City of Lowell
Massachusetts

Master Plan Update
EXISTING CONDITIONS REPORT

Office of the City Manager
Department of Planning and Development
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DPD
Department of Planning and Development

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1.0 INTRODUCTION

1.1 THE COMPREHENSIVE MASTER PLAN UPDATE

A Comprehensive Master Plan is an officially adopted public document which establishes long term goals and policies for the City. The plan itself includes an analysis of and recommendations for the use of land and the improvement of the transportation system, the provision of community facilities, the economy, housing, and the environment. It has been and will continue to be used as a policy statement aimed at the unified and coordinated development of the City. The long-range policies within the plan have been continually referred to by decision-makers in considering items regarding development. The plan has also been used to guide the location, development and maintenance of the many facilities and services provided by the City. As such, the Comprehensive Plan has been one of the main policy tools of the City Council, the Planning Board, Zoning Board of Appeals, the City's administration, and the Department of Planning and Development as well as other City boards and departments.

The vision of the current Master Plan is summarized by the following statements:

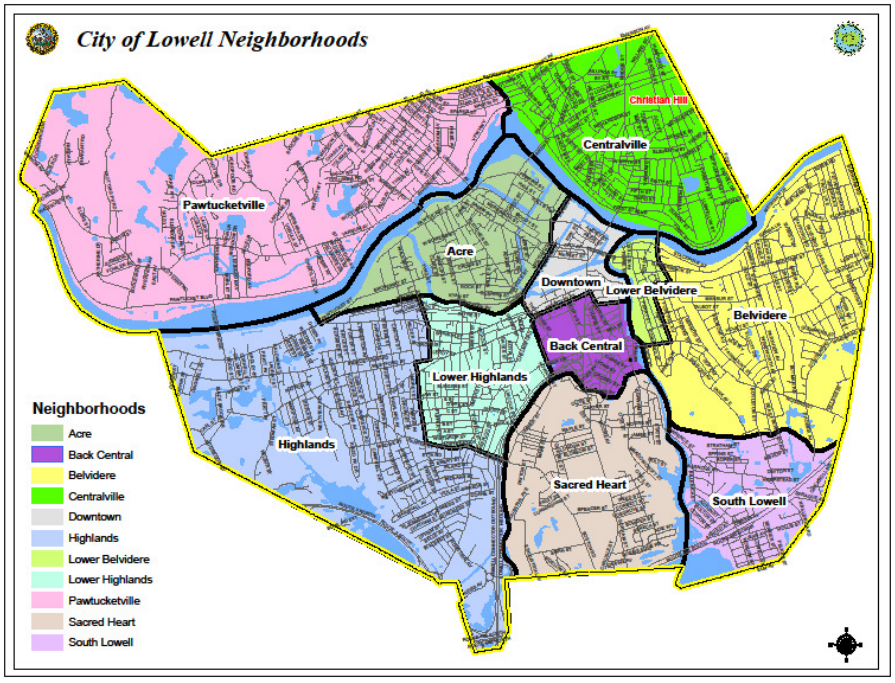
- Lowell should be a lifetime City, a place where people can enjoy all stages of life at a variety of income levels. People should be able to find desirable, appropriate and affordable residential opportunities for all stages of life within Lowell's city limits.
- Lowell should have a creative workforce that supports a diverse base of employment, retail, and commercial opportunities that meet the needs of the community and capitalizes on the City's historic, cultural, natural and educational resources.
- Lowell should offer a high quality of life for both current and new residents, while striving to protect and promote the unique character of its neighborhoods.
- Lowell should retain an independent identity as a unique city, even as it becomes more closely connected to greater Boston, to preserve the community's pride of place.

By regularly reviewing and referring to the Plan, decision-makers can keep the Plan current. Over the course of this year, the city is making its first update to its current Master Plan, which was officially endorsed by the City Council in 2003. While the Plan has effectively guided the City's development plans and strategy and this vision remains salient for Lowell, much has changed both locally and regionally in the years since its release. The most significant change that has occurred since 2003 is the emergence of sustainability as a seminal factor impacting nearly all aspects of society and the economy nationally and locally. Although the original Master Plan included a chapter on sustainability, the entire updated plan will place greater emphasis on environmental, economic, and social sustainability. The Department of Planning and Development will manage this update process, in addition to future updates that will occur.

The City has many kinds of plans for parks, streets, utilities, land use, etc. The Master Plan encompasses these categorical plans and provides a means for relating them to one another. The Master Plan is not designed to replace those studies but should be used to complement and recommend future needed studies. It should be realized that the Plan is more than a sum of these components; it is a unified vision of the future of the City. The term "planning process" suggests the on-going, cyclical nature of planning and, in general, it attempts to answer a series of questions:

- What are the existing conditions with regard to population, housing, land use, transportation, etc. (Inventory)
- What do we anticipate in years to come in terms of population growth, housing changes, public facilities, etc. (Analyses and Forecasting)
- What do we want and need for the future? For example, what do the citizens want or expect Lowell to be like in the future with regard to neighborhoods, parks, employment opportunities, etc. (Goal Setting)
- How can internal City operations be improved to strategically implement the goals? (Management Improvement)
- How do we accomplish the desired future end? This is the overall strategy or plan, intended to create the conditions wanted. (The Comprehensive Plan itself)
- What detailed studies and programs are necessary to meet the goals of the Plan? (Plan Implementation)
- Is the Plan working? Is it effectively achieving our desired goals? (Plan Monitoring)

Figure 1.1: Lowell's Neighborhoods



1.2 EXISTING CONDITIONS

As the first product of Lowell's Comprehensive Master Plan update process, this Existing Conditions Report is intended to provide a snapshot of Lowell today. By comparing past data to current trends, the city will be better able to plan for the future. In some cases information has been collected through first-hand observations and other primary research (including traffic counts and land use data). In other cases, we have relied on statistics from various sources including the US Census Bureau.

1.3 REGIONAL CONTEXT

Lowell, Massachusetts, the nation's first successfully planned industrial community, is located in northern Middlesex County in the northeastern section of Massachusetts. The city is bisected by the Merrimack River and is located approximately 25 miles north of Boston. Lowell has a land area of 13.38 square miles with the remaining 0.89 square miles covered by surface water. The total area within the Lowell city border is 14.27 square miles. The major bodies of water that have had tremendous impact on the development and success of the City area the Merrimack River and the Concord River.

The city is a diverse urban/suburban community built primarily around the extensive industrial mill complexes along the Merrimack River. The industrial revolution of the 19th Century gave the city its economic base, heritage, and character that are still prevalent today. Today, the city can be characterized as a highly urbanized community surrounded by wealthier suburban white-collar communities. Lowell is surrounded by the suburban communities of Tewksbury, Chelmsford, Dracut, and Tyngsborough, communities with extensive open land testifying to their rural, agricultural past.

1.4 HISTORY

As America's most significant planned industrial community, Lowell dramatically illustrates the country's transition from an agrarian to an industrial society. The physical remains of Lowell's industrial past – 5.6 miles of canal ways, lock chambers, mills, boarding houses, bridges, and machinery – are monuments to the American Industrial Revolution. Lowell was America's first large scale planned industrial community. It was incorporated as a city in 1826. Its mills helped transform American life with high volume mechanized manufacturing, the rise of the large corporation, and the growth of an urban working class. The rich diversity of Lowell's subsequent growth and development is displayed in the central business district and surrounding ethnic neighborhoods.

The "Venice of America", as Lowell was known, was remarkable among 19th century industrial cities for its quick ascent to fame, the symbolic value it held for America concerned with large scale industrialization, and the sheer enormity of its industrial processes. This success largely rested on certain advantages of people, place and timing.

By 1840, Lowell had become the principal manufacturing center of the United States and the model for many similar ventures. The transformation from rural community to industrial Mecca occurred in less than two decades. This was among the most rapid industrialization processes the country has ever experienced.

Lowell's geographical location at the confluence of the Merrimack and Concord Rivers attracted settlers to its banks for approximately 10,000 years. The site first served as an ideal location for Native American fishing camps. Early English settlers made use of the rich farmland along the rivers' floodplains that later led to the location of one of America's first planned industrial communities. The two rivers provided an abundance of inexpensive yet reliable waterpower for the mills, the level terrain simplified subsequent construction, and the city had convenient access to Boston via the Middlesex Canal and to Newburyport via the Pawtucket Canal and the Merrimack River.

Lowell's designers awarded mill sites and canal routes their highest priority. To facilitate the use of river power, mill complexes were constructed along the banks of the Merrimack and Concord Rivers, where the force of the water courses were greatest. As more corporations were founded, an intricate system of canals continued to evolve to provide the necessary power. Eventually, 10 canals were constructed, and as they fanned out across the landscape, they cut the city into seven islands. The rest of the community developed within the confines of the V-shaped wall formed by the mills. Here, behind the wall of mills, the corporations established the residential communities that housed mill employees and led to the formation of ethnic neighborhoods.

2.0 DEMOGRAPHICS

The population in Lowell is currently 106,519. This is an increase of 1.3 % from the 2000 US Census. Lowell witnessed its greatest population growth from 1890 to 1900 and peaked in 1920 at 112,759. After a steady decline from 1920- 1980, the number of Lowell residents is once again increasing at a regular rate. As of 2010, the City of Lowell had a population of 106,419 and a population density of 12.1 persons per acre (p/a). Since 1980, the population has increased by 15.3%. The greatest population densities can be found in the neighborhoods of Back Central (26.6 p/acre), the Lower Highlands (25.5 p/a), and a portion of the Acre (30 p/a) while the lowest population densities are located in South Lowell (6.1 p/a) and Pawtucketville (7.4 p/a).

Perhaps the most significant changes within the city over the past decade have occurred with the redevelopment of Downtown. As of 2010, the population and density of Downtown has increased by more than five times what it was in 1970. Since 2000, the addition of 2,202 market-rate units has contributed to a 36% increase of the population in this census tract. The creation of these market-rate units has substantially contributed to the de-concentration of low-income and minority populations in this neighborhood without displacing a single affordable unit. Through a number of aggressive redevelopment plans targeted at vacant or underutilized properties, the City has successfully improved the area with the increase of residential use. Continuing residential development within Downtown will help to relieve growth pressures in other neighborhoods and ensure a vibrant center.

Perhaps the most predominate changes in the city's population have been in the racial and ethnic composition of the population. In the past 10 years, minority populations have increased from 37.5% to 47.2% of the total population. The City's White population is the only race with a decreasing population, however it remains the largest racial group in Lowell (52.8%). In the past ten years, neighborhoods that have shown the largest decrease in white populations are the Lower Highlands, Highlands, and the Acre, which are the same neighborhoods that have accommodated the large minority populations. Areas that still contain large White majorities include Pawtucketville (73%), South Lowell (78%), and Belvidere (90%). Since 2000, the Downtown Census Tract has experienced a significant increase in its White population due to the extensive market-rate residential development that has occurred during this time frame.

Age trends have remained relatively stable in the community over the past ten years. No single age range dominates the population of Lowell. Over the past twenty years, the most notable change in the age of the population of the City of Lowell has occurred with the population aged 50-69, increasing by 39%. This demonstrates an aging population and is similar to demographic trends for the Commonwealth and across the nation. The growth of the 50 – 69 age cohort for Lowell is lower than the rest of the U.S. and state, suggesting that the population isn't aging as quickly.

Median household incomes declined in every neighborhood across the city during the 1970s. This trend changed in the 1980s, with neighborhood median incomes varying and the citywide adjusted median income increasing by 5.9% ($38,156). During the 1990s, median incomes once again varied throughout the neighborhoods and the city's overall adjusted median income increased by 2.7% ($39,192). Although income data is no longer collected through the Census in the same format as it has been in the past, the American Community Survey (ACS) one-year estimates for Lowell in 2010 indicate that median household income is $49,698 in 2010 inflation-adjusted dollars. This figure represents a 26.8% increase in median household income since 1999. However, it is important to note that the American Community Survey only represents a small survey of the population and should therefore not be used for direct comparison purposes to previous 10-year Census counts.

Overall, Lowell residents aged 25 and over have a lower level of educational attainment than their counterparts on the state and national levels. While 22.3% of Massachusetts residents have earned a Bachelor's degree, only 14.9% in Lowell have obtained a BA. Similarly, 7.8% of Lowell residents have pursued a graduate degree, a significantly smaller percentage than their statewide counterparts at 16.7%.

2.1 HISTORIC TRENDS

Lowell witnessed its greatest population growth from 1890 to 1900 (Table 1). During this period the textile mills began to prosper and new commercial and industrial enterprises appeared in the city creating an increased demand for labor. In 1875, the first influx of immigrants began to settle in the city in response to the new employment opportunities. Lowell's population increased from 59,475 in 1880 to 94,969 in 1900.

By the early 1900's, industrial production in Lowell had reached its peak. Lowell's population grew steadily as immigrants continued to move into the city, gradually replacing the early "mill girls" as the major source of labor. By 1920, Lowell's population had reached a high of 112,759.

The resulting Depression and the movement of the textile industry to the south resulted in Lowell's eventual economic collapse. During the decade 1920-1930, Lowell experienced its first significant loss in population, decreasing to 100,234 persons in 1930. The city's population remained stable throughout the Depression of the 1930s. Following the Depression and World War II, the population began a steady decline as residents began to move into the suburbs. Lowell's population decreased 10 percent from 101,389 in 1940 to 92,107 in 1960. Table 1 identifies the historical population increase and decline experienced in Lowell over the past century.

Table 2.1.1
Population Trends 1880 to 2010

Year	Population	% Change
1880	59,475	
1890	77,695	+30.6
1900	94,969	+22.2
1910	106,294	+11.9
1920	112,759	+06.0
1930	100,234	-11.1
1940	101,389	+01.1
1950	97,249	-04.1
1960	92,107	-05.3
1970	94,239	+2.3
1980	92,418	-01.9
1990	103,439	+10.7
2000	105,167	+ 1.7
2010	106,519	+1.3

Source: Census of Population; US Census Bureau

In the late 1950s, Lowell began undertaking many urban renewal projects to curtail the growing out-migration of its residents. These efforts achieved limited success. Although Lowell's population grew in 1970 to 94,239, it dropped off again in 1980 to 92,418.

2.2 POPULATION & DENSITY

As of 2010, the City of Lowell had a population of 106,419 and a population density of 12.1 persons per acre (p/a). Since 1980, the population has increased by 15.3%.

The largest percentage of the population lives in the Highlands neighborhood (17.2%). However, the 10.8 p/a in the neighborhood is just below the City's density average. The greatest population densities can be found in the neighborhoods of Back Central (26.6 p/a), the Lower Highlands (25.5 p/a), and a portion of the Acre (30 p/a). The lowest population densities are located in South Lowell (6.1 p/a) and Pawtucketville (7.4 p/a). Since 1970, Downtown and a portion of Pawtucketville have experienced the biggest increases in density, with Downtown increasing by 512% and Pawtucketville by 63%. Overall, neighborhoods physically portray their density levels, with more two-family and multi-family homes in highly dense areas and predominantly single-family homes on larger lots in lower density areas.

Perhaps the most significant changes within the city have occurred with the redevelopment of Downtown. As of 2010, the population and density of Downtown has increased by more than five times what it was in 1970. Since 2000, the addition of 2,202 market-rate units and 1,356 subsidized units has contributed to a 36% increase of the population in this census tract. The creation of these market-rate units has substantially contributed to the de-concentration of low-income and minority

populations in this neighborhood without displacing a single affordable unit. Through a number of aggressive redevelopment plans the City has successfully improved the area with the increase of residential use. Continuing residential development within Downtown will help to relieve growth pressures in other neighborhoods and ensure a vibrant center.

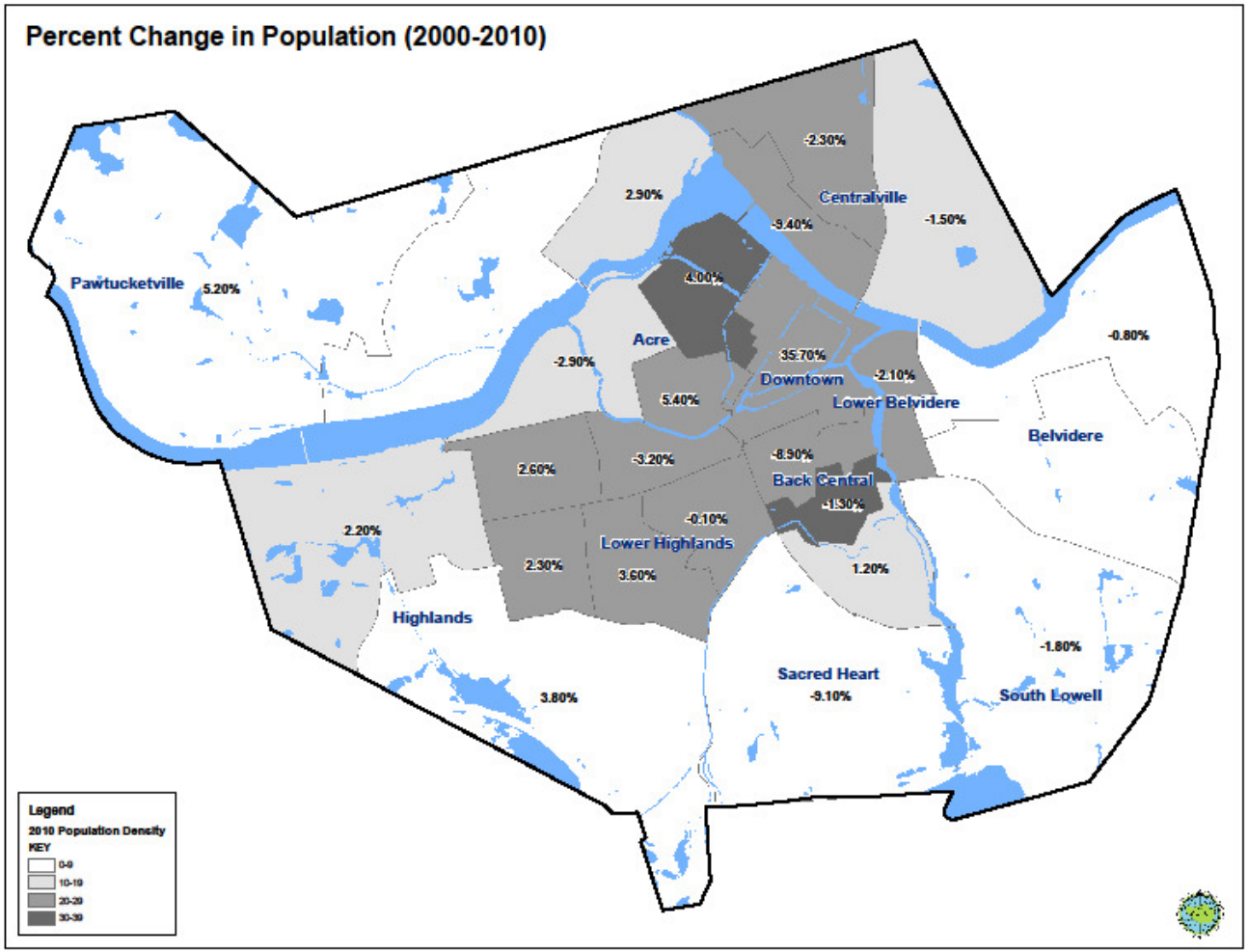

Percent Change in Population (2000-2010)
Pawtucketville
5.20%
2.90%
-2.30%
Centralville
-3.40%
-1.50%
4.00%
Acre
-2.90%
35.70%
Downtown
-2.10%
5.40%
Lower Belvidere
-0.80%
Belvidere
2.60%
-3.20%
-8.90%
Back Central
-1.30%
-0.10%
2.20%
Lower Highlands
2.30%
3.60%
1.20%
Highlands
-1.80%
Sacred Heart
-9.10%
South Lowell
3.80%
Legend
2010 Population Density
KEY
0-9
10-19
20-29
30-39

Table 2.2.1
Population and Density Trends, 1970-2010

				1970	1970	1970-80	1980	1980	1980-90	1990	1990	1990-00	2000	2000	2000-10	1990-10	1980-10	2010	2010
TRACT	**Neighborhood**	**Sq. Mi.**	**Acres**	**POP**	**Density**	**Change**	**POP**	**Density**	**Change**	**POP**	**Density**	**Change**	**POP**	**Density**	**Change**	**Change**	**Change**	**POP**	**Density**
3101	Downtown	0.384	245.8	859	3.5	121.4%	1902	7.7	75.6%	3340	13.6	16.2%	3,881	15.8	35.7%	57.7%	176.9%	5,267	21.4
3102	Christian Hill	0.739	473	6117	12.9	-4.0%	5873	12.4	4.5%	6137	13	-1.1%	6,070	12.8	-1.5%	-2.6%	1.8%	5,976	12.6
3103	Centralville	0.424	271.4	5827	21.5	-6.2%	5463	20.1	4.2%	5695	21	8.1%	6,157	22.7	-2.3%	5.6%	10.1%	6,016	22.2
3104	Centralville	0.212	135.7	3604	26.6	-10.3%	3233	23.8	9.5%	3540	26.1	1.2%	3,581	26.4	-9.4%	-8.3%	0.4%	3,245	23.9
3105	Pawtucketville	0.325	208	3636	17.5	-11.0%	3236	15.6	4.9%	3396	16.3	-1.3%	3,353	16.1	2.9%	1.6%	6.6%	3,449	16.6
3106	Pawtucketville	2.848	1822.7	7131	3.9	26.4%	9012	4.9	16.0%	10450	5.7	5.3%	11,002	6	5.2%	10.7%	28.4%	11,571	6.3
3107	Acre	0.36	230.4	3825	16.6	1.0%	3864	16.8	8.9%	4207	18.3	8.7%	4,575	19.9	-2.9%	5.6%	14.9%	4,441	19.3
3108	Acre	0.104	66.6	1754	26.4	43.8%	2523	37.9	6.2%	2679	40.2	-8.3%	2,457	36.9	n/a	n/a	n/a	n/a	n/a
3110	Acre	0.178	113.9	2332	20.5	-15.8%	1963	17.2	49.1%	2927	25.7	-5.9%	2,754	24.2	n/a	n/a	n/a	n/a	n/a
3111	Acre	0.172	110.1	2742	24.9	-26.8%	2008	18.2	49.0%	2991	27.2	-23.6%	2,286	20.8	5.4%	-19.4%	20.0%	2,410	21.9
3112	L. Highlands	0.177	113.3	3257	28.8	-12.8%	2839	25.1	12.5%	3195	28.2	5.6%	3,374	29.8	-3.2%	2.3%	15.1%	3,267	28.8
3113	Highlands	0.249	159.4	3929	24.7	-8.9%	3581	22.5	-1.7%	3519	22.1	12.4%	3,954	24.8	2.6%	15.3%	13.3%	4,057	25.5
3114	Highlands	0.849	543.4	3918	7.2	22.1%	4782	8.8	12.8%	5394	9.9	8.6%	5,857	10.8	2.2%	11.0%	25.2%	5,986	11.0
3115	Highlands	0.214	137	2847	20.8	-6.4%	2664	19.5	0.8%	2684	19.6	8.3%	2,908	21.2	2.3%	10.8%	11.6%	2,974	21.7
3116	Highlands	1.341	858.2	5318	6.2	-5.6%	5020	5.8	-2.2%	4911	5.7	3.8%	5,099	5.9	3.8%	7.8%	5.5%	5,295	6.2
3117	L. Highlands	0.293	187.5	4327	23.1	-9.9%	3897	20.8	12.3%	4375	23.3	12.5%	4,923	26.3	3.6%	16.5%	30.8%	5,098	27.2
3118	L. Highlands	0.23	147.2	3625	24.6	-21.3%	2854	19.4	16.5%	3324	22.6	5.8%	3,516	23.9	-0.1%	5.7%	23.1%	3,513	23.9
3119	Back Central	0.171	109.4	4075	37.2	-38.5%	2507	22.9	15.1%	2885	26.4	-7.6%	2,666	24.4	-8.9%	-15.8%	-3.1%	2,429	22.2
3120	Back Central	0.144	92.2	2445	26.5	28.6%	3145	34.1	7.9%	3392	36.8	-12.2%	2,977	32.3	-1.3%	-13.4%	-6.6%	2,938	31.9
3121	Sacred Heart	0.258	165.1	2592	15.7	-3.7%	2495	15.1	29.1%	3221	19.5	-3.4%	3,112	18.8	1.2%	-2.2%	26.2%	3,149	19.1
3122	Sacred Heart	1.161	743	4510	6.1	-7.6%	4165	5.6	14.7%	4776	6.4	-0.7%	4,741	6.4	-9.1%	-9.8%	3.5%	4,309	5.8
3123	South Lowell	1.253	801.9	4264	5.3	2.9%	4388	5.5	14.0%	5003	6.2	0.4%	5,023	6.3	-1.8%	-1.4%	12.4%	4,931	6.1
3124	L. Belvidere	0.163	104.3	2570	24.6	-17.9%	2109	20.2	23.2%	2598	24.9	-7.4%	2,405	23.1	-2.1%	-9.4%	11.6%	2,354	22.6
3125	Belvidere	1.529	978.6	8735	8.9	1.8%	8895	9.1	-0.9%	8819	9	-3.7%	8,496	8.7	-0.8%	-4.5%	-5.3%	8,424	8.6
3883*	Acre	0.282	180.5	4086	22.6	9.8%	4486	24.9	25.0%	5606	31.1	-7.0%	5211	28.9	4.0%	-3.3%	20.8%	5,420	30.0
	City of Lowell	13.778	8817.9	94,239	10.7	-1.9%	92,418	10.5	11.9%	103,458	11.7	1.7%	105,167	11.9	1.3%	3.0%	15.3%	106,519	12.1

*note: A change was made to the Census tracts within the City of Lowell for the 2010 Census. Census tracts 3108 and 3110 (in the Acre) were combined into a single Census tract: 3883.

All density figures are persons/acre. Source: United States Census Bureau

2.3 FERTILITY, MORTALITY & MIGRATION

According to 2009 American Community Survey data, the birth rate for women ages 15-50 in the city of Lowell (48 women per 1000) is only slightly higher than the state rate (46 women per 1000). Similarly, Lowell's birthrate of 15 per 1000 women in their teens (15-19) is very close to the state rate of 14 per 1000 women. Birthrates for Lowell women in the age ranges of 20-34 and 35-50 are also comparable to the state rates. Birthrates for unmarried women, however, are higher among women in Lowell (37% of births) than on the state level (28.7% of births). When compared to the national rates, Lowell's birthrates for all the age groups are lower than the national average.

Table 2.3.1

FERTILTY RATES			
	Lowell	**MA**	**US**
Number of women 15 to 50 years old who had a birth in the past 12 months	1339	78,226	4,263,387
Unmarried women (widowed, divorced, and never married)	496 (37%)	22,419 (28.7%)	1,422,577 (33.4%)
Per 1,000 unmarried women	30	24	37
Per 1,000 women 15 to 50 years old	48	46	56
Per 1,000 women 15 to 19 years old	15	14	28
Per 1,000 women 20 to 34 years old	79	80	104
Per 1,000 women 35 to 50 years old	25	29	24

Source: 2005-2009 American Community Survey, US Census Bureau

According to the most recent statistics from the Massachusetts Department of Public Health, the age-adjusted death rate for Lowell is higher than the state rate of 703.5 deaths per 100,000 people. When compared to other large cities across the state, Lowell's death rate of 822.6 deaths per 100,000 people is second only to that of Worcester.

Table 2.3.2

Age-Adjusted Death Rates: Lowell and other MA Cities		
	# of deaths	Death Rate*
MA	53,340	703.5
Boston	3,878	737.1
Brockton	764	802.3
Cambridge	477	560.2
Lowell	**781**	**822.6**
New Bedford	1,005	817.7
Springfield	1,251	799.1
Worcester	1,715	823.3

Source: MA Department of Public Health

*Rates are per 100,000 population age-adjusted to the 2000 US Standard Population and calculated using MA Dept. of Public Health population estimates for 2005

The latest national-level data on age adjusted death rates from the National Center for Health Statistics, a division of the Center for Disease Control (CDC) suggests that

Lowell's death rate is also higher than the national average, which was 803.6 deaths per 100,000 people in 2007.

Despite this higher than average death rate, higher fertility rates and an average migration rate means that the city experiences average population growth each year. The city's population growth can be attributed to the large population in the prime child-bearing age range. The age group is healthy and experiences a low mortality rate creating a stable population group for annual growth.

Table 2.3.3

Migration Rates: Lowell, MA and the US					
	TOTAL POPULATION, 1 year and over	Moved; within same county	Moved; from different county, same state	Moved; from different state	Moved; from abroad
Lowell	104,692	13.0%	2.3%	1.3%	0.7%
MA	6,445,237	7.9%	2.7%	2.3%	0.9%
US	302,880,262	9.4%	3.2%	2.3%	0.6%

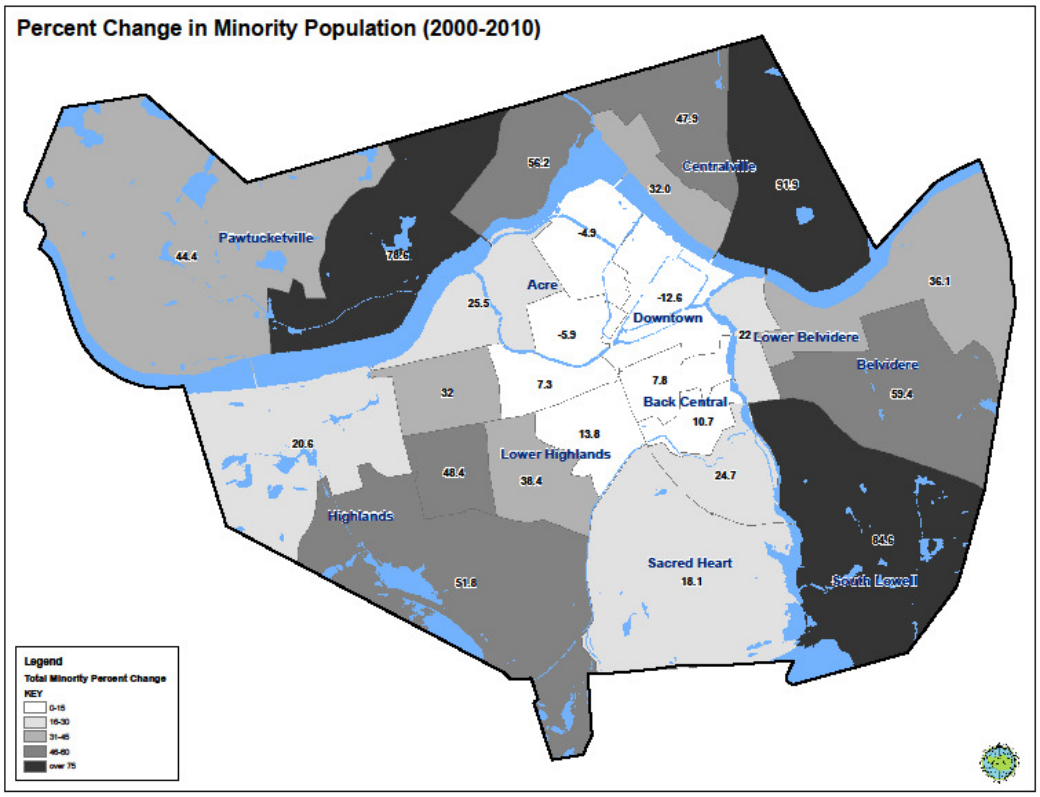
Source: 2008-2010 American Community Survey 3- Year Estimates
Table B07001; Geographical Mobility in the Past Year by Selected Characteristics in the United States

2010 American Community Survey data (3-year estimates) indicates that of the total population of Lowell, 13% or 13,562 individuals moved within Middlesex County. The same data set indicates that 2,380 or 2.3% of the total population moved to Lowell from a different county in Massachusetts. On a broader scale, 1.3% of the total population of Lowell moved from a different state and .7% moved from abroad. Of the total population, 86,641 or 82.8% of the population lives in the same house as they did a year ago in Lowell. As illustrated in table 2.3.3, these percentages are similar to the state and national averages.

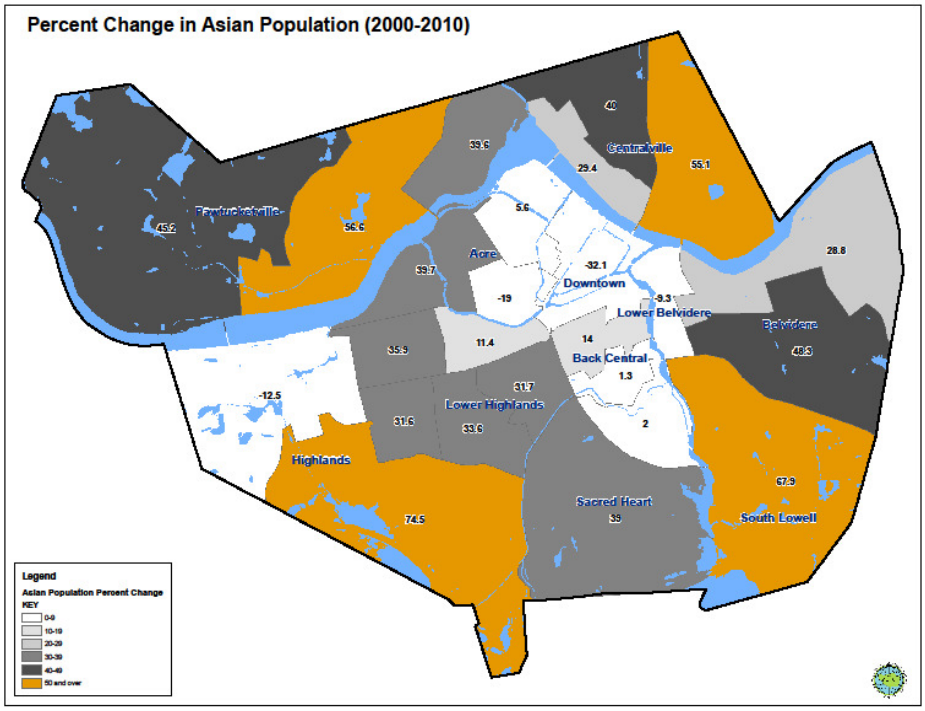
2.4 RACE & MINORITY TRENDS

The most predominate changes in the City's demographics have been in the racial and ethnic composition of the population. The following maps and tables summarize these changes citywide, utilizing the U.S. Census race and ethnicity category breakdowns as a framework. As "Latino" is not a race category, and is addressed separately from other categories such as "White" and "Asian" within the Census, it is important to note that those self-identifying as one race category, such as "White", who also self-identified as "Latino" would be counted twice for our data analysis purposes in this report. The same would be the case for those reporting as "Latino" and "Black", "Asian", "American Indian", "Native Hawaiian" or "Some other race".

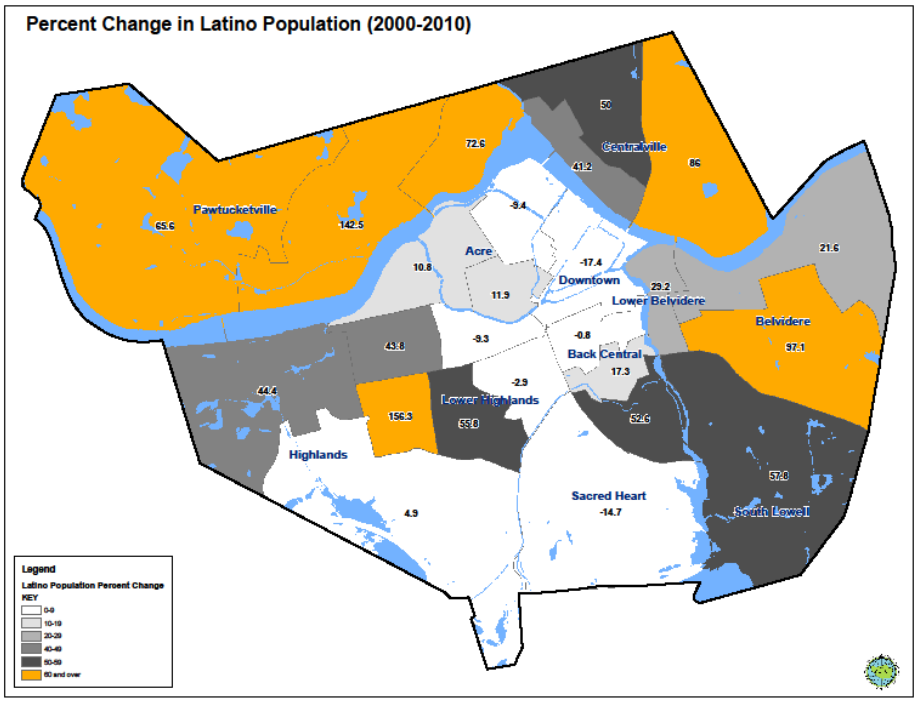
In the past twenty years, minority populations in Lowell have increased from 23.5% to 47.2% of the total population. All races have experienced substantial growth in the past twenty years except the White population, which decreased by just under 20,000, from 81.1% of the total population in 1990 to 52.8% in 2010. The Asian population has experienced the largest growth (+82% change since 1990). The Hispanic population has also grown substantially, increasing 70% since 1990.



