/ Haddam Quarter Road	Hay, Corn	48.55
77	Maiden Lane	Hay	20.98
78	Haddam Quarter Road	Horses	8.90
79	Maiden Lane and Johnson Lane	Hay	7.31
80	Johnson Lane	Hay, Corn	18.97
81	Foot Hills Road	Hay	23.63
82	Maiden Lane	Hay	3.96
83	Bean Rock Road	Vegetables, Hay, Woodland	70.78
85	Maple Ave	Hay, Corn, Animals	5.09
86	Route 147	Nursery	45.52
87	Foot Hills Road	Horses	10.16
88	Mauro Drive	Deer	52.68
89	Howd Road	Hay and Woodland	159.75
90	New Haven Road (East Side)	Hay	5.92
90	New Haven Road (West Side)	Horses	10.43
91	152R Creamery Road	Hay	36.13
92	New Haven Road	Hay and Corn	265.38
93	Cherry Lane	Hay	7.31
93	Cherry Lane	Hay	9.02
94	150 New Haven Road	Durham Farms; Trees	11.17
94	Guilford Road	Durham Farms; Trees Hay, Pumpkins	25.88
Total			**3513.38**

8.15. Goals

- Protect existing farms and encourage new ones by actively supporting the policies and actions of Public Act 490 (Connecticut's Land Use Value Assessment Law for Farm Land, Forest Land and Open Space Land - now CGS 12-107a through 12-107f) and the CT Farmland Preservation Program.
- Review, and revise if necessary, policies and regulations in all town departments, boards, and commissions to ensure that they are agriculture-friendly so that the town's present agricultural activities are encouraged to expand and new agricultural ventures see Durham as a welcoming place in which to reside.
- Consider state initiatives to further reduce taxation on farm equipment and buildings to encourage additional investment by farmers (i.e., Public Act 14-33).
- Develop new Durham initiatives, such as business tax incentives for new agri-businesses, to attract both start-ups and relocations to Durham.
- Durham's Agricultural Commission should be actively involved in working with other town boards and commissions to develop an aggressive advertising program that creates awareness of Durham's agriculturally and equine-friendly policies in order to attract new agricultural entities to Durham. Simultaneously, promote Durham as a great place for families to visit because of its agricultural activities.
- Durham should be aggressively pursuing funds at all levels of government (federal, state and local) for the purchase of development rights or outright purchase of open-space/ agricultural lands.
- In order to grow its Farmers' Market, the town should consider alternate days of operation and venues that might provide more accessible parking for patrons.
- In order to build upon its reputation as an agricultural community, the town, in conjunction with the Agriculture and Economic Development commissions, should consider the development and promotion of agri-tourism day-trips and other agricultural events.

Chapter 9.0
Energy and Energy Conservation

9.1. Introduction

Energy powers our way of life. It heats our homes, cooks our food, allows us to travel, and drives our economy. Where available in sufficient amounts, it allows industry and commerce to flourish. Where derived from alternative energies or conserved, it lessens the impact we make on our environment and saves money. Its role and impact on our community should be considered when making land-use, development, transportation, or conservation decisions.

9.2. Energy Infrastructure

As is typical in rural New England towns, most of Durham's homes, businesses, and industries are heated with electricity, heating oil, or bottled gas. The town currently has limited energy resources and there are no plans to develop generation, supply, or distribution facilities. There are currently no consumer-accessible natural gas pipelines within the town, and no such construction is proposed in the foreseeable future. The town currently has no micro-grids, although such a grid could be beneficial during periods when normal utility power is unavailable. The town's automotive filling stations are not presently equipped with emergency generators that could enable these facilities to continue dispensing motor fuel during periods when normal utility power is unavailable. The town should consider conducting a detailed cost analysis regarding the possible installation of a micro-grid that would serve the center area of town. The proposed area to be served includes the Town Hall, Library, public safety complex, and one or more school buildings, all of which are relatively close to each other. Grants may be available from the State of Connecticut to offset the cost of implementing such a micro-grid. The town should also encourage the owners of automotive filling stations to install appropriately located emergency generators.

9.3. Renewable and Alternative Energies

Durham has become a shining example of what can be done with alternative forms of energy, particularly renewable solar energy. The town's *"Solarize Durham"* initiative in 2012 was enormously successful in placing solar panels on 119 properties throughout the town, generating in excess of one megawatt of clean energy. The town currently has no large-scale solar farm; however, in future years, the cost of converting solar energy into electrical energy is expected to be more competitive with utility-generated power and is expected to lead to an increase in the placement of solar panels. The town should continue its efforts to identify a suitable location for the installation of a large-scale solar farm. This would allow the town to take advantage of virtual-net metering revenues, which would offset the cost of the electricity used by the town's municipal buildings.