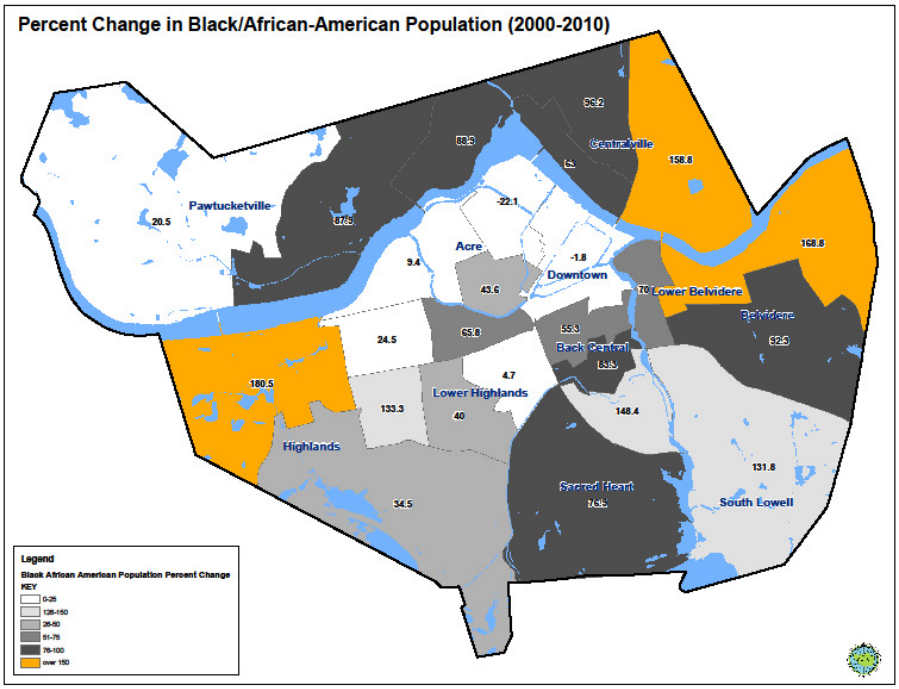
The dramatic increase in the Asian populations, primarily from Cambodia and other Southeast Asian nations, has occurred throughout the City with significant concentrations in Lowell's Lower Highlands (currently 51% Asian) and the Census Tracts adjacent to this neighborhood. Today the residents of Asian descent in these areas formulate a distinct community in Lowell. Smaller Asian populations inhabit Back Central, the Highlands, Pawtucketville, and Sacred Heart. Belvidere, Downtown, Centralville, Pawtucketville and South Lowell house the smallest Asian populations that range from 4% to 15%. The growing Asian population has and will continue to change the composition of Lowell and diversify the community with new culture and traditions.



Similar to national trends, Latino populations are growing considerably in the city. Census Tracts with the highest populations of Latinos are located in the Acre and Lower Belvidere neighborhoods. A portion of the Centralville neighborhood has also experienced a significant growth in the Latino population in the past twenty years. The Lower Highlands and Belvidere have the lowest Latino populations in the City.



The Black population has increased to 7,238 citywide (6.8% of the total population) and reside throughout the City, with the lowest percentage in Belvidere (2.5%) and highest percentage in the Highlands (11.5%). Current trends for these populations show little change from previous growth rates.



The City's White population, the only group with decreasing population, remains the major racial group in Lowell (52.8%). In the past ten years, neighborhoods that have shown the largest decrease in white populations are the Lower Highlands, Highlands, and the Acre, which are the same neighborhoods that have accommodated the large minority populations. Since 2000, the Downtown Census Tract has experienced a significant increase in its White population due to the extensive market-rate residential development that has occurred during this time frame.

Figure 2.4: Ethnic Trends

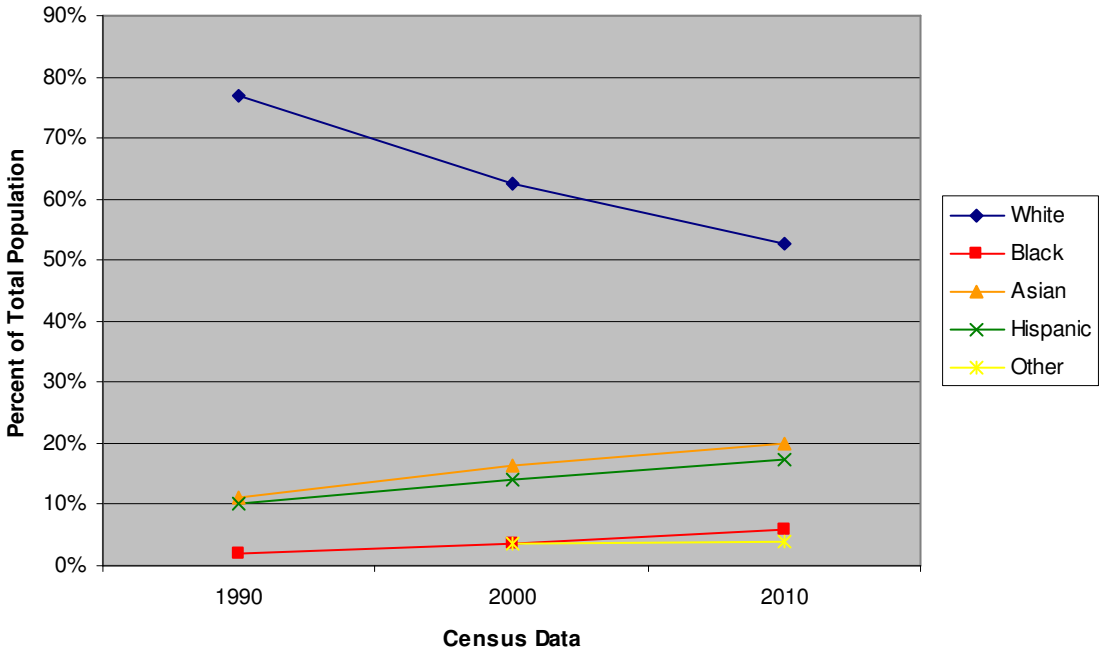


Table 2.4.1
Minority Population Trends, 1990-2010

	1990			2000			2010		
Census Tract	Total Pop	# minority	%minority	Total Pop	# minority	%minority	Total Pop	# minority	%minority
3101	3,340	1,423	42.6%	3,881	2,032	52.4%	5,267	2,413	45.8%
3102	6,137	549	8.9%	6,070	1,195	19.7%	5,976	2,256	37.8%
3103	5,695	603	10.6%	6,157	1,864	30.3%	6,016	2,694	44.8%
3104	3,540	967	27.3%	3,581	1,569	43.8%	3,245	1,874	57.8%
3105	3,396	314	9.2%	3,353	757	22.6%	3,449	1,218	35.3%
3106	10,441	1,033	9.9%	split into CTs 3106.01 & 3106.02 in 2000					
3106.01	n/a	n/a	n/a	5,392	1,212	22.5%	5,746	1,870	32.5%
3106.02	n/a	n/a	n/a	5,610	942	16.8%	5,825	1,749	30.0%
3107	4,258	972	22.8%	4,575	1,953	42.7%	4,441	2,382	53.6%
3108	2,628	818	31.1%	2,457	1,048	42.7%	combined into CT 3883 in 2010		
3110	2,927	1,693	57.8%	2,754	1,910	69.4%			
3111	2,863	1,961	68.5%	2,286	1,845	80.7%	2,410	1,828	75.9%
3112	3,323	1,761	53.0%	3,374	2,459	72.9%	3,267	2,556	78.2%
3113	3,519	669	19.0%	3,954	1,816	45.9%	4,057	2,458	60.6%
3114	5,394	1,422	26.4%	5,857	2,702	46.1%	5,986	3,327	55.6%
3115	2,684	241	9.0%	2,908	979	33.7%	2,974	1,486	50.0%
3116	4,911	607	12.4%	5,099	1,388	27.2%	5,295	2,185	41.3%
3117	4,375	939	21.5%	4,923	2,438	49.5%	5,098	3,492	68.5%
3118	3,432	1,485	43.3%	3,516	2,389	67.9%	3,513	2,716	77.3%
3119	2,777	1,004	36.2%	2,666	1,226	46.0%	2,429	1,205	49.6%
3120	3,392	1,254	37.0%	2,977	1,420	47.7%	2,938	1,550	52.8%
3121	3,221	1,028	31.9%	3,112	1,384	44.5%	3,149	1,749	55.5%
3122	4,776	1,343	28.1%	4,741	1,812	38.2%	4,309	1,945	45.1%
3123	4,988	350	7.0%	5,023	748	14.9%	4,931	1,358	27.5%
3124	2,613	1,275	48.8%	2,405	1,170	48.6%	2,354	1,395	59.3%
3125	8,773	563	6.4%	split into CTs 3125.01 & 3125.02 in 2000					
3125.01	n/a	n/a	n/a	4,497	746	16.6%	4,464	1,007	22.6%
3125.02	n/a	n/a	n/a	3,999	403	10.1%	3,960	637	16.1%
3883	n/a	n/a	n/a	n/a	n/a	n/a	5,420	2,889	53.3%
Lowell	**103,403**	**24,274**	**23.5%**	**105,167**	**39,407**	**37.5%**	**106,519**	**50,239**	**47.2%**

source: 1990, 2000, 2010 Census (SF1 file)

Table 2.4.2: Census 2010 Race & Ethnicity Data

Minority Breakdown in Lowell, MA 2010

Census Tact	Total Population	Total Minority		One Race Alone										Two or more races		Hispanic or Latino	
				White		Black or African American		American Indian and Alaska Native		Asian		Native Hawaiian and Other Pacific Islander		Some other race			
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
3101	5,267	2,413	45.8%	3,526	66.9%	566	10.7%	21	0	299	5.7%	1	0.0%	608	11.5%	246	4.7%	1,402	26.6%
3102	5,976	2,256	37.8%	4,238	70.9%	524	8.8%	6	0.1%	455	7.6%	4	0.1%	513	8.6%	236	3.9%	1,113	18.6%
3103	6,016	2,694	44.8%	3,983	66.2%	614	10.2%	21	0.3%	504	8.4%	0	0.0%	619	10.3%	275	4.6%	1,415	23.5%
3104	3,245	1,874	57.8%	1,877	57.8%	286	8.8%	8	0.2%	429	13.2%	4	0.1%	467	14.4%	174	5.4%	1,123	34.6%
3105	3,449	1,218	35.3%	2,423	70.3%	233	6.8%	10	0.3%	485	14.1%	3	0.1%	201	5.8%	94	2.7%	433	12.6%
3106.01	5,746	1,870	32.5%	4,226	73.5%	270	4.7%	10	0.2%	869	15.1%	3	0.1%	195	3.4%	173	3.0%	611	10.6%
3106.02	5,825	1,749	30.0%	4,356	74.8%	361	6.2%	7	0.1%	694	11.9%	0	0.0%	251	4.3%	156	2.7%	567	9.7%
3107	4,441	2,382	53.6%	2,267	51.0%	258	5.8%	16	0.4%	1,171	26.4%	0	0.0%	561	12.6%	168	3.8%	776	17.5%
3111	2,410	1,828	75.9%	865	35.9%	190	7.9%	36	1.5%	825	34.2%	2	0.1%	385	16.0%	107	4.4%	792	32.9%
3112	3,267	2,556	78.2%	835	25.6%	207	6.3%	5	0.2%	1,822	55.8%	0	0.0%	274	8.4%	124	3.8%	481	14.7%
3113	4,057	2,458	60.6%	1,795	44.2%	266	6.6%	4	0.1%	1,551	38.2%	0	0.0%	321	7.9%	120	3.0%	520	12.8%
3114	5,986	3,327	55.6%	3,023	50.5%	687	11.5%	23	0.4%	1,544	25.8%	3	0.1%	474	7.9%	232	3.9%	855	14.3%
3115	2,974	1,486	50.0%	1,567	52.7%	167	5.6%	3	0.1%	979	32.9%	3	0.1%	155	5.2%	100	3.4%	244	8.2%
3116	5,295	2,185	41.3%	3,272	61.8%	205	3.9%	8	0.2%	1,375	26.0%	0	0.0%	322	6.1%	113	2.1%	458	8.6%
3117	5,098	3,492	68.5%	1,881	36.9%	249	4.9%	4	0.1%	2,389	46.9%	7	0.1%	343	6.7%	225	4.4%	681	13.4%
3118	3,513	2,716	77.3%	1,020	29.0%	157	4.5%	19	0.5%	1,854	52.8%	0	0.0%	311	8.9%	152	4.3%	581	16.5%
3119	2,429	1,205	49.6%	1,466	60.4%	178	7.3%	12	0.5%	315	13.0%	2	0.1%	355	14.6%	101	4.2%	590	24.3%
3120	2,938	1,550	52.8%	1,739	59.2%	227	7.7%	21	0.7%	458	15.6%	1	0.0%	333	11.3%	159	5.4%	716	24.4%
3121	3,149	1,749	55.5%	1,677	53.3%	241	7.7%	5	0.2%	658	20.9%	0	0.0%	428	13.6%	140	4.4%	658	20.9%
3122	4,309	1,945	45.1%	2,633	61.1%	299	6.9%	2	0.0%	924	21.4%	1	0.0%	319	7.4%	131	3.0%	598	13.9%
3123	4,931	1,358	27.5%	3,834	77.8%	250	5.1%	8	0.2%	437	8.9%	1	0.0%	267	5.4%	134	2.7%	496	10.1%
3124	2,354	1,395	59.3%	1,396	59.3%	200	8.5%	11	0.5%	183	7.8%	0	0.0%	456	19.4%	108	4.6%	970	41.2%
3125.01	4,464	1,007	22.6%	3,666	82.1%	190	4.3%	10	0.2%	298	6.7%	3	0.1%	196	4.4%	101	2.3%	402	9.0%
3125.02	3,960	637	16.1%	3,496	88.3%	100	2.5%	6	0.2%	171	4.3%	2	0.1%	137	3.5%	48	1.2%	274	6.9%
3883	5,420	2,889	53.3%	3,179	58.7%	313	5.8%	16	0.3%	824	15.2%	4	0.1%	834	15.4%	250	4.6%	1,640	30.3%
Lowell	**106,519**	**50,239**	**47.2%**	**64,240**	**60.3%**	**7,238**	**6.8%**	**292**	**0.3%**	**21,513**	**20.2%**	**44**	**0.0%**	**9,325**	**8.8%**	**3,867**	**3.6%**	**18,396**	**17.3%**

Source: US Census Bureau, 2010 Census SF1 File

Table 2.4.3: Census 2000 Race & Ethnicity Data

Minority Breakdown in Lowell, MA 2000

Census Tact	Total Population	Total Minority		One Race Alone												Two or more races		Hispanic or Latino	
				White		Black or African American		American Indian and Alaska Native		Asian		Native Hawaiian and Other Pacific Islander		Some other race					
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
3101	3,881	2,032	52.4%	2,406	62.0%	422	10.9%	10	0.3%	327	8.4%	1	0.0%	529	13.6%	186	4.8%	1,249	32.2%
3102	6,070	1,195	19.7%	5,120	84.3%	209	3.4%	13	0.2%	300	4.9%	2	0.0%	296	4.9%	130	2.1%	610	10.0%
3103	6,157	1,864	30.3%	4,703	76.4%	318	5.2%	8	0.1%	372	6.0%	0	0.0%	479	7.8%	277	4.5%	967	15.7%
3104	3,581	1,569	43.8%	2,414	67.4%	193	5.4%	14	0.4%	365	10.2%	0	0.0%	401	11.2%	194	5.4%	879	24.5%
3105	3,353	757	22.6%	2,699	80.5%	122	3.6%	8	0.2%	337	10.1%	6	0.2%	103	3.1%	78	2.3%	245	7.3%
3106.01	5,392	1,212	22.5%	4,358	80.8%	211	3.9%	15	0.3%	562	10.4%	1	0.0%	123	2.3%	122	2.3%	345	6.4%
3106.02	5,610	942	16.8%	4,755	84.8%	183	3.3%	13	0.2%	425	7.6%	0	0.0%	125	2.2%	109	1.9%	227	4.0%
3107	4,575	1,953	42.7%	2,971	64.9%	243	5.3%	10	0.2%	864	18.9%	2	0.0%	300	6.6%	185	4.0%	722	15.8%
3108	2,457	1,048	42.7%	1,558	63.4%	141	5.7%	3	0.1%	355	14.4%	1	0.0%	274	11.2%	125	5.1%	492	20.0%
3110	2,754	1,910	69.4%	1,302	47.3%	252	9.2%	25	0.9%	397	14.4%	2	0.1%	626	22.7%	150	5.4%	1,292	46.9%
3111	2,286	1,845	80.7%	727	31.8%	126	5.5%	9	0.4%	964	42.2%	3	0.1%	324	14.2%	133	5.8%	673	29.4%
3112	3,374	2,459	72.9%	1,178	34.9%	128	3.8%	10	0.3%	1,691	50.1%	0	0.0%	226	6.7%	141	4.2%	545	16.2%
3113	3,954	1,816	45.9%	2,326	58.8%	208	5.3%	13	0.3%	1,110	28.1%	2	0.1%	110	2.8%	185	4.7%	353	8.9%
3114	5,857	2,702	46.1%	3,452	58.9%	240	4.1%	13	0.2%	1,726	29.5%	4	0.1%	249	4.3%	173	3.0%	579	9.9%
3115	2,908	979	33.7%	2,001	68.8%	71	2.4%	3	0.1%	726	25.0%	0	0.0%	25	0.9%	82	2.8%	92	3.2%
3116	5,099	1,388	27.2%	3,906	76.6%	149	2.9%	2	0.0%	758	14.9%	6	0.1%	149	2.9%	129	2.5%	418	8.2%
3117	4,923	2,438	49.5%	2,687	54.6%	173	3.5%	13	0.3%	1,730	35.1%	0	0.0%	178	3.6%	142	2.9%	422	8.6%
3118	3,516	2,389	67.9%	1,392	39.6%	152	4.3%	15	0.4%	1,409	40.1%	3	0.1%	265	7.5%	280	8.0%	599	17.0%
3119	2,666	1,226	46.0%	1,651	61.9%	125	4.7%	7	0.3%	303	11.4%	1	0.0%	418	15.7%	161	6.0%	652	24.5%
3120	2,977	1,420	47.7%	1,826	61.3%	124	4.2%	3	0.1%	457	15.4%	1	0.0%	342	11.5%	224	7.5%	619	20.8%
3121	3,112	1,384	44.5%	1,878	60.3%	96	3.1%	11	0.4%	638	20.5%	0	0.0%	204	6.6%	285	9.2%	425	13.7%
3122	4,741	1,812	38.2%	3,263	68.8%	183	3.9%	10	0.2%	732	15.4%	0	0.0%	383	8.1%	170	3.6%	772	16.3%
3123	5,023	748	14.9%	4,449	88.6%	110	2.2%	4	0.1%	267	5.3%	0	0.0%	93	1.9%	100	2.0%	320	6.4%
3124	2,405	1,170	48.6%	1,576	65.5%	120	5.0%	11	0.5%	208	8.6%	0	0.0%	352	14.6%	138	5.7%	768	31.9%
3125.01	4,497	746	16.6%	3,898	86.7%	73	1.6%	6	0.1%	232	5.2%	0	0.0%	169	3.8%	119	2.6%	331	7.4%
3125.02	3,999	403	10.1%	3,649	91.2%	51	1.3%	7	0.2%	116	2.9%	3	0.1%	70	1.8%	103	2.6%	138	3.5%
Lowell	**105,167**	**39,407**	**37.5%**	**72,145**	**68.6%**	**4,423**	**4.2%**	**256**	**0.2%**	**17,371**	**16.5%**	**38**	**0.0%**	**6,813**	**6.5%**	**4,121**	**3.9%**	**14,734**	**14.0%**

Source: US Census Bureau, 2000 Census SF1 File

Table 2.4.4: 1990 Census Race & Ethnicity Data

Minority Breakdown in Lowell, MA 1990															
Census Tact	Total Population	Total Minority		One Race Alone										Hispanic or Latino	
				White		Black or African American		American Indian; Eskimo; or Aleut		Asian or Pacific Islander		Some other race			
		#	%	#	%	#	%	#	%	#	%	#	%	#	%
3101	3,340	1,423	42.6%	2,161	64.7%	179	5.4%	11	0.3%	559	16.7%	430	12.9%	708	21.2%
3102	6,137	549	8.9%	5,713	93.1%	95	1.5%	4	0.1%	197	3.2%	128	2.1%	251	4.1%
3103	5,695	603	10.6%	5,240	92.0%	72	1.3%	9	0.2%	217	3.8%	157	2.8%	294	5.2%
3104	3,540	967	27.3%	2,743	77.5%	101	2.9%	3	0.1%	382	10.8%	311	8.8%	498	14.1%
3105	3,396	314	9.2%	3,125	92.0%	28	0.8%	13	0.4%	199	5.9%	31	0.9%	66	1.9%
3106	10,441	1,033	9.9%	9,554	91.5%	177	1.7%	22	0.2%	537	5.1%	151	1.4%	306	2.9%
3107	4,258	972	22.8%	3,471	81.5%	89	2.1%	1	0.0%	540	12.7%	157	3.7%	366	8.6%
3108	2,628	818	31.1%	1,966	74.8%	60	2.3%	6	0.2%	390	14.8%	206	7.8%	377	14.3%
3110	2,927	1,693	57.8%	1,654	56.5%	121	4.1%	8	0.3%	454	15.5%	690	23.6%	1,180	40.3%
3111	2,863	1,961	68.5%	1,121	39.2%	51	1.8%	4	0.1%	1,223	42.7%	464	16.2%	718	25.1%
3112	3,323	1,761	53.0%	1,712	51.5%	125	3.8%	2	0.1%	1,165	35.1%	319	9.6%	505	15.2%
3113	3,519	669	19.0%	2,946	83.7%	120	3.4%	8	0.2%	338	9.6%	107	3.0%	197	5.6%
3114	5,394	1,422	26.4%	4,101	76.0%	280	5.2%	16	0.3%	755	14.0%	242	4.5%	374	6.9%
3115	2,684	241	9.0%	2,473	92.1%	28	1.0%	0	0.0%	174	6.5%	9	0.3%	46	1.7%
3116	4,911	607	12.4%	4,405	89.7%	62	1.3%	4	0.1%	253	5.2%	187	3.8%	298	6.1%
3117	4,375	939	21.5%	3,515	80.3%	107	2.4%	11	0.3%	530	12.1%	212	4.8%	277	6.3%
3118	3,432	1,485	43.3%	2,191	63.8%	116	3.4%	10	0.3%	866	25.2%	249	7.3%	545	15.9%
3119	2,777	1,004	36.2%	2,078	74.8%	129	4.6%	5	0.2%	390	14.0%	175	6.3%	493	17.8%
3120	3,392	1,254	37.0%	2,606	76.8%	94	2.8%	5	0.1%	479	14.1%	208	6.1%	679	20.0%
3121	3,221	1,028	31.9%	2,392	74.3%	63	2.0%	3	0.1%	660	20.5%	103	3.2%	315	9.8%
3122	4,776	1,343	28.1%	3,698	77.4%	177	3.7%	12	0.3%	418	8.8%	471	9.9%	774	16.2%
3123	4,988	350	7.0%	4,750	95.2%	42	0.8%	6	0.1%	102	2.0%	88	1.8%	189	3.8%
3124	2,613	1,275	48.8%	1,884	72.1%	81	3.1%	5	0.2%	459	17.6%	184	7.0%	763	29.2%
3125	8,773	563	6.4%	8,324	94.9%	77	0.9%	9	0.1%	206	2.3%	157	1.8%	280	3.2%
Lowell	**103,403**	**24,274**	**23.5%**	**83,823**	**81.1%**	**2,474**	**2.4%**	**177**	**0.2%**	**11,493**	**11.1%**	**5,436**	**5.3%**	**10,499**	**10.2%**

Source: US Census Bureau, 1990 Census STF1 File

2.5 AGE

No single age range dominates the population of Lowell. Over the past twenty years, the most notable change in the age of the population of the City of Lowell has occurred with the population aged 50-69. Since 1990, this age group has increased by 39%. While significant, this population group has grown less significantly in Lowell than the national (67%) and Massachusetts (52%) growth rates. Other significant patterns in Lowell since 1990 include a 10% decrease in the population of persons under the age of fifteen and a 15% decrease in the population over the age of seventy.

Age Breakdown for the City of Lowell, 1990-2010

	1990		2000		2010		% change since 1990
Age Group	#	%	#	%	#	%	
Total Population	103,439	-	105,167	-	106,519	-	
Under 15	23,194	22.4%	23,902	22.7%	20,826	19.6%	-10%
15-29	29,935	28.9%	26,004	24.7%	28,038	26.3%	-6%
30-49	26,673	25.8%	31,483	29.9%	29,473	27.7%	10%
50-69	14,796	14.3%	15,384	14.6%	20,632	19.4%	39%
70+	8,841	8.5%	8,394	8.0%	7,550	7.1%	-15%

Source: US Census, 1990, 2000, 2010 (SF1 File)

Age Breakdown for the State of MA, 1990-2010

	1990		2000		2010		% change since 1990
Age Group	#	%	#	%	#	%	
Total Population	6,016,425	-	6,349,097	-	6,547,629	-	
Under 15	1,138,601	18.9%	1,259,376	19.8%	1,158,387	17.7%	-22%
15-29	1,480,493	24.6%	1,254,040	19.8%	1,379,949	21.1%	-7%
30-49	1,799,566	29.9%	2,017,704	31.8%	1,806,199	27.6%	0%
50-69	1,030,747	17.1%	1,174,313	18.5%	1,564,829	23.9%	52%
70+	567,018	9.4%	643,664	10.1%	638,265	9.7%	13%

Source: US Census, 1990, 2000, 2010 (SF1 File)

Age Breakdown for the United States, 1990-2010

	1990		2000		2010		% change since 1990
Age Group	#	%	#	%	#	%	
Total Population	248,709,873	-	281,421,906	-	308,745,538	-	
Under 15	53,567,871	21.5%	60,253,375	21.4%	61,227,213	19.8%	14%
15-29	58,087,372	23.4%	58,565,227	20.8%	64,728,191	21.0%	11%
30-49	73,314,363	29.5%	85,751,319	30.5%	83,741,296	27.1%	14%
50-69	42,610,171	17.1%	51,393,777	18.3%	71,216,117	23.1%	67%
70+	21,130,096	8.5%	25,458,208	9.0%	27,832,721	9.0%	32%

Source: US Census, 1990, 2000, 2010 (SF1 File)

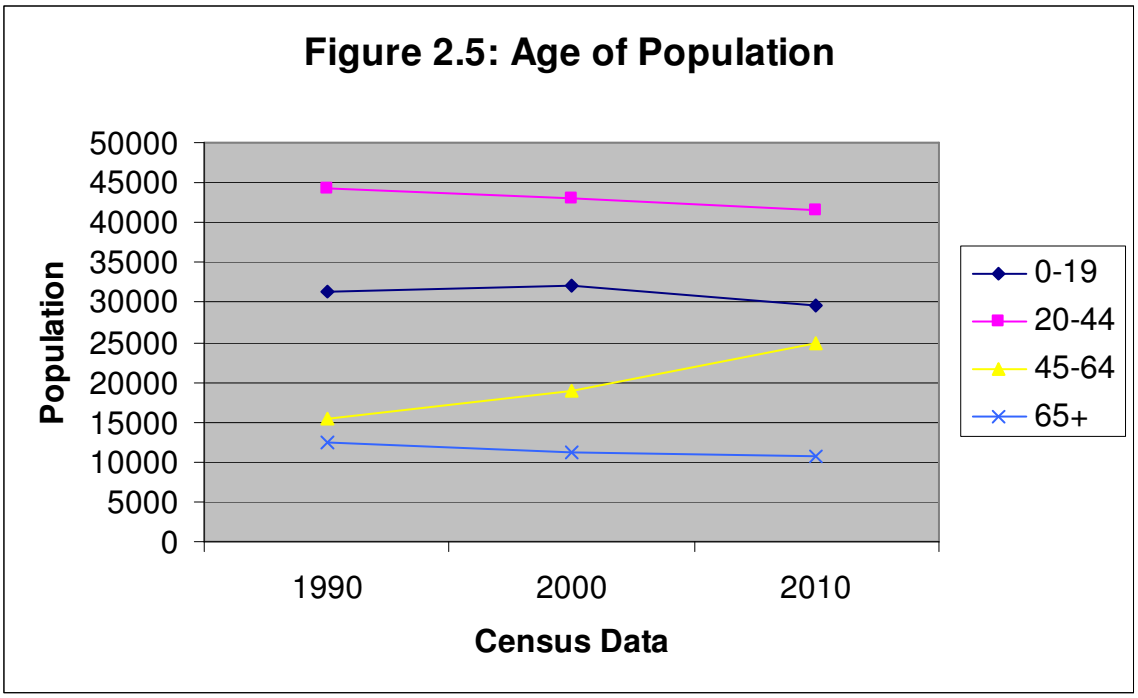


Figure 2.5: Age of Population
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Population
1990
2000
2010
Census Data
0-19
20-44
45-64
65+

2.6 INCOME TRENDS

In the 1970's, citywide median household incomes declined in every neighborhood with most severe cases in portions of the Acre (-54.9%), Lower Belvidere (-42.7%), and Centralville (-37.3%). Between 1970 and 1980 the City's overall median household income fell from $44,627 to $36,038 (in 1999 dollars). Only one area in the Highlands had a slight increase of 3.7%.

In the 1980's, median incomes varied throughout the neighborhoods and the city's overall adjusted median income increased by 5.9% ($38,156). Neighborhoods that continued to experience declining incomes included the Acre, the Lower Highlands, and Back Central. Centralville experienced the biggest increase in median household income by roughly 35%, along with neighboring Christian Hill (+17.9%). Other areas to progress include South Lowell and Sacred Heart.

During the 1990's median incomes once again varied throughout the neighborhoods. By 2000, the city's overall adjusted median income increased by 2.7% to $39,192. Census tracts with the largest increase in median household income during this decade were located in the Lower Highlands (+72%) and the Acre (+36%). Census Tracts with the largest decrease in median household income were located in Centralville (-16%) and Back Central (-15%).

The Census Bureau has changed the way it collects income data, beginning with the 2010 Census, will no longer be releasing this information with the 10-year Census counts. Details regarding the release of these figures are forthcoming. To supplement this data, the American Community Survey (ACS) provides annual estimates of the population for the nation, states and counties and cities of 50,000 people or more. The ACS one-year estimates for Lowell in 2010 indicate that median household income is $49,698 in 2010 inflation-adjusted dollars. This figure represents a 26.8% increase in median household income since 1999. However, it is important to note that the American Community Survey only represents a small survey of the population and should therefore not be used for direct comparison purposes to previous 10-year Census counts. Despite the limitations of this data, it does provide an accurate picture of the overall growth in median household income. It is believed that the largest percent in median household income during the 2000s occurred in the Downtown census tract with the addition of over 2,200 new market-rate housing units.

Table 2.6.1
Median Income Trends

TRACT	Neighborhood	1969 Med. Inc.	1969 Adjusted	1969-79 Change	1979 Med. Inc.	1979 Adjusted	1979-89 Change	1989 Med. Inc.	1989 Adjusted	1989-99 Change	1979-99 Change	1969-99 Change	1999 Med. Inc.
3101	Downtown	$4,542	$21,347	-25.20%	$6,384	$15,960	-7.80%	$11,324	$14,721	25.45%	15.71%	-13.49%	$18,468
3102	Christian Hill	$10,342	$48,607	-13.60%	$16,797	$41,993	17.90%	$38,093	$49,521	-8.44%	7.98%	-6.72%	$45,343
3103	Centralville	$9,701	$45,595	-13.00%	$15,864	$39,660	4.70%	$31,947	$41,531	-2.74%	1.84%	-11.41%	$40,391
3104	Centralville	$8,571	$40,284	-37.30%	$10,102	$25,255	33.40%	$25,919	$33,695	-15.55%	12.67%	-29.36%	$28,456
3105	Pawtucketville	$9,189	$43,188	-5.60%	$16,307	$40,768	-11.40%	$27,799	$36,139	13.35%	0.48%	-5.15%	$40,965
3106.01	Pawtucketville												$50,734
3106.02	Pawtucketville	$10,645	$50,032	-15.00%	$17,012	$42,530	13.10%	$36,997	$48,096	5.48%	19.29%	1.40%	$45,136
3107	Acre	$9,178	$43,137	-45.20%	$9,456	$23,640	16.40%	$21,169	$27,520	18.10%	37.48%	-24.66%	$32,500
3108	Acre	$6,800	$31,960	-27.90%	$9,211	$23,028	-7.30%	$16,417	$21,342	36.25%	26.28%	-9.01%	$29,079
3109	Acre	$7,132	$33,520	-54.90%	$6,048	$15,120	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3110	Acre	$5,161	$24,257	-50.70%	$4,786	$11,965	-16.40%	$7,691	$9,998	-1.03%	-17.30%	-59.21%	$9,895
3111	Acre	$6,813	$32,021	-22.90%	$9,881	$24,703	5.50%	$20,054	$26,070	29.77%	36.95%	5.65%	$33,831
3112	L. Highlands	$7,757	$36,458	-23.10%	$11,212	$28,030	-38.90%	$13,173	$17,125	71.80%	4.96%	-19.30%	$29,420
3113	Highlands	$10,406	$48,908	-19.90%	$15,673	$39,183	10.30%	$33,234	$43,204	-10.12%	-0.89%	-20.60%	$38,833
3114	Highlands	$10,017	$47,080	-13.60%	$16,269	$40,673	10.70%	$34,637	$45,028	4.22%	15.38%	-0.32%	$46,929
3115	Highlands	$10,596	$49,801	3.70%	$20,653	$51,633	-12.80%	$34,648	$45,042	14.24%	-0.34%	3.33%	$51,458
3116	Highlands	$10,944	$51,437	-13.70%	$17,756	$44,390	-5.10%	$32,401	$42,121	9.47%	3.88%	-10.35%	$46,111
3117	L. Highlands	$9,547	$44,871	-4.40%	$17,167	$42,918	-3.90%	$31,737	$41,258	7.39%	3.23%	-1.26%	$44,306
3118	L. Highlands	$7,897	$37,116	-15.40%	$12,567	$31,418	2.90%	$24,857	$32,314	13.80%	17.04%	-0.93%	$36,772
3119	Back Central	$6,015	$28,271	-13.80%	$9,747	$24,368	-36.40%	$11,925	$15,503	22.10%	-22.32%	-33.04%	$18,929
3120	Back Central	$7,514	$35,316	-14.40%	$12,088	$30,220	11.30%	$25,866	$33,626	-15.16%	-5.60%	-19.22%	$28,528
3121	Sacred Heart	$9,546	$44,866	-30.50%	$12,467	$31,168	1.00%	$24,213	$31,477	13.04%	14.17%	-20.69%	$35,583
3122	Sacred Heart	$9,318	$43,795	-14.80%	$14,928	$37,320	14.50%	$32,865	$42,725	0.98%	15.61%	-1.49%	$43,144
3123	South Lowell	$10,608	$49,858	-12.50%	$17,448	$43,620	18.00%	$39,579	$51,453	-12.35%	3.39%	-9.55%	$45,098
3124	L. Belvidere	$7,947	$37,351	-42.70%	$8,558	$21,395	-4.70%	$15,684	$20,389	24.66%	18.80%	-31.95%	$25,417
3125.01	Belvidere												$61,429
3125.02	Belvidere	$12,568	$59,070	-11.40%	$20,923	$52,308	11.70%	$44,951	$58,436	2.89%	17.44%	3.99%	$58,819
	City of Lowell	$9,495	$44,627	-19.20%	$14,415	$36,038	5.90%	$29,351	$38,156	2.72%	5.18%	-15.06%	$37,906

Source: United States Census Bureau

2.7 EDUCATIONAL ATTAINMENT

Overall, Lowell residents aged 25 and over have a lower level of educational attainment than their counterparts on the state and national levels. A higher percentage of Lowell residents drop out of high school when compared to the state and national levels. Furthermore, fewer Lowell residents on average go on to complete a bachelors or graduate/ professional degree. The table below outlines the highest level of educational attainment in Lowell and compares these rates to the state and national statistics.

Table 2-7

HIGHEST LEVEL OF EDUCATIONAL ATTAINMENT						
	Lowell		MA		US	
	#	%	#	%	#	%
Population 25 years and over	68,000	100.0%	4,458,898	100.0%	204,288,933	100.0%
Less than 9th grade	7,729	11.4%	220,010	4.9%	12,452,952	6.1%
9th to 12th grade, no diploma	7,348	10.8%	265,391	6.0%	17,010,063	8.3%
High school graduate (includes equivalency)	21,544	31.7%	1,168,464	26.2%	58,225,602	28.5%
Some college, no degree	11,102	16.3%	728,540	16.3%	43,469,168	21.3%
Associate's degree	4,821	7.1%	337,594	7.6%	15,553,106	7.6%
Bachelor's degree	10,165	14.9%	992,307	22.3%	36,244,474	17.7%
Graduate or professional degree	5,291	7.8%	746,592	16.7%	21,333,568	10.4%

Source: 2008-2010 American Community Survey; 3 year estimates
Table DP02: Selected Social Characteristics

3.0 LAND-USE

Zoning is one of the primary tools for implementing a community's comprehensive master plan for land use. For the development of the original Master Plan in 2002, the City completed a comprehensive land use plan which included recommendations for zoning changes in coordination with the development and proposed adoption of the City's Master Plan. These changes were adopted unanimously by the City Council and the 2004 zoning code remains the basic framework for Lowell's zoning today. There have been a number of amendments to the zoning ordinance since 2004. Some of these include the addition of a wind ordinance, floodplain and wetlands regulations, a pathway for privately developed dormitories, the Hamilton Canal District Form-Based Code, and several changes to clarify language in the code itself. Some of the comprehensive changes in 2004 increased dimensional and parking requirements for residential building lots and added new open space and yard area requirements for multi-family residential development. These comprehensive changes were made to the Zoning Code in response to concerns about density being too high in some neighborhoods.

The Lowell Zoning Code grants Site Plan Review authority to the Lowell Planning Board via the Home Rule Amendment of the Massachusetts Constitution. Under existing Massachusetts law, the Board may approve projects or approve them with conditions that must be satisfied. In Massachusetts, Planning Boards do not have the authority to reject development proposals outright during the site plan review process. Consistent with this observation, the site plan review authority of the Planning Board has been expanded so that a greater percentage of non-residential projects as well as smaller multi-family residential projects receive the scrutiny of the Board. Consistency with architectural context and existing neighborhood character were incorporated as established review criteria and submission requirements as a part of the City's adoption of the Master Plan.

Also since the adoption of the Master Plan, eight additional design review districts under the purview of the Lowell Historic Board (LHB) were created in 2005, at citizen petition initiative, in already existing neighborhood National Register districts for purposes of reviewing proposed demolition and new construction. A 9th district was created in 2011. The LHB also serves as the local agent representing the Massachusetts Historical Commission and the Advisory Council on Historic Preservation for purposes of federal Section 106 and state Chapter 254 historic/environmental reviews.

Although the Planning Department conducted a building-by-building analysis of land-use in preparation for the original 2003 plan, this level of ground-truthing was not feasible for the Master Plan update. Instead, DPD utilized geographic information maintained by the Commonwealth of Massachusetts to carry out the analysis, which allowed for meaningful comparisons with surrounding towns and "peer" communities such as Springfield, Lawrence and Worcester. The land-use categories designated for the purpose of the 2003 analysis were used again for this report. The percentage of Lowell's

land allotted for residential use was greater than the percentage allotted for any peer community. The percentage of Lowell's total developed land dedicated to residential is 63.25% in 2011. Overall, Lowell's industrial and commercial land use, when aggregated, are approximately 13% of its total land area, which is similar to the figures for other peer communities. The percentage of Lowell's developed area which is devoted to urban open space (parks, cemeteries, school yards) is roughly equal to that of other peer cities, approximately, 8.7%.

Finally, in 2010, the Department of Planning and Development was reorganized so as to streamline permitting, code-enforcement and land-use planning and make information more accessible and government more transparent to the public. Under this transformation, code enforcement, including building, trades, health, and solid waste were combined and co-located with project review functions including all of the land-use boards and neighborhood planning to form the Division of Development Services. In addition to enhancing service through streamlined permitting processes for developers and builders, the reorganization has helped improve communication and collaboration across the various areas of expertise with an ultimate goal of enhancing the quality of life across Lowell's neighborhoods. This reorganization has resulted in a total net positive impact of nearly $1 million.

3.1 ZONING REGULATION

Zoning ordinances are written to guide future development in order to protect the health, safety, and welfare within a community, preserve community character, prevent undesirable development, and, maintain property values. Zoning is one of the primary regulatory tools for implementing a community's comprehensive master plan land use objectives. In Massachusetts, all zoning ordinances must conform to the requirements of Chapter 40A of the General Laws, the Zoning Act, adopted in 1975. Zoning proscribes what types of land use activities may occur in which portions of the city and establishes requirements for intensity of development, building size and location on lots, the size of buildable lots, according to the context of the neighborhood. The code also establishes a number of general performance standards such as off-street parking requirements, landscaping, usable open space as well as performance standards related to a specific use such as wind energy facilities or telecommunications facilities.

Lowell's current zoning ordinance was adopted in 2004 as a complete rewrite of the preceding ordinance, which was last comprehensively revised in 1966. Prior to the 1966 ordinance revision zoning regulations were based on the original ordinance enacted in 1926. These early ordinances had essentially served to solidify the then-existing growth patterns of the City with a dense core of industrial, commercial, and multi-family residential land-uses surrounded by low density residential and limited commercial development in the City's outlying areas. The 1966 ordinance had broadened the scope of regulation and provided tighter requirements for developments. However, it was

enacted without the guidance of a comprehensive land-use plan and continued to reinforce the City's existing land-use patterns.

In 1972, the Lowell City Development Authority completed a comprehensive land use plan which included recommendations for zoning changes. These were not adopted and the 1966 zoning code remains the basic framework for Lowell's zoning today. There have been a number of amendments to the zoning ordinance since 1966. These include the addition of a sign code, floodplain and wetlands regulations, and several planned development models that may be followed for specific types of developments. In 1978, the City responded to new requirements of the Massachusetts Zoning Act and clarified the procedural language governing the actions of the Zoning Board of Appeals in granting variances and special permits. In 1986, comprehensive changes were made to the Zoning Code in response to concerns about overdevelopment. These changes increased dimensional and parking requirements for residential building lots and added new open space and yard area requirements for multi-family residential development.

In 2002, as part of the process of completing the Comprehensive Master Plan, recommendations were made for broad based changes to the zoning code so that the development regulations would be consistent with the goals and objectives of the Plan. Significant contributions to the revised framework included transect based zoning and elements of form based coding. Transect-based zoning is a strategy that creates and delimits zoning districts based upon neighborhood character addressing the need for new development to reflect the urban, traditional neighborhood, suburban or rural character of the surrounding neighborhood. Form Based codes prioritize urban design elements such as building bulk and form, and the placement of porches and garages, as well as traditional setbacks, to ensure that the design of new infill projects is more appropriate for the surrounding streetscape. These changes were adopted unanimously by the City Council and the 2004 zoning code remains the basic framework for Lowell's zoning today. There have been a number of amendments to the zoning ordinance since 2004. Some of these include the addition of a wind ordinance, permitting path for privately developed dormitories, and the Hamilton Canal District Form-Based Code. The Hamilton Canal Form-Based Code is the first manifestation of a pure Form-Based code utilized in the Lowell zoning ordinance and may serve as a model for other districts where urban design considerations are prioritized over building use. Some of the comprehensive changes in 2004 increased dimensional and parking requirements for residential building lots and added new open space and yard area requirements for multi-family residential development. These comprehensive changes were made to the Zoning Code in response to concerns about density being too high in some neighborhoods.

Before the adoption of the City's Master Plan and the 2004 Zoning Ordinance, most amendments to the City's zoning ordinance have been made on an ad hoc basis to respond to particular circumstances ranging from urban redevelopment plans to significant economic development opportunities. Before 2003, the City of Lowell had never enjoyed the guidance of a comprehensive master plan in crafting a zoning

ordinance. As a result, the City's building activity had ranged from weakly-regulated free-market development of open or under-developed land in some areas to wholesale disinvestment in other areas where dimensional requirements rendered the majority of existing lots non-conforming and therefore non-buildable when they became vacant.

Lowell is a historic urban center where nearly all of the City's land area is already developed or protected from development for conservation or recreational purposes. Further many of the existing buildings in Lowell were constructed before any zoning was in place and others have been "grandfathered" as existing non-conforming structures when dimensional requirements have been increased. With so many existing non-conformities and little open land remaining for development, zoning in Lowell must be considered in different terms than in a developing suburban or rural area. In an existing urban setting, zoning regulations are a weak tool to limit density or rapidly change land-use patterns. Instead, well-crafted zoning can enable the City to stimulate redevelopment in a manner consistent with planning goals, protect existing neighborhood character, and encourage appropriate economic development in targeted areas. The City's 2003 Master Plan has been a guide for incorporating these goals into the City's zoning regulations, as shall the forthcoming update provide the basis for future changes to development regulations.

Under the current zoning ordinance the City is generally grouped into three development typologies based on the character of the surrounding area and include development requirements and reflect the context of suburban areas, traditional neighborhoods, and urban communities. Spread across these three development typologies are seven residential districts, six commercial districts, including four mixed use residential/commercial districts, five office/industrial districts, and one project-specific planned development district. The zoning districts are as follows:

RESIDENTIAL DISTRICTS

1. Suburban Neighborhood Residential Districts are designed to preserve, promote, and enhance the Neighborhood Character of Lowell's newer residential areas. The SSF district emphasizes single-family homes, while the SMF encourages suburban-scale apartment and condominium developments.
   SSF: Suburban Neighborhood Single Family
   SMF: Suburban Neighborhood Multi Family

2. Traditional Neighborhood Residential Districts are designed to preserve, promote, and enhance the pedestrian-scale character of Lowell's historic residential neighborhoods. All three encourage moderately-sized lots and prohibit large-scale developments. The TSF district emphasizes single- family homes, the TTF district also allows two-family homes, while the TMF also allows three-family homes and up to 6-unit multi-family developments by special permit. To encourage neighborhood stability and owner-occupancy, special provisions are provided for single-family developments in the TTF and TMF zones.
   TSF: Traditional Neighborhood Single Family

TTF: Traditional Neighborhood Two Family
TMF: Traditional Neighborhood Multi-Family

3. Urban Neighborhood Residential Districts are designed to preserve, promote, and enhance the character of Lowell's neighborhoods and redevelopment areas where urban-scale development patterns are typical or appropriate. The USF district emphasizes single-family homes on smaller lots, while the UMF district also allows two-family and multi-family developments.

USF: Urban Neighborhood Single Family
UMF: Urban Neighborhood Multi-Family

COMMERCIAL DISTRICTS

There are two general types of commercial districts proposed: retail and mixed-use. Retail districts are designed to promote and strengthen retail and related commercial development at key nodal areas where commercial uses should be specifically emphasized. Mixed Use Commercial Districts are designed to promote and sustain vibrant commercial activity by encouraging a balanced mix of uses that collectively create a viable market environment for commercial development and expansion. Unlike the retail districts that strictly limit non-commercial development in prime retail locations, mixed-use districts recognize and encourage complementary residential development alongside commercial uses.

1. Suburban Retail and Mixed-Use Districts promote the development of businesses that draw their markets from citywide and regional service areas, with the SMU district also allowing a balance of regional-retail and suburban-scale apartment and condominium developments.

RR: Regional Retail District
SMU: Suburban Mixed-Use District

2. Traditional Retail and Mixed-Use Districts promote a vibrant business environment in Lowell's traditional neighborhood centers that enhance the character of the surrounding neighborhood. The TMU district is designed to promote a mix of residential and retail uses in secondary areas where neighborhood-scale commercial activity can enhance the character of the surrounding residential area.

NB: Neighborhood Business District
TMU: Traditional Mixed-Use District

3. Urban Retail and Mixed Use Commercial Districts promotes the vitality of Lowell's historic downtown. The DMU is designed to promote a vibrant urban environment in the heart of Downtown Lowell. The UMU district focuses on revitalizing the commercial areas in the urban neighborhoods near downtown.

DMU: Downtown Mixed-Use District
UMU: Urban Mixed-Use District

OFFICE, INDUSTRIAL, AND SPECIAL PURPOSE

Office and Industrial Districts are designed to encourage the location of commercial and industrial activities in locations which best serve the needs of these land uses while also protecting the health, safety, and welfare of the occupants of residential properties for whom these activities may constitute nuisances. The OP district is designed to promote research and development as well as general office uses. The LI district allows a broad range of cleaner industrial uses as well as storage activities. The GI district allows most manufacturing and industrial uses, as well as most automotive uses. The HRC district promotes the continued development of mid-rise and high-rise commercial areas in areas that are well served by transportation infrastructure. The institutional mixed-use district is designed to capitalize on the development potential of the major institutional campuses in the City, while also serving to contain the impact of these campuses within designated areas.

OP: Office/Research Park
LI: Light Industry, Manufacturing, & Storage
GI: General Industry
HRC: High-Rise Commercial District
INST: Institutional Mixed-Use District

PLANNED DEVELOPMENT DISTRICTS

Planned Development Districts support the implementation of approved comprehensive development schemes for designated areas of the City primarily focusing on medical and other institutional campus settings.

PDMI: Planned Development – Medical/Institutional (PD-MI).

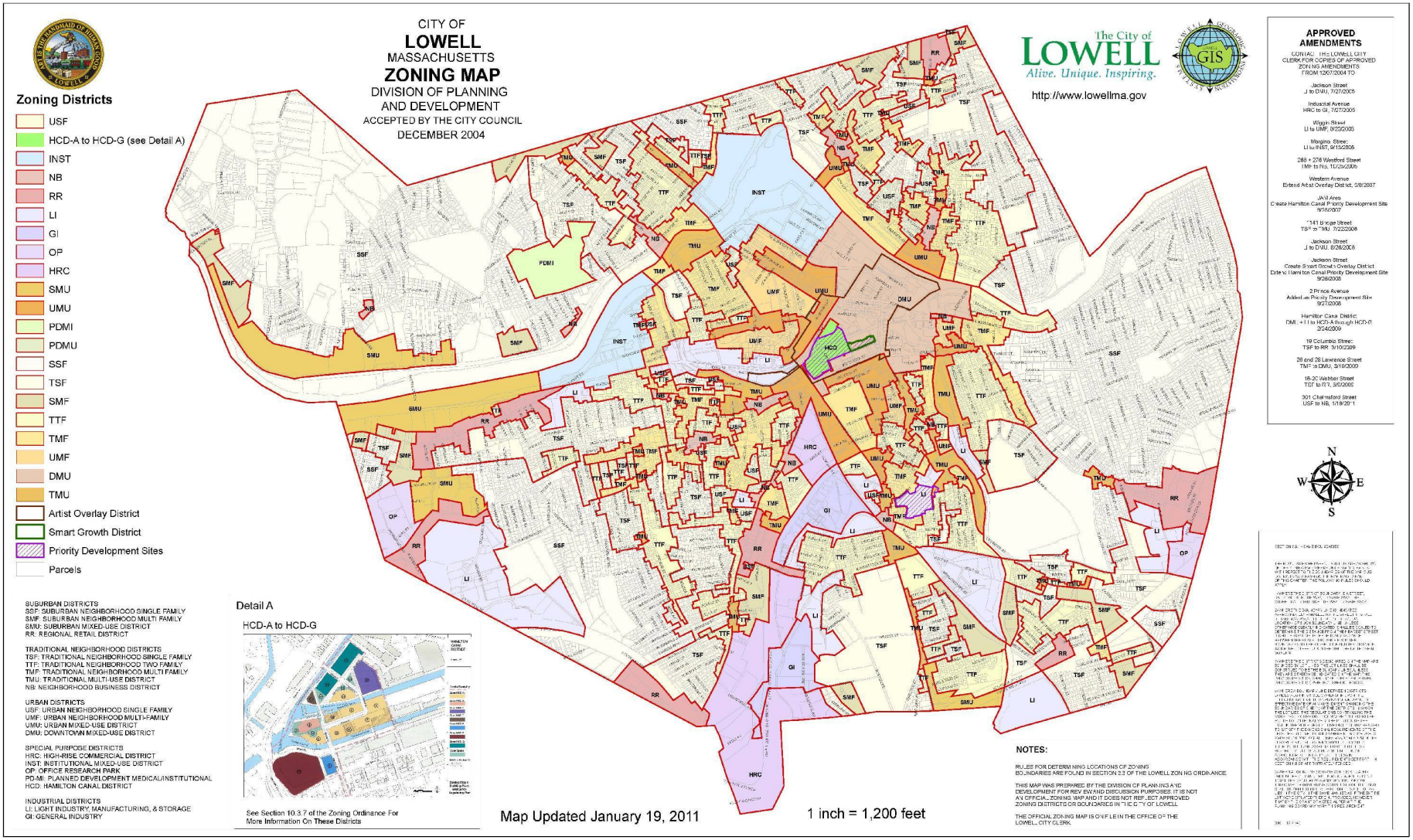
OVERLAY DISTRICTS

There are three existing overlay districts, the Downtown Lowell Smart Growth Overlay District, the Flood Plain Overlay District, and the Artist Overlay District. The smart growth overlay zoning district and artist overlay district are designed to encourage redevelopment of existing building in the downtown where specific performance and design guidelines are met. The smart growth district streamlines permitting for redevelopment in the district that provides a minimum number of affordable housing units according to MGL Chapt. 40R. The Artist Overlay District encourages redevelopment that provides artist live/work space. The Flood Plain Overlay district set specific performance standards for development that occurs in the floodplain and floodway as defined by FEMA.

FLOP: Flood Plain Overlay District
AOD: Artist Overlay District
DLSGOD: Downtown Lowell Smart Growth Overlay District

HAMILTON CANAL FORM-BASED CODE

The purpose of the Hamilton Canal District Form-Based Code (HCD-FBC) is to insure that the development in this area is consistent with the urban design goals and regulations of the HCD Master Plan (2008) and the Jackson Appleton Middlesex (JAM) urban renewal plan.


CITY OF
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DIVISION OF PLANNING
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GIS
Zoning Districts
USF
HCD-A to HCD-G (see Detail A)
INST
NB
RR
LI
GI
OP
HRC
SMU
UMU
PDMI
PDMU
SSF
TSF
SMF
TTF
TMF
UMF
DMU
TMU
Artist Overlay District
Smart Growth District
Priority Development Sites
Parcels
APPROVED
AMENDMENTS
SUBURBAN DISTRICTS
SSF: SUBURBAN NEIGHBORHOOD SINGLE FAMILY
SMF: SUBURBAN NEIGHBORHOOD MULTI FAMILY
SMU: SUBURBAN MIXED-USE DISTRICT
RR: REGIONAL RETAIL DISTRICT
TRADITIONAL NEIGHBORHOOD DISTRICTS
TSF: TRADITIONAL NEIGHBORHOOD SINGLE FAMILY
TTF: TRADITIONAL NEIGHBORHOOD TWO FAMILY
TMF: TRADITIONAL NEIGHBORHOOD MULTI FAMILY
TMU: TRADITIONAL MULTI-USE DISTRICT
NB: NEIGHBORHOOD BUSINESS DISTRICT
URBAN DISTRICTS
USF: URBAN NEIGHBORHOOD SINGLE FAMILY
UMF: URBAN NEIGHBORHOOD MULTI-FAMILY
UMU: URBAN MIXED-USE DISTRICT
DMU: DOWNTOWN MIXED-USE DISTRICT
SPECIAL PURPOSE DISTRICTS
HRC: HIGH-RISE COMMERCIAL DISTRICT
INST: INSTITUTIONAL MIXED-USE DISTRICT
OP: OFFICE RESEARCH PARK
PD-MI: PLANNED DEVELOPMENT MEDICAL/INSTITUTIONAL
HCD: HAMILTON CANAL DISTRICT
INDUSTRIAL DISTRICTS
LI: LIGHT INDUSTRY, MANUFACTURING, & STORAGE
GI: GENERAL INDUSTRY
Detail A
HCD-A to HCD-G
See Section 10.3.7 of the Zoning Ordinance For
More Information On These Districts
Map Updated January 19, 2011
1 inch = 1,200 feet
NOTES:
N
W
E
S

3.2 SUBDIVISION REGULATIONS

Consistent with the authority granted in Massachusetts General Law Chapter 41, Section 81A-81GG, the regulations governing the subdivision of land in the City of Lowell were adopted in 1970 by vote of the Lowell Planning Board. With the exception of minor amendments and administrative clarifications, these regulations have changed little since their original enactment. Consistent with the Planning Board's mandate, the stated purpose subdivision regulations is to protect the health, safety, and welfare of the inhabitants of Lowell by regulating and establishing standards for public ways and other public works that serve subdivisions. These regulations are designed to insure that minimum quality standards are met for this new infrastructure through public hearings before the Planning Board and technical staff review of subdivision proposals. The subdivision regulations outline minimum standards and have been partially waived during the approval process for most development proposals.

Since the total land in Lowell remaining for potential subdivision that is subject to these regulations is less than 400 acres, these regulations will have little impact on the continued development of the City. Nevertheless, the design standards should be revised to better reflect current construction and engineering methods.

Since the implementation of the Master Plan, the City has made strides to update subdivision regulations. A document is currently in draft form and is undergoing an interdepartmental review.

3.3 SITE PLAN REVIEW

In 1987, the Lowell Zoning Code was amended to grant Site Plan Review authority to the Lowell Planning Board via the Home Rule Amendment of the Massachusetts Constitution. The stated purpose of this process is to protect and promote the health, safety, convenience, and general welfare of the inhabitants of the city and to promote acceptable site planning practices within the City of Lowell. The ordinance allows the Planning Board to review each project to insure that it satisfies a number of designated criteria. Under existing Massachusetts law, the Board may approve projects or approve them with conditions that must be satisfied. In Massachusetts, Planning Boards do not have the authority to reject development proposals outright during the site plan review process. Under the current site plan ordinance, all the following projects are subject to site plan review and approval by the Planning Board before a building permit can be issued:

- the construction and/or exterior alteration or expansion of any non-residential building or buildings where the area of the development exceeds ten thousand (10,000) square feet,

- commercial construction involving self service gas stations, drive-through or drive-up customer service,
- construction of privately developed dormitory,
- construction of a free standing telecommunication tower,
- construction or expansion of parking lot where the number of spaces is greater than 14 spaces or where the lot becomes greater than 4000sqft of impervious surface,
- Construction, exterior alteration, conversion or expansion of any residential structure or structures exceeding three (3) residential dwelling units, except for subdivisions containing only single family homes approved by the Planning Board under MGL 41 Section 81 and the City of Lowell's Subdivision of Land Regulations. Single family homes on lots created through the regulations of MGL 41 Section 81P (Approval Not Required Lots) will require site plan review, when more than 3 units are built on common or contiguous lots.

In an urban environment, where most new developments are located in or near existing residential areas, site plan review is one of the most important tools for the ongoing regulation of land development and implementation of the goals of the comprehensive master plan. Consistent with this observation, the site plan review authority of the Planning Board has been expanded so that a greater percentage of non-residential projects as well as smaller multi-family residential projects receive the scrutiny of the Board. Consistency with architectural context and existing neighborhood character were incorporated as established review criteria and submission requirements as a part of the City's adoption of the Master Plan.

3.3 LOWELL HISTORIC BOARD

The Lowell Historic Board (LHB) and the Downtown Lowell Historic District was created by special act of the Massachusetts Legislature (Lowell Historic District Act, Chapter 566, Acts of 1983) to promote the educational, cultural, economic, and general welfare of the public through the preservation, protection, and enhancement of Lowell's unique historic resources. Strengthening and expanding historic preservation review and regulations in Lowell was a requirement of the federal law creating Lowell National Historical Park (P.L. 95-290) in order to ensure community actions would not be inconsistent with the preservation goals of the Park.

The LHB currently has design review, permitting, and enforcement authority in ten review districts. Within the Downtown Lowell Historic District, the erection, demolition, or alteration of any exterior feature (and interior when work affects the exterior appearance) of a building, structure, or parcel requires the approval of the LHB. By state law, no City department, board, or commission can issue any permit, variance, or approvals within the district until the LHB has first granted its approval. Their design review standards assist in guiding all construction, preservation, restoration, and alteration of all properties in the district so that the integrity of Lowell's 19th century

setting is not disrupted. The LHB plays a similar role in the Acre Neighborhood District, a design review district established pursuant to the Board's special act that was created in 1999 to assist in the implementation of the Acre Urban Revitalization and Development Plan. Eight additional design review districts under the purview of the LHB were created in 2005, at citizen petition initiative, in already existing neighborhood National Register districts for purposes of reviewing proposed demolition and new construction. One additional design review district was created in 2011.

The LHB also serves as the local agent representing the Massachusetts Historical Commission and the Advisory Council on Historic Preservation for purposes of federal Section 106 and state Chapter 254 historic/environmental reviews. In addition, the LHB maintains a comprehensive survey of over 2,500 historic resources in Lowell; provides citywide technical assistance related to preservation, design, and history; works to include preservation into everyday community planning efforts; and maintains an active education and outreach program including website, newsletter, reference library, publications, house marker program, and Doors Open Lowell, the first such event in the United States when first presented in 2002.

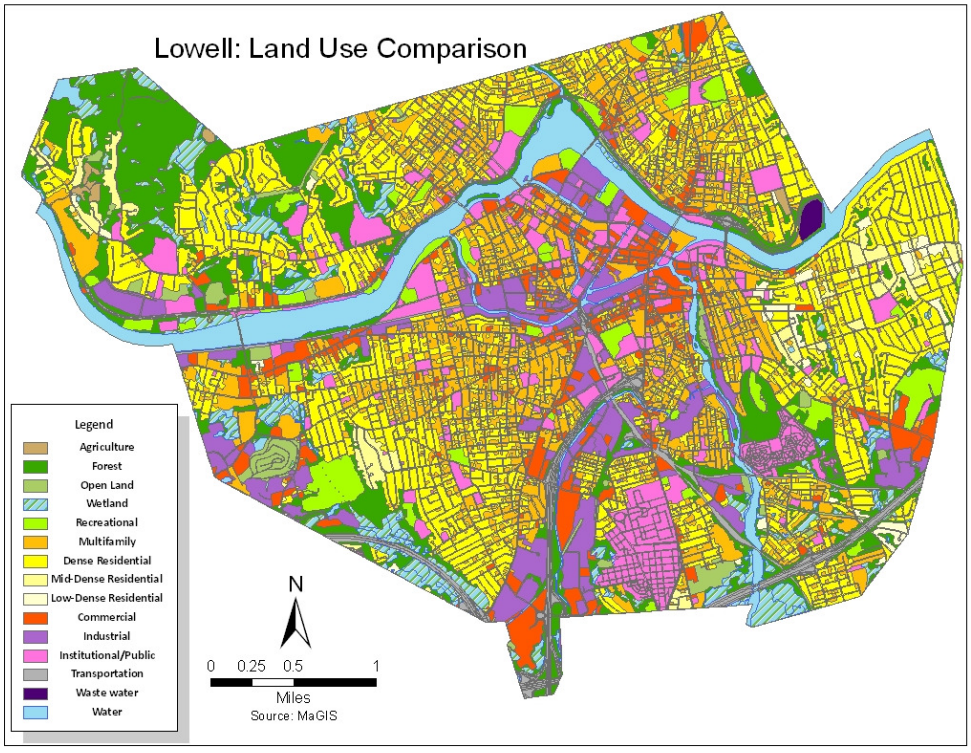
The Board is comprised of nine members, each serving two-year terms, representing various public and private entities as defined by statute.

3.4 LAND-USE ANALYSIS

The Commonwealth of Massachusetts maintains a collection of geographic information through MassGIS. Among the data available at www.mass.gov/mgis are land use data layers for each city and town in the Commonwealth. The land use data used for the comparative analysis derived from a 2009 data layer created by MassGIS from orthophoto (aerial) imagery taken in April 2005. Land use characterizations were made based on previous datasets developed for MassGIS however include minor modifications and a number of additional land use categories. Modifications to the land classifications have significantly challenged our ability to provide a seamless comparison of the 1999 data used in the 2002 analysis with current land use data available to us. Land use data has historically used 21 land use categories with the 1999 dataset included a 37-code breakdown option providing more granular data for analysis. For clarity and simplicity in comparing data with other communities the 2002 analysis further aggregated the 21 code system into 16 land use codes as shown in the table below.

Land Use	1999 MaGIS Code	2005 MaGIS Code	Developed ?
Agriculture	1, 2, 21	1, 2, 23, 35, 36	N
Forest	3	3, 40	N
Open Land	6	6, 17, 24	N
Wetland	4, 14	4, 14, 37	N
Mining	5	5	N
Recreation	7, 8, 9	7, 8, 9	Y
Multifamily Residential	10	10	Y
Residential <1/4 acre	11	11	Y
Residential 1/4 - 1/2 acre	12	12	Y
Residential >1/2 acre	13	12, 38	Y
Commercial	15	15	Y
Industrial	16	16, 39	Y
Urban Open	17	31, 34	Y
Transportation	18	18	Y
Waste Disposal	19	19	Y
Water	20	20	N

The 2009 data set used for this analysis has further disaggregated data by creating a single dataset with 40 land use categories without providing the 21 code option. In order to analyze the trends related to land use change over time and at a minimum allow for simple comparisons between the 1999 and 2009 data the land use codes were once again combined into to the same 16 different land use codes analyzed in 2002. For detailed descriptions of the MaGIS land-use datasets and code descriptions go to the link http://www.mass.gov/mgis/lus2005.htm (2009 dataset) and http://www.mass.gov/mgis/lus.htm (1999 and earlier dataset).



The land use data from the State is different from that compiled by the DPD in that it seeks to characterize areas based on their physical conditions rather than the activities carried out within individual buildings or properties. For example, MassGIS's "Commercial" category includes "General Urban" development. In Lowell, this category is applied to much of the downtown area, and encompasses properties containing a mix of office, retail, residential, and institutional uses. The "Industrial" category includes areas in the downtown that have not supported industrial uses for quite some time, most notably the JAM urban renewal area as well as the Lawrence Mills area. It is also important to note that recreational space is considered a developed land use whereas recreational parks are typically considered open space in other DPD land use analysis. Therefore the open space data will generally undercount open areas that are available to the public for recreational use. Despite these differences it is valuable to analyze land use utilizing the MassGIS data to compare how land development has been carried out in the surrounding communities and "peer" communities such as Lawrence, Worcester, and New Bedford. Utilizing the MassGIS data also gives us another mechanism to measure quantitatively the trends and changes in land use patterns in Lowell.

TABLE 3.5.1: LOWELL LAND USE TRENDS 2002 – 2011

		2011		2002		Percent Change
Land Use	**Developed?**	**Acres**	**Percentage**	**Acres**	**Percentage**	
AGG	N	21.33	0.23%	79.93	0.86%	-73.26%
FOREST	N	1164.46	12.54%	1105.50	11.88%	5.54%
MINING	N	0.00	0.00%	1.86	0.02%	-100.00%
OPEN LAND	N	156.04	1.68%	289.93	3.12%	-46.08%
WETLAND	N	388.97	4.19%	91.87	0.99%	324.21%
WATER	N	580.47	6.25%	495.75	5.33%	17.32%
Total Undeveloped		2311.27	24.90%	2064.84	22.20%	12.15%
RECREATION	Y	318.29	4.57%	312.00	3.35%	36.10%
TRANSPORT	Y	282.72	4.05%	317.23	3.41%	18.90%
WASTE	Y	17.13	0.25%	43.19	0.46%	-47.10%
INDUSTRIAL	Y	621.46	8.91%	802.83	8.63%	3.27%
URBAN PUBLIC	Y	749.41	10.75%	733.63	7.89%	36.28%
COMMERCIAL	Y	573.01	8.22%	514.22	5.53%	48.66%
LOW RES	Y	94.52	1.36%	80.95	0.87%	55.77%
MED RES	Y	186.25	2.67%	773.76	8.32%	-67.89%
HIGH RES	Y	2518.97	36.13%	3104.15	33.37%	8.26%
MULTI FAM	Y	1610.64	23.10%	555.11	5.97%	287.09%
Total Housing		4410.37	63.25%	4513.97	48.53%	30.35%
Total Developed		6972.38	75.10%	7237.06	77.80%	-3.47%
Total		9283.65	100.00%	9301.90	100.00%	-0.20%

*Category URBAN PUBLIC/ INSTITUTIONAL - 2011
URBAN OPEN – 2002

When looking at the trends between the two datasets some inexplicable and significant changes seem to have occurred. For example, the area of land categorized as Wetlands increased by over 300%, with Open Land decreasing by 48%, and area devoted to Multi-Family housing increasing by nearly 200%. Although some of these changes may be somewhat representative of a general trend in one direction or the other, they more likely illustrate a change in the way which data was collected for the 2009 dataset. For instance there was a larger effort in ground-truthing the data developed from the orthophoto, including cross-referencing assessor data with aerial imagery to gain more site specific data. This would explain the large increase in the Multi-Family land use as many of the two and three-family residential buildings common in older, traditional neighborhoods would likely be mistaken for high or medium density housing with the 1999 analysis. Reductions in land used for medium and high density housing support this explanation for the Multi-Family increase, with medium density housing reduced by

nearly 75% and high density housing by 19%. The large change in wetlands is however difficult to explain without a more careful review of the two datasets.

Considering the relatively large changes in land uses, it is difficult to draw strong conclusions with what they mean as far as trends in land development and are best left alone. That said, the data still provides us with an opportunity to better understand how land use is in Lowell as compared with other communities.

This analysis compares MassGIS land use data across communities to determine how Lowell's development patterns compare to those of other old industrial cities in Massachusetts, as well as to the less urbanized communities surrounding Lowell. The cities used in this analysis include, Lawrence, New Bedford, Springfield, and Worcester. The surrounding communities include Billerica, Dracut, Chelmsford, Tewksbury, and Tyngsboro.

The primary difference between Lowell and its suburbs is the percentage of the city's land area which has been developed for intensive human use. The categories above were divided into Developed and Undeveloped groups, in order to allow more meaningful comparisons of development patterns among communities with varying amounts of undeveloped space. Lowell's developed area includes 75% of the city, while its suburbs on average have under half of their land categorized as developed land (43.9%) with the Chelmsford with the highest proportion of developed land at nearly 52% and Tyngsboro the lowest with just over 23%. The average for the cities included in the sample was 79.9%. The communities which are most similar to Lowell in size, history, and population (Springfield and Lawrence) were mixed when compared with Lowell, Springfield with less developed land (72.9%) and Lawrence showing more at (81. 4%). Lowell's undeveloped area includes considerably more water (6.3%) than Springfield (3.7%), and Worcester (2.7%), however mirrors Lawrence (6.3%). The average of undeveloped land devoted to surface water for peer cities is 3.4%. Overall, Lowell has a significantly lower percentage of undeveloped land area than other "peer" cities with the exception of Lawrence.

As noted above land use categories considered to be developed for this analysis include recreational uses, public open spaces devoted to passive recreational or ceremonial purposes, and cemeteries. The percentage of Lowell's developed area which is dedicated to urban open space (parks, cemeteries, school yards) is roughly equal to that of other cities, approximately 8.7%, where the average for peer communities is 8%. The amount of land dedicated to recreational uses (athletic fields, arenas, swimming pools, etc.) is slightly lower in Lowell (3.4%) than Worcester (3.9%), which is the peer community with the highest percentage of land devoted to recreational facilities; the lowest being Lawrence with 2.2%. Lowell is slightly above the mean when compared to average peer communities (3.3%). All in all, Lowell has slightly more land devoted to leisure activities, whether sports, relaxation, playing, or entertainment, than is available in the peer communities. It is worth noting that suburban communities on average have

1.7% of land devoted to recreational activities and 1.4% of land dedicated to urban open space.

Although the analysis shows that recreational facilities appear to be generally available when compared to peer and suburban communities we need to consider accessibility of facilities to all residents in the City. Neighborhoods such as the Lower Highlands, Centralville, the Acre, Downtown, and Back Central, are not served as well by the rest of the City. More detail regarding access to public recreational facilities and open space is discussed in the open space portion of this report.

As was the case in all communities, the majority of Lowell's land (47.5%) is developed for residential use. Lowell's residential percentage is the highest when compared to peer cities (average of 41.4%) with Lawrence the closest at 46.7%. Generally, the suburban communities have less land devoted to residential use compared to developed and undeveloped land with the average at 33.1%. However much larger portions of suburban communities' developed land is devoted to residential use with the average at 75%. The proportion of developed land dedicated to residential use is 63%, again higher than the peer community average (59%). Suburban communities tend to have smaller areas dedicated to commercial, industrial, and recreation use.

MassGIS divided residential land use into five land-use categories: multifamily, parcels <¼ acre, parcels between ¼ - ½ acre, parcels ½ - 1 acre, and over 1 acre. The last of the residential codes was an addition to the 2009 dataset and in our analysis was combined to create a single low density residential category including all properties ½ acre and greater. The lower density residential categories were combined to better compare data with the 1999 which did not include the acre and over category. The Multifamily Residential category includes duplexes, apartment buildings, condo complexes as well as grounds and accessory landscaping. Many multi-family residential buildings in Lowell's traditional neighborhoods are located in buildings that were converted from single-family residences at some point in the past; this may undercount the number of multi-family residential buildings in the dataset. However as noted earlier, the process for collecting the latest dataset likely corrected for this.

	Table 3.5.2: Residential - Percentage of Total Developed Land				
	Lowell	**Suburban**	**Springfield**	**Worcester**	**Peer Comm.**
< ¼ acre Residential	1.36%	33.80%	1.34%	3.04%	1.97%
¼ - ½ acre Residential	2.67%	26.24%	5.99%	7.21%	5.75%
> ½ acre Residential	36.13%	9.76%	40.01%	29.28%	32.45%
Multi-Family Residential	23.10%	5.61%	14.98%	19.75%	19.25%
Total Housing	63.25%	75.41%	62.31%	59.28%	59.41%

Lowell's residential development pattern is highly concentrated in houses, whether single-, two-, or multifamily, on lots under ¼ acre. For a city of Lowell's size, there are relatively few "Multifamily" areas. Of course, Lowell has many multifamily residences. These homes, however, tend to be of the tenement house variety, on a relatively small lot, rather than large apartment buildings. Larger buildings on larger lots can take advantage of economies of scale to provide more satisfactory parking and open space in the same land area. A trend that continues to not be captured by the MaGIS data relates to the many residential conversions experienced in the downtown and JAM areas, including the Dutton Street lofts and the Lofts at Boott Mills. Furthermore many of the commercial buildings are mixed-use buildings that include a residential component whereas the MassGIS data does not identify mixed-residential buildings and does not illustrate the growing residential community in downtown Lowell. A more complete building by building analysis will be undertaken over the coming year and will yield more detailed information on the prevalence of different housing types across the city.

Lowell has slightly more land categorized as industrial, and slightly less labeled commercial, than is the average for cities. It is important to keep in mind the data set used. Many mill complexes which have been converted to office or residential use are counted as industrial land. Overall, Lowell's industrial and commercial land use, when aggregated, are approximately 13% of its total land area, which is similar to the figures for other peer communities (average 12.8%) except for Lawrence which remains an outlier with approximately 20% of total land devoted to industrial & commercial uses. For more details on the land-use analysis, please see Appendices A, B and C.