Another renewable energy that is rapidly gaining popularity for heating or cooling is low-grade geothermal energy. Geothermal systems harness the power of the earth's relatively constant subterranean temperatures, thus using the earth as a heat source in the winter and heat sink in the summer. The town should consider installing low-grade geothermal systems for heating and cooling its municipal buildings. Because there are geothermal systems that use liquids other than water for heat transfer, the Planning & Zoning Commission should work with the town's Building Official and Health Director to promulgate regulations that ensure that groundwater aquifers are not contaminated by the heat transfer chemicals used in some geothermal systems.

9.4. Energy Efficiency and Conservation Measures

The efficient conversion of energy from one form to another minimizes the costs associated with its use. Improved efficiency and conservation measures lessen our impact on the environment; as fewer power

plants are required to operate to meet our energy needs. Improved efficiency and conservation measures further our country's goal of energy independence.

Efficiency can be described mathematically as the output divided by the input, expressed in percent. A furnace having an efficiency rating of 88% converts approximately 88% of its fuel (input) to usable heat (output). A more efficient furnace, with an efficiency rating of 90%, may cost more to purchase initially; however, it will consume less fuel to produce the same amount of heat over its lifetime. Since the cost of energy consumed can be many times the purchase price (a $4,000 furnace can easily consume $40,000 of fuel during its lifetime), purchasing more efficient heating, air conditioning, or lighting equipment can be an excellent investment.

The same is true of building materials, such as insulation, siding, and windows. Some materials offer average efficiency ratings, while others have higher efficiency ratings. Materials with higher efficiency ratings cost more because they save more. Since these savings occur over the lifetime of the material, installing higher-efficiency materials during initial construction offers the highest return on investment

9.4.1. Insulation, Windows, and Air Ingress/Egress

Durham has a number of older homes, some of which are historic. Many of these older homes were constructed with the materials of the day, which provided much lower values of insulation than do modern materials. Some of these older buildings were constructed with little to no insulation between the inner and outer walls or with windows constructed from a single layer of thin glass. Some contain poorly insulated piping for their steam or hot water heating systems.

These historic and older homes often have openings where cold air can enter. Buildings and homes that are not properly sealed or insulated are at a higher risk for the ingress of cold, damp air and the resulting mold growth. Poorly insulated homes and buildings with air leaks use more energy in both winter and summer months as heating and air conditioning systems must operate more often to make up for air leaks and heat losses.

Buildings that suffer from inadequate insulation, older windows, or air leaks can be sealed and fitted with a variety of high-performance insulation materials and windows. The town should contract with a Qualified Energy Assessor (QEA) to perform an in-depth audit of all municipal buildings to identify needed repairs and specific opportunities for improvement. Needed repairs should be made immediately and the identified opportunities prioritized for funding.

9.4.2. Heating Systems

Furnaces and boilers consume a large share of a building's energy. They should be cleaned and tuned annually, to maximize their efficiencies and reduce emissions. Hot water baseboard systems can develop pockets of air within their piping. These pockets of air can inhibit the flow of heated water through the radiators, resulting in inadequate heating. As the boiler continues to burn fuel in an attempt to reach the setting on the thermostat, additional energy is wasted. Efficiency can be restored by simply removing this trapped air. This should be done as part of any annual servicing procedure. In forced hot air systems, air filters should be changed, ducts checked for leaks, and dampers adjusted as needed.

9.4.3. Programmable Thermostats

Homes, businesses, and municipal buildings that are equipped with simple on-off thermostats should have these replaced with programmable thermostats; these are able to memorize the preferred times and temperatures for heating and cooling systems. Programmable thermostats typically save enough energy to cover their cost (including installation) in less than one year.

9.4.4. Domestic Hot Water Systems

In many homes and businesses, water is heated for domestic uses (e.g., faucets, baths, dishwashers, etc.), but then sits in a large storage tank (cooling off) until needed. The practice of heating 40 to 80 gallons of water in advance of its use wastes energy. A more efficient solution would be to heat just the water required just prior to its use. This can be accomplished by installing one or more instantaneous ("on-demand") hot water heaters and eliminating the tank.