TABLE 3.5.3: LOWELL LAND USE COMPARISON: PEER COMMUNITIES

		Lowell		PEER COMMUNITIES									
				Lawrence		New Bedford		Springfield		Worcester		Average	
		2011		2011		2011		2011		2011		2011	
Land Use	**Developed**	**Acres**	**Perc.**	**Acres**	**Perc.**	**Acres**	**Perc.**	**Acres**	**Perc.**	**Acres**	**Perc.**	**Acres**	**Perc.**
AGG	N	21	0.23%	0	0.00%	42	0.32%	30	0.14%	55	0.22%	32	0.20%
FOREST	N	1164	12.54%	417	8.78%	2408	18.64%	3810	17.99%	5707	23.20%	3086	19.45%
MINING	N	0	0.00%	0	0.00%	8	0.06%	15	0.07%	0	0.00%	6	0.04%
OPEN LAND	N	156	1.68%	75	1.58%	303	2.34%	291	1.37%	480	1.95%	287	1.81%
WETLAND	N	389	4.19%	91	1.91%	2032	15.73%	809	3.82%	500	2.03%	858	5.41%
WATER	N	580	6.25%	301	6.33%	175	1.35%	791	3.74%	673	2.74%	485	3.06%
Total Undeveloped		2311	24.90%	885	18.61%	4968	38.44%	5746	27.14%	7414	30.14%	4753	29.96%
RECREATION	Y	318	4.57%	103	2.66%	422	5.30%	643	4.17%	954	5.55%	530	4.77%
TRANSPORT	Y	283	4.05%	154	3.99%	672	8.45%	623	4.04%	1133	6.59%	646	5.81%
WASTE	Y	17	0.25%	0	0.00%	85	1.07%	38	0.25%	29	0.17%	38	0.34%
INDUSTRIAL	Y	621	8.91%	556	14.37%	822	10.33%	1187	7.69%	1281	7.45%	961	8.65%
URBAN PUBLIC	Y	749	10.75%	420	10.86%	840	10.56%	1715	11.12%	2094	12.18%	1267	11.41%
COMMERCIAL	Y	573	8.22%	416	10.75%	734	9.23%	1608	10.42%	1507	8.77%	1066	9.60%
LOW RES	Y	95	1.36%	14	0.37%	130	1.64%	206	1.34%	522	3.04%	218	1.97%
MED RES	Y	186	2.67%	62	1.61%	328	4.12%	924	5.99%	1240	7.21%	639	5.75%
HIGH RES	Y	2519	36.13%	1006	26.00%	2209	27.77%	6172	40.01%	5031	29.28%	3605	32.45%
MULTI FAM	Y	1611	23.10%	1137	29.40%	1712	21.52%	2311	14.98%	3395	19.75%	2139	19.25%
Total Housing		4410	63.25%	2220	57.38%	4380	55.06%	9614	62.31%	10188	59.28%	6600	59.41%
Total Developed		6972	75.10%	3868	81.39%	7955	61.56%	15428	72.86%	17186	69.86%	11109	70.04%
Total		9284	100.00%	4753	100.00%	12923	100%	21174	100.00%	24600	100.00%	15862	100.00%

*Category URBAN PUBLIC/ INSTITUTIONAL - 2011
URBAN OPEN - 2002

TABLE 3.5.4: LOWELL LAND USE COMPARISON: SUBURBAN COMMUNITIES

		Lowell		SUBURBAN TOWNS											
				Billerica		Chelmsford		Dracut		Tewksbury		Tyngsboro		Average	
		2011		2011		2011		2011		2011		2011		2011	
Land Use	**Developed**	**Acres**	**Perc.**	**Acres**	**Perc.**	**Acres**	**Perc.**	**Acres**	**Perc.**	**Acres**	**Perc.**	**Acres**	**Perc.**	**Acres**	**Perc.**
AGG	N	21	0.23%	188	1.12%	251	1.70%	1025	7.48%	348	2.57%	335	2.89%	429	3.05%
FOREST	N	1164	12.54%	5085	30.19%	4530	30.65%	4807	35.09%	3948	29.19%	6098	52.71%	4893	34.75%
MINING	N	0	0.00%	0	0.00%	26	0.18%	296	2.16%	2	0.01%	15	0.13%	68	0.48%
OPEN LAND	N	156	1.68%	389	2.31%	213	1.44%	499	3.64%	426	3.15%	129	1.11%	331	2.35%
WETLAND	N	389	4.19%	2099	12.46%	1611	10.90%	1587	11.58%	2451	18.12%	893	7.72%	1728	12.27%
WATER	N	580	6.25%	384	2.28%	347	2.35%	434	3.17%	230	1.70%	823	7.11%	444	3.15%
Total Undeveloped		2311	24.90%	8145	48.36%	6979	47.22%	8647	63.12%	7405	54.75%	8292	71.67%	7894	56.05%
RECREATION	Y	318	4.57%	277	3.19%	212	2.72%	156	3.08%	295	4.83%	264	8.04%	241	3.89%
TRANSPORT	Y	283	4.05%	409	4.70%	461	5.91%	37	0.73%	162	2.65%	188	5.75%	251	4.06%
WASTE	Y	17	0.25%	47	0.54%	22	0.28%	0	0.00%	20	0.32%	126	3.86%	43	0.69%
INDUSTRIAL	Y	621	8.91%	1072	12.33%	556	7.13%	134	2.65%	481	7.85%	97	2.95%	468	7.56%
URBAN PUBLIC	Y	749	10.75%	267	3.07%	297	3.80%	84	1.66%	230	3.76%	117	3.56%	199	3.21%
COMMERCIAL	Y	573	8.22%	371	4.27%	428	5.48%	222	4.39%	394	6.43%	184	5.62%	320	5.17%
LOW RES	Y	95	1.36%	1438	16.53%	3017	38.69%	2138	42.32%	1976	32.29%	1891	57.70%	2092	33.80%
MED RES	Y	186	2.67%	3808	43.79%	1968	25.23%	553	10.96%	1713	27.99%	76	2.31%	1624	26.24%
HIGH RES	Y	2519	36.13%	625	7.18%	374	4.80%	1215	24.06%	565	9.23%	242	7.37%	604	9.76%
MULTI FAM	Y	1611	23.10%	382	4.39%	464	5.95%	513	10.15%	284	4.64%	93	2.84%	347	5.61%
Total Housing		4410	63.25%	6252	71.90%	5824	74.67%	4420	87.48%	4539	74.15%	2302	70.23%	4667	75.41%
Total Developed		6972	75.10%	8696	51.64%	7799	52.78%	5052	36.88%	6121	45.25%	3277	28.33%	6189	43.95%
Total		9284	100.00%	16841	100.00%	14778	100.00%	13699	100.00%	13526	100.00%	11569	100.00%	14083	100.00%

4.0 BUILD-OUT ANALYSIS

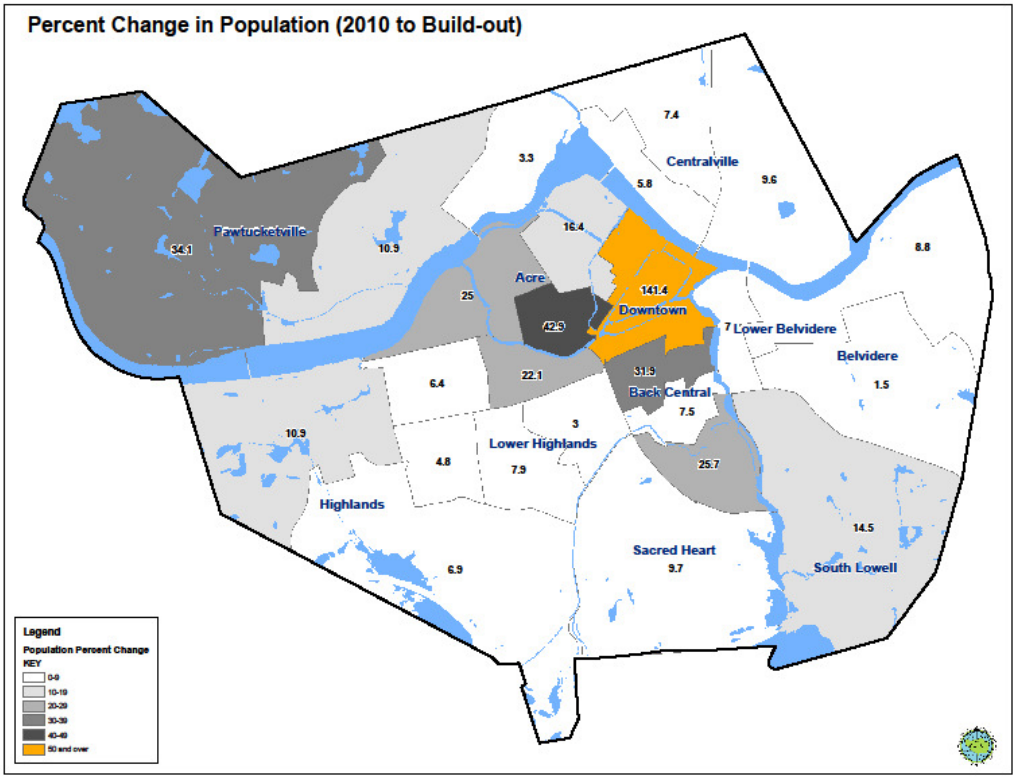
A build-out analysis is an important part of understanding the impact of land-use regulations on the future provision of municipal services. A build out analysis is a theoretical exercise where the allowable development under existing land-use constraints—especially zoning standards—is maximized. The potential residential development is then used to determine the future demand on municipal services such as schools, solid waste, water and sewer infrastructure to name a few. A build out analysis will also help a community understand the geographic distribution of easily developable land in the municipality.

The build-out analysis completed for the 2011 update to the City of Lowell Master Plan utilized the alternative methodology envisioned in the 2002 Existing Conditions Report for the 2003 Master Plan document. Specifically, a "standard" build-out analysis for the City of Lowell would indicate the City is almost at capacity due to the small number of singular vacant parcels. However, experience dictates that property owners in Lowell can utilize innovative approaches to create developable land. To that end, a multitude of approaches have been contemplated to determine the true build out capacity in the City.

The following elements are combined herein to determine the full development capacity for the City:

1. Contiguous, open land was reviewed for its capacity to create large subdivisions. The original build-out analysis in 2002 identified the existing areas in the City. However, three significant upgrades were necessary. First, many areas identified in the original were already developed and necessarily removed from this update. Second, many areas originally identified were in parcels that were and continue to be zoned as industrial land. However, the residential development potential of the industrially-zoned areas has decreased significantly, resulting from a zoning ordinance amendment that no longer allows any form of residential development. A recent study conducted by DPD analyzed the development potential of residential areas in the City of Lowell through the Approval Not Required (ANR) Subdivision process. Parcels previously identified in the 2002 Build-Out analysis as potential development sites and through ANR report determined to be no longer developable due to changes in zoning were excluded;
2. Potential units for the Downtown-Mixed Use (DMU) district were calculated using the known gross floor area for buildings in the DMU district and a 2009 analysis of downtown vacancy by the City of Lowell Office of Economic Development. The total available space was calculated based on this information and a potential residential build-out was calculated by assuming that the current percentage of downtown space devoted to residential uses—as calculated using square footage—would remain constant through full development;

3. The 2004 zoning ordinance provided a new residential development opportunity through Section 8.1: Conversion of Existing Buildings. This section enables the redevelopment of historic churches, mills, schools and fire stations through a Special Permit with the Planning Board. Typically, processes requiring Special Permits have been eliminated from consideration in the build-out analysis. However, use special permits are were included in the 2001 analysis and are included in this projection. Special permits for residential uses effect Section 8.1 conversions more than any other development opportunity and this process has been utilized extensively to create large infill projects across the City of Lowell and, given its alignment with other long-term goals, seems likely to function more closely as a process to facilitate conversation than a heavy-handed development control. To complete the analysis for this section all churches, mills, public schools, private schools and fire stations of sufficient age were reviewed. Reasonable projections of development potential were used to determine the total square footage available for development and the total potential units;
4. The Assessor's database from March 30, 2011 was utilized for all applicable land use codes and parcel determinations. All parcels classified as "Vacant Land Dev" and "Vacant Land Pot" were reviewed for their by-right development potential. This analysis creates an estimate for vacant land build-out potential;
5. Planned development figures for the two existing Urban Renewal districts were included without computation;
6. The previously-referenced ANR Subdivision report was included without significant computations. However, the current report utilized a more expansive review process than the 2001 ANR review. Therefore, the potential lots determined prior to the Sept. 2011 frontage change were reduced to 44 percent of the total to improve the comparison with the 2001 analysis;
7. To provide an accurate means of comparison with the 2001 Build-out analysis, the same service change calculations (water consumption, recyclable and non-recyclable, and vehicle trips per day) were used in both projection tables. Additional resident numbers for the DMU, JAM Urban Renewal District, Acre Urban Renewal District, and development opportunities through zoning code section 8.1, are based on 1.91 persons/dwelling unit (DU). Additional resident numbers for large parcels for subdivisions, vacant land, and ANR potential lots are based on 2.67 persons/dwelling unit. Water consumption is based on 72 gallons/person/day, non-recyclable solid-waste is based on 1.2 tons/year/DU, recyclable solid waste is based on .17 tons/year/DU, and vehicle trips/day is based on 9.0 trip ends/DU.



The specific methodology that was used to perform the 2011 build-out analysis is outlined below so as to allow for a deeper understanding of the assumptions used in the current iteration. The information is presented in a bulleted list approximately in order of operations completed and assumptions utilized.

Areas for potential subdivisions:

- Used large contiguous parcels identified in 2001/2002 by the City of Lowell
- Only parcels in the following zones were considered: SMF, SMU, SSF, TMF, TMU, TSF, TTF, UMF, UMU, USF. The LI district does allow two-story mixed use buildings, but it was excluded.
- Areas of overlap with a summer 2011 Approval Not Required subdivision report were removed.
- After removing overlap with the ANR report a small number of parcels were too small to create a single lot under current zoning. Those areas were deleted from the Excel table calculation.
- Areas listed as developable in the 2001/2002 large lot review that are now developed were removed by heads-up digitizing using 2008 aerial photos.
- Lot lines were redrawn where the clear intent was to match the parcel boundary. Updates to the accuracy of the City of Lowell data created parcel boundaries that did not match the previous layer. Areas where lots did not match parcel boundaries but did not generally conform to the parcel outlines were left unchanged.

- All GIS files used, and the ArcMap file, are located in the following public folder: O:\GISData\Arcview\AV_Data\Buildout\2011.
- Amount of area lost to roadway, etc. (public ways) was determined to be approximately 23.5 percent based on the average of land used for public infrastructure in recent subdivision at 61 Bishop Street (Berkeley Avenue extension) and 104 West Meadow Road.
- Where parcels were split zoned the more restrictive zone was used.
- The TMF and TMU maximum unit calculation was based on single family use as the lot area standard is less restrictive.

Section 8.1 Work: Notes on general methods

- No buildings that qualify for redevelopment under City of Lowell Zoning Ordinance Section 8.1 were included in the DMU zone because that zone was reviewed independently for a specific build-out determination.
- All mills, firehouses, schools (public and private) and churches built before 1960 were selected based on the best available data from the Assessor. Staff then cleaned the data generally, although the review of churches required significant additional cleaning.
- The potential new dwelling units, the critical new calculation for the build-out upon which population and all municipal service projections are based, were calculated by development pathway. For almost all types of potential future development the conversation to projections by Census tract required simply classifying the parcels by location. However, for potential public school and public firehouse development an additional multiplier was added to reduce potential dwelling units beyond other controls such as floor area lost to communal space that were used in all other calculations. The additional percentage reduction makes a parcel to Census tract correlation impossible as the nature of the corrective factor indicates our belief that a small portion of the buildings will be redeveloped (where the build out assumes the maximum possible residential conversions for other groups of structures). Therefore, the reduced numbers of units were equally distributed among the Census tracts that contain any parcel from those two groups eligible for redevelopment as housing. We acknowledge the added uncertainty to this approach, but there is no clearer way to link the development potential for these two special development pathways, due to their public ownership, to Census tracts for discussion.
- For mill buildings
    - Removed 1320 Middlesex Street because not historic mill building
    - Removed 180 Phoenix Ave as not historic mill structure on site
    - Removed 51 Payne Street because demolished
    - Removed 1012 Westford Street as not historic mill structure
    - Removed Prince Spaghetti because of other development incentives, etc. to be used for non-residential
    - Assumed 100 percent of available space would become housing and used a communal space corrective factor of 0.725 which is the average of the Appleton Mills redevelopment and Western Ave “G Mill”

- For school square footage calculation, UMass Lowell and MCC buildings were removed
    - Removed 246 Market Street, as was already built-out
    - Deleted churches with associated schools: 105 Princeton, 1195 Varnum Ave, 360 High Street
    - Keep some clearly accessory buildings used as schools: 21 Sixth/24 Fifth
    - Calculated based on ALL private/religious schools going for housing
    - Calculated based on 10.4 percent of public school floor area becoming housing stock
    - Corrected potential floor area for unit calculation by using a "communal space" corrective factor of 0.73. The recent redevelopment by the Coalition for a Better Acre of the former St. Josephs High School utilized 73 percent of gross floor area for housing units (the rest went to hallways, mechanical, etc.)
- Firehouses
    - Only deleted Fourth Street as it has already been redeveloped
    - Corrective communal space factor of 0.96 from the Fourth Street firehouse redevelopment
- Notes of churches:
    - Even after generally cleaning up the data from the Assessor's database churches presented a problem. Because religious uses are exempt from use zoning, churches are located in all types of structures. An indication in the data that a church was located in a building built before 1960 did not necessarily confirm that it would qualify as a "historic church" for redevelopment under section 8.1. The Lowell Historic Board assisted in determining the true historic structures.
    - Using the shorter list, the gross floor area was located in the Assessor's data for each structure including churches and rectories. In some cases multiple parcels identified contained only one building, in which case the "extra" parcels were marked and not counted for total floor area.
    - Buildings with no floor area data at the legal address but where such data was contained in an abutting parcel are noted

Notes on Vacant Land

- Used Assessors determination of the following "LND_USE_DE" for:
    - Vacant Land Dev & Vacant Land Pot
- Zones excluded: DMU, GI, LI, HRC, OP
- Only reviewed lots with 1-2 times the required Min Lot Area and 3+ required Min Lot Area. The ANR report completed in summer 2011 reviewed all parcels in the City of Lowell residential zones with 2-3 times the required Min Lot Area. All parcels were reviewed and some were deleted to avoid double-counting with the ANR report.
- Total potential units were determined using LA/DU for each zoning district.

Urban Renewal Area Calculations

- Used information provided by the Urban Renewal Project Manager to determine the planned build-out for each zone.

ANR Report

- For each parcel identified, the total lot area was discounted by the required Min Lot Area for that zoning district. This removed the existing lots from the count and avoided counting existing lots as new lots.
- The number of potential new units was then determined using the LA/DU requirement for each zoning district.
- Total lots reduced to 44 percent of project total for comparability with 2001 analysis.

DMU Work: Steps noted sequentially due to complexity of calculation

1. Get all the gross floor area of the buildings in the DMU from the 3/30/11 Assessor's database under "CNS_AREA_G".
2. Using the 31.5 percent vacancy rate identified in the Economic Development report from 2009—which we confirmed appears to be just floors above ground-level retail—it was assumed that 31.5 of the total gross area is available.
3. Correction for market conditions. Take the total units downtown, multiply by 900, multiply by the inverse of the "public space" conversion factor used for mills (0.725) and compare to total gross floor area from top step. That residential built percentage will be used to assume a similar residential density at full build-out, ie the corrected gross area in step two will be reduced by this amount.
4. Then correct for a common area (same corrective factor identified above) and divide by 900 square feet per unit EQUALS PROBABLE UNITS.

Table 4.1.1: Comparison of 2001 and 2011 Build-out Analyses

2011 Classification	2001		2011	
	Potential Dwelling Units	Additional Residents	Potential Dwelling Units	Additional Residents
Zoning 8.1: Church Redevelopment	N/A	N/A	527	1,007
Zoning 8.1: Firehouse Redevelopment	N/A	N/A	21	40
Zoning 8.1: School Redev.	N/A	N/A	330	630
Zoning 8.1: Mill Redevelopment	N/A	N/A	971	1855
Large Contiguous Land for Subdivisions	2566	6852	710	1896
JAM Urban Renewal	30	57	1000	1910
ACRE Urban Renewal	194	518	60	115
Vacant Land (Includes ANR Potential Lots)	1399	3735	237	633
ANR Lots (Included above)	N/A	N/A	959	2561
DMU	134	256	900	1719
Totals:	4,323	11,418	5,715	12,364

Table 4.1.2: 2011 Build-out Analysis Service Changes

2011 Classification	Potential Dwelling Units	Additional Residents	Additional Water Demand (gal/day)	Additional Non-Recyclable Solid Waste (tons/yr)	Additional Recyclable Solid Waste (tons/yr)	Additional Vehicle Trips/Day
Zoning 8.1: Church Redevelopment	527	1,007	72473.04	632.4	89.59	4743
Zoning 8.1: Firehouse Redevelopment	21	40	2887.92	25.2	3.57	189
Zoning 8.1: School Redevelopment	330	630	45381.6	396	56.1	2970
Zoning 8.1: Mill Redevelopment	971	1855	133531.92	1165.2	165.07	8739
Large Contiguous Land for Subdivisions	710	1896	136490.4	852	120.7	6390
JAM Urban Renewal	1000	1910	137520	1200	170	9000
ACRE Urban Renewal	60	115	8251.2	72	10.2	540
Vacant Land	237	633	45560.88	284.4	40.29	2133
ANR Potential Addition Lots (Pre-Frontage Increase)	959	2561	184358.16	1150.8	163.03	8631
DMU	900	1719	123768	1080	153	8100
TOTAL:	5,715	12,364	890,223	6,858	972	51,435

CONCLUSIONS:

The 2011 build out analysis, composed of different studies outlined above, projects the potential for by-right and use Special Permit redevelopment of 5,715 housing units and 12,364 additional Lowellians. Total expected increases of municipal services are outlined in the accompanying tables, which provide comparisons of 2001 and 2011 total build-out projections by census tract.

Table 4.1.2: 2001 Build-out Totals

TRACT	Neighborhood	2000 Population	Potential Building Lots	Potential Dwelling Units	Additional Residents	Population at Build-Out	Additional Water Demand gal/day	Additional Non-Recyclable Solid Waste tons/yr	Additional Recyclable Solid Waste tons/yr	Additional Vehicle Trips/Day
3101	Downtown	3,881	28	164	313	4,194	22,553	197	28	1,476
3102	Christian Hill	6,070	76	79	211	6,281	15,187	95	13	711
3103	Centralville	6,157	49	229	611	6,768	44,023	275	39	2,061
3104	Centralville	3,581	16	71	190	3,771	13,649	85	12	639
3105	Pawtucketville	3,353	23	68	182	3,535	13,072	82	12	612
3106.01	Pawtucketville	5,392	572	1271	3394	8,786	244,337	1,525	216	11,439
3106.02	Pawtucketville	5,610	186	379	1012	6,622	72,859	455	64	3,411
3107	Acre	4,575	41	177	473	5,048	34,026	212	30	1,593
3108	Acre	2,457	2	14	37	2,494	2,691	17	2	126
3110	Acre	2,754	2	148	395	3,149	28,452	178	25	1,332
3111	Acre	2,286	2	203	542	2,828	39,025	244	35	1,827
3112	L. Highlands	3,374	13	27	72	3,446	5,190	32	5	243
3113	Highlands	3,954	25	95	254	4,208	18,263	114	16	855
3114	Highlands	5,857	49	101	270	6,127	19,416	121	17	909
3115	Highlands	2,908	7	15	40	2,948	2,884	18	3	135
3116	Highlands	5,099	199	220	587	5,686	42,293	264	37	1,980
3117	L. Highlands	4,923	12	48	128	5,051	9,228	58	8	432
3118	L. Highlands	3,516	16	78	208	3,724	14,995	94	13	702
3119	Back Central	2,666	8	41	109	2,775	7,882	49	7	369
3120	Back Central	2,977	7	33	88	3,065	6,344	40	6	297
3121	Sacred Heart	3,112	17	28	75	3,187	5,383	34	5	252
3122	Sacred Heart	4,741	102	155	414	5,155	29,797	186	26	1,395
3123	South Lowell	5,023	178	232	619	5,642	44,600	278	39	2,088
3124	L. Belvidere	2,405	15	30	80	2,485	5,767	36	5	270
3125.01	Belvidere	4,497	81	172	459	4,956	33,065	206	29	1,548
3125.02	Belvidere	3,999	60	245	654	4,653	47,099	294	42	2,205
	City of Lowell	105,167	1,786	4,323	11,418	116,585	822,079	5,188	735	38,907

Table 4.1.3: 2011 Build-out Totals

TRACT	Neighborhood	2000 Population	2010 Population	Potential Dwelling Units	Additional Residents	Population at Build-Out	Additional Water Demand (gal/day)	Additional Non-Recyclable Solid Waste (tons/yr)	Additional Recyclable Solid Waste (tons/yr)	Additional Vehicle Trips/Day
3101.00	Downtown	3,881	5,267	1989	3848	9,115	277084.08	2386.8	338.13	17901
3102.00	Christian Hill	6,070	5,976	130	321	6,297	23076	156	22.1	1170
3103.00	Centralville	6,157	6,016	166	367	6,383	26439.84	199.2	28.22	1494
3104.00	Centralville	3,581	3,245	53	121	3,366	8711.28	63.6	9.01	477
3105.00	Pawtucketville	3,353	3,449	29	64	3,513	4590	34.8	4.93	261
3106.01	Pawtucketville	5,392	5,746	559	1493	7,239	107462.16	670.8	95.03	5031
3106.02	Pawtucketville	5,610	5,825	207	481	6,306	34650	248.4	35.19	1863
3107.00	Acre	4,575	4,441	157	342	4783	24654.96	188.4	26.69	1413
3111.00	Acre	2,286	2,410	248	564	2,974	40616.64	297.6	42.16	2232
3112.00	L. Highlands	3,374	3,267	170	407	3,674	29288.16	204	28.9	1530
3113.00	Highlands	3,954	4,057	78	167	4,224	12039.84	93.6	13.26	702
3114.00	Highlands	5,857	5,986	235	466	6,452	33575.76	282	39.95	2115
3115.00	Highlands	2,908	2,974	50	102	3,076	7368.48	60	8.5	450
3116.00	Highlands	5,099	5,295	159	367	5,662	26407.44	190.8	27.03	1431
3117.00	L. Highlands	4,923	5,098	139	278	5,376	20045.52	166.8	23.63	1251
3118.00	L. Highlands	3,516	3,513	34	84	3,597	6043.68	40.8	5.78	306
3119.00	Back Central	2,666	2,429	215	459	2,888	33068.88	258	36.55	1935
3120.00	Back Central	2,977	2,938	56	124	3,062	8959.68	67.2	9.52	504
3121.00	Sacred Heart	3,112	3,149	311	649	3,798	46708.56	373.2	52.87	2799
3122.00	Sacred Heart	4,741	4,309	141	280	4,589	20156.4	169.2	23.97	1269
3123.00	South Lowell	5,023	4,931	186	417	5,348	30011.04	223.2	31.62	1674
3124.00	L Belvidere	2,405	2,354	40	105	2,459	7525.44	48	6.8	360
3125.01	Belvidere	4,497	4,464	115	273	4,737	19645.2	138	19.55	1035
3125.02	Belvidere	3,999	3,960	20	45	4,005	3242.88	24	3.4	180
3883	Acre	n/a	5,420	228	540	5,960	38851.2	273.6	38.76	2052
	CITY OF LOWELL SERVICE CHANGES:			5,715	12,364	118,883	890,223	6,858	972	51,435

5.0 TRANSPORTATION & PARKING

The Lowell community is well served by a clean and modern public transportation system and regional highways system that provides direct access to the Boston metropolitan area. The transportation system includes local and regional bus routes, passenger commuter trains, inter-city bus shuttles, airport limousine service and a modern multi modal transportation facility at the Gallagher Terminal. Commuter trains provide convenient 40-minute travel service between Lowell and Boston's North Station with 22 inbound and 27 outbound trips per day. Free wifi is included to enhance the rider experience.

Improving traffic flow throughout the city and region remains a challenge, as does connecting Lowell's neighborhoods with its downtown and Gallagher Terminal. Major pedestrian and traffic improvements have been made along Thorndike Street between South Common and the Lord Overpass, and in numerous other locations throughout the city, including the Downtown, Centralville, the Lower Highlands and Back Central. While the volume to capacity analysis has found that some streets, such as Thorndike, Dutton, Bridge and School Streets, now have proportionally higher traffic volume/capacity ratios, the majority of major thoroughfares have remained at the level found in 2002 or have decreased in this regard. When comparing the road conditions in 1999 with those in 2009, the city saw an 8% increase in the streets that fell under the category "Do Nothing". The city also saw a decrease in traffic accidents between 2001 and 2010. The number fell from 4,247 to 3,494 during that time.

Over the course of the past decade, studies in the city have been undertaken to determine ways of better meeting growing transportation needs using sustainable means. With the expansion of UMass Lowell, the city's second largest employer, there is an increased need for both parking and alternative modes of transport by which to shuttle the thousands of faculty, staff and students throughout the city on a daily basis. UML has improved their shuttle system and added new routes, in addition to providing more on-campus parking. UMass Lowell is currently undertaking a transportation study to improve shuttle access between campuses and the downtown, and encourage biking. Other studies, such as the Downtown Evolution Plan, provide a framework for enhanced bike and pedestrian amenities throughout downtown for all residents and for the re-introduction of the historic trolley to the city. DPD is currently undertaking a bus shelter study, with the hope of increasing LRTA rider ship over the longer term. Implementation of these plans is set to begin over the next year or so.

Other improvements to the transportation infrastructure have included enhanced signage for drivers and pedestrians, the use of energy efficient bulbs for all traffic lights and many street lights, the introduction of a new parking kiosk system in the downtown, the addition of bike racks to all LRTA buses, the installation of the city's first electric vehicle charging station, the covering of cobblestone walkways for improved handicap access downtown, and the construction of the Early parking garage in the JAM Plan area. This $22 million garage, which opened in 2009, consists of 940 spaces and 17,000 square feet of commercial space on the ground floor. Security has improved overall in all 5 city owned garages. The construction of the new University Avenue Bridge, equipped with bike lanes on each side, will also improve traffic flow along a heavily utilized city corridor. The hope is that these significant improvements will continue to spur economic growth throughout the city and enhance the quality of life for residents.

5.1 CLASSIFICATION OF STREETS

The street classification in Lowell, produced by MassDOT and utilized by the Northern Middlesex Council of Governments (NMCOG), divides the City streets into six categories (see street classification map). The following is a brief explanation of each category:
(use http://www.fhwa.dot.gov/planning/fcsec2_1.htm)

- *Interstate*: are primarily for interstate and regional travel (high regional connectivity at high speeds with limited access to adjacent land and limited access for pedestrians and bicyclists) I-495 is the only interstate in Lowell..

- *Principal Arterials*: These limited access arterials provide the greatest level of regional mobility with all connections between these roadways and other transportation facilities (other roadways or parking lots serving land use) provided by high-speed ramps. Route 3 is the only Principal Arterial in Lowell.

- *Urban Principal Arterials:* These arterials provide a lower level of regional mobility than limited access principal arterials, but provide the highest level of mobility for roadways with driveway access, unsignalized intersections, and signalized intersections..In Lowell, VFW Highway, Gorham Street, Bridge Street, the Lowell Connector and Route 38 are examples of Urban Principal Arterials.

- *Urban Minor Arterials*: These arterials provide a lower level of regional mobility than principal arterials. These roadways provide the important connections between the principle arterial and collector network in urban areas. In Lowell, Varnum Avenue, Mammoth Road, Chelmsford Street, Merrimack Street, Stevens Street and Boylston Street are examples of Urban Minor Arterials.

- *Urban Collectors*: These roadways provide an intra regional level of mobility, connecting the arterial network with the local roadways. These roadways collect traffic from the local roadway network and distribute them to the arterial system. Examples of Urban Collectors include Wilder Street, Pine Street, Parker Street, Powell Street, Wentworth Avenue and Beacon Street.

- *Local streets*: These roadways provide the lowest level of mobility by accessing adjacent land use, serving local trip purposes, and connecting to higher order roadways.. They are not intended for regional connectivity (low speeds with a high degree of local circulation and access).

5.2 TRAFFIC VOLUME STUDY

Records of traffic counts in Lowell date back to 1990. NMCOG calculated total traffic growth for Lowell for the period 2001-2009 at 1.12 percent, a significant departure from previous assumed traffic volume projections. The traffic origin in Lowell varies. The average daily traffic volume ranges up to 2000 for local streets, from 2000 to 10,000 for collector streets, from 10,000 to 16,000 for minor arterials, and over 16,000 for expressways and principal arterials. This information is drawn from the Northern Middlesex Regional Traffic Volume Report: 2010 Edition, created by NMCOG. The full listing of traffic volumes can be found in the accompanying table.

Table 5.2.1: Traffic Volumes

Location	Year Counted	Counted By	ADT	2010 ADT*
Route I-495 South of Route 38 (Main Street in Tewksbury)	2007	MassDOT	122,932	123449
Route I-495 North of Lowell Connector	2008	MassDOT	108,800	109105
Lowell Connector North of I-495 Exit	2006	MassDOT	55,900	56214
Route 3A (Thorndike Street) between Highland and YMCA Drive	2006	MassDOT	45,200	45454
Route 3A (Thorndike Street) North of Lowell Connector	2007	MassDOT	42,100	42277
Lowell Connector South of Route 3A (Thorndike Street)	2006	MassDOT	40,900	41130
Lowell Connector South of Plain Street	2009	MassDOT	38,839	38893
Lowell Connector North of Plain Street	2008	MassDOT	37,857	37963
Lowell Connector South of I-495 Exit	2006	MassDOT	35,600	35800
School Street @ O'Donnell Bridge	2002	CoL	34,000	34383
Dutton Street North of Lord Overpass	2007	FPA	32,263	32399
Route 3A (Thorndike Street) South of Lord Overpass	2007	FPA	32,243	32379
Route 38 (Nesmith Street) North of Route 133 (Andover Street)	2002	CoL	31,300	31652
Route 38 (Nesmith Street) North of Merrimack Street	2009	MassDOT	30,100	30142
Route 3A (Gorham Street) South of Lowell Connector	2002	CoL	29,800	30135
Route 3A (Thorndike Street) South of Madison Street	2006	MassDOT	29,800	29967
Dutton Street South of Broadway Street	2007	FPA	28,319	28438
Westford Street North of Technology Drive	2006	NMCOG	27,600	27755
Dutton Street West of Broadway Street	2002	MassDOT	27,000	27304
Westford Street North of Chelmsford Town Line	2002	CoL	26,400	26697
Route 3A (Gorham Street) South of Butler Avenue	1999	MassDOT	25,800	26200
Route 38 (Rogers Street) North of Boylston Street	2008	MassDOT	25,600	25672
Rourke Bridge (Wood Street) South of Route 113 (Pawtucket Boulevard)	2002	CoL	25,100	25383
Route 113 (Varnum Avenue) West of Mammoth Road	2008	MassDOT	24,900	24970
Route 38 (Bridge Street) South of West Third Street	2007	PD	24,600	24703
Route 113 (Pawtucket Boulevard) East of Rourke Bridge (Wood Street)	2002	CoL	23,900	24169
Bridge Street North of Hampshire Street	2002	CoL	23,800	24068
Gorham Street South of Highland Street	2006	MassDOT	22,600	22727
VFW Highway West of University Avenue (Textile Avenue)	2005	MassDOT	22,200	22356
Bridge Street @ John Cox Bridge	2002	CoL	22,000	22248
Route 38 (Nesmith Street) @ Hunt Falls Bridge	2002	CoL	21,700	21944
Route 133 (Andover Street) East of High Street	2000	MassDOT	21,300	21600

Route 133 (Andover Street) East of Route 38 (Nesmith Street)	2002	CoL	21,300	21540
Middlesex Street West of Pawtucket Street	2004	NMCOG	21,100	21278
Plain Street between Lowell Connector NB and SB Ramps	2007	PD	20,900	20988
Route 110 (Chelmsford Street) South of Stevens Street	2000	VHB	20,500	20789
Bridge Street North of French Street	2002	MassDOT	20,400	20630
Dutton Street North of Broadway Street	2006	MassDOT	20,100	20213
Route 38 (Bridge Street) North of VFW Highway	2009	MassDOT	19,600	19627
Route 110 (Andover Street) West of High Street	2010	NMCOG	19,500	19500
VFW Highway West of Route 38 (Bridge Street)	2009	MassDOT	19,400	19427
Wood Street Between Westford and Princeton	2002	CoL	18,800	19012
Route 133 (Andover Street) @ Tewksbury Town Line	2009	MassDOT	18,900	18926
Middlesex Street East of Webber Street	2002	CoL	18,200	18405
Gorham Street North of Union Street	2000	MassDOT	18,100	18355
Mammoth Road North of Route 113 (Varnum Avenue)	2004	NMCOG	18,000	18152
Pawtucket Street West of Merrimack Street	2006	MassDOT	17,900	18000
VFW Highway East of University Avenue (Textile Avenue)	2007	MassDOT	17,900	17975
Lowell Connector South of Gorham Street	2006	MassDOT	17,800	17900
Pawtucket Street East of Arlington Street	2006	MassDOT	17,400	17498
Gorham Street South of Walnut Street	2009	MassDOT	17,300	17324
Route 3A (Gorham Street) North of Elsworth Street	2009	MassDOT	17,000	17024
Route 110 (Chelmsford Street) South of Parker Street	2010	NMCOG	16,900	16900
Lakeview Avenue South of Farmland Road	2003	NMCOG	16,700	16864
Pawtucket Street North of Fletcher Street	2002	CoL	16,400	16585
Route 3A (Gorham Street) North of Moore Street	2007	MassDOT	16,400	16469
Wood Street South of Middlesex Street or North of Princeton Street	2009	NMCOG	16,400	16423
Fletcher Street South of Chelmsford Street	2000	MassDOT	16,100	16327
University Avenue North of VFW Highway	2010	NMCOG	16,000	16000
Fletcher Street South of Broadway Street	2006	MassDOT	15,900	15989
University Avenue South of VFW Highway	2005	PD	15,855	15966
Pawtucket Street South of Merrimack Street	2002	CoL	15,700	15877
Fletcher Street North of Thorndike Street/ Dutton Street	2008	NMCOG	15,800	15844
University Avenue Bridge North of Pawtucket Street	2006	MassDOT	15,700	15788

Stevens Street South of Upham Street	2005	PD	15,500	15609
Industrial Avenue East of Composite Way	2006	PD	15,300	15386
Bridge Street North of Merrimack Street	2007	NMCOG	15,200	15264
VFW Highway West of Aiken Street	2009	NMCOG	15,200	15221
Pawtucket Street North of Merrimack Street	2002	CoL	14,600	14764
Route 110 (Chelmsford Street) West of Howard Street	2007	FPA	14,689	14751
Route 133 (Andover Street) West of Route 38 (Nesmith Street)	2002	CoL	14,500	14663
Pawtucket Street South of Fletcher Street	2002	CoL	14,400	14562
Lakeview Avenue West of Fisher Street	2002	CoL	14,300	14461
East Merrimack Street South of Bridge Street	2002	MassDOT	14,200	14360
VFW Highway West of University Avenue	2005	PD	14,100	14199
Mammoth Road @ Dracut Town Line	2009	NMCOG	14,100	14120
Route 110 (Appleton Street) East of Lord Overpass	2007	FPA	13,965	14024
Route 113 (Riverside Street) near Bodwell Avenue	2002	CoL	13,700	13854
Route 113 (Riverside Street) South of Bodwell Avenue	2002	MassDOT	13,600	13753
Merrimack Street East of John Street	2010	NMCOG	13,600	13600
Middlesex Street West of Wood Street	2002	CoL	13,300	13450
Middlesex Street West of Lord Overpass	2007	FPA	13,274	13330
Fletcher Street North of Broadway Street	2006	MassDOT	13,100	13174
Route 113 (Pawtucket Boulevard) @ Tyngsborough Town Line	2002	CoL	13,000	13146
Route 113 (Pawtucket Boulevard) East of Tyco Electronics (MA/COM)	2008	NMCOG	13,100	13137
Aiken Street South of Bridge	2009	NMCOG	12,700	12718
Route 110 (Chelmsford Street) North of Stevens Street	2010	NMCOG	12,700	12700
Mammoth Road North of West Meadow Road	2002	CoL	12,500	12641
Aiken Street South of VFW Highway	2002	CoL	12,300	12438
Industrial Avenue South of Route 110 (Chelmsford Street)	2009	NMCOG	12,300	12317
Mammoth Road South of Eighth Avenue	2010	NMCOG	12,300	12300
Westford Street East of Wood Street	2009	NMCOG	12,100	12117
Fletcher Street East of Pawtucket Street	2006	MassDOT	12,000	12067
Central Street South of Jackson Street	2010	NMCOG	11,900	11900
Route 110 (Chelmsford Street) North of Albert Street	2005	PD	11,800	11883
Broadway Street East of Fletcher Street	2006	MassDOT	11,800	11866
Middlesex Street West of Wilder Street	2002	CoL	11,700	11832
Industrial Avenue under Lowell Connector	2010	NMCOG	11,700	11700