9.4.5. Lighting Systems

A vast range of lighting sources is currently available with various efficiencies, life expectancies, illumination qualities, and purchase prices. Among the very best are those that are designed around the Light-Emitting Diode (LED). Modern LED lamps and fixtures produce high-quality illumination while consuming just 25% to 35% of the energy used by traditional light sources. Environmentally, LEDs are superior to fluorescent lamps and CFLs, which contain trace amounts of mercury.

From a maintenance perspective, LED lamps and fixtures are far superior to other light sources. Their exceptionally long life and minimal maintenance requirements nearly eliminate routine replacements. For these reasons, the town should require that all new municipal buildings and major upgrades to its facilities include the use of LEDs or other energy-efficient lighting systems.

The least expensive watt is the one that is never used. Thanks to technological advances in occupancy controls and ambient light sensing, the cost of operation for lighting systems can be a fraction of what it would be without these technologies. The town should promote the use of these technologies in municipal, residential, commercial, and industrial applications.

9.4.6. Energy Audits and Public Outreach

An energy audit (energy assessment) provides a thorough accounting of the energy used by a building or process. Energy audits identify wasted energy and specific areas for improvement. Periodically, the town should contract with a Qualified Energy Assessor (QEA) to perform an in-depth audit of its municipal buildings and identify needed repairs, specific areas for improvement, and energy-efficiency projects that should be funded. In addition, the town should sponsor a public seminar on energy-conservation methods for home and business owners.

9.5. Land-Use Practices that Reduce Energy Consumption

Durham has the ability to improve energy conservation efforts through land-use practices that promote efficiency and conservation. These practices could include promoting the construction of smaller homes as well as considering higher-density or mixed-use and transit-oriented development patterns.

Smaller homes tend to use less energy than do larger homes. Higher-density developments typically use less energy than lower-density developments. Mixed-use buildings and communities offer synergies with regard to heating and cooling systems. And transit-oriented development allows public transportation to serve more individuals more efficiently.

The town should review and, if necessary, revise its building and land-use regulations to accommodate the construction of smaller homes and consider higher density development in areas where septic/soil limitations are not problematic. Mixed-use and transit-oriented development should also be considered where appropriately located.

9.6. Building Placement, Orientation, and Design

Building placement and design can have a dramatic effect on energy consumption over the life of a building. These factors should be considered prior to new construction or major renovations. The town's Building Department and land-use commissions should include language in their regulations that requires builders and developers to consider energy use when determining building placement, orientation, and design. The following criteria should be considered:

- The relative position of the sun is a major factor in heat gain in buildings, which makes accurate orientation of the building a fundamental consideration in passive solar construction. Builders should note that these directions are given in reference to the sun and not magnetic north, which can vary significantly from the sun's actual position. Magnetic north, as read from a compass, can still be used as a reference if the builder adjusts the figure based on the location-specific magnetic variation, which can be found on publicly available maps.

- A rectangular house's ridgeline should run east-to-west, to maximize its length (exposure) along the southern side, which should incorporate several windows in its design. Fewer windows should be located on the northern side of the house, where the summer sun can be intense. A deep roof overhang can shade the few windows along the northern side, as can different types of shade trees and bushes. Homes oriented toward the sun without any additional solar features save between 10% and 20%; they can save up to 40% on home heating.

- To maximize heat gain, builders should orient the floor plan (not merely the building profile) toward the sun. Rooms that are more frequently used, such as the kitchen and living room, should be located on the southern side of the home, where possible. Homeowners appreciate having sun rays in the winter and relief from the sun in the summer. Patios and decks should be built on the south side of the house, where direct sunlight will permit their use for more hours during the day and more days during the year. Likewise, the garage, laundry room, and other areas that are less frequently used should be situated at the northern part of the house where they will act as buffers against the cold winter winds.

9.7. Energy-efficient Initiatives and Construction Standards

There are a number of new techniques that can be used when constructing new buildings or reconstructing existing buildings to make them more energy efficient. Part of this increased efficiency can be realized through building construction techniques and part can come through the efficiency of the appliances and systems used for heating, ventilation, and air conditioning (HVAC). The standards that are commonly used to rate the efficiency of buildings, appliances, and HVAC systems include:

- *Leadership in Energy and Environmental Design (LEED):* Rating System of the U.S. Green Building Council, which provides a group of standards for environmentally sustainable building construction. The LEED standards are used throughout the United States.

- *Seasonal Energy Efficiency Ratio (SEER):* Metric used to measure how much cooling an air conditioner puts out for each unit of energy it consumes. The higher the SEER rating, the more efficiently an air conditioner operates.