Broadway Atreet over Western Canal	2006	MassDOT	11,500	11565
Stevens Street South of Parker Street	2009	NMCOG	11,400	11416
Lawrence Street East of Billerica Street	2009	NMCOG	11,300	11316
Route 110 (VFW Highway) @ Dracut Town Line	2009	NMCOG	11,300	11316
Middlesex Street @ Chelmsford Town Line	2008	NMCOG	11,200	11231
Rogers Street East of Concord Street	2002	CoL	11,000	11124
Father Morissette Boulevard @ Post Office (Arcand Drive)	2005	CoL	11,000	11077
Route 110 (Appleton Street) East of South Street	2010	NMCOG	11,000	11000
Lawrence Street @ Concord River	2008	NMCOG	10,900	10931
Woburn Street South of I-495	2009	NMCOG	10,900	10915
Varnum Avenue West of Route 113 (Pawtucket Boulevard)	2010	NMCOG	10,900	10900
Middlesex Street East of Pawtucket Street	2001	MassDOT	10,600	10734
Boylston Street North of Bishop Street	2008	NMCOG	10,700	10730
Liberty Street West of Powell Street	2002	CoL	10,500	10618
Route 3A (Westford Street) West of School Street	2009	MassDOT	10,600	10615
Route 113 (Pawtucket Boulevard) East of Old Ferry Road	1999	NMCOG	10,400	10561
French Street East of Kirk Street	2010	NMCOG	10,500	10500
East Merrimack Street West of High Street	2002	CoL	10,300	10416
Broadway Street West of Mount Vernon Street	2008	NMCOG	10,300	10329
Moore Street East of Route 3A (Gorham Street)	2007	MassDOT	10,100	10142
Route 3A (Gorham Street) South of Spencer Street	2010	NMCOG	10,100	10100
Westford Street West of Pine Street	2008	NMCOG	9,900	9928
Plain Street East of Tanner Street	2002	CoL	9,700	9809
Green Street East of Central Street	2010	NMCOG	9,800	9800
School Street South of Broadway Street	2008	NMCOG	9,700	9727
Broadway Street West of Fletcher Street	2006	MassDOT	9,600	9654
Broadway Street West of Dutton Street	2010	NMCOG	9,600	9600
Varnum Avenue West of West Meadow Road	2004	CoL	9,500	9580
Father Morissette Boulevard @ High School (Dutton Street)	2005	CoL	9,400	9466
Merrimack Street East of Worthen Street	2001	MassDOT	9,300	9418
Aiken Street South of Hall Street	2007	MassDOT	9,300	9339
Middlesex Street East of Lord Overpass	2007	FPA	9,292	9331
Middlesex Street West of Central Street	2007	FPA	9,292	9331
Market Street East of Dutton Street	2002	MassDOT	9,200	9304
Market Street West of Central/Prescott Street	2010	NMCOG	9,200	9200
Clark Road West of Route 133 (Andover Street)	1999	MassDOT	9,000	9140

Market Street between Hanover and Suffolk Street	2008	MassDOT	9,100	9125
Route 3A (Westford Street) West of Wilder Street	2010	NMCOG	9,100	9100
Middlesex Street West of Pearl Street	2009	MassDOT	8,900	8912
Westford Street West of Wilder Street	2007	NMCOG	8,800	8837
Stedman Street @ Chelmsford Town Line	2009	NMCOG	8,700	8712
High Street South of Merrimack Street	2010	NMCOG	8,700	8700
Merrimack Street West of Dutton Street	2006	MassDOT	8,600	8648
Powell Street North of Route 110 (Chelmsford Street)	2002	CoL	8,400	8495
Middlesex Street West of Burnside Street	2010	NMCOG	8,400	8400
School Street North of Branch Street	2010	NMCOG	8,400	8400
Industrial Avenue East of Lowell Connector	2002	NMCOG	8,300	8393
Route 3A (Princeton Street) West of Baldwin Street	2002	CoL	8,300	8393
Lakeview Avenue @ Dracut Town Line	2010	NMCOG	8,200	8200
Route 3A (Westford Street) West of Stevens Street	2008	NMCOG	8,100	8123
Branch Street East of School Street	2006	NMCOG	8,000	8045
Wilder Street South of Pawtucket Street	2008	NMCOG	8,000	8022
Prescott Street South of Merrimack Street	2010	NMCOG	8,000	8000
Old Ferry Road North of Route 113 (Pawtucket Boulevard)	2008	NMCOG	7,900	7922
Pawtucket Street West of Wilder Street	2010	NMCOG	7,900	7900
Market Street @ Suffolk Street (On Bridge)	2005	CoL	7,800	7855
Aiken Street North of Cumberland Street	2002	CoL	7,700	7787
Middlesex Street East of South Street	1999	NMCOG	7,600	7718
Woburn Street West of I-495	2009	NMCOG	7,700	7711
Middlesex Street West of Garnet Street (2-Way Traffic beginning 2007)	2008	NMCOG	7,600	7621
Route 3A (Gorham Street) @ Chelmsford Town Line	2006	MassDOT	7,500	7542
Dutton Street SB Ramp to Lord Overpass	2007	FPA	7,459	7490
Pine Street West of Wilder Street	2002	CoL	7,400	7483
Plain Street East of Route 110 (Chelmsford Street)	2002	CoL	7,400	7483
Boylston Street South of I-495	2008	NMCOG	7,400	7421
Route 3A (Gorham Street) South of Carlisle Street	2010	NMCOG	7,100	7100
Route 3A (Westford Street) @ Tyler Park (West of Florence Avenue)	2009	NMCOG	7,000	7010
Industrial Avenue East of Lowell Connector Northbound Ramps	2008	NMCOG	6,900	6919
Varnum Avenue South of Frenchette Street	2004	NMCOG	6,700	6756
Shattuck Street South of Middle Street	2002	MassDOT	6,600	6674
John Street North of Merrimack Street	2010	NMCOG	6,600	6600
West 6th Street West of Hampshire Street	2002	CoL	6,500	6573
Broadway Street West of Wilder Street	2010	NMCOG	6,500	6500
Route 3A (Princeton Street) @ Chelmsford Town Line	2009	MassDOT	6,400	6409

Stevens Street North of Route 3A (Westford Street)	2008	NMCOG	6,200	6217
Baldwin Street South of Middlesex Street	2009	NMCOG	6,200	6209
Pine Street @ Route 3A (Westford Street)	2002	CoL	6,100	6169
Lawrence Street South of Church Street	2002	CoL	6,000	6068
Wilder Street North of Route 3A (Westford Street)	2010	NMCOG	6,000	6000
Post Office Square at entrance to Post Office	2002	MassDOT	5,900	5966
NB Ramp from Lord Overpass to Dutton Street	2007	FPA	5,921	5946
Dummer Street North of Broadway Street	2008	NMCOG	5,900	5917
School Street South of Pawtucket Street	2006	MassDOT	5,800	5833
Meadow Road North of Varnum Avenue	2010	NMCOG	5,800	5800
Gorham Street South of Lowell Connector	2006	MassDOT	5,700	5732
Old Ferry Road	1999	NMCOG	5,600	5687
Hildreth Street North of Richardson Street	2002	CoL	5,600	5663
Lakeview Avenue West of Route 38 (Bridge Street)	2010	NMCOG	5,600	5600
Parker Street East of Stevens Street	2010	NMCOG	5,600	5600
Boylston Street @ Tewksbury Town Line	2001	NMCOG	5,500	5570
Wilder Street South of Middlesex Street	2008	NMCOG	5,500	5515
University Avenue @ Dracut Town Line	2002	CoL	5,400	5461
Arcand Drive East/South of Father Morrisette Boulevard	2002	MassDOT	5,100	5157
Old Ferry Road @ Varnum Avenue	1999	NMCOG	4,900	4976
Technology Drive West of Westford Street	2010	NMCOG	4,900	4900
Clark Road @ Tewksbury Town Line	2009	NMCOG	4,800	4807
Swan Street West of Boston Road	2008	NMCOG	4,700	4713
Stevens Street North of Princeton Boulevard	2010	NMCOG	4,600	4600
Lewis Street (one way) North of Broadway Street	2006	MassDOT	4,500	4525
Clark Road South of Route 133 (Andover Street)	2010	NMCOG	4,500	4500
Merrimack Street East of Pawtucket Street	2009	NMCOG	4,400	4406
Thorndike Street NB Ramp South of Lord Overpass	2007	FPA	4,331	4349
Sixth Street East of Route 38 (Bridge Street)	2008	NMCOG	4,200	4212
SB Ramp From Lord Overpass to Thorndike Street Southbound	2007	FPA	4,114	4131
Essex Street North of Aiken Street	2002	CoL	3,900	3944
Rock Street East of Mount Vernon Street	2008	NMCOG	3,900	3911
Pine Street South of Route 3A (Westford Street)	2002	CoL	3,800	3843
Spencer Street West of Route 3A (Gorham Street)	2010	NMCOG	3,800	3800

Cabot Street North of Father Morrisette Boulevard	2010	NMCOG	3,400	3400
Hale Street West of Route 3A (Thorndike Street)	2000	NMCOG	3,200	3245
Varnum Avenue @ Tyngsborough Town Line	2008	NMCOG	3,200	3209
Walker Street South of Broadway	2009	NMCOG	3,200	3204
Meadowcroft Street South of Moore Street	2006	MassDOT	3,100	3117
Palmer Street South of Middle Street	2002	MassDOT	2,700	2730
Douglas Road North of Route 38 (Rogers Street)	2009	NMCOG	2,300	2303
Lexington Avenue North of Route 113 (Pawtucket Boulevard)	1999	NMCOG	2,200	2234
Tanner Street North of Lincoln Street	2001	NMCOG	2,200	2228
Dunbar Avenue @ Varnum Avenue	1999	MassDOT	2,100	2133
Lincoln Street West of Autumn Street	2003	NMCOG	2,100	2121
Dunbar Avenue South of Varnum Avenue	1999	NMCOG	2,000	2031
Beacon Street North of 11th Street	2002	CoL	2,000	2023
Suffolk Street (One Way) North of Broadway Street	2006	MassDOT	2,000	2011
Methuen Street @ Dracut Town Line	2010	NMCOG	2,000	2000
Warren Street 400 Feet East of Central Street	2005	CoL	1,900	1913
Douglas Road South of Route 133 (Andover Street)	2002	CoL	1,700	1719
Suffolk Street South of Broadway Street	2006	MassDOT	1,700	1710
Jackson Street West of Central Street	2007	FPA	1,613	1620
Carlisle Street S(W) of Route 3A (Gorham Street)	2010	NMCOG	1,500	1500
Clark Road North of Village Street	2001	NMCOG	1,400	1418
Hampshire Street North of West 6th Street	2002	CoL	1,400	1416
Elliott Street South of Middlesex Street	2004	CoL	1,344	1355
Mansur Street East of Route 38 (Nesmith Street)	2001	NMCOG	1,300	1316
Beacon Street North of 6th Street	2009	NMCOG	1,300	1302
King Street North of Middlesex Street	2007	FPA	1,185	1190
Lexington Avenue South of Varnum Avenue	1999	NMCOG	1,100	1117
Billerica Street South of Lawrence Street	2006	NMCOG	1,100	1106
Lincoln Street West of Route 3A (Gorham Street)	2009	NMCOG	1,100	1102
Townsend Street Between Pawtucket Boulevard & Varnum Avenue	1999	NMCOG	1,000	1016
Fleming Street West of Stevens Street	2010	NMCOG	940	940
Jewett Street North of West 6th Street	2002	CoL	910	920
Fairmont Street North of Whitman Street	2005	CoL	830	836
Freda Lane @ Varnum Avenue	2002	CoL	810	819
Gates Street South of Route 3A (Westford Street)	2004	CoL	750	756

Dunbar Avenue North of Route 113 (Pawtucket Boulevard)	2003	NMCOG	710	717
Third Street West of Vernon Street	2009	NMCOG	630	631
North Street West of Lawrence Street	2004	CoL	600	605
Jefferson Street over Western Canal	2006	MassDOT	530	533
Morton Street between Epping & Stratham Streets	2002	MassDOT	520	526
Western Avenue West of Fletcher Street	2001	MassDOT	480	486
Trotting Park Road @ Varnum Avenue	2002	CoL	460	465
Magnolia Avenue North of Route 113 (Pawtucket Boulevard)	2000	NMCOG	400	406
Merril Street East of Lawrence Street	2004	CoL	260	262
Birch Street East of Fairmont Street	2004	CoL	130	131

*0.14 percent annual growth used for adjustment (calculated by NMCOG for period 2001-2009).

5.3 CAPACITY OF STREETS

The capacity of a street is a measured by how many vehicles per hour can be accommodated in a segment without significant delays. Capacity is a function of the number and width of lanes, presence of proper breakdown lanes on highways, and a comfortable street width for safe travel on an urban arterial. Geometric characteristics of the streets help to decrease the level of service. In Lowell the majority of the major streets fall into the 40 to 50 foot right-of-way width category with parking on one or both sides of the streets.

Capacity of Lowell's major streets varies between 1300 and 8800 vehicles/hour. These figures assume an even traffic distribution for each direction of travel, level of service "E" or better for speeds less than 45 mph, a width factor between 0.90 to 1 due to narrow lanes, and a commercial vehicles factor of 0.95 which assumes a typical volume of commercial vehicles.

The concept of level of service (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with LOS A representing the operating conditions with the highest level of mobility, exhibiting free flowing traffic and no delays, and LOS F indicating frequent traffic delay and excess capacity. Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

The volume to capacity (V/C) ratio gives an idea of traffic congestion, with V being the hourly traffic volume and C the street capacity. An enclosed table indicates the V/C ratios for Lowell's major streets. The main traffic corridors have a V/C ratio close to or greater than one (1.00). This ratio indicates that existing traffic volumes approach or exceed the street capacity. Where peak hour counts are not available, the conservative assumption was made that the peak hour volume is equal to ten percent of the daily total volume. It is noteworthy that three of the reported street segments are beyond capacity according to the V/C analysis; however, it is important to consider that traffic mobility is also affected by traffic signal timing, and the number of intersections or access points (commercial or residential driveways) along a street segment.

Table 5.3.1: Traffic Volume to Capacity Analysis

Street	Segment Analyzed	Pavement width (ft)	Traffic Lanes Width (ft)	Shoulder (ft)	I. C.	Fd	Fw	Fhv	R. C.	2002 ADT	2010 ADT	VPH	2002 V/C	2010 V/C	
Thorndike st (Rt 3A)	Gallager sq/Lord Overpass	70	64	6	3800	1	1	0.9	3420	21540	45454	4545	0.63	1.33	
School st	at O' Donnell Bridge	50	48	2	3800	1	0.93	0.95	3357	29500	34383	3438	0.88	1.02	
Dutton st	**North of Lord Overpass**	50	48	2	3800	1	0.93	0.9	3181	14580	32399	3240	0.46	1.02	
Wood st	Entrance to Rourke Bridge	26	26	0	3800	1	0.8	0.95	2888	35609	25383	2226	1.23	0.77	*
Bridge st	**Hampshire** st/Dracut limit	44	38	6	3800	1	0.95	0.9	3249	19121	24068	2407	0.59	0.74	
Bridge st (Rt 38)	**South of W. Third St.**	46	30	4	3800	1	1	0.9	3420	29810	24703	2470	0.87	0.72	
Stevens st	**Upham St**/Chelmsford st	29	28	1	2120	1	0.9	0.95	1813	15500	15609	1145	0.65	0.63	**
Church st (Rt 110)	**West of High St.**	36	30	6	3800	1	1	0.9	3420	24888	19500	1950	0.73	0.57	
Pawtucket st	**South of Fletcher St.**	46	34	2	3800	0.9	0.9	0.85	2616	10950	14562	1456	0.42	0.56	
Andover st	Clark st/City limit	42	36	6	3800	1	1	0.9	3420	18462	18926	1893	0.54	0.55	
French st	**East of Kirk St.**	48	44	4	2120	1	1	0.9	1908	9128	10500	1050	0.48	0.55	
Mammoth rd	VFW hway/Fourth st	36	34	2	3800	1	0.93	0.95	3357	27798	18152	1815	0.83	0.54	
Gorham st (Rt 3A)	**North of Moore St.**	32	30	2	3800	1	0.93	0.9	3181	27379	16469	1647	0.86	0.52	
Lakeview ave	South of Farmland	32	30	2	3800	1	0.93	0.95	3357	16120	16864	1686	0.48	0.50	
Wood st	Princeton Blvd/Middlesex st	26	26	0	3800	1	0.88	0.95	3177	24762	16423	1518	0.78	0.48	*
Aiken st	**South of Hall St.**	36	28	2	2120	1	1	0.95	2014	11142	9339	934	0.55	0.46	
Fletcher st	**North of Thorndike/Dutton**	36	33	3	3800	1	0.95	0.95	3430	15027	15844	1584	0.44	0.46	
Chelmsford st	Stevens st/Chelmsford border	45	33	6	3800	1	1	1	3800	21328	20789	1730	0.56	0.46	**
Appleton st	**East of Lord Overpass**	44	36	8	3800	1	1	0.9	3420	16184	14024	1402	0.47	0.41	
Merrimack st	**East of John St.**	32	30	2	3800	1	0.93	0.95	3357	15847	13600	1360	0.47	0.41	
Middlesex st	School st/Saunders st	34	28	6	2120	1	1	0.95	2014	8109	N/A	811	0.4	0.40	
University ave (Bridge)	South of VFW Hway	38	36	2	3800	1	0.93	0.9	3181	23318	15966	1268	0.73	0.40	†

Stevens st	Westford st/Parker st	29	28	1	2120	1	0.9	0.95	1813	9680	N/A	714	0.53	0.39	**
Central st	South of Jackson St.	44	36	2	3800	1	0.93	0.9	3181	22917	11900	1190	0.72	0.37	
Industrial ave	East of Lowe's Way	40	36	4	3800	1	0.97	0.9	3317	15300	15386	1215	0.48	0.37	**
Westford st	School st /Chelmsford st	36	30	6	3800	1	1	0.9	3420	12275	N/A	1228	0.36	0.36	
Chelmsford st	North of Albert Street	36	32	4	3800	1	1	0.9	3420	11800	11883	1107	0.46	0.32	††
Pawtucket st	West of Wilder St	29	26	3	3800	0.9	0.9	0.85	2616	9725	7900	790	0.37	0.30	
Varnum ave	West of Rt. 113	32	28	4	3800	1	1	0.95	3610	10020	10900	1090	0.28	0.30	
Broadway	West of Dutton Street	30	28	2	3800	1	0.93	0.9	3181	10016	9600	960	0.31	0.30	
VFW Highway	West of Mammoth Rd	68	56	12	8800	1	1	1	8800	32806	24970	2497	0.37	0.28	
Market	West of Prescott/Central	30	28	2	3800	1	0.93	0.95	3357	13633	9200	920	0.41	0.27	
School st	South of Broadway	36	28	8	3800	1	1	0.95	3610	12026	9727	973	0.33	0.27	
Steadman st	at Chelmsford Town line	30	28	2	3800	1	0.93	0.95	3357	6913	8712	871	0.21	0.26	
Branch st	East of School Street	30	28	2	3800	1	0.93	0.9	3181	10353	8045	804	0.33	0.25	
Parker st	East of Stevens	28	24	4	2120	1	0.97	0.97	1995	8366	5600	504	0.42	0.25	**
Wilder st	South of Pawtucket St	30	26	4	3800	1	0.97	0.95	3502	6686	8022	802	0.19	0.23	
Middlesex st	East of South St	39	30	3	3800	1	0.95	0.95	3430	8065	7718	772	0.24	0.23	
Middlesex st	West of Garent st	39	28	5	3800	1	1	0.9	3420	10779	7621	762	0.32	0.22	
VFW Highway	east of University Ave	32	26	6	8800	1	0.92	1	8096	26411	17975	1798	0.33	0.22	
VFW Highway	West of Bridge St	65	48	17	8800	1	1	1	8800	25654	19427	1943	0.29	0.22	
Old Ferry rd	North of Rt. 113	36	28	8	3800	1	1	1	3800	8115	7922	786	0.21	0.21	‡
West sixth st	West of Hampshire St.	28	26	2	3800	1	0.93	0.95	3357	5652	6573	657	0.17	0.20	
Stevens st	North of 3A (Westford St)	29	26	3	3800	1	0.95	0.95	3430	8281	6217	622	0.24	0.18	
School st	South of Pawtucket St	36	28	2	3800	1	0.93	0.95	3357	9403	5833	583	0.28	0.17	
Walker st	South of Broadway	30	26	4	2120	1	0.97	0.95	1954	3779	3204	320	0.19	0.16	
VFW Highway	west of university ave	30	26	6	8800	1	0.92	1	8096	18253	14199	1058	0.23	0.13	†
Adam st	Broadway st/Cross st	28	26	2	2120	1	0.93	0.95	1873	2054	N/A	205	0.11	0.11	

I. D.: Ideal capacity in vehicls per hour

Fd: Traffic distribution factor

Fw: Lane width factor

Fhv: Heavy Vehicle Factor

R. C.: Real capacity in vehicles per hour

ADT: Average daily traffic

VPH: Assumed traffic volume in vehicles per hour

V/C: Volume to capacity ratio

*VPH by Vanasse & Associates 2010

**VPH by VHB 2006

†VPH by BETA Group, Inc. 2006

††VPH by GPI 2007

‡VPH by Vanasse & Associates 2009

5.4 TRAFFIC CONTROL SYSTEMS

Within the city limits of Lowell there are 97 traffic signals, of which 18 are owned and maintained by the Massachusetts Department of Transportation (MassDOT). The remaining 79 signals are owned and operated by the City of Lowell. The majority of the city's signals are outdated and lack the capability of providing coordination. Lack of coordination between the lights along a traffic corridor, or traffic signal timing adjustments for peak hours, inhibit smooth traffic flow. Vehicular detection systems are needed at most intersections.

Level of service (LOS) is a term used to describe the quality of traffic flow on a roadway or intersection for a particular point in time. The concept of LOS is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists. An LOS definition provides an index to measure traffic mobility in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. Since LOS is a measure of vehicular mobility, activities often implemented to improve LOS may reduce multi-modal capacity of the street, potentially reducing access, comfort and safety for pedestrians and bicyclists.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with LOS A representing the best operating conditions and LOS F the worst. Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year. A description of the operating condition under each level of service is provided below:

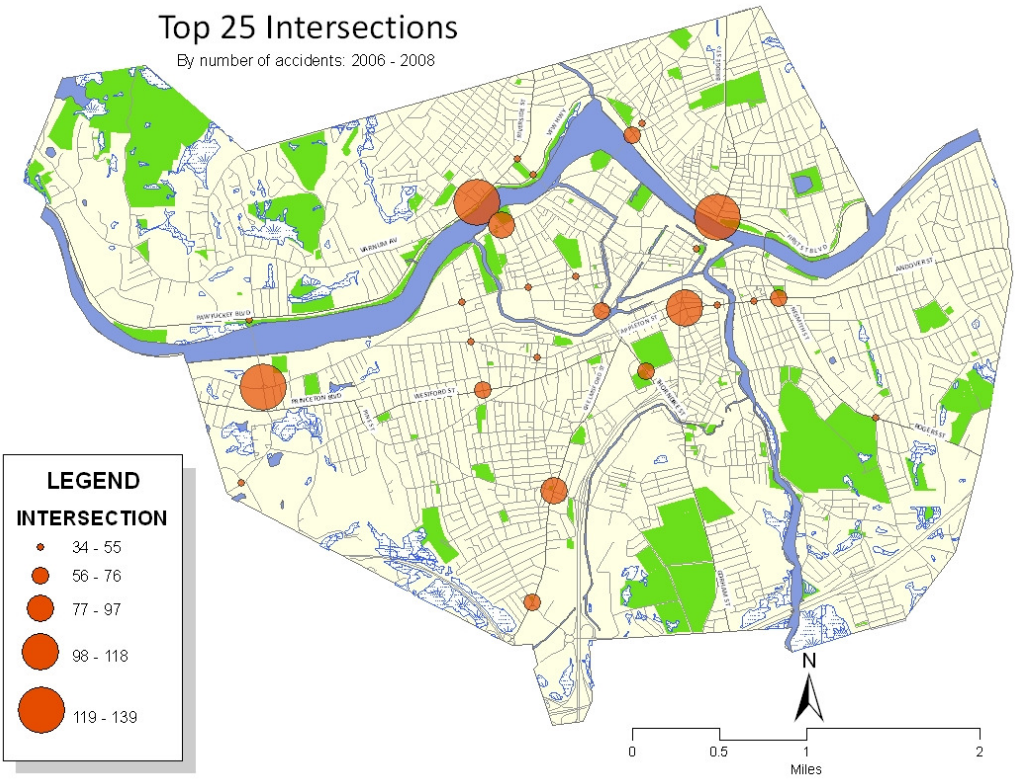
- LOS A describes conditions with little to no delay to motorists.
- LOS B represents a desirable level with relatively low delay to motorists.
- LOS C describes conditions with average delays to motorists.
- LOS D describes operations where the influence of congestion becomes more noticeable. Delays are still within an acceptable range.
- LOS E represents operating conditions with high delay values. This level is considered by many agencies to be the limit of acceptable delay.
- LOS F is considered to be unacceptable to most drivers, with high delay values that often occur when arrival flow rates exceed the capacity of the intersection.

A traffic study conducted in 2007 for the redevelopment of the Hamilton Canal District analyzed the operations of 22 signalized and 12 un-signalized intersections in the downtown area. The results of the traffic study indicated that 10 of the 34 intersections in the downtown area were operating at LOS E or F during one or more of the peak hours. The majority of the intersections were operating at LOS D or better during all peak hours. With the intersection and roadway improvements proposed as part of the project, only one signalized intersection will operate at LOS E or F by the year 2017.

Outside of the downtown area, critical signalized intersections are located along either side of the Merrimack River crossings, and on School Street at the intersections with

Middlesex Street and Branch Street. Lack of designated lanes or green arrows for left-turn movements increases the waiting time at many intersections and increases traffic congestion.

5.5 ACCIDENTS AND SAFETY



The overall yearly number of accidents in Lowell has decreased in recent years, from a high of 4,247 in 2001 to 3,494 in 2010. Accidents are caused by any combination of the following:

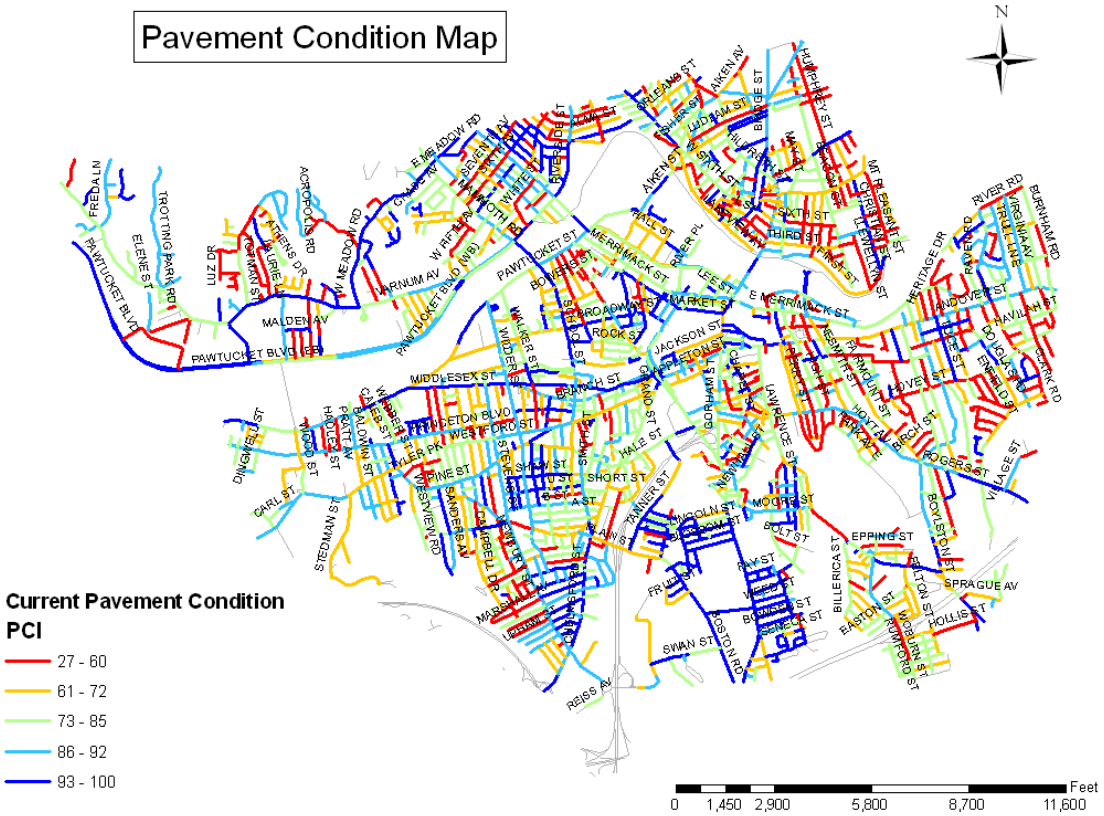
- traffic congestion
- high traffic volumes exceeding the capacity of the street system
- unsafe left turn movements
- unexpected pedestrian crossing streets in non designated area
- uncertainty of the right-of-way in some intersections
- lack of driver education
- careless driving
- alcohol

The following are the top accident locations in the city based on data compiled by MassDOT from 2006 to 2008. It is a weighted basis, using crash severity to determine overall ranking. Their ranking among the top crash locations in the state is also provided.

Intersection	State Rank
1. Mammoth Road at School Street, Varnum Avenue and Riverside St	2
2. Middlesex Street at Wood Street	4
3. Bridge Street at VFW Highway and Lakeview Avenue	6
4. Church Street at Appleton Street	10
5. Thorndike Street at Highland Street	65
6. Plain Street at Chelmsford Street	75
7. VFW Highway at Aiken Street	78
8. School Street at Pawtucket Street	95
9. School Street at Branch Street	122
10. Central Street at Warren Street	139
11. Chelmsford Street at Industrial Avenue	139
12. Westford Street at Wilder Street	163
13. Broadway Street at School Street	185
14. University Avenue at Riverside Street	199

MassDOT has also compiled a list of the top locations for pedestrian accidents in the state. The downtown area, bordered by French Street and Market Street, Kirk Street and Bridge Street, ranks number 3 on the state's top pedestrian accident locations.

5.6 PAVEMENT & SIDEWALK CONDITION



*This section is taken from a report prepared by VHB for the City of Lowell completed in 1999, updated April 2009.

Current estimates show that Lowell has approximately 232.9 miles of public roads. The City accepted mileage is comprised of 226.4 miles of hot mix asphalt (bituminous concrete) surfaces, 3.0 miles of surface treated roadways, 1.6 miles of cement concrete, 1.3 miles of cobblestone base and surfaced roadways, 0.4 miles of composite surfaces, and 0.2 miles of gravel roadways.

VHB determined that the average Pavement Condition Index (PCI) for the City-accepted road network in the Spring of 2009 was 74, placing Lowell's typical road conditions in the middle of the Preventive Maintenance treatment band (PCI range from 73 to 85). This average PCI value generally represents a road in fair condition that is or would soon be in need of resurfacing.

Within Lowell's public roadways VHB inventoried 232.5 sidewalk miles. The mileage is compromised of 174.0 miles of hot mix asphalt (bituminous concrete) sidewalks, 57.7 miles cement concrete sidewalks. VHB also inventoried 2,228 pedestrian ramps.

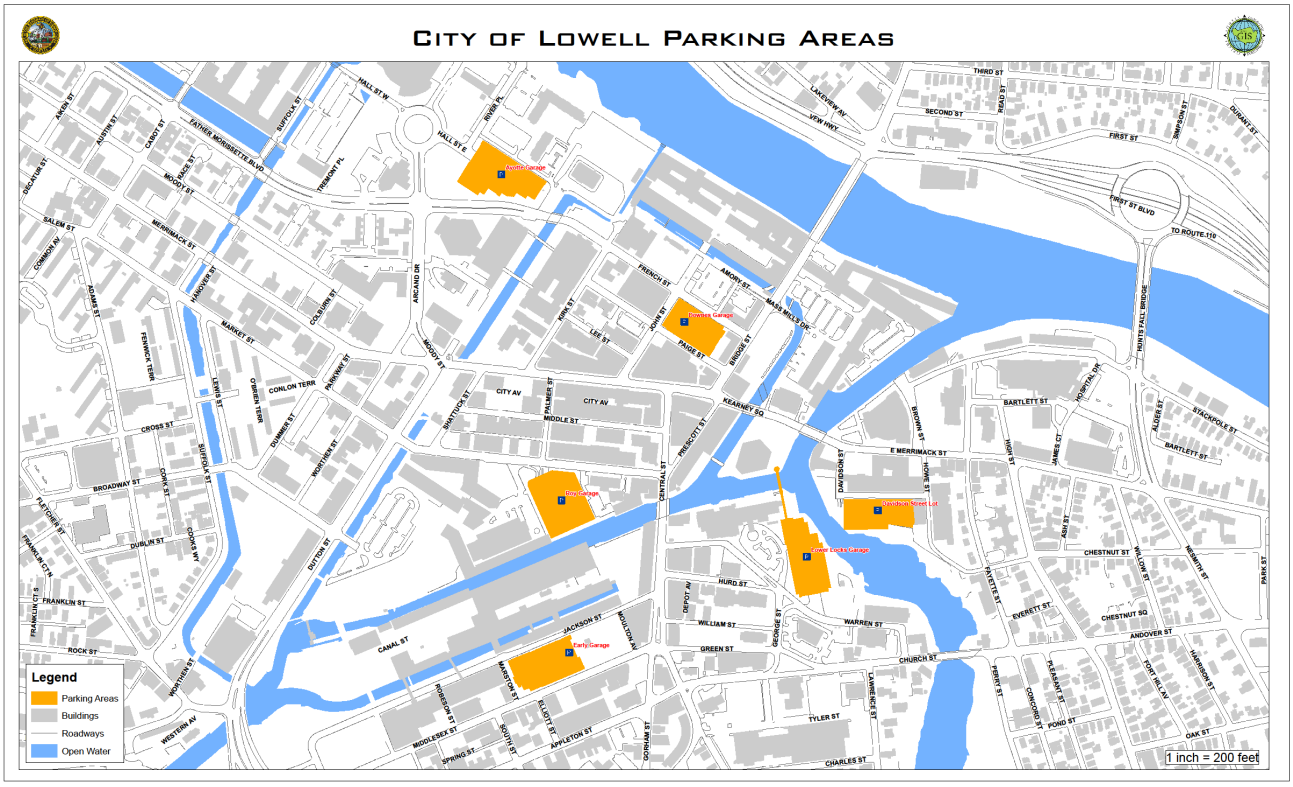
An average road condition in the Preventive Maintenance repair band definition means that considerable resources will be needed to sustain network-wide road conditions. It is likely that while any proposed pavement management spending plan will strive to maximize the benefit of each dollar spent, without a preemptive strike the system will undoubtedly continue to lose roads from the preventive maintenance category into the structural improvements and base rehabilitation bands. This very costly loss will present a challenge to Lowell officials if the City wants to retain its roads in good condition.

Distribution of Roadway Conditions
A 2009 categorization of the surveyed roadway segments show that 17 percent (39.6 miles) of the roadway fall into the "Do Nothing" band; 21 percent (49.8 miles) of the roads are in the "Routine Maintenance" band; 22 percent (51.6 miles) of the roads are in need of "Preventive Maintenance"; 18 percent (40.7 miles) of the roadway segments are in need of "Structural Improvement"; and 22 percent (51.2 miles) of the roadway segments are in need of "Base Rehabilitation". This indicates that these roadways are at a critical point in time where immediate attention is needed.

Current Roadway Backlog
Backlog is defined as the cost of bringing all roads up to near perfect condition within one year. The backlog not only represents how far behind the Lowell roadway network is in terms of its present physical condition, but it also measures the road repair costs to achieve varying PCI ranges. Current year backlog cost estimates offer a basis for comparison to future and/or past year's backlogs. Backlog is a relative measure of outstanding repair work and is not used as the basis for determining alternative scenario options. Rather, the City's goals for short and long term budgeting strategies.

As of Spring 2009, Lowell's backlog of pavement surface repair work totaled approximately $44,700,000. This cost estimate consists of $31,000,000 in road reconstruction/base rehabilitation (69 percent of total backlog); $6,400,000 for structural improvement work (14 percent of total backlog); $6,600,000 in preventive maintenance (15 percent of the total backlog). The base rehabilitation category adds up to the most significant repair dollars even though it accounts for only 51 road miles.

5.7 DOWNTOWN PARKING ANALYSIS



The City of Lowell Parking Department currently manages approximately 5,466 off-street public parking spaces in Downtown, distributed among five parking structures and one surface lot owned by the City. The City's deliberate and successful use of the parking structures to support the redevelopment of Downtown Lowell over the past 10-15 years has led to a self-sufficient parking system whereby revenues match or exceed operation and maintenance costs to the system. The success of this program is highlighted by the City's ability to construct the $22 million, 900-space Edward Early Jr. Garage (completed in 2009) on Middlesex Street, funded entirely by city bonds paid for by the Parking Department revenues. This parking structure will support the redevelopment of the JAM Plan and a portion of the Hamilton Canal District.

Table 5.7.1 Parking Garage/Lots in Downtown		
Parking Garage/Lot	**Location**	**Spaces**
Davidson Street Lot	Davidson Street	200
Ayotte Garage	11 Post Office Square	1,250
Leo Roy Garage	100 Market Street	1,012
Lower Locks Garage	90 Warren Street	963
Joseph Downes Garage	75 John Street	1,141
Edward Early Jr. Garage	135 Middlesex Street	900
	TOTAL:	**5,466**

In addition to public parking lots in Downtown, there are approximately 2,823 off-street privately-owned parking spaces, and an estimated 610 metered on-street spaces.

Lowell's municipal parking garage rates are comparable to other cities of similar size:

Table 5.7.2 Parking Structure Pricing in New England Cities			
City/ Town	**Hourly Rate**	**Per day (8hr)**	**Monthly Pass**
Lowell, MA	$1.00	$8.00	$64.00*
Springfield, MA	$1.50	$12.00	$80.00-$95.00
Providence, RI	$1.00	$8.00 - $20.00	$100.00 - $175.00
Manchester, NH	$0.75	$7.50	$75.00

* Lowell's Monthly Pass rates vary depending on type of user.

- Individual - $64
- Elderly/Disabled - $26
- Resident - $48
- Business - $52

In recent years, on-street parking enforcement has increased throughout Downtown. The City's Parking Department recently invested in a new on-street parking kiosk system, allowing for more accurate calculations of parking demand and more efficient enforcement of on-street parking rules. A visual survey of Downtown reveals that this system has resulted in more short-term (up to 2 hours) parking space availability on street during the day for use by short-term visitors and patrons of Downtown shops and restaurants. Enforcement is conducted from 8am to 6pm, when Downtown on-street parking becomes free to all users. On several nights during the week between 6pm and midnight Downtown on-street spaces fill to near capacity, displaying the high demand for parking as people frequent the shops and restaurants of the neighborhood and/or residents choose to park on the street rather than in the garage structures.

Over 600 metered spaces promote short-term use (up to 2-hours) for customers, clients and visitors of Downtown. The table below displays the capacity of on-street parking by street.

Table 5.7.3
Downtown On-Street Parking Capacity

Street	On-Street Parking Spaces
Merrimack Street	112
Market Street	41
Middle Street	43
Palmer Street	11
Fayette Street	19
Bartlett Street	4
Middlesex Street	42
Jackson Street	5
Appleton Street	22
Gorham Street	11
Gorham Street Lot	28
Elliot Street	11
Dummer Street	14
Dummer Street Lot	45
Paige Street	12
Central Street	29
John Street	11
French Street	0
Arcand Drive	25
Worthen Street	3
Shattuck Street	10
Church Street	6
Hurd Street	22
East Merrimack Street	39
Warren Street	19
Lee Street	15
Cardinal O'Connor	11
Total On-Street Parking	**610**

A number of private surface lots are also available in the Downtown area. Totaling approximately 2,800 additional parking spaces, these lots fill a portion of the need generated by the Downtown office and residential market.

Table 5.7.4 Downtown Private Off-Street Parking Capacity	
Location	**Spaces**
Canal Place Parking (Market Place)	58
Mass Mills Parking Lot (Bridge St)	360
Boott Mills Parking Lot (French St.)	120
Wannalancit Mills Parking Lot (Suffolk St)	296
Lowell Five Parking Lot (Paige St)	25
Lowell Five Parking Lot (French St)	96
Post Office Parking Lot (Arcand Drive)	98
River Place Towers Parking Lot (French St.)	320
Enterprise Bank Parking Lot (Merrimack/ Middle St.)	112
Arcand Drive Professional Bld. Parking Lot (Arcand Drive)	62
148 Central Street lot	35
Lowell Co-Operative Bank Parking Lot (Hurd St.)	26
Gateway Center Parking (I & II)	98
Baghaw Mills Parking (Warren St)	16
NPS Visitor Center Parking Lot (Dutton St.)	135
27 Bridge Street (behind Atlas Sports)	50
Athenian Corner (Market St.)	11
Worthen House	40
Masonic Center (Arcand Drive)	38
53 John Street lot	12
Washington Savings Bank (Gorham Street)	28
Loft 27 (27 Jackson Street lots)	202
Jeane D'Arc (Father Morissette)	158
UML Inn & Conf Center (surface lot)	60
CTI – Lee Street (off Kirk)	24
32 Bridge Street lot	20
55 Brooking Street (off Bridge)	25
Cobblestones lot	15
129/149 Market Street lot	30
New Lowell Association (45 Central)	15
40 Market Street lot	20
Lowell District Court (27 Hurd Street)	90
21 George Street/30 Green Street lot	90
Middlesex Community College lot	38
Total Off- Street Privately Owned Parking Spaces	**2,823**

Table 5.7.5 Downtown Total Off-Street Parking Capacity	
Location	**Spaces Provided**
Off- Street Parking - Public	5,466
Off-Street Parking - Private	2,823
On-Street Parking	610
Total Parking Spaces Available:	**8,899**

DOWNTOWN LOWELL PARKING DEMAND

Calculating parking demand in Downtown Lowell is difficult. As with most downtowns, Lowell's commercial center is characterized by a mix of retail store fronts, upper floor commercial and/or residential space, and a mix of uses and users. Further, Downtown Lowell is blessed to be serviced by adequate bus and transit services, making calculating parking demand challenging as users have multiple options to enter and exit downtown.

Compounding this challenge is the reality that one of the most commonly used parking demand estimate guidelines is the *Parking Generation Handbook* issued by the Institute of Transportation Engineers in the (ITE), which is based solely on observations of peak demand for parking at single-use developments in relatively low-density suburban settings. Such places differ greatly from a downtown setting like Lowell's, whereby the compact mix of uses throughout the 24-hour day provides users the ability to share parking resources and utilize multiple transit options to reach a final destination.

Since 2000, the City has made a concerted effort to encourage residential development in and around Downtown, thus increasing the demand for residential parking. Over the past 10 years, the City has supported the mixed-use redevelopment of many formerly vacant historic buildings in Downtown (including over 80% of previously vacant, existing mill space). This has resulted in the construction of an estimated 2,202 new market rate housing units. Further, the Downtown population increased by over one third according to the recent 2010 Census figures, from 3,881 in 2000 to 5,267 in 2010 (Census Tract 3101.00). An estimated 2,858 housing units are located in Downtown according to the 2010 Census.

Interestingly, even with the significant increase in Downtown Lowell's population, the demand for parking is still well below supply. As noted in the *Downtown Lowell Evolution Plan,* completed by Jeff Speck in 2010, the City's five municipal parking structures hold significant unused capacity. All are mostly empty at night, and "cumulatively the lots peak at under 70% occupancy on a typical day" (Speck, pg. 78). The Downes Garage on Market Street is one of the City's most heavily used garages during the day time, with peak usage of approximately 85% during typical mid-day hours. Fortunately, as noted by Speck, the parking structures are in close proximity to each other and the City's Parking Department is able to move the demand for garage

spaces among the five facilities to generate capacity when new development demands space.

Much of Lowell's Downtown neighborhood is located within the Downtown Mixed Use (DMU) zoning district. As noted in the Lowell Zoning Ordinance, Section 6.1, the DMU district simply requires one parking space per dwelling unit for all residential projects, and "all non-residential uses in the DMU district…are exempt from listed parking requirements if a publicly-owned off-street parking facility is located within one thousand five hundred (1,500) feet of an entrance to the site" (pg. 47, as amended through November 16, 2010). This essentially includes all of Downtown Lowell.

Since Lowell's Zoning Ordinance places little to no parking requirements for projects within the Downtown neighborhood, calculating demand must be measured by other methods. One such method is by calculating total square footage of building space and use within the Downtown (such as residential, commercial, retail, etc) and estimating parking demand based on industry standards. As noted above, however, industry standards such as the ITE handbook are largely based on suburban parking figures. Therefore, it is the suggestion of the author of this report that a more in-depth study of the parking demands in Downtown Lowell be undertaken to accurately calculate the parking usage figures by type of use.

In an effort to calculate usage at this time, the following tables display estimates based on current data on the use and size of building space in Downtown, utilizing ITE handbook estimates.

Table 5.7.6
Parking Demand Standards

Land Use	Standard	Required Parking Spaces (DMU Zoning)	ITE Estimate
Residential	Dwelling Unit	1	1.11
Commercial/Retail	1,000 SF	NA	3.23

Table 5.7.7
Downtown Core Residential Parking Demand

Number of Dwelling Units in Downtown (2010 Census)	Spaces required by Zoning	Spaces Required by ITE Standard
2,858	2,858	3,172

Table 5.7.8 Downtown Commercial bld. with >20,000 S.F. of available office space			
Address	**Total S.F.**	**Available S.F.**	**Est. Demand at 0% Vacancy**
130 John St (Boot Mills West)	110,000	75,479	355
26 Jackson St (Adden Bld)	150,000	150,000	485
110 Canal St (Freudenberg)	60,000	60,000	194
24 Merrimack St	66,764	66,764	216
17 Kearney Square (Former Lowell Sun)	62,500	62,500	202
166 Central St (Central Bank Bld)	46,786	46,786	151
116 John St (Boot Mills South)	90,439	27,671	292
165 Merrimack St (Bon Marche)	125,000	25,000	404
TOTAL:	**711,489**	**514,200**	**2,299**

Data Source: DPD/Economic Development Office

Table 5.7.9 Downtown Retail Space Estimated Demand			
	Total S.F.	**Number of Store Fronts**	**Estimated Parking Demand**
Total Retail Space	533,663	145	1,724
Vacant Retail Space	37,356	Est. 10 (7% of total SF)	121
Utilized Retail Space	496,277	Est. 135 (93$ of total SF)	1,603

Data Source: DPD/Economic Development Office

Lowell's public-parking facilities are also heavily used by the educational institutions located Downtown. Students, faculty and staff from Middlesex Community College, UMass Lowell (ICC), and Lowell High School use well over 3,000 (est. 3,500) public spaces on a daily basis.

Utilizing the ITE standard, which can be assumed to over estimate the parking demand needed to support the residential, commercial, and retail figures, the following table seeks to provide an estimated parking space demand for Downtown, assuming 0% vacancy rates in all existing commercial and retail space. Furthermore, day-time demand must also be separated from night-time demand, as all users utilize spaces at differing times during the day. Therefore, the following table also calculates day-time versus night-time demand to more accurately calculate peak parking demand for Downtown.

Table 5.7.10 Downtown Total Estimated Parking Demand			
Type of Use	**Est. Total Demand (spaces)**	**Day-time Demand**	**Night-time Demand**
Residential	3,172	318 (10% total)	3,172
Commercial	2,299	2,299	230 (10% total)
Retail	1,724	1,724	172 (10% total)
Institutional	3,500	3,500	0
Total:	**10,695**	**7,841**	**3,574**

Parking capacity versus parking demand for existing land uses in Downtown during day-time hours assuming 0% vacancy in 2011:

total spaces available – estimated day-time demand

8,899 – 7,841 = +1,058 or approx 12% vacancy

The vacancy rate determined in the Downtown Plan 2007, using the same formula, was:

7,748 – 8,219 = - 471 or approx -6% vacancy

5.8 TRAFFIC PATTERNS

Travel patterns for the City of Lowell vary depending on the time of day and types of vehicles involved. Resident traffic, commuting traffic, deliveries, local business traffic, and services and utilities traffic present their own distinct travel patterns. During AM and PM peak hours, the traffic congestion from resident and non-resident commuters significantly delays the travel time between districts in the city. Cut-through traffic on side streets is common, leading to an increasing number of accidents, further delays, and reduced visibility on sharp corners.

5.9 COMMUTE TO WORK

Over the past decade, an increasing percentage of Lowell residents have used personal vehicles when commuting to work. The percentage of those carpooling, using public transportation, or walking has also decreased.

Table 5.9.1: Journey to Work (2000 and 2010)				
	Number in 2000	**% in 2000**	**Number in 2010**	**% in 2010**
Car, truck or van -- drove alone	33,905	72.58%	39,987	79.30%
Car, truck or van -- carpooled	7,020	15.03%	5,748	11.40%
Public transportation	1,415	3.03%	1,261	2.50%
Walked	2,391	5.12%	1,967	3.90%
Other means	1,413	3.02%	555	1.10%
Worked at home	570	1.22%	908	1.80%
Total Workers	**46,714**	**100.00%**	**50,426**	**100.00%**

Source: 2000 Census and 2010 American Community Survey Year 1 Estimates

The mean travel time to work has increased from 24.3 minutes in 2000 to 25.6 minutes in 2010. American Community Survey Year-1 Estimate data was used for the 2010 figures.

5.10 PUBLIC TRANSPORTATION

The Lowell Regional Transit Authority (LRTA) has maintained the same 18 bus routes between 2005 and the present day. While ridership rates have risen on certain routes, the total ridership has decreased slightly from 5,946 in 2005 to 5,933 in 2011. Note that 2005 data is from October and 2011 data is from May.

Table 5.10.1
LRTA Ridership Data 2005 & 2011

	ROUTES	2005 Trip Total	2005 % Total	2011 Trip Total	2011 % Total
1	**Christian Hill**	117	1.97%	198	3.34%
2	**Belvidere**	500	8.41%	517	8.71%
3	**South Lowell**	230	3.87%	267	4.50%
4	**Shaw-Stevens**	421	7.08%	331	5.58%
5	**Westford Street**	551	9.27%	663	11.17%
6	**Broadway / UMASS**	169	2.84%	190	3.20%
7	**Pawtucketville**	658	11.07%	857	14.44%
8	**Centerville**	213	3.58%	186	3.14%
9	**Downtown Circulator**	215	3.62%	208	3.51%
10	**Dracut /Tyngsborough**	148	2.49%	219	3.69%
11	**IRS / Rte 133**	47	0.79%	24	0.40%
12	**Tewksbury / Rte 38**	147	2.47%	254	4.28%
13	**Billerica / Edson**	243	4.09%	292	4.92%
14	**Burlington / Lahey**	220	3.70%	402	6.78%
15	**Chelmsford / Rte 129**	67	1.13%	108	1.82%
16	**Chelmsford /Chelms St**	256	4.31%	280	4.72%
17	**North Chelmsford**	266	4.47%	323	5.44%
18	**Express/Downtown Shuttle**	1,478	24.86%	614	10.35%
	TOTALS	**5,946**	**100.00%**	**5,933**	**100.00%**

As a way to promote LRTA ridership, DPD has recently undertaken a bus shelter study for the city of Lowell. The accompanying map displays LRTA routes, current shelter locations, and proposed locations along inbound and outbound routes. Stops were proposed based on the ridership counts along each route and at each stop, proximity to major city and regional destinations (hospitals, schools, malls, etc), and the existing lack of space for a shelter. An effort was made to accommodate all neighborhoods and routes. Final locations have yet to be modified.

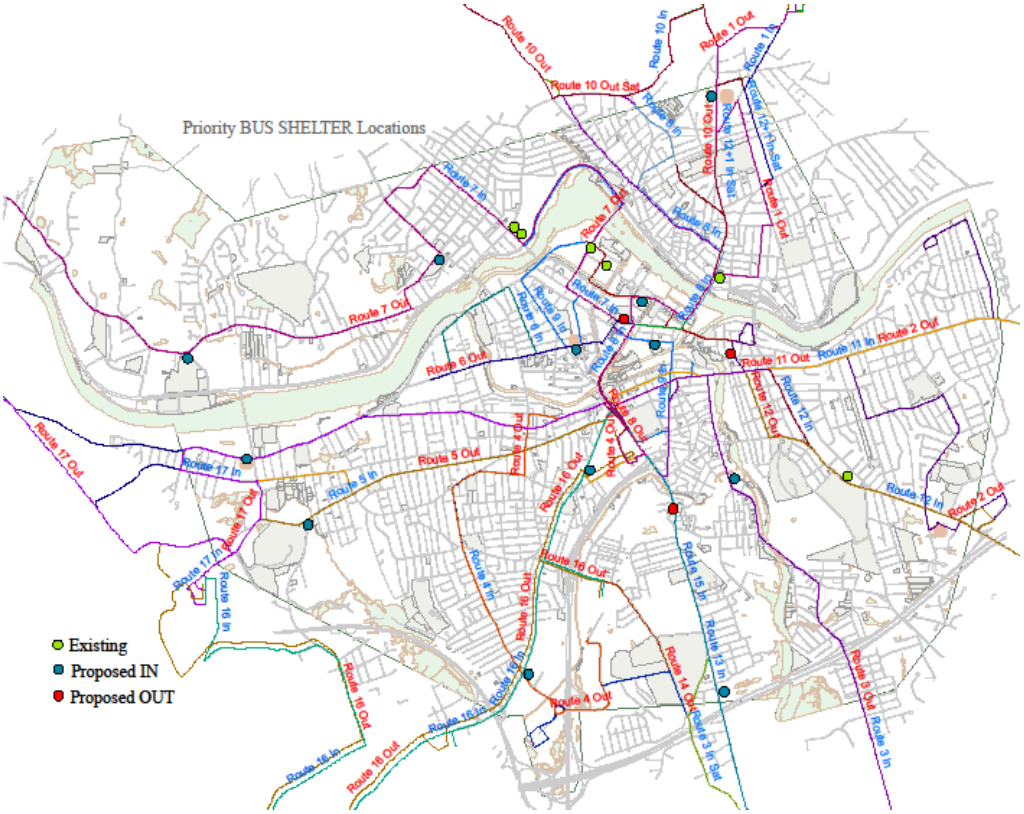


Table 5.10.2: Proposed Bus Shelter Locations	
ROUTE	**Locations**
ROUTE 2 Belvidere (Rt 12 Tewksbury)	○ Roger & High Street, Rogers School IN (2) ○ Senior Housing on High Street *(Easement?)* OUT (2 &12) ○ Andover Street *(wide walks)* IN (2) ○ Shedd Park OUT (2 &12) ○ Cawley Stadium, Douglas Road OUT (2)
ROUTE 3 S. Lowell to N. Billerica T	○ Lawrence St across from Riverside School IN ○ Centennial Island Housing, Lawrence St *(Easement)* IN ○ Court House, Gorham St. OUT ○ Riverside School (Woburn & Juniper) OUT
ROUTE 4 Shaw/Stevens	○ Cross Point IN *(Easement)* ○ St. Margaret's School, Stevens St. (*Easement?)* IN ○ Callery Park, Parker & Wilder OUT ○ Clemente Park OUT
ROUTE 5 Westford (Rt 17 Chelmsford & Rt 18-Pheasant Lane)	○ Westford & Steadman, (*Lowell lot adjacent)* IN (5) ○ Wood & Middlesex, (Mkt Basket lot) IN (17) ○ Tyler Park on Westford, IN (5) ○ Middlesex @ Rourke Bridge (city of Lowell lot) 17 & 18 OUT ○ Middlesex @ Hadley Park (17 & 18) IN ○ Cupples Square public parking lot (5) IN & OUT
ROUTE 6 Broadway; Circulator 9; Shuttle	○ Senior Center IN (*Easement)* (6, 9) IN ○ Market Basket *(Easement)* OUT (6) ○ Roy Garage, Market St IN (9, Shuttle) ○ City Hall on Merrimack (6 & 7) OUT ○ Pawtucket Blvd @ Wannalancitt (City of Lowell parcel) 6 IN ○ Lowell High School on Father Morissette Blvd. (Shuttle) IN

ROUTE 7 Pawtucketville	○ Woodward Ave & Mammouth St, McQuire Playgd. IN ○ Westminster Village, Varnum Ave. (City of Lowell parcel adjacent) IN ○ 930 Varnum Ave. across from D'Youville (*City of Lowell parcel)* IN
ROUTE 8 Centralville (Rt 10-Dracut, Rt 1-Christian Hill)	○ Bridge Street Mall (*Easement*) IN (10) ○ Jewett & 6th, Moultan Sq, *walk in front of store* IN (8) ○ Bridge St @ CVS (*Easement)* RTs 8, 10, & 1- IN ○ Beech St @ vacant school RT1- IN
ROUTE 13 Billerica (Gorham St.)	○ 799 Gorham (Firestation @ Ellsworth St) RTs 13, 15 OUT ○ River's Edge Housing, Gorham St (*Easement)* IN ○ Shannessy School on Gorham IN
ROUTE 14 (Burlington, Lahey)	○ Boston Post Road, City of Lowell Cemetery IN
ROUTE 15 Chelmsford by Carlisle St	○ 68 Carlisle St (*City of Lowell)* IN
ROUTE 16 Chelmsford Street	○ Cross Point by shops *(Easement)* IN ○ Chelmsford & Ave. B LHA (*Easement)* IN ○ Lincoln School Yard 14 & 16 - IN ○ Lincoln Park 14 & 16 - IN

6.0 ECONOMIC DEVELOPMENT

Since 2003, Lowell and the surrounding Merrimack Valley region were greatly impacted by shifts in the nation's economy. The U.S. suffered its most severe economic recession since the Great Depression, sending job and housing markets into turmoil and leading to conservative lending practices and consumer spending behaviors by businesses and individuals. Lowell's unemployment rate reached double digits and its housing market reflected national trends, but the negative news also came with a silver lining. The great strides made by the City in the past 10 years helped to mitigate the severity of the negative economic impact and City of Lowell continues to attract private investment.

Lowell has diversified its economy base from its traditional manufacturing roots to more knowledge-base industries, including technology, health care, education and service sectors. From 2000 to 2008, Lowell also experienced tremendous growth within its Downtown, particularly in the development of new residential housing. The change brought over 3,000 new residents and added over 2,200 new units in buildings that were previously sitting vacant. The new residents brought with them disposable income to support a growing number of downtown restaurants and shops. Over 30 new retailers & restaurants located in Downtown and several high-tech companies took residence at Wannalancit Mills, Boot Mills, and Cross Point Towers. Lowell's "creative economy" also grew substantially within the past ten years due to the concentration of artist work-space at Western Ave. Studios, attracting over 200 artists to this complex. On the commercial side, Lowell experienced an increase in new and renovated class A and B office space, as well as expansion of its regional retail base including the completion of a new Target and Lowe's. Redevelopment opportunities continue to emerge despite this economic downturn, particularly within the successful and nationally acclaimed, Hamilton Canal District (HCD) project, and most recently, the Tanner Street redevelopment initiative.

Lowell is one of the largest "gateway cities" in the Commonwealth and continues to attract immigrants from various parts of the globe with a strong spirit of entrepreneurship. This spirit has become visible throughout our city, from a Cambodian grocery store in the Lower Highlands, to a small Brazilian restaurant in Back Central, to an eclectic African boutique in Centralville.

Lowell's elected officials and city administration have cultivated a business friendly environment in recognition of the need to increase job opportunities for its residents and to grow its tax base to support and expand public services including upgrading aging infrastructure. And its proven track record in leveraging federal, state and local resources is testimony to the city's ability to support commercial development and businesses at different stages of its life cycle, from brownfields remediation to accessing historic and new markets tax credits.

Lastly, Lowell is held up as a model for its strong public-private partnerships. Its ability to increase capacity by working closely with economic development organizations,

educational institutions and other government agencies forms the basis of its successful economic development strategy.

This chapter looks at the recent trends that influence Lowell's economic growth. Changes such as: employment levels, wages, leading industries, major employers, and commercial vacancy rate are among other factors driving Lowell's economy. This data analysis provides an in-depth look at how Lowell's economic indicators measure up to the regional and national trends. Lowell's economy has become increasingly interconnected with regional and global economies.

6.1 LABOR FORCE & EMPLOYMENT TRENDS

Table 6.1.1: Labor Force and Employment in Lowell

Yr.	Labor Force	Employed
2000	51,122	49,514
2001	52,246	49,469
2002	52,319	48,309
2003	51,501	47,359
2004	50,366	46,814
2005	50,134	46,901
2006	49,883	46,925
2007	49,843	47,097
2008	50,446	46,998
2009	51,160	45,424
2010	51,631	46,069
2011*	51,913	47,110

Data Source: MA Exec. Office of Labor & Workforce Development (EOLWD)
*2011 data referent to month of October only.

Figure 6.1: City of Lowell - Labor Force (2000-2011)

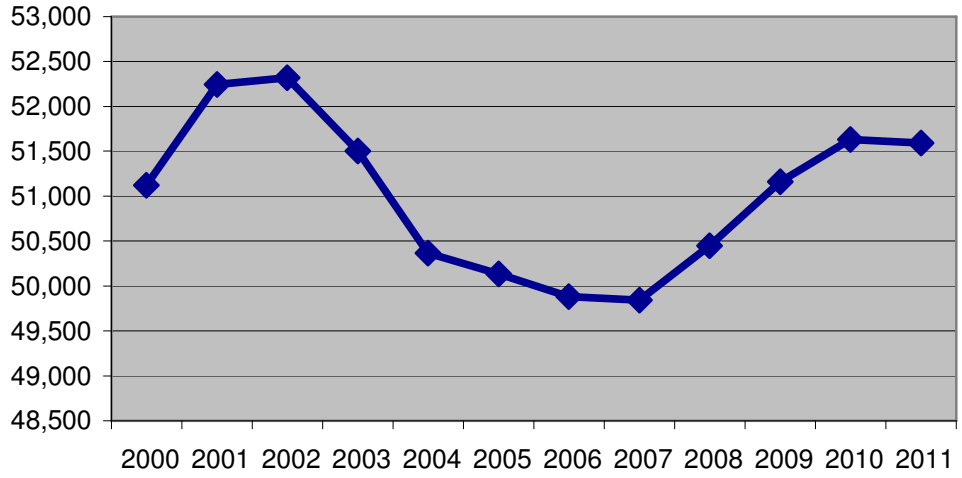
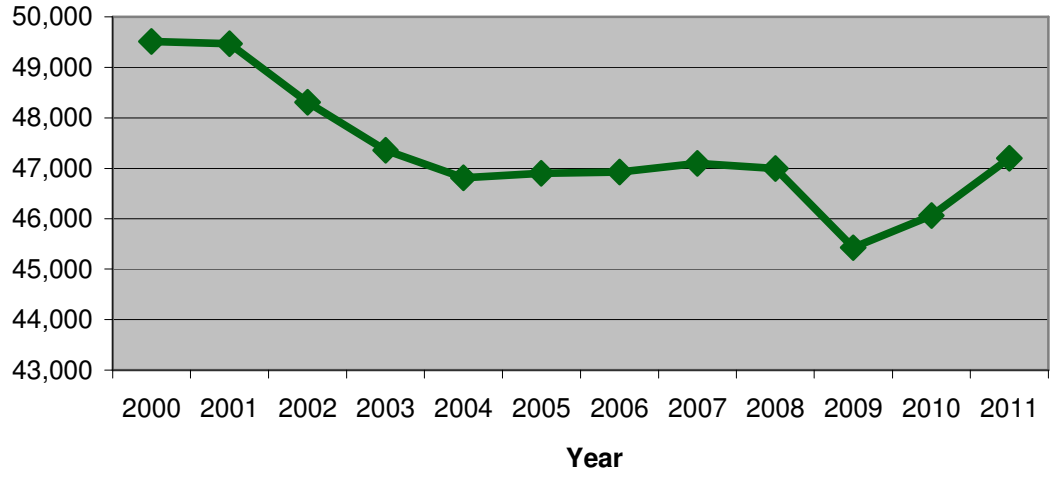


Figure 6.2: City of Lowell- Annual Employment (2000-2011)



Data Source: MA Exec. Office of Labor & Workforce Development (EOLWD)
2011 data referent to month of Jan. only

6.2 EMPLOYMENT CHANGES

Between the period of 2004-2009, employment levels in Lowell have decreased at a more significant rate (4%) compared with the region and state (each just over 2%).

6.3 UNEMPLOYMENT

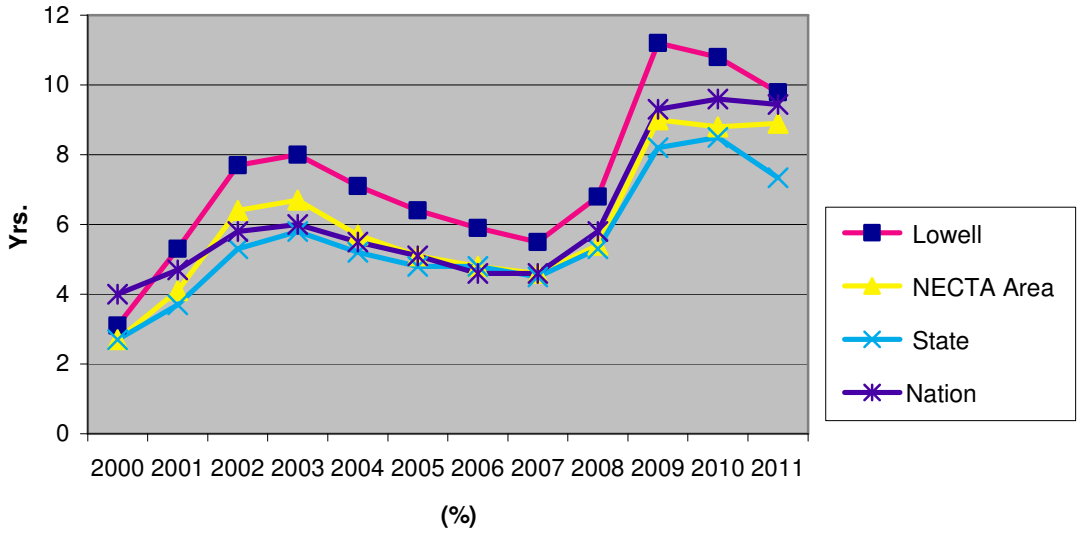
Lowell's unemployment rates remain higher than the regional, state, and national averages. In comparison with other "gateway" cities, Lowell lags behind Haverhill and Worcester, but scoring better than Brockton, Springfield, Lawrence and Fall River.

Table 6.3.1- Unemployment Rates in Lowell (2000-2011)

Year	*Lowell*	*NECTA Area*	*State*	*Nation*
2000	***3.1***	2.7	2.7	4
2001	***5.3***	4.1	3.7	4.7
2002	***7.7***	6.4	5.3	5.8
2003	***8***	6.7	5.8	6
2004	***7.1***	5.7	5.2	5.5
2005	***6.4***	5.1	4.8	5.1
2006	***5.9***	4.8	4.8	4.6
2007	***5.5***	4.6	4.5	4.6
2008	***6.8***	5.4	5.3	5.8
2009	***11.2***	9	8.2	9.3
2010	***10.8***	8.8	8.5	9.6
2011*	***9.8***	8.6	7.2	9.1

Data Source: *MA Exec. Office of Labor & Workforce Development (EOLWD)*
**2011 data referent to month of September only*

Figure 6.3: Unemployment Rates (2000-2011)



Data Source: *MA Exec. Office of Labor & Worforce Development (EOLWD)*

Table 6.3.2: Unemployment Rates in Lowell and other "Gateway" Cities in MA

Year	*Lowell*	Worcester	Springfiled	Lawrence	Haverhill	Brockton	Fall River
2000	***3.1***	3.1	4.1	5.6	2.7	3.4	5.1
2001	***5.3***	4.5	5.2	8.8	4.1	4.7	6.2
2002	***7.7***	6.1	7.2	12.3	6.4	6.4	7.8
2003	***8***	6.7	8.1	12.3	6.6	7.3	8.3
2004	***7.1***	6.1	7.8	11.1	5.8	6.9	8.2
2005	***6.4***	5.8	7.3	10.1	5.3	6.1	8.1
2006	***5.9***	5.7	7.4	9.6	5	6.1	8.2
2007	***5.5***	5.3	7	8.9	4.8	5.8	8.3
2008	***6.8***	6.3	7.9	10.6	5.8	6.8	9.4
2009	***11.2***	9.9	11.7	16.3	9.4	10.7	14.6
2010	***10.8***	10	12.6	16.5	9.4	11.6	14.7
2011	***9.8***	9.2	11.7	16.1	8.3	10	13.1

Data Source: MA Exec. Office of Labor & Workforce Development (EOLWD)
2011 data refer to month of September only.

Since mid-2008, Lowell's labor force was seriously impacted by a series of layoffs within the Greater Lowell labor market area. Table 3 illustrates major layoffs in the region between July 1st, 2008 and October 31st 2010.

Table 6.3.3: Major Layoffs in the Greater Lowell area July-1, 2008-Oct. 31st, 2010

Community	*Company*	*Number of employees affected*
Greater Lowell	Internal Revenue Service	200
Ayer	Plexus Corp.	170
Andover	Pfitzer	300
Andover & Boston	Putman Investments	260
Billerica	Tel Epion, Inc.	18
	Jabil Circuits	70
	Jabil Circuits	20
	Jabil Circuits	315
	Office Depot	58
	Scholl Solar	215
Chelmsford	Arbor Networks	19
	Kronos Inc.	87
	Potpourri Group, Inc.	60
	Brooks Automation, Inc.	241
	Sycamore Networks	46
Haverhill	Haverhill Paperboard	174
Lowell	Adden Furniture	15
	Cass Information Systems	48
Marlborough	Fidelity Investments	500
	Sepracor	530
North Andover	Solo's Cup	360
North Reading	Teradyne, Inc.	1,055
Tewksbury	DJ Reardon Company	56
	Avid Technologies	54
Westford	AECOM	30
	Alcatel-Lucent	450
Wilmington	Charles River Laboratories	50
Total Layoffs	**5,401**	

Data Source: NEMCOG, Boston Globe; Lowell Career Center and MA Labor News MA AFL-CIO

6.4 WEEKLY WAGES

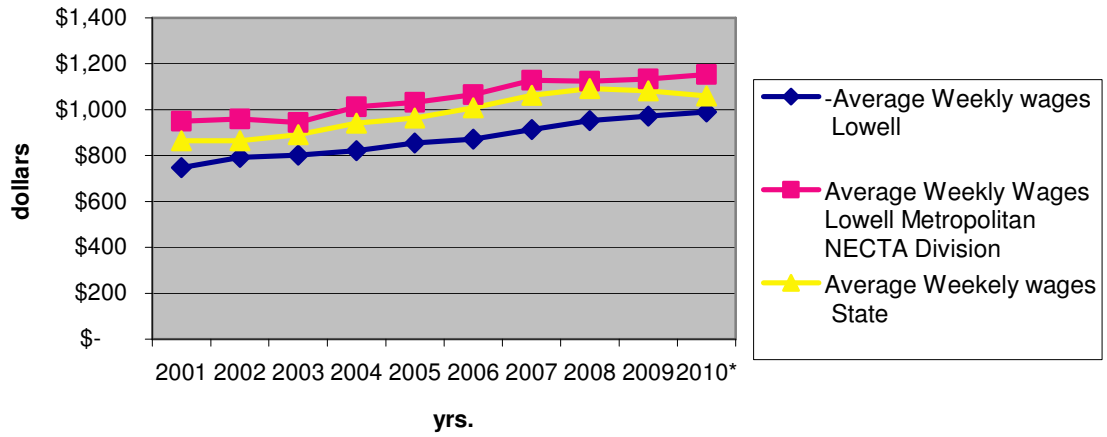
Since 2001, weekly wages have experienced steady increases. In comparison, Lowell's weekly wages fall behind the area and state averages. This discrepancy is approx. $178.00 less per week compared to the Greater Lowell area and $111.00 less than the state's average during the same period.

Table 6.4.1: Lowell & State Average Weekly Wages

Yr.	Average Weekly wages- Lowell	Average Weekly Wages Lowell Metropolitan NECTA Division	Average Weekly wages State
2001	$ 748	$ 949.00	$ 865.00
2002	$ 792	$ 959.00	$ 865.00
2003	$ 802	$ 944.00	$ 891.00
2004	$ 821	$ 1,012.00	$ 941.00
2005	$ 855	$ 1,032.00	$ 963.00
2006	$ 871	$ 1,065.00	$ 1,008.00
2007	$ 914	$ 1,128.00	$ 1,063.00
2008	$ 953	$ 1,124.00	$ 1,092.00
2009	$ 972	$ 1,133.00	$ 1,082.00
Average			

Data Source: MA Exec. Office of Labor & Workforce Development (EOLWD)

Figure 6.4: Lowell and State- Average Weekly Wages



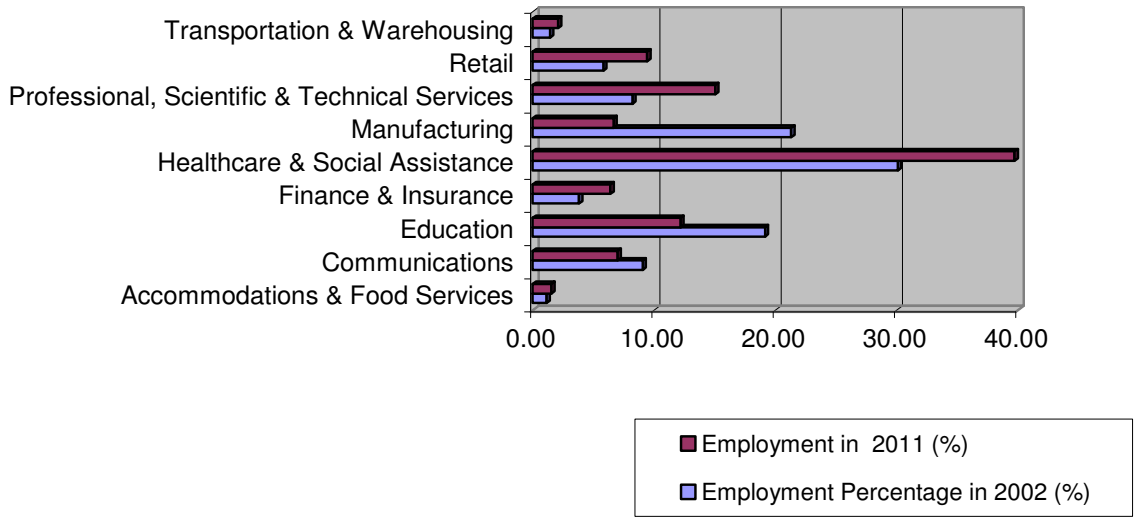
Data Source: Data Source: MA Exec. Office of Labor & Workforce Development (EOLWD)
* data corresponds to 2nd quarter of 2010

Table 6.4.2: Lowell- Total Number of Establishments by Industry, Employment and Wages (2009)

Industry	Establishments	Percentage of total	Average Employment	Total Wages
Total, All Industries	1,980	100.00	33,033	$972
Construction	156	7.80	867	$1,029
Manufacturing	100	5.00	3,600	$1,280
Utilities	7	5.00	180	$1,471
Wholesale Trade	59	0.00	583	$1,051
Retail Trade	210	0.35	2,319	$492
Transportation and Warehousing	29	0.05	480	$960
Information	19	0.95	828	$1,639
Finance and Insurance	84	4.20	1,529	$1,295
Real Estate and Rental and Leasing	62	3.13	298	$605
Professional and Technical Services	160	8.00	1,930	$1,905
Management of Companies and Enterprises	8	0.40	289	$1,075
Administrative and Waste Services	88	4.40	2,001	$480
Educational Services	18	0.90	4,221	$1,082
Health Care and Social Assistance	213	10.70	7,814	$902
Arts, Entertainment, and Recreation	29	1.46	547	$712
Accommodation and Food Services	190	9.60	2,179	$281
Other Services, Ex. Public Admin	523	26.40	1,367	$437
Public Administration	25	1.26	1,907	$1,175

Source: Massachusetts Division of Employment and Training (DET)

Figure 6.4.3: Lowell's Average Employment by Industry (2002 & 2011)



Source: Massachusetts Division of Employment and Training (DET)

6.5 TOP EMPLOYERS IN THE CITY

With a thriving Downtown, flexible office space and ample amenities, Lowell is a great place to do business. Lowell's well established business community provides solid ground for a thriving local economy. The City is home to many of the region's top employers including: two major medical centers (Lowell General Hospital and Saints Memorial), numerous technology and financial companies. Compared with ten years ago, Lowell's top companies have transitioned from heavy industry to more knowledge-based and/or service-oriented industries. These industries commonly have a significant focus on healthcare and education, as well as environmental / green industries; however traditional manufacturing hasn't completely disappeared in the City. The following long-time, well-established manufacturers moved or have downsized within the past 10 years: Joanne Fabrics, Colins & Aikman, Freudenberg Nonwovens, Bradford Industries, Mother Hubbard, MSL Qualitronics, Eltech, Adden Furniture, among others not listed. However, a smaller number of existing manufacturing companies have retained or expanded their employee base, as follows: Interstate Container, Ideal Tape, Specialty Materials, Unwrapped, Inc., among others. The following companies have recently relocated into the city within the past year: Cristek Interconnects, Moms & Jobs. Lowell provides a rich pool of labor source, affordable flex-space, as well as financial incentives, i.e. HUB Zone & Economic Target Area Designations, making the City very attractive for manufacturers to relocate in Lowell. In contrast, the number of major employers within the retail industry experienced a significant increase within the past few years due to the addition of two new major retailers: Lowe's Home Improvements and Target (employing approximately 300 employees combined). Marshalls also opened recently adjacent to Target. Market Basket is also expanding at their Bridge Street location. In 2008, a new CVS also opened on Bridge Street. In addition, plans for a new pharmacy are in the planning stages.