- *Energy Star:* An international standard for energy-efficient appliances, consumer products, building materials, and other products. Devices carrying the *Energy Star* logo typically reduce energy by between 20 and 30 percent.

- *Energize Connecticut:* The Energize Connecticut initiative helps Connecticut residents and businesses reduce their energy usage through services, rebates, and financing for energy-efficient surveys and projects. This program is funded by rate payers through a charge on their electric bills.

- *C-PACE:* The Connecticut Property Assessed Clean Energy (C-PACE) program allows building owners to access affordable, long-term financing for qualifying clean energy upgrades, through the placing of a voluntary assessment on their property tax bill.

9.8. Energy-efficient Appliances

Significant energy savings can be achieved by purchasing higher-efficiency appliances. As the following table shows, approximately 27% of the electricity supplied to the average household is consumed by appliances:

Estimated U.S. residential electricity consumption (2014)	
End use	**Share of total**
Space cooling	13%
Lighting	11%
Water heating	9%
Space heating	9%
Refrigeration	7%
Televisions and related equipment[1]	7%
Clothes dryers	4%
Furnace fans and boiler circulation pumps	3%
Computers and related equipment[2]	2%
Cooking	2%
Dishwashers[3]	2%
Freezers	2%
Clothes washers[3]	1%
Other uses[4]	27%

[1] Includes televisions, set-top boxes, home theater systems, DVD players, and video game consoles.
[2] Includes monitors and networking equipment.
[3] Does not include water heating.
[4] Includes small electric devices, heating elements, and motors not listed above. Does not include electric vehicle charging.

Source: U.S. Energy Administration - U.S. Department of Energy

9.9. Goals

- Consider installing a micro-grid to serve the central area of town. This would include the Town Hall, Library, public safety complex, and one or more school buildings in an emergency. Pursue grants which help offset the cost of implementing a micro-grid.
- Encourage one or more automotive filling stations to install emergency generators to facilitate the dispensing of motor fuel during periods when utility power is unavailable.
- Explore a suitable location for the installation of a large-scale solar farm in order to take advantage of virtual-net metering incentives that may not be available in the future.
- Consider using low-grade geothermal systems for heating or cooling municipal buildings.
- Promulgate regulations that ensure that groundwater aquifers are not contaminated by the heat transfer chemicals of geothermal systems.

- Contract periodically with a Qualified Energy Assessor (QEA) to perform an in-depth audit of municipal buildings; identify needed repairs, specific areas for improvement, and energy-efficient projects to be funded.
- Sponsor a public seminar on energy-conservation methods for homes and businesses.
- Communicate to the public that, despite a higher initial cost, the purchase of high-efficiency building materials, appliances, heating, air conditioning, and lighting equipment is a wise investment.
- Require that all new municipal buildings and major upgrades to municipal facilities include the use of energy-efficient lighting systems, occupancy controls, ambient light, and dusk-to-dawn sensing equipment; promote the use of these technologies in residential, commercial, and industrial applications.
- Review and, if necessary, revise building and land-use regulations to accommodate the construction of smaller homes; consider higher-density development in areas where septic/soil limitations are not problematic; and consider compact, mixed-use and transit-oriented development patterns.
- Require that builders and developers consider energy use when determining building placement, orientation, and design.
- Explore alternative energy sources as new technologies become available.

Chapter 10.0
Land Use

10.1. Introduction

Durham's character is defined, in part, by its geographic setting and how its land is utilized. Land use is largely dependent on the historic development of the town prior to the adoption of zoning, and on the various forms of land-use controls that have been in effect since zoning was enacted. In order to make decisions about how land should be used in the future, it is necessary to first conduct an accurate inventory of present-day land uses.

With that goal in mind, in 2015, Durham, in conjunction with the *Lower Connecticut River Valley Council of Governments (RiverCOG)* completed a major update of its geospatial parcel databases. Using Geographic Information System (GIS) technology, new maps were produced to state Cadastral Level III standards (with the exception of a small percentage of survey maps, which were updated to state Cadastral Level II standards). The town's 2013 Grand List and Tax Assessor's records were utilized to provide unique identification numbers and land use codes for each parcel of land within the town. These attributes were linked with the mapped data to produce *Computer-Aided Mass Appraisal* (CAMA) datasets. The town's GIS parcel datasets are now available in the latest ESRI Parcel Fabric format.

10.2. Lot Size

10.2.1. One-acre to Two-plus Acre Lot Size per Dwelling Unit

These are areas that have or can support residential development at the desired density of one (1) dwelling unit per acre of land or less. Recent development patterns reveal that the average lot size is between 2.25 and 2.5 acres per dwelling. Effective January 1, 2003, the town adopted a two-acre minimum zoning requirement. An analysis of the town's vacant residentially-zoned lands reveals that approximately 1,619 acres of developable land remain in the town. Assuming that future lots contain 0.5 acres of "unbuildable" land and that 15% of each lot might be consumed for accessibility (driveways), roads or lot geometry, this results in approximately 920 theoretical remaining lots. Assuming a household size of 2.84 persons, this might translate into 2,613 additional Durham residents.

10.2.2. One-half Acre Lot Size per Dwelling Unit

The current Main Street Residential Zone permits a lot size of one-half acre per dwelling unit. To maintain the rural character and desired density of this area, and to support the town's policy of sewer avoidance, no expansion of this category is proposed.

10.3. Area Identification – Proposed Land Use Plan

The following subsections describe the designations used in the Land Use Plan in detail.

10.3.1. Existing Open Space

Areas designated as *Existing Open Space* include:

- All existing State of Connecticut park and forest land within the town, including development rights acquisitions;
- Town of Durham recreational and open space areas and private property which is encumbered by a conservation easement to the town, or the State Of Connecticut;
- Property of the Wallingford Water Company and the South Central Regional Water Authority, where located in the town;

- Land owned by local or regional land trusts, where located in the town.

10.3.2. Proposed Open Space

Areas designated as *Proposed Open Space* include:

A. Water-related resources
   - Inland wetlands and watercourses
   - 100' buffers in A watersheds
   - 200' buffers in AA watersheds that are active water supply watersheds
   - Areas identified as having a high potential for groundwater development
   - Floodways
   - 100-year flood hazard area

B. Habitat
   - High priority wildlife corridors
   - DEP areas of special concerns
   - Basalt ridges

C. Scenic Resources
   - Ridge lines

D. Open Space Land Uses
   - Sportsman's clubs, camps, and recreational uses

E. Cultural Resources
   - Dam sites and old mills
   - Historical quarry sites
   - Native American camp sites

10.3.3. Community Facilities

Areas designated as *Community Facilities* include land owned by the town of Durham and Regional School District 13 which have not been classified as open space. The expansion of public facilities in these areas may be considered in the future.

10.3.4. Heavy/Light Industrial

Areas designated as *Heavy/Light Industrial* include areas near arterial roads or railways that have developed or are intended to develop with industrial facilities.

10.3.5. Designed Development District (DDD)

Areas designated as *Designed Development District* (DDD) are required to meet design standards that assure compatibility with abutting residential areas, preservation of traffic capacity and protection of environmentally sensitive areas. These areas provide for a variety of uses, including retail under specific conditions, and may accommodate business parks.

10.3.6. Commercial

Areas designated as *Commercial* are intended to support commercial businesses.

10.3.7. Main Street Residential

Areas designated as *Main Street Residential* contain a combination of residential and pre-existing non-conforming uses; including a number of non-residential uses (ie: post office).

10.3.8. Farm Residential

Areas designated as *Farm Residential a*re intended to support residential and agricultural uses.

10.3.9. Historic District

Areas designated as *Historic District* delineate the boundaries of the town's Historic District.

10.3.10. Mixed-Use Development

Mixed-use development is permitted in all Commercial Zones provided that the uses are no more intensive than Commercial. Mixed-use development is permitted in nonconforming parcels of the Main Street Residential Zone, provided that the use is no more intensive than the previous use. Should regulations be crafted with regard to Mixed-Use Development, the Planning and Zoning Commission shall consider the historic differences and values of all properties concerned when making any decision related to Mixed-Use Development.