The following table indicates largest employers (with at least 100 employees) in Lowell, exclusive of the City itself:

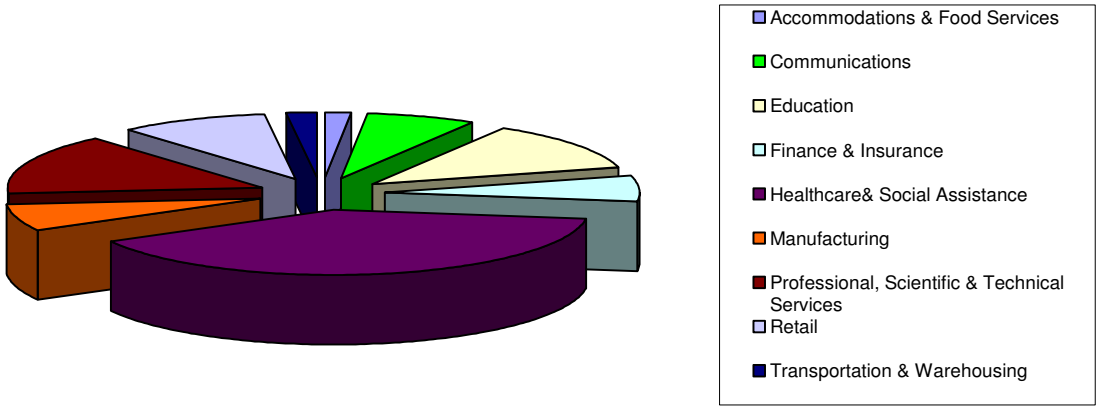
Table 6.5.1- Leading Lowell Employers, 2011

COMPANY NAME	**Nature of Business**	**Approximate Number of Employees**
Lowell General Hospital	Healthcare	1,940
UMass Lowell	Education	1,385
Saints Memorial Hospital	Healthcare	1,200
Demoulas /Market Basket	Supermarket	800
Middlesex Community College	Education	500
Parexel	Biotechnology	500
Motorola	Electronics	458
Community Teamwork (CTI)	Social Services	440
Cobham Sensor Systems*	Electronics	400
D'Youville Senior Care Center	Healthcare	386
MA/COM Technology Solutions*	Electronics	350
JP Morgan	Financial Services	280
Lowell Community Health Center	Healthcare	270
Metlife Auto & Home Insurance	Insurance	250
Siemens Water Technology Corp.	Electronics	250
Unwrapped Inc.	Manufacturing	220
Trinity EMS	Healthcare	204
Enterprise Bank & Trust	Financial Services	201
Aramark Corp.	Hospitality/ Food Services	200
Visiting Nurses Assoc. of Lowell	Healthcare	190
Target	Retail	175
D.S. Graphics	Printing & Publishing	160
Oakwood Living Centers	Healthcare	160
Sterling Commerce	Distribution	150
Microsemi Corp.	Electronics	143
Interstate Containers Co.	Corrugated	140
Litle & Co	Software	139
TRC Environmental Corporation	Environmental	139
The Lowell Sun	News Publishing	137
Lowe's Home Improvements	Retail	130
Madison Security Group	Security	130
Wentworth Nursing Care Center	Healthcare	130
Jeanne D'Arc Credit Union	Financial	124
AH Notini & Sons	Distribution	120
Americraft Carton, Inc.	Corrugated	120
Hannaford	Supermarket	120
AutoLiv Electronics America*	Electronics	100
Cass Information Systems	Software	100
Ideal Tape	Manufacturing	100

Source: City of Lowell, Economic Development Office survey; March 2011

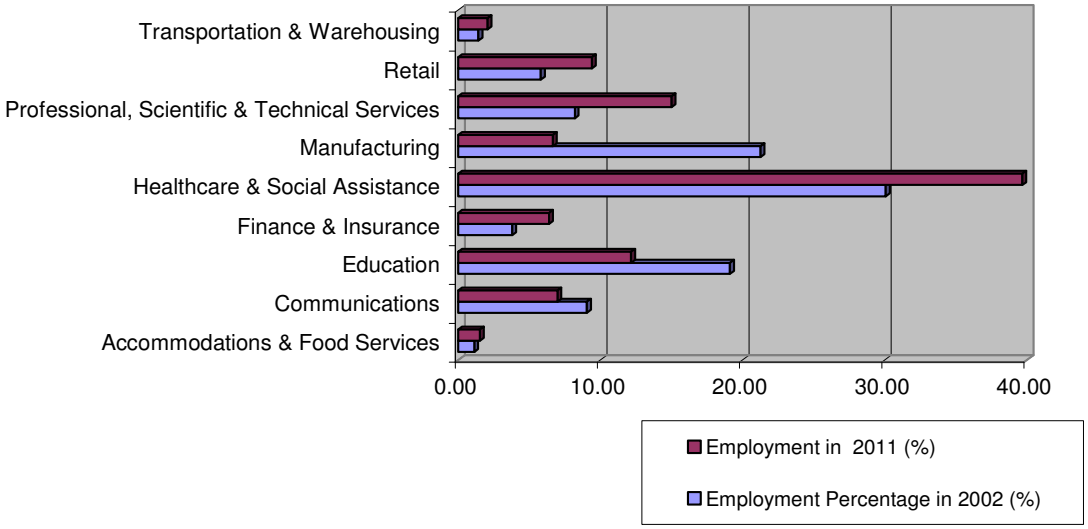
*former Tycos: company has split into three separate divisions/ companies

Figure 6.5: Leading Lowell Employers by Major Industries (2011)



Data Source: DPD/EDO survey, March 2011

Figure 6.6: Leading Lowell Employers by major industries (2011 versus 2002)



Source: Massachusetts Division of Employment and Training (DET)

Table 6.5.2- Major employers in the NMCOG Region 2004 & 2009

Rank	Employer (2004)	Employees	Employer (2009)	Employees
1	Raytheon	6,976	Raytheon	8,000
2	Demoulas Supermarkets	5,500	Demoulas Supermarkets	5,500
3	BAE Systems	5,500	Lahey Clinic	5,202
4	Lahey Clinic	5,500	BAE Systems	5,000
5	Hewlett-Pakard	3,500	IBM, Inc.	3,400
6	UPS	2,300	Mitre Corp.	2,080
7	Cisco Systems	2,100	Lowell General Hospital	2,017
8	Sun Microsystems	2,000	UPS	2,000
9	Mitre Corporation	1,900	Teradyne, Inc.	1,500
10	Wyeth Boipharma	1,800	Verizon Communications	1,500
11	Verizon Communications	1,600	Analog Devices, Inc.	1,400
12	Analog Devices	1,500	Hannaford Bros.	1,400
13	M/A COM Inc.	1,500	Wal-Mart Stores, Inc.	1,350
14	Lowell General Hospital	1,400	The Home Depot, Inc.	1,350
15	Saints Memorial Hospital	1,400	Cisco Systems	1,300
16	Wal-Mart Stores, Inc.	1,350	Sun Microsystems	1,300
17	The Home Depot, Inc.	1,300	Emerson Hospital	1,171
18	N.E. Business Services	1,200	Saint Medical Center	1,000
19	Malden Mills	1,200	Kronos, Inc.	1,000
20	Lucent Technologies	1,200	Milipore Corporation	1,000

Data Source: Northern Middlesex Council of Governments (NMCOG) - Greater Lowell Comprehensive Economic Development Strategy, 2009-2013

6.6 BUSINESS CREATION & NUMBER OF ESTABLISHMENTS

In addition to our top employers, several other mid & small size / knowledge-based companies have recently either expanded or relocated into Lowell, including, but not limited to: Metabolix/Telles, Nobis Engineering, Watermark, Xenith, Kadient, Borrego Solar, Veeco Solar Technologies, Pridestar Ambulance, Dassault Systems, Litle & Co.; ViewPoint, Madison Security, DiagnosisOne, Cristek Interconnect, Eastern Salt and Mom and Jobs.

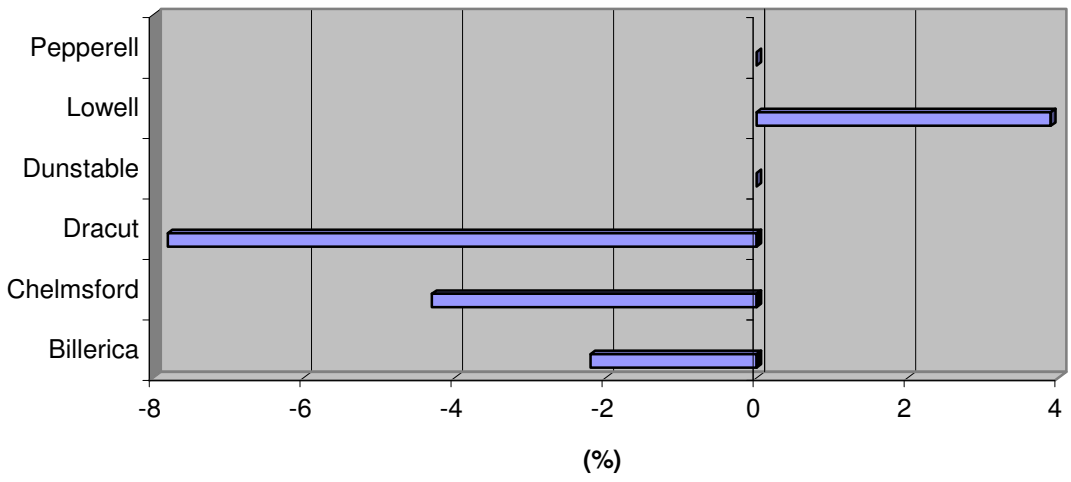
Per Table 10, Lowell has been the only community in the area that has experience an increased number of establishments between 2004 - 2009.

Table 6.1.1: Total Number of establishments in Lowell / Lowell area and % change: 2004 (Q2) - 2009 (Q2)

Community	2004 (Q2)	2009 (Q2)	Percent Change (%)
Billerica	1,192	1,166	-2.2
Chelmsford	1,170	1,120	-4.3
Dracut	615	567	-7.8
Dunstable	61	61	0
Lowell	***1,892***	***1,966***	***3.9***
Pepperell	223	223	0
Tewksbury	838	836	0.1
Tyngsboro	365	353	-3.3
Westford	705	645	-8.5
NMECOG Region	7,061	6,907	-2.2

Data Source: Northern Middlesex Council of Governments (NMCOG) - Greater Lowell Comprehensive Economic Development Strategy, 2009-2013

Figure 6.7: Total number of Establishments % Change (2004 & 2009)



Source: Executive Office of Labor and Workforce Development

COMMERCIAL SPACE OVERVIEW: SUPPLY VERSUS DEMAND

Lowell and Regional Commercial Real Estate Overview:

Centrally located, Lowell provides easy access to Boston and the Merrimack Valley and Southern New Hampshire regions. In addition, the availability of affordable and flexible commercial space makes the city very enticing to small and mid-size companies. Since mid-2008, Boston area and Merrimack Valley regions experienced tough times in the commercial real estate market. According to real estate experts, office vacancy rates

are expected to remain high (15% - 20%) throughout 2011. A major factor for this trend, are companies that have downsized by consolidating their operations, often seeking more affordable space or taking advantage of competitive rates offered by newer office space, thus offering more perks to tenants.

COMMERCIAL REAL ESTATE SUPPLY*:*

Class A & B Office Space:

Lowell's Class A & B office space remains fairly healthy compared with Lowell-Chelmsford sub-market and other suburban sub-markets. Average rents in Lowell are slightly lower than the suburban market creating an advantage point. See below market analysis for office space:

Table 6.6.1: Class A & B Office Space

Market Area	Available S.F.	Vacancy rate (%)	Net Absorption	Average Rent
Boston	59,750,735	11.3	(253,307)	$40.86
Cambridge	9,769,186	10.2	1,000,152	$36.64
Suburban	127,087,763	16.6	(275,175)	$21.87
Rt-3 Corridor	437,327	13	(21,212)	$19.01
Lowell/Chelmsford Market	3,113,297	21	117,493	$17.18
Lowell	***512,185***	***14***	***(21,212)***	***$17.0***

Data Source: Costar Properties, 2010

A recent DPD survey conducted to all class A-B office complexes revealed even lower vacancy rates found at Wannalancit Mills (currently 6.6%). This office complex is located in the vicinity of Downtown, offering excellent amenities to its tenants in a rich urban setting.

Regional Retail

In the past few years, Lowell has been successful in attracting well-known national retailers, such as: Lowe's Home Improvements, Target, and Marshalls (2011). Lack of available sites accessible to the Lowell Connector has been one of the greatest impediments to the growth of regional retail in the City. Vacancy rates at our existing retail plazas are fairly low. Lowell's average annual rent for retail space is relatively lower than the surrounded retail sub-markets. The table below illustrates the average vacancy rate and rent prices for Lowell and other retail sub-markets:

Table 6.6.2: Retail Space:

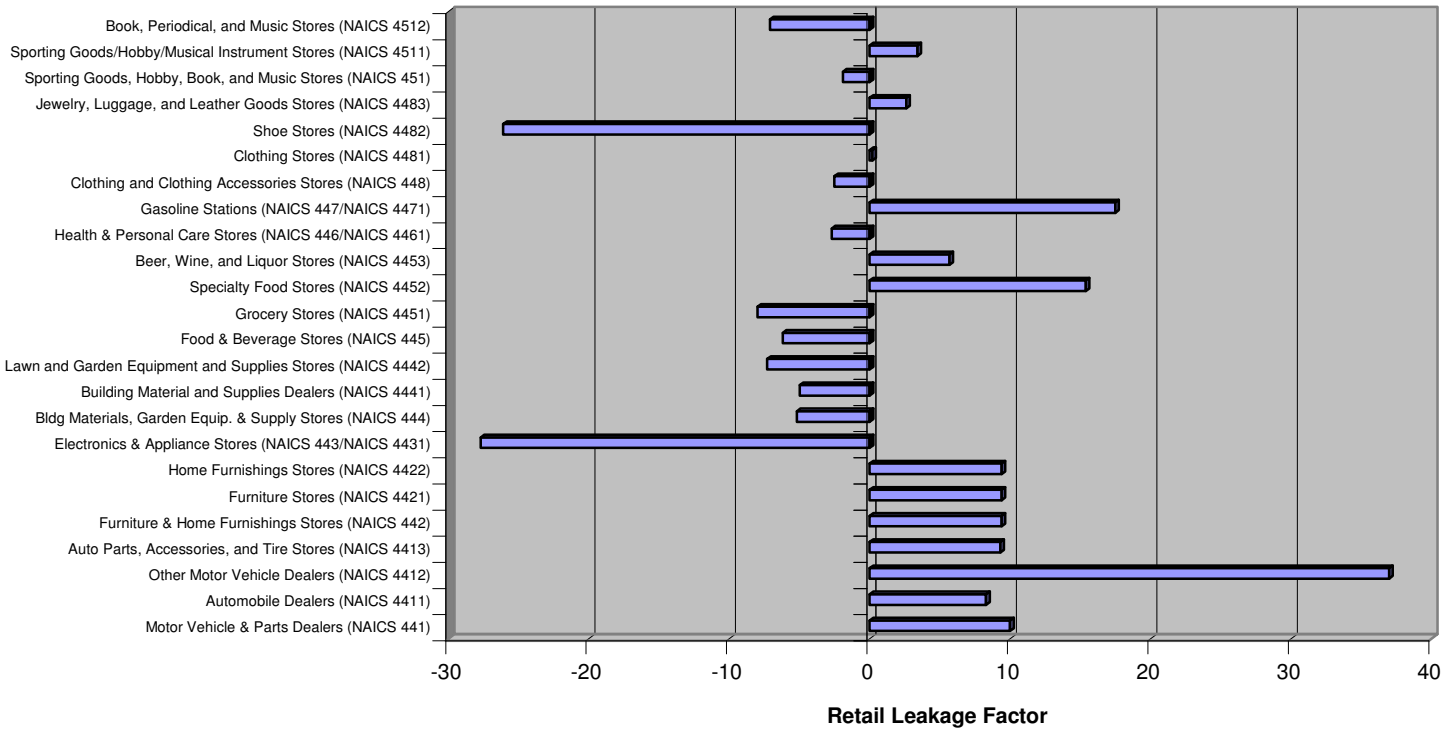
Sub-Market	Available S.F.	Vacancy rate (%)	Net Absorption	Average Rent
Burlington- Woburn	317,797	7	(9,254)	$19.87
Framingham/ Natick	907,968	10	69,900	$16.07
Lawrence/ Andover	889,231	8	(3,880)	$14.15
Lowell/ Chelmsford	617,723	8	13,078	$17.03
Worcester Metro	1,118,515	12	1,802	$11.75
Lowell	***279,680***	***9***	***8,416***	***$13.08***

Data Source: Costar Properties, 2010

Retail Surplus & Leakages

In the past few years, Lowell has been successful in attracting well-known national retailers, such as: Lowe's Home Improvements, Target, and Marshalls (2011). There is a potential for more regional type retail development and locally- owned stores as figure 6.8. illustrates significant retail leakages in Lowell (20 minute driving radius from the Lowell Connector, at Plain St.). Significant retail potential exists in the areas of: shoes and accessories; electronics and appliances; groceries and food establishments; and lawn, garden and supplies.

Figure 6.8- Retail Sales: Leakage/Surplus by Industry Group (20 minute drive from Lowell Connector at Plain St.)



Data Source: *ESRI & Info Group, 2010*

Table 6.6.3: Leakage in Food Establishments

	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap (Demand-Supply)	Surplus/Leakage (Factor)	Number of Establishments
Total Retail Trade and Food & Drink (NAICS 44-45, 722)	$8,570,499,732	$8,391,728,212	**$178,771,520**	1.1	5,680
Total Retail Trade (NAICS 44-45)	$7,236,123,409	$6,999,039,783	**$237,083,626**	1.7	4,278
Total Food & Drink (NAICS 722)	$1,334,376,323	$1,392,688,429	**$237,083,626**	-2.1	1,420

Data Source: 2011 ESRI

Industrial / Flex-Space:

Lowell's industrial and flex-space is a combination of high-quality manufacturing space (1011 Pawtucket Blvd. and 38 Prince Ave.) and old mill space. Industrial Avenue East, Lowell's only industrial office park, is currently at full-capacity. The two highest vacancies for industrial/ flex-space can be found at 38 Prince Ave. (former Prince Spaghetti/ Joanne Fabrics) and 1011 Pawtucket Blvd. (former MACOM). The property owners of these two properties, have been focused on converting these properties from single to multi-tenancy, and have been successful to some extent, by subdividing these spaces and attracting smaller space users. Table 13 shows Lowell's vacancy rates and rent prices are comparable to other sub-markets.

Table 6.6.4: Industrial/Flex Space

Sub-Market	Available S.F.	Vacancy rate (%)	Net Absorption	Average Rent
New Bedford	10,937,706	19	607,930	$4.08
Fitchburg/ Leominster	3,030,591	3.36	6,600	$3.36
Lawrence/ Andover	5,516,654	19	180,477	$4.71
Lowell/ Chelmsford	6,012,466	25	(264,045)	$6.32
Rt. 3 Corridor	783,874	11	67,945	$6.50
Worcester Metro	4,324,746	24	45,941	$4.31
Lowell	***1,353,379***	***23***	***(178,060)***	***$6.5***

Data Source: Costar Properties, 2010

Downtown Office Space

Downtown office space vacancies for class B-C office space are much higher, estimated at 31.5%.
The average age of our downtown office inventory is approx. 88 years old. Most Class C office space is very outdated, lacking basic amenities, i.e. internet access and ADA accessibility. However, these offices offer affordable rents, attracting start-ups, and a good number of non-profit and social-service agencies as well as several attorneys, accountants, health care professionals, and financial advising services. Major Downtown office users include: Enterprise Bank, Lowell Five, Jean D'Arc Credit Union, Eastern Bank, National Park Service, Eastern Salt, TRC Environmental, Watermark, Community Teamwork, Konarka, Northern MATelephone Workers Credit union, among others.

In 2008, Jeanne D'Arc Credit Union, constructed a five-story building (53,664 SF) for its new headquarters at One Tremont Place, at the former Tremont Yard Historic Site. Since 1998, this building was the first newly constructed office building in Downtown.

Table 14 illustrates commercial buildings in Downtown Lowell with > 20,000 S.F. of available space for office use:

Table 6.6.5: Downtown Commercial bld. with >20,000 S.F. of available office space

Address	Total S.F.	Available S.F.	Status
130 John St (Boot Mills West)	110,000	75,479	For Sale/Lease
26 Jackson St (Adden Bld)	150,000	150,000	For Lease
110 Canal St (Freudenberg)	60,000	60,000	For lease/Sale
24 Merrimack St	66,764	66,764	For Sale
17 Kearney Square (Former Lowell Sun)	62,500	62,500	For Sale/ Lease
166 Central St (Central Bank Bld)	46,786	46,786	For Sale
116 John St (Boot Mills South)	90,439	27,671	For Lease
165 Merrimack St (Bon Marche)	125,000	25,000	For Lease

Data Source: DPD/Economic Development Office

Downtown Retail Space:

The inventory of downtown retail space covers approx. 533,663 SF of ground-level storefront space in the downtown core (approx. 145 storefronts). Due to economic difficultly, during 2008-2011, the Downtown area experienced business closings, in particular, several small eateries. In comparison, the Downtown area now has several very successful retailers that found their market niche as follows: Bredw'd Awakening Coffee Haus, Coffee Mill, Humanity, Mambo Grill, Mr. Jalapeño, Market Street Market, Life Alive, and Tutto Benne, are some good examples. Remarkably, Downtown Lowell continues to be a desirable location for independently-owned shops and start-ups. A new clothing store and two restaurants are currently in the planning stages, demonstrating that Downtown Lowell is resilient to economic crisis and has great market potential.

Major institutional uses, i.e. Lowell City Hall, Lowell High School, Middlesex Community College, and major attractions, i.e. Lowell National Historic Park, Tsongas Arena and LeLacheur Park; currently serve as major foot-traffic generators. In addition, office space tenants provide a major source of activity, especially during weekdays, supporting the downtown restaurants and shops. With a recent growing physical presence of UMASS Lowell, foot-traffic in the downtown will improve.

The downtown vacancy rate for retail space is relatively low at 7%.

Commercial Real Estate demand in Lowell:

Through its "SiteFinder" services, the City of Lowell - Department of Planning & Development/ Economic Development Office (EDO) maintains a comprehensive database of available commercial space to assist companies seeking space in Lowell. The ED office receives dozens of inquiries on an annual basis. Table 16 gives an overview of the type of inquiries received in 2010:

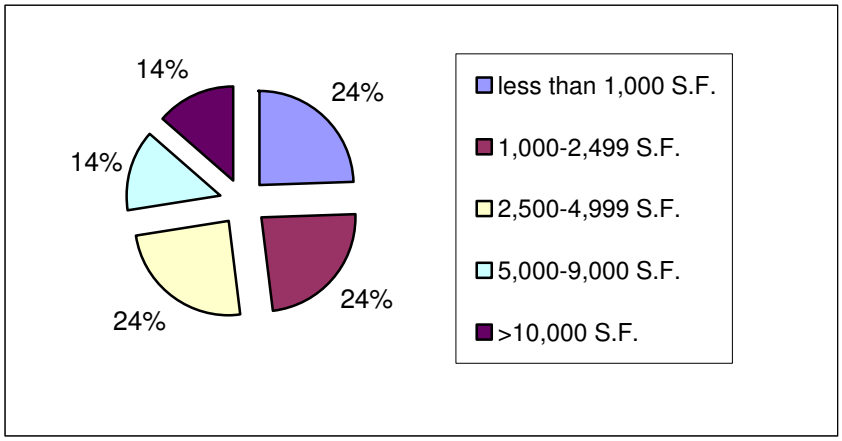
Table 6.6.6 - Inquiries by Type of Space:

Type of Use	Total Inquiries	Percentage (%)
Retail	11	16.4
Restaurant	4	5.9
Office Space	21	31.3
Industrial/ Manufacturing	12	17.9
Storage/ Warehouse	8	11.9
Mixed-Use	8	11.9
R & D	3	4.7
Total	67	100

Data Source: DPD/EDO, 2010

As shown above on ***figure 13***, the greatest demand in 2010 was Office Space. The greatest number of inquiries originated from neighboring communities, i.e. Chelmsford, Tewksbury, and Nashua. The common reason for companies wishing to relocate to Lowell is that office lease rates are still affordable in Lowell compared with suburban office space. Lowell continues to attract small manufacturing and warehousing companies looking for affordable mill space. Since the beginning of the economic recession, the EDO office as well as the Lowell Small Business Assistance Center (SBAC) has seen a spike of office space inquiries by individuals who were unemployed. Job seekers view their unemployment situation as a good opportunity to follow their dreams and become small business owners. These small entrepreneurs, with a majority being immigrants, often seek to open small stores, restaurant, or service oriented small businesses.

Figure 6.9: Retail Inquiries (%) by Size of Space Needed (2010)

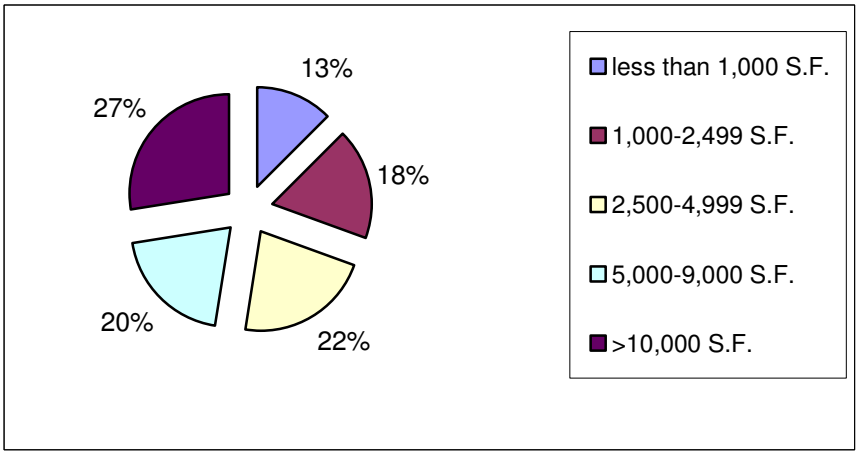


Data Source: DPD/Economic Development Office

The largest inquiry for retail space was for > 10,000 S.F. and the smallest was for 500 S.F.

Retail inquiries included: hair and nail salon; convenience store, Karate studio, Laundromat, and small restaurants.

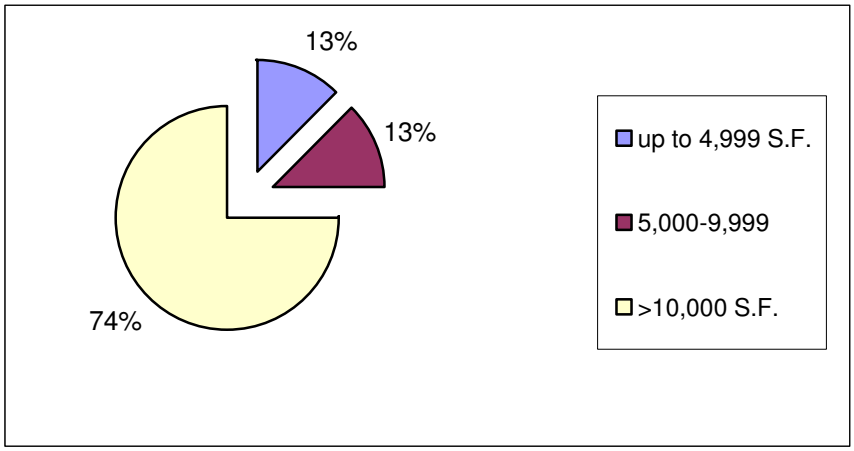
Figure 6.10: Office Space Inquiries (%) by Size of Space Needed (2010)



Data Source: DPD/Economic Development Office

The largest request for office space was 60,000-80,000 S.F. and lowest request was for approx. 800 S.F.

Figure 6.11: Industrial/ Flex. Space Inquiries (%) by Size of Space Needed (2010)



Data Source: DPD/Economic Development Office

The largest request for industrial space was 25,000-35,000 S.F. and the lowest request was for 1,000 SF.

Mixed-use inquiries represent 12% of total inquiries. The largest request was for 40,000 S.F. and the lowest request was for 1,000 SF. The most common inquiries under this category is available space for religious services with ample parking. Others include: adult daycare facilities, a film studio, an independent movie theater, classroom space, and indoor sports.

Supply Versus Demand:

One of the biggest challenges that the City faces in recruiting / retaining larger companies is that the majority of the existing commercial space is inadequate. Particularly R&D companies have difficulty finding space with high ceilings, clean-rooms, lab space, etc. Often companies are looking to move into existing retrofitted buildings and cannot afford to wait or invest on major retrofit projects. As a result, these companies locate in surrounding communities where there are many newer and well-suited buildings. As mentioned earlier, Industrial Avenue East, the only industrial office park in the city, is at full capacity. Adding to this problem are some of the City's industrial properties have been occupied during the past few years by non-commercial users, i.e. religious organizations and adult daycare facilities.

Well-managed commercial complexes, i.e. Wannalancit and CrossPoint, have been successful in retaining and recruiting tenants. Other buildings, due to the lack of maintenance and/or successful management remain empty. The Hamilton Canal Redevelopment Project and Tanner Street Initiative are two major redevelopment areas that have great potential for commercial development and will definitely alleviate the lack of available new and/or retrofitted space. More information about these and other development projects are as follows:

6.7 KEY ECONOMIC DEVELOPMENT PARTNERS

The City of Lowell has adopted an active economic development strategy to attract new companies, create new job opportunities, and expand the commercial/industrial tax base to the City. The City's economic development effort is illustrative of the strong public-private partnership among major economic development key role-players: the City's Department of Planning and Development; the Lowell Plan; the Lowell Development and Financial Corporation (LDFC); MassDevelopment; MA Office of Business Development (MOBD); the National Park Service; U.S Economic Development Administration (EDA); U.S. Housing & Urban Development (HUD); U-Mass Lowell; Middlesex Community College; among other economic development partners.

Department of Planning & Development: The City's Planning & Development Department, through the Economic Development Office, is responsible for assisting businesses with financing, locating to or relocating within the City, and securing the technical assistance they may need to start and grow their business. The Economic Development Office has actively worked with private developers on their market-rate residential projects throughout the Downtown area – as of date, over 2,000 units have been or will shortly be added the to the housing stock. The DPD has developed the Lowell Site Finder Advisory Service for business seeking to locate or expand in Lowell, providing a computerized database of available commercial and industrial property and access to the commercial real estate agents listing property in the Lowell market. The DPD has also taken a very active role in all major recent City projects, such as the Riverwalk, The Acre Plan, the Jackson/ Appleton/ Middlesex St (JAM Plan), and The Hamilton Canal Project.

Lowell Development and Financial Corporation: The LDFC was created by an Act of the Legislature in 1975 to provide a non-profit public body to provide low interest loans to property owners and commercial tenants in the central business district to renovate their facades in a manner consistent with the historic theme of the State and National Parks. Since 1975, the LDFC has financed nearly 200 projects citywide totaling over $85 million in development. The LDFC has several funding programs for commercial and industrial development and down payment assistance for first time homebuyers. The LDFC also has loan pools available for start-up downtown businesses and low interest loans for energy retro-fits for buildings in the downtown historic district. These pools were created with the help of area lending institutions. The LDFC currently has assets totaling nearly $15 million and continues to work with the City of Lowell and local institutions to provide low interest financing to assist in the City's revitalization.

Lowell National Historical Park: The Lowell National Historical Park was established by a Congressional Act in 1978 to recognize Lowell's unique contribution to the American Industrial Revolution and to preserve and interpret key physical elements of 19th century manufacturing. Over the three (3) decade, the Park has been developed according to a plan approved by the Secretary of the Interior, and over $170 million has been invested in the Park's historic preservation. The Park's major exhibit at the Boott

Cotton Mills and the Tsongas Industrial History Center has been the focal point of the Park and provides a comprehensive view of the Park's themes. Over the next few years, the Park is undertaking a major multi-million dollar Canalway Development Program financed by both public and private sources that will enhance the City's 5.6-mile historic canal system.

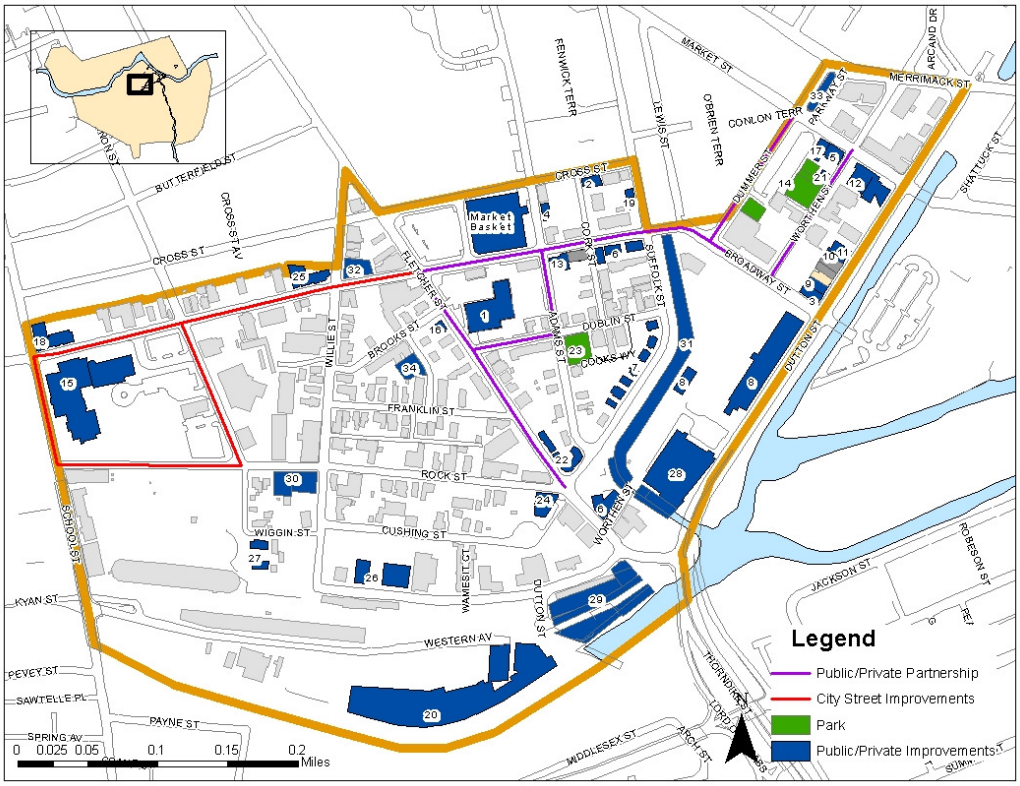
University of Massachusetts at Lowell: The University of Massachusetts at Lowell is an active partner in the City's economic development strategy. The University is actively providing research and development support to local start-up companies in need of expanded technical capacity. UMass Lowell is building an $80 million dollar bio-and manufacturing center on Campus; its construction is currently underway. Greater Lowell has been named as one of the top five regions for nanotechnology research, according to the Washington-based Project on Emerging Nanotechnologies. Recently, U-Mass Lowell has become a key player in the continuous Downtown revitalization by making three major real estate acquisitions in Downtown Lowell: the former "Doubletree Hotel", the Tsongas Arena, and most recently, the former Saint Joseph's Hospital on upper Merrimack Street. The purchase of the hotel alone represents a total investment of $25 million dollars that brought over 500 students to the Downtown and will boost the local economy. Now the U-Mass Lowell Inn & Conference Center, it includes a substantial number of hotel rooms available to hotel guests during school year and will make all rooms available to guests during the summer. The transformed Conference Center is also open all year for various public/private functions. In February, 2010 U-Mass took ownership of the $24 million, 6,500 seat Tsongas Arena and the adjacent 3 acre riverfront parcel. Most recently, the purchase of the partially vacant, former Saint Joseph's hospital, will allow UML to expand its campus and connect North, South and East campuses with the Downtown area. This expansion will revitalize the neighborhood and strengthen the nearby businesses.