10.3.11. Adaptive Re-Use

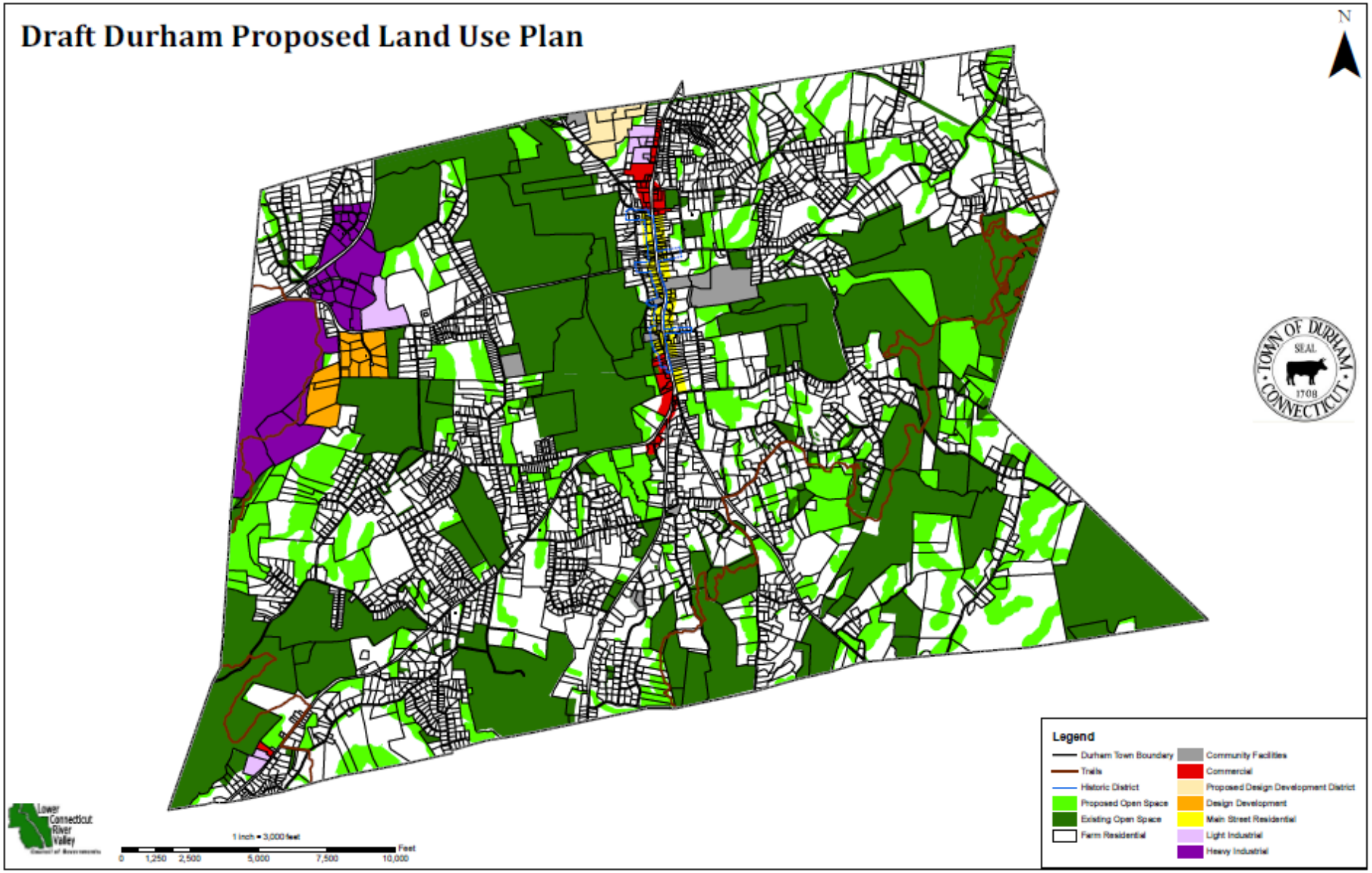
The Planning and Zoning Commission, in an effort to prevent conflicts between nonresidential utilization of historically significant structures and their preservation, has chosen to "hold the line" on the commercially zoned land abutting the Historic District. This policy has proven effective and the residential atmosphere of Main Street has been enhanced over the years. The Commission has also considered the concept of adaptive re-use of historic structures for offices, banks, and other similar uses as a method of historic restoration. The Commission previously determined that this mechanism was not necessary and believed that the continued residential use of historic structures was the most compatible with their preservation. The Commission is currently exploring the concept of adaptive re-use.

10.3.12. Land Reuse

Land reuse can be appropriate and is encouraged, provided that the new use is no more intensive than the prior use of a particular property. Depending upon the anticipated reuse, a special permit may be required.

10.3.13. Proposed Land Use Plan

Draft Durham Proposed Land Use Plan



Chapter 11.0

Inconsistencies with State and Regional Plans

11.0. Introduction

The following sections identify known inconstancies between this Plan of Conservation and Development and the State and Regional Plans of Conservation and Development.

11.1. Inconsistency #1

The area identified in this inconsistency includes the area along Connecticut Route 17 (Main Street from the Durham-Middletown town boundary to approximately its intersection with Conn. Rt. 79). The area is designated as *Balanced Priority Funding*, which is appropriate. However, when one looks in detail at the points assigned to the adjacent land areas, they range from 1-2, and are in the first tier of the three possible priority funding area categories. **The town of Durham is of the opinion that the area outlined above meets all three (3) of these criteria; and the area warrants the full three points, and should be included in the second tier of priority funding area categories.** The reasons noted for this position are as follows:

The assignment of points includes three categories:

- the area is designated as urban
- there is local bus service available
- there is an existing water service, or one is planned

I. A detailed review of the areas designated as urban include both sides of Route 17 (Main Street) and portions of the surrounding area.

II. Durham presently contracts with the Estuary Transit District for a “Dial-A-Ride” service known as 9 Town Transit for the general public for areas of Durham, including Connecticut Route 17 (Main Street).

III. A portion of the Main Street area has been designated as the Durham Meadows Super Fund Area. Contamination of the ground water was identified in the early 1980's and the Environmental Protection Agency (EPA) has recommended that the only feasible way to remediate this contamination is to provide public water to the impacted properties. After years of study it was determined that extending public water from Watch Hill Road in Middletown to the Allyn Brook Bridge on Route 17 in Durham is the preferred solution. Durham and Middletown are in agreement and currently have a signed *Memorandum of Understanding* to implement the plan proposed by the EPA. Middletown has updated its water supply plan to the satisfaction of the Connecticut Department of Health (DPH) and claims to have sufficient water to supply Durham's needs. The EPA has contracted for the final design of the suggested water system; which is expected to be completed in January 2018. The design goes from Talcott Ridge Road southerly along Route 17, into Durham. It extends to Old Cemetery Road, north along Maple Avenue to Talcott Lane, and easterly back to Main Street. It also includes a portion of Wallingford Road (Route 68) from Main Street.to the Durham Meadows; and includes a portion of Maiden Lane from Main Street to Brick Lane.

IV. In addition, the town of Durham currently owns the Durham Center Water System and its wells and water distribution system. The Durham Center Water System provides water to 38 customers along portions of Route 17 (Main Street), Maple Avenue, Town House Road, Fowler Avenue, a portion of Cherry Lane and on Main Street, from Allyn Brook to just north of Higganum Road.

11.2. Inconsistency #2

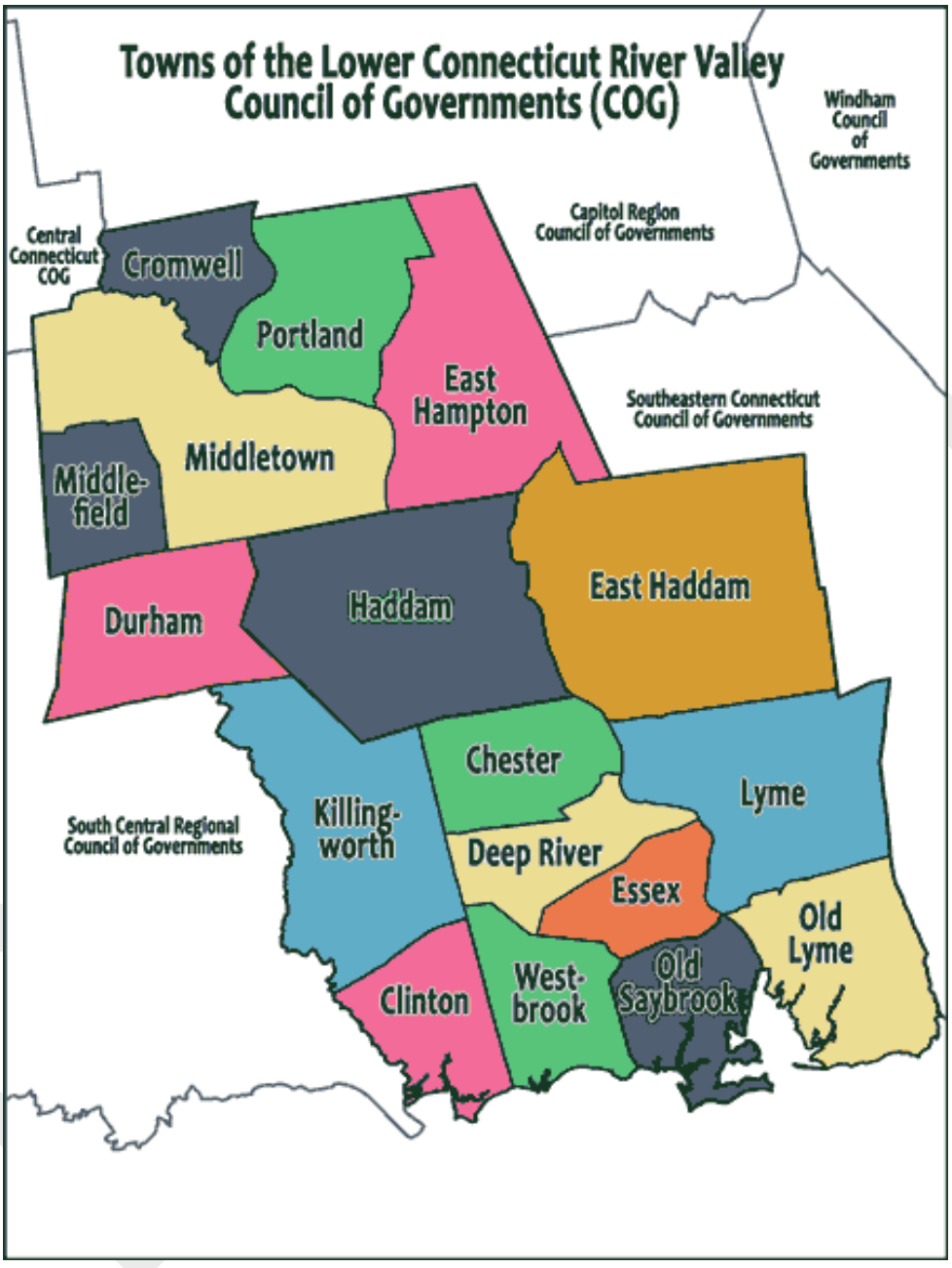
The area identified in this inconsistency includes westerly side of Durham near the Wallingford Town Line. **The town of Durham is of the opinion that this section of town should be designated as a Balanced Priority Funding Area, similar to the adjacent designations.** The reasons noted for this position are as follows:

I. This area holds the largest concentration of the town's industrial base. These industrial areas include the land east of Route 157 and north of Route 68, and areas south of Route 68 along Mountain Road and Ozick Drive. These areas are shown as Conservation Areas, with factors 1-3.

II. When reviewing the specific reasons for the designations, a potential water supply and factor of 1 is given. In the early 1960's Connecticut was in a drought and many of the water companies had to develop additional sources of supply. Wallingford was no exception. It purchased the 158 acre "Fitzgerald Property" west of Route 17 and south of Howd Road in the Town of Durham and pumped water through an above ground piping system from Parmalee Brook to nearby Pistapaug Reservoir. The US Department of Agriculture analyzed Middlesex County for potential impoundment sites that could possibly be used for water supply purposes. Three (3) such sites were identified in Durham. Working with the Town of Wallingford, the Durham Conservation Commission identified properties that would need to be acquired in order to develop these impoundments and their use a future water supply. The intent was for the towns to each purchase designated properties; and in 1967 Durham acquired three large properties; all being a component to the proposed impoundment areas. Wallingford did not follow suite, and the remainder of these impoundment sites were developed for housing, industrial and recreational uses. The watersheds to these impoundment areas and the impoundment areas themselves are depicted primarily as "Conservation Areas"; although the failure to purchase the necessary lands related to these impoundment areas, and their subsequent development, makes it impossible to implement the original concept of using these sites for water supply purposes; thus negating their designation as "Conservation Area". In short, none of these areas can be developed for their intended purpose and cannot meet current water supply watershed protection requirements.

III. Currently, within this area which is designated as a "Conservation Area" are thirty (30) industrial lots; most of which are developed. The approximately one-hundred-sixty three (163) acre area is currently zoned to accommodate industrial uses.

IV. From the west side of Mountain Road to the Wallingford town line, Tilcon Connecticut Inc. owns in excess of three hundred (300) acres of land situated within the town of Durham. Its current trap rock mine along the south side of Route 68 is approximately one-hundred-forty five (145) acres in size, with an excavation depth of nearly eighty (80) feet. In the future, the company plans to expand the excavation to nearly twice the current size. The designation of this area as a conservation area is based on its potential as a future water supply or a core forest area. This denuded 250-300 acre area does not qualify as a core forest area.



The Town of Durham is a member of the *Lower Connecticut River Valley Council of Governments*