Middlesex Community College (MCC): This two-year state supported school opened its Lowell campus in 1991 at the Wang Training Center building located at the Lower Locks area of the Central Business District representing a total investment cost of approximately $12.5 million dollars. Since then, the college has expanded its facilities and has occupied other buildings in the downtown area including the Morse Federal Building on East Merrimack St., the historic "Rialto" and other several buildings on Middle Street and Merrimack Street. MCC recently acquired the historic "Pollard Exchange" building on Middle Street in affiliation with the Middlesex Academy Charter School. This purchase resulted in the expansion of college's health and science programs as well as the Charter school's capacity to serve local students who have left high-school before graduating or face risks of dropping out. MCC's operating budget is approximately $65 million dollars annually.

Cross Point: The former site of the Wang Towers continues to be a highly successful office complex at the juncture of Routes 3 and Interstate 495. The first tenant of the 1.2 million square feet Towers was NYNEX, which occupied over 95,000 square feet and employed 425 people on site as part of its consolidation. The City provided a $3 million tax increment financing (TIF) agreement which leveraged $60 million in private investment. Two year ago, the City provided a 20-year TIF to Motorola, which brought over 500 employees at this location and represented an $18 million dollars in private investment. In 2009, four (4) major tenants have renewed long-term leases: JP Morgan, Bitwave Semiconductors, Verizon Communications and Cass Information Systems. In 2010, DiagonsisOne, a healthcare information technology company, moved its headquarters from Nashua, NH to CrossPoint. DiagnosisOne plans to expand its workforce from its current staff of 30 employees to a few hundred within the next 3 years. Despite difficult economic times, Cross Point's occupancy rate has been kept higher at +/- 90%.

Major Retail Developments: Within the last twenty-four months, two of the nation's largest retailers have open new stores in Lowell: Lowes' Home Improvement, and Target. Lowes' has hired 130 people so far, most of the employees are local residents. Target has opened as well hiring 175 employees to date. Another popular regional retailer, Marshall's, recently opened on Plain St.

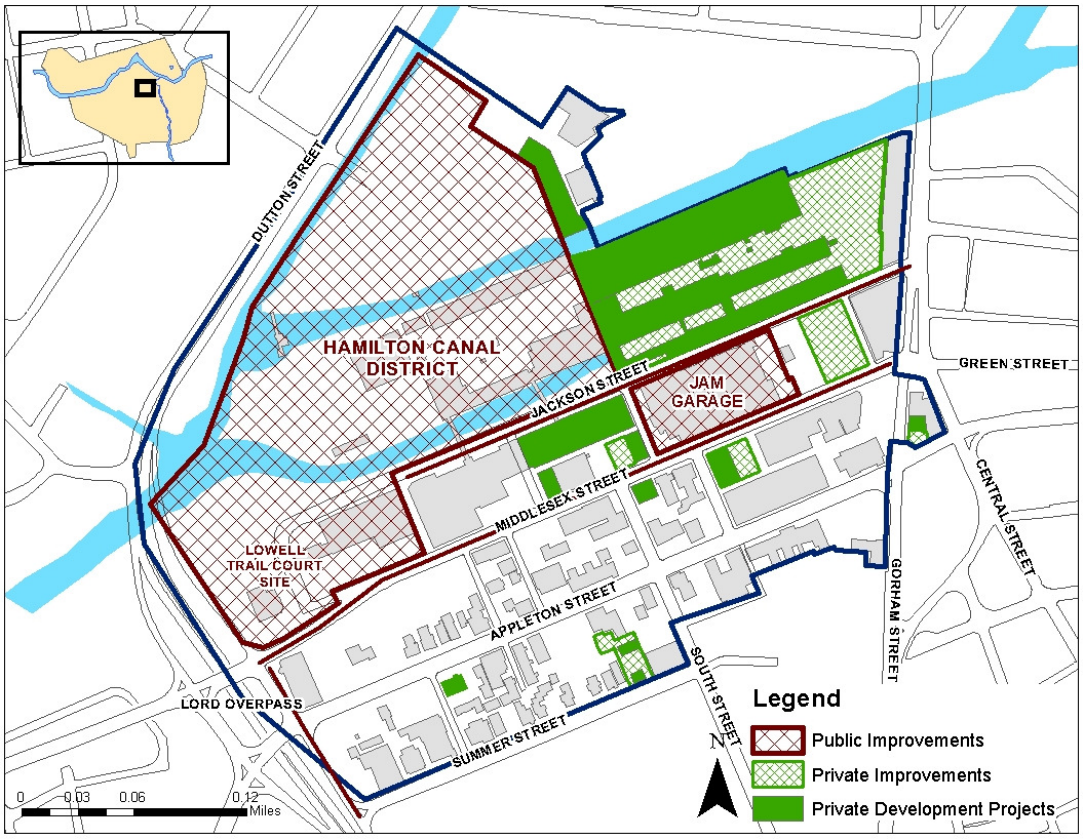
Acre Urban Revitalization and Development Plan: The City has underway a comprehensive urban revitalization plan of the Acre neighborhood that includes significant housing rehabilitation, new commercial development, job creation, and major public infrastructure improvements. The early implementation of the Plan included a new Senior Center, pharmacy and Adult Day Care facility, a new middle school, and over 300 units of new or renovated affordable and market rate housing, public parking, underground utilities, period lighting, new canal walkways with improved open space, and new or expanded commercial development retaining and generating new jobs in the neighborhood. The plan is effective until 2020 and utility, lighting, and open space improvements are ongoing. A major 30 unit housing development is in the pre-development stage along with smaller housing components likely to be targeted to low and moderate income families. Brownfield assessment funds are being utilized to identify potential commercial and/or residential development opportunities. The Acre Plan has generated over $60 million in private investment and is a successful model for urban renewal in MA.



Jackson/Appleton/Middlesex Urban Revitalization and Development District (JAM Plan):

Following decades of disinvestment and recognizing the need for substantial and direct public sector involvement, the Lowell City Council adopted the Jackson/Appleton/Middlesex Urban Revitalization and Development District, or JAM Plan, in early 2000. The plan was created in order to inject life into the redevelopment of the neighborhood that is located adjacent to the heart of Downtown Lowell. Since the creation of the state approved and locally adopted urban renewal district, a wave of public and private improvements and investments have materialize in the JAM Plan neighborhood, which continues to be an area ripe with redevelopment opportunities.

The first 9 years of the JAM Plan have included the City's initiatives to develop a 900 space parking structure with ground floor retail space, the conversion of Middlesex Street to two-way traffic supporting the businesses in the neighborhood, and the targeted redevelopment or rehabilitation of a number of smaller targeted properties along Middlesex, Appleton, Summer and Gorham Streets. Private investments have included the development of over 350 market-rate housing units, with another 250 housing units in development, leveraging over $70 million in private investments to date. The City has also created the JAM Façade & Lot Improvement Program, which provides matching grant funds to private business and property owners seeking to complete façade improvements within the JAM Plan.



Hamilton Canal District:

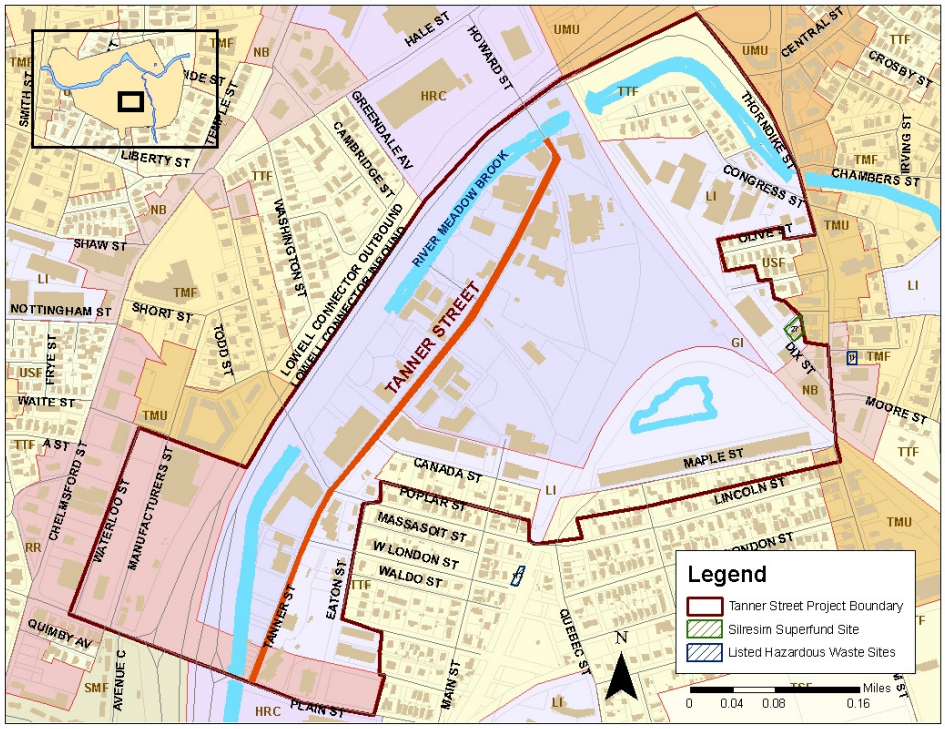
The most exciting and comprehensive initiative in the JAM Plan is the redevelopment of the Hamilton Canal District. This project will result in the creation of a new mixed-use transit-orientated neighborhood reconnecting Downtown Lowell with the City's transportation infrastructure at the Gallagher Intermodal Transit Center and the Lowell Connector highway. In August 2007, the City named Trinity Hamilton Canal Limited Partnership (Trinity) of Boston as the selected Master Developer for this exciting project. Beginning on December 5, 2007, Trinity and the City embarked on a year-long ambitious public Master Planning process for the development site. This process included a series of five comprehensive design planning charrettes, each attended by over 100 individuals from the community, and more than a dozen smaller community meetings, collectively known as the Vision Sessions. Through this process, the vision for entire build-out of the Hamilton Canal District was created.

As outlined in the Hamilton Canal District Master Plan, the redevelopment effort represents a $700-$800 million investment that will create nearly 2 million square feet of new building space, leading to the creation of at least 400 and up to 1,800 new permanent jobs in the City. The project will include the development of over 700 new units of housing, up to 55,000 square feet of retail, and up to 450,000 square feet of commercial/office space. Additionally, the Massachusetts Division of Capital Asset Management (DCAM) will construct the new 225,000+ square foot, $175 million Lowell Trial Court on a portion of the site. In September 2008, the City Council voted unanimously to approve the Hamilton Canal District Master Plan that outlines the

redevelopment vision for the site, as well as the Land Disposition Agreement with Trinity that outlines and ensures the sale and development of the property by Trinity over the next 10-years. In February 2009, the Council adopted the Hamilton Canal District Form Based Code, the zoning code for the district modeled after the Master Plan, which ensures the development of the site consistent with the community's vision.

In June 2009, the City completed the transfer of ownership of both the Lowell Trial Court portion of the site to DCAM as well as the Phase I portion to Trinity for the construction of the Appleton Mills property. In November 2009, Trinity held the official groundbreaking ceremony for the Hamilton Canal District, ushering in the start of construction for Phase I that is transforming the Appleton Mills site into 130 units of affordable artist live/work/sell housing units. Construction is nearing completion and the project is on schedule to open to residents in April 2011. Phase I will also include the rehabilitation of another former mill building on site into roughly 50,000+ SF of office space. Construction on this project is anticipated to follow the completion of the Appleton Mills.

Tanner Street Initiative: The City received two grants in Fall 2000 to address challenges surrounding the redevelopment of the Silresim Superfund Site (Site). A $100,000 grant was provided by the EPA to perform planning and reuse scenarios for the Site. That, along with a grant from the Commonwealth of Massachusetts funded the work performed by Stoss Landscape Urbanism in completing the Tanner Street Initiative Plan. Another EPA grant, in the amount of $65,000, was awarded to the City in 2007 to conduct a study and design for an innovative storm water flow system at the Silresim Site. In 2010, the City applied for and was awarded $175,000 as part of the EPA's Brownfields Area-Wide Planning Pilot. The focus area for this study includes a newly defined Tanner Street District (District) which encompasses approximately 125 acres of the Sacred Heart Neighborhood. These funds will assist the City with producing a planning study that will identify economic development and environmental remediation strategies for the District. The area-wide plan will focus on establishing a collective vision in an effort to significantly improve the overall environmental health, economics, job opportunities, and quality of life within the District.



Brownfield's Redevelopment: Over the past 10-15 years Lowell has built a national reputation for successful brownfields redevelopment with projects including the Paul Tsongas Arena, LeLacheur Ballpark, Stocklosa Middle School, Edward Early Parking Garage, Hamilton Canal District, and numerous other projects revitalizing formerly contaminated sites. To date, the City has contributed to the assessment, remediation and redevelopment of over 40 acres of land. Currently, the City is managing over $1 million in assessment and remediation grant funds provided by the EPA.

Lowell Memorial Auditorium: Following a nearly $8 million renovation to the Lowell Memorial Auditorium in 1985, the City was awarded a grant from the Cultural Facilities Funds in 2008 in the amount of $564,00 for selective renovations. The City matched this grant with over $2 million in funds to replace the roof, HVAC systems, decorative masonry repair, interior painting and plastering, and electrical and gas piping associated with new systems. In addition, a total of 273 solar panels were installed on the roof and other energy efficiency upgrades.
A second Cultural Facilities Fund grant was awarded in 2009 in the amount of $310,000 that has been matched by the City and used for the replacement of the fire alarm system and flooring. Using a full building assessment, completed in late 2005, the City intends to seek additional funds to steadily and strategically address building maintenance and upgrades. This construction project is underway.

Paul E. Tsongas Center: Lowell was awarded a state grant for $20 million in 1994 for construction of a 6,200 seat multi-purpose arena, which is the home of the UMASS Lowell Division 1 Hockey Team and a new American League Hockey Franchise, the Lowell Devils. The City and the University committed $4 million each to the

construction of the facility. This facility makes Lowell a destination point for Northern Massachusetts, New Hampshire, and Southern Maine for sports, recreation, concerts and the art. In January, 2010 the ownership of the $24 million, 3,600 seat arena, was transferred to U-Mass Lowell. The university also acquired an adjacent lot, for $800,000 from the city. As a result of this transfer, the City will have no further responsibility for operating the arena, which costs up to $1.3 million a year. An advisory commission has been recently created to oversee the redevelopment of the 3 acre riverfront parcel to ensure that the development of this site will be compatible with the Arena, the downtown's continuous revitalization efforts, and the City's Master Plan.

LeLacheur Park: A 4,700 seat, $10.4 million baseball stadium was opened in 1998 and is home to the Lowell Spinners, a Single-A Minor League franchise of the Boston Red Sox, and the UMass Lowell baseball team. $8 million came from state sources and $ 2.4 million from the City. The Spinner's commissioned a Condition Assessment Report that is the basis for a series of maintenance and enhancement efforts in the years ahead. The capital account under the lease allowed the City to fund the repair of the outfield wall which includes replacing 137 boards and painting the entire steel frame in fiscal year 2011. The City Council authorized funding for immediate, short, and long term repairs at the Stadium in July of 2010. An RFP for architectural and engineering services has been executed for services to take the City through the next steps of repairs and upgrades. The majority of the immediate and short term repairs will be accomplished during fiscal year 2012. The remaining long term improvements will be addressed in fiscal year 2013. As funding allows, and with the Lowell Spinners continued maintenance of the facility these improvements will maintain the facility in good overall condition.

Lowell Riverwalk: This $3.5 million walkway runs along the historic "Mile of Mills" on the Merrimack River and connects the University of Massachusetts at Lowell, the minor league baseball facility, and the Paul E. Tsongas Center with the City's Central Business District. An extension of the Riverwalk project is currently in the design phase. This project will design and construct the extension to the "Mile of Mills" Riverwalk from its current terminus at the historic Boott Mills complex to the Lowell Memorial Auditorium. The extended Riverwalk will complete the system and will provide connections to historic and cultural resources located within the Lowell National Historical Park. The initial phase of this extension has been designed and provides accessible pedestrian access from Bridge Street to the Merrimack River. The construction will start in fiscal year 2012.

Downtown Improvements: Over the past decade the City of Lowell spent $1.6 million in City and Community Development Block Grant Funds for downtown improvements included street resurfacing, updated crosswalks (ADA compliant), brick sidewalks, tree planting, hanging planters, City Hall landscaping, victorian gaslights, benches and directional kiosks. The City has undertaken a $17 million project in canal, river walkway and roadway improvements and other off-site aesthetic improvements in the downtown area that have made vehicular and pedestrian access to the various

attractions much easier. Last year the City undertook a major construction project in the downtown area, with the installation of ADA compliant crosswalks and resetting of granite cobblestones which had been previously patched with asphalt. The final cost for this project was $700,000 and it has been completed.

Lowell General Hospital: Lowell General Hospital was recently recognized as a *2010 Boston Globe 100 Top Places to Work* recipient among both private and publically-held businesses throughout the Commonwealth. LGH ranked #4 among large companies, and ranked #1 hospital in the Commonwealth. The 217 bed, acute-care community hospital has experienced significant growth over that last few years as annual volumes in adult and pediatric inpatient care increased 26% and 32% respectively. The hospital is undertaking an extensive physical expansion and partial-facility replacement project estimated at approximately $100 million. LGH also recently received the Gold Plus award for Treatment of Heart Failure by the American Heart Association.

Artist Live/Work Space: The City completed the development of the J.C. Ayer and Save-Mor Buildings on Middle Street into live-work space for local artisans. The $4.5 million renovation of the two buildings resulted in 51 live-work units and was completed in June 2000. The most recent artist live/work space, the Appleton Mills, has been transformed into 130 units of affordable artist live/work housing units. Construction is nearing completion and the project is on schedule to open to residents in April 2011. The Western Avenue Studios has largest concentration of Artists' work space in New England, with approximately 150 work studios, and over 200 artists. The proposed Western Avenue Lofts calls for 46 new live/ workspace units and it is currently in planning stage.

Other Recent/ Ongoing Residential Projects in Downtown Area: Bellow is a table illustrating the most recent and ongoing residential projects in the Downtown area. These projects represent a total investment of approximately $280 million dollars.

Table 6.8.1: Recent/Ongoing Market-Rate Residential Projects in Downtown

Project Name	Address	Total Investment (million)	Total Number of Units	Type	Average Sale Price/ Rent	Average Sale Price/ S.F.	Status
Canal Place I & II	200 Market St	$6.5	175	Condos	$183,000	$153.00	Completed
Massachusetts Mills I & II	169 Bridge St	$29.5	300	Rentals	$1,200/ month	---	Completed
Ayer Lofts	158-172 Middle St	$4.6	51	Condos	$246,000	$249.00	Completed
McCartin Build.	165 Market St	$3.5	27	Condos	$367,000	$265.00	Completed
305 Dutton St	305 Dutton St	$14.0	135	Rentals	$1,200/ month	---	Completed
Lawrence Mills	Aiken/ Perkins	$25.0	152	Condos	$225,000	$202.50	Completed
Moller's Lofts	23 Middle St	$4	24	Condos	$209,120	$219.12	Completed
D.L.Page Building	16 Merrimack St	$1.5	12	Condos	$128,750	$326.00	Completed
Fairburn Building	10 Kearney Square	$3.5	25	Condos	$250,000	$250.00	Completed
Lull & Hartford	78 Prescott St	$2.5	14	Condos	$395,000*	$330.00	Competed
Dutton St Lofts	Dutton St	$3.2	7	Condos/ rentals	$183,770	$172.00	Completed
Birke's Lofts	59 Market St	$2.0	14	Condos	$250,000*	$250.00	Completed
Boott Mills- East	Foot of John St	$25	154	Rentals	$1,225/ month	---	Completed
Waterfront Lofts (Phase I)	130 John St	$25	23	Condos	$263,000	$188.00	Completed
Canal Place III	200 Market St	$11	124	Condos	$157,000	$212.00	Completed
Lofts 27	27 Jackson St	$35	173	Apartments	$1,500/ month	---	Completed
Cotton House Lofts	240 Jackson St	$11	31	Condos	$180,000*	$112.00*	Completed
Trio Development	26 Market St	$4.0	14	Condos	$366,416*	$325.00	Completed
Marston Building	155 Middlesex	$1.7	7	Condos	From $185,000 to $226,000*	*	Completed
"Working Men Co-op" Building.	160 Middlesex St	*	5	Condos	*	*	In progress
Residences at the American Textile Museum	491 Dutton St	$1.8	45	Condos	$350,000*	$190.00*	Completed
One City Square	98 Central St	$2	9	Condos	*	*	Completed
15 Kearney Square	15 Kearney Sq.	*	19	Condos	*	*	In progress
Perkins St Apartments	40 Perkin St	*	193	Apartments	*	*	Completed
26 Jackson Street	26 Jackson St.	*	101	Apartments	*	---	In progress
Appleton Mills	219-265 Jackson St.	$64	130	Apartments	*	---	In progress
Western Avenue Lofts	150 Western Ave	*	46	Condos	*	--	In progress

* Estimated value, early development stage/ not all units have been sold

Below is a table illustrating other approved residential projects outside of Downtown Lowell that either have been completed or have been approved by the Lowell Planning Board between August 2006 and February 2011:

Table 6.8.2: Recent/Ongoing Residential Projects outside of Downtown

NAME OF THE PROJECT	*DESCRIPTION*	*NO. OF UNITS*	*STATUS*
14 Watson Rd	Townhouses	20	Completed
SmithField Crossing	Condo Conversion	33	Completed
685-689 Lawrence St	Mixed Use: commercial/ residential	24	Completed
117 Marginal Street	Residential	156	In progress
1975-1995 Middlesex St	Townhouses	74	Completed
900 Lawrence St	Townhouses	16	Completed
Old Mother Hubbard	Townhouses	34	In progress
200-206 Rogers St	Townhouses	12	In progress
760 Merrimack St/ St. Joseph's	Apartments	22	In progress
76-80 Rogers St	Townhouses	35	Phase I completed 2nd Phase in progress
107 W Meadow Rd.	Single-Family	5	In progress
Rivers Edge Road	Single-Family/ Duplex	181	In progress
478-486 Moody St	Apartments	23	In progress
941 Merrimack St	Apartments	50	Completed
27 4th St.	Multi-Family	3	Completed
451-454 Lawrence St	Multi-Family	4	In progress
159-177 Moore St	Multi-Family	36	In progress

Data Source: DPD/Economic Development Office

Table 6.8.3: Other recently Completed or in Progress Commercial Development Projects in the City

Address	**Description**	**Square Footage**	*STATUS*
491 Dutton St	Office Rehabilitation for the Lowell Sun offices	25,000	Completed
115 Chelmsford St	Mixed Use, Retail/ office plaza	10,000	Completed
724 Chelmsford St	Mixed Use, retail/ office plaza	11,837	Completed
790 Chelmsford St	Retail (Lowe's Home Improvement store)	153,000	Completed
963 Chelmsford St	Mixed Use, Retail/ Restaurant plaza	8,000	Completed
900 Chelmsford St	Office space Rehab/ Motorola	225,000	Completed
30 Gorham St	Restaurant space rehabilitation	3,000	Completed
378 Gorham St	Gas Station Rebuilt	1,500	Completed
15 Hurd St	Office space Rehab for the Lowell Co-Op Bank	9,000	Completed
20 Market St	Mixed Use, retail/ office/ restaurant rehabilitation	10,000	Completed
672 Suffolk St	Office building rehabilitation	14,355	Completed
250 Western Avenue	Industrial building rehabilitation	12,782	Completed
150 Western Avenue	Mixed Use, office/ warehouse	26,500	Completed
612 Dutton St	Restaurant (Dunkin Donuts)	2,800	Completed

585 Middlesex St.	Office Space (Nobis Engineering)	18,207	Completed
25 Wood St.	Retail Space	7,150	Completed
1519- 1527 Middlesex St.	Retail Plaza	9,970	Completed
318 Bridge St.	Retail Space (CVS)	11,800	Completed
15 Kearney Square	Mixed Use, retail/ office (former Lowell Sun bld.)	40,000	In progress
14 Perry St	Construction 2-bay car wash facility	6,000	Completed
1095 Westford St	Mixed Use, retail/ office plaza	34,500	Completed
235 Father Morrissette	Mixed Use, Office/ Restaurant (Jeanne D'Arc)	73,000	Completed
229 Stedman St	Commercial (PrideStar EMS)	34,100	Completed
1235 Bridge St.	Retail Plaza (Market Basket)	110,500	In progress
1141 Bridge St.	Mixed Use, retail/office	7,500	In progress
62 Lewis St.	Parking lot	37,261	In progress
40 Perkins Place	Parking structure	70,757	Completed
26 Jackson St	Office/ R&D	150,000	In progress
119 Plain St	Retail/ Target	137,000	Completed
392 Chelmsford St	Restaurant (Burger King)	2,223	Permitted
295 Varnum St	Lowell General Hospital	120,000	In Progress
1088-1100 Gorham St.	Commercial (Test 'n Build, Inc.)	42,000	In progress
32 Branch St	Mixed Use, retail / residential	6,500	In progress

Data Source: DPD/Economic Development Office

6.9 EXISTING FINANCIAL INITIATIVES & INCENTIVES TO PROMOTE BUSINESS DEVELOPMENT

The City of Lowell, in partnership with other regional economic development agencies, offers an array of financial programs and tax incentives. Over the past few years, small and mid-size companies experienced difficult times obtaining credit through traditional banking due to tighter lending practices. A diverse source of funding and tax incentives has been critical for companies and developers to be able to invest in the City. Fortunately, Lowell has been successful in securing these funds and tax incentives, due in part by the great partnerships it has with local, state and federal agencies. The following paragraphs are a brief summary of the current available financial programs and other economic development initiatives:

Economic Development Incentive Program/TIF's: Under the Commonwealth's Economic Development Incentive Program (EDIP), the City of Lowell has designated sixteen (16) Economic Opportunity Areas (EOA) in which the City can offer Tax Increment Financing Agreements (TIF's). Businesses, which execute such agreements with the City, are also eligible for investment tax credits from the state. Recent TIF agreements include Cross Point (Motorola), Nobis Engineering, PrideStar EMS, Tremont Yard LLC. (Jeanne D'Arc Credit union), Cristek Interconnects, and most recently, Cobham Sensor Systems, which combined will create and retain well over 1,500 jobs in the City.

Economic Development Loan Pools: The city created a $10 million loan pool under the HUD Section 108 Loan Guarantee Program. This program provides varied interest rate financing and guarantees for larger development projects that create new permanent jobs for low and moderate-income persons. The City has leveraged over $90 million in private investment with approximately $7 million of public funds. This has resulted in private to public ratio of 12 to 1 with nearly 3,000 jobs created and retained in the City.

The Downtown Venture Fund: The City, in conjunction with the LDFC and several other banking institutions in the City, formed the Downtown Venture Fund in 2000. The fund offers low interest loans to business seeking to locate or expand in the downtown area, and offers loans of up to $200,000 with flexible repayment options that include no payments in the first year. To date the project has been a tremendous success, financing 34 new businesses in Downtown Lowell resulting in the creation of over eighty (80) jobs and a total investment of $4 million dollars. The total leveraged private investment is estimated at $1,600,000.

The Best Retail Practices Grant Program: Launched in 2008, this program was created to assist small retailers, restaurants and storefront service businesses in Lowell with professional advice and grant money in the areas of store and restaurant design, window and merchandise displays, signage, and cost-effective marketing tips. Since the program was introduced, approximately 170 retail and restaurant businesses have participated in the workshop, and 34 have proceeded to Parts II and III of the program, receiving a $2,500 grant each for store improvements. Following the most recent February 2011 workshop, 15 more businesses are queued to benefit from the in-store consultation and grant support.

Lowell Renewal Community (RC) A large portion of the city of Lowell has been named one of 40 Renewal Communities in the Nation named by the Department of Housing and Urban Development (HUD). The Act authorizes special tax incentives for business, which chose to locate and invest in portions of the Acre, Lower Highlands, Back Central, Downtown and Centralville neighborhoods. To date, local property owners and developers have deducted over $42 million dollars on their federal income taxes. This tax benefit has leveraged over $50 million dollars in private investment, resulting in over 190,000 square feet of commercial development, and creating approximately 350 new jobs available to RC residents. Unfortunately this program has expired in 2010. The City is currently working with Senator Kerry as well as with Congresswoman Niki Tsongas in extending this valuable program.

Technical Assistance to Small and Minority owned businesses: The City works in partnership with the Greater Lowell Chamber of Commerce, the Greater Lowell Workforce Investment Board (WIB), the Lowell Small Business Assistance Center, UMASS-Lowell, Middlesex Community College, the Merrimack Valley Venture Forum (MVVF), the “Interise”, MassChallenge, and the local business community to foster not only new business development, but also minority and small business development. As a collaborating partner with the Lowell Small Business Assistance Center, the City of

Lowell has assisted in the opening of approximately 250 new businesses in the past five years, over half of which are minority owned businesses.

"Better Buildings" Grant Program: Last year, the City of Lowell received a $5 million federal stimulus grant from the Department of Energy. This grant enables owners of properties located within the Downtown Historic District to rehabilitate their properties to become energy-efficient. In addition, a newly established public-private partnership, committed nearly $8 million into a loan pool to provide low-interest loans to eligible energy-efficient retrofit projects. To date, the Department of Planning & Development received 60 letters of interest from property owners.

Marketing and Promotions: In 2008, the City and Lowell Plan, a local think-tank on urban and civic matters, coordinate marketing initiatives to highlight the City's abundant amenities for business growth and expansion, committed to a three-year, one-million dollar multi-media marketing campaign to further promote Lowell, centered around the theme, "Alive. Unique. Inspiring." while continuing to utilize the tag line "There's a lot to like about Lowell." A branding exercise with key stakeholder groups (National Park Service, Greater Merrimack Convention & Visitors Bureau, University of Massachusetts-Lowell, etc.) resulted in a long-term, coordinated media strategy that leverages each dollar spent. This focused media campaign includes a comprehensive website (Lowell.org), social media suite, marketing collateral, and advertising and promotion in major media outlets such as the Boston Globe, the Lowell Sun, and key radio stations in the New England region.

The City of Lowell is also engaged in economic development initiatives with border-sharing municipalities and as well as with other former industrial mill cities throughout the entire Commonwealth. The examples given below illustrate areas of inter-municipal cooperation.

Route 3 Corridor Branding – In cooperating with the towns of Bedford, Billerica, Burlington, Chelmsford and the Executive Office of Housing and Economic Development, this regional effort will promote economic growth along the Route 3 corridor by increasing site readiness through regional infrastructure analysis and improvements, and generating demand for commercial real estate through marketing and branding of this corridor.

BioReady Community Campaign – The City is participating in an effort sponsored by the Massachusetts Biotechnology Council, Northern Middlesex Council of Government, Merrimack Valley Economic Development Council, Merrimack Valley Planning Commission and the Massachusetts Alliance for Economic Development to take advantage of the growth in the biotech industry and by assisting communities to ready itself to host R&D and manufacturing opportunities.

Gateway Cities – "Reconnecting Massachusetts Gateway Cities," a report by MassINC and Brookings Institution Metropolitan Policy Program found that traditional industrial mill cities lagged in economic growth relative to the Boston region. To remedy deficiencies leading to this disparity, particularly since the Gateway Cities offer tremendous potential and assets, i.e. middle-class housing, infrastructure to support smart growth, etc., the city of Lowell is engaged with MassINC and other "Gateway Cities" including Brockton, Fall River, Fitchburg, Haverhill, Holyoke, Lawrence, New Bedford, Pittsfield, Springfield, and Worcester to forge a better partnership with the state to overcome obstacles that hinder economic growth.

7.0 HOUSING

The housing market in Lowell mirrors trends throughout the Commonwealth. The City saw a significant housing boom in the early 2000s with an increase in home prices and a strong market. The booming real estate market was also a source of economic development for the city as investors and developers began building in the City. The increased sale prices also reflected an influx of new residents with greater purchasing power that benefited Lowell's neighborhoods and businesses. More recently however the market has seen a drop in both single family and condominium sales prices. A national foreclosure crisis coupled with high unemployment rates has significantly impacted the housing market.

As a broader impact of the economic downturn, household incomes have failed to keep pace with the increases in housing costs in the Lowell area, causing a decrease in housing affordability, particularly for rentals. These trends mirror those in the Commonwealth as a whole. The lack of affordable housing options is particularly detrimental to those families with low and moderate incomes.

According to the Department of Housing and Community Development's Subsidized Housing Inventory, 12.6 % or 5,212 units of the City's total housing stock of 41,431 units are subsidized to assist low-income residents. In addition, the Lowell Housing Authority and Community Teamwork Inc., a regional affordable housing agency, manage about 2,030 Section 8 rental assistance vouchers. When these vouchers are factored into the subsidized housing units, the total percentage of affordable housing in Lowell increases to 17.5%. According to the latest American Community Survey data, this represents 38% of the total rental units in the City. Lowell is one of only a handful of communities that exceeds the State's goal of 10% affordability under Chapter 40B. However, as mentioned above, the availability of affordable housing remains a challenge for the City of Lowell.

The number of housing units in the City of Lowell has grown since 1990, most especially among ownership units. The 2010 Census documented 41,431 year-round housing units in the City of Lowell. Of these units, nearly 93% are occupied and slightly less than half are homeownership units. The percentage of occupied units dropped between 2000 and 2010 by approximately 3%.

Nearly 50 percent of Lowell's 2000 housing stock was constructed before 1940. New housing construction from 1990 to 2000 accounted for only 1.8% of Lowell's housing stock in 2000. New housing construction during this period was concentrated in Downtown, Pawtucketville and portions of the Highlands. According to the U.S. Census, since 2000 approximately 2,000 new housing units have been added to Lowell's inventory, although the City of Lowell maintains records of approximately 2,202 market rate and 1,356 subsidized units in the downtown alone. DPD is currently working with the UMass Donahue Institute's Population Estimate Program to investigate these discrepancies.

Table 7.1.1
City of Lowell: Housing Units by Tenure

	1990		2000		2010	
	Number	Percent	Number	Percent	Number	Percent
Total No. of Units	40,302		39,468		41,431	
Total No. of Occupied Units	37,019	91.0%	37,887	96.0%	38,470	92.9%
Ownership Units	15,508	41.0%	16,309	43.0%	17,385	45.2%
Rental Units	21,511	58.1%	21,578	57.0%	21,085	54.8%

Source: U.S. Census Bureau, 1990 Census, 2000 Census, 2010 Census Summary Files

Tables 7-2 and 7-3 display Lowell's housing statistics by neighborhood and census tract in 2000 and 2010, respectively. The percentage of occupied units dropped between 2000 and 2010 by approximately 3%. Currently the highest incidences of vacant units among Lowell's neighborhoods occur in the Downtown, Centralville, Highlands, and Acre neighborhoods. These neighborhoods saw some of the highest incidences of home foreclosures in the City during the national foreclosure crisis which has likely contributed to these vacancy statistics.

Also worthy of mention, is the increase in total housing units reported in Lowell's Downtown neighborhood. Significant private and public investment in the development of housing in Downtown has resulted in the addition of 2,202 market rate and 1,356 subsidized housing units, according to DPD records.

Table 7.1.2
Census 2000 City of Lowell Housing Data

Census Tract	Neighborhood	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percentage Occupied
3101.00	Downtown	2,025	1,930	95	95.3%
3102.00	Centralville	2,288	2,194	94	95.9%
3103.00	Centralville	2,414	2,329	85	96.5%
3104.00	Centralville	1,209	1,157	52	95.7%
3105.00	Pawtucketville	1,223	1,172	51	95.8%
3106.01	Pawtucketville	1,942	1,916	26	98.7%
3106.02	Pawtucketville	2,284	2,212	72	96.8%
3107.00	Acre	1,593	1,518	75	95.3%
3108.00	Acre	361	345	16	95.6%
3110.00	Acre	1,235	1,208	27	97.8%
3111.00	Acre	636	574	62	90.3%
3112.00	Lower Highlands	1,129	1,074	55	95.1%
3113.00	Highlands	1,375	1,317	58	95.8%
3114.00	Highlands	2,500	2,338	162	93.5%
3115.00	Highlands	1,085	1,040	45	95.9%
3116.00	Highlands	1,903	1,862	41	97.8%
3117.00	Lower Highlands	1,627	1,556	71	95.6%
3118.00	Lower Highlands	1,019	977	42	95.9%
3119.00	Back Central	1,196	1,131	65	94.6%
3120.00	Back Central	1,016	970	46	95.5%
3121.00	Sacred Heart	1,140	1,094	46	96.0%
3122.00	Sacred Heart	1,861	1,747	114	93.9%
3123.00	South Lowell	2,036	1,990	46	97.7%
3124.00	Lower Belvidere	978	941	37	96.2%
3125.01	Belvidere	1,721	1,665	56	96.7%
3125.02	Belvidere	1,672	1,630	42	97.5%
City of Lowell		**39,468**	**37,887**	**1,581**	**96.0%**

Source: U.S. Census Bureau, 2000 Census

Table 7.1.3
Census 2010 City of Lowell Housing Data

Census Tract	Neighborhood	Total Housing Units	Occupied Housing Units	Vacant Housing Units	Percentage Occupied
3101.00	Downtown	2,858	2,599	259	90.9%
3102.00	Centralville	2,283	2,113	170	92.6%
3103.00	Centralville	2,447	2,277	170	93.1%
3104.00	Centralville	1,208	1,067	141	88.3%
3105.00	Pawtucketville	1,256	1,170	86	93.2%
3106.01	Pawtucketville	2,112	2,058	54	97.4%
3106.02	Pawtucketville	2,412	2,253	159	93.4%
3107.00	Acre	1,628	1,458	170	89.6%
3111.00	Acre	844	777	67	92.1%
3112.00	Lower Highlands	1,133	1,043	90	92.1%
3113.00	Highlands	1,407	1,290	117	91.7%
3114.00	Highlands	2,512	2,331	181	92.8%
3115.00	Highlands	1,092	1,011	81	92.6%
3116.00	Highlands	1,922	1,844	78	95.9%
3117.00	Lower Highlands	1,636	1,528	108	93.4%
3118.00	Lower Highlands	1,058	979	79	92.5%
3119.00	Back Central	1,169	1,077	92	92.1%
3120.00	Back Central	1,059	969	90	91.5%
3121.00	Sacred Heart	1,190	1,110	80	93.3%
3122.00	Sacred Heart	1,697	1,616	81	95.2%
3123.00	South Lowell	2,098	2,001	97	95.4%
3124.00	Lower Belvidere	996	911	85	91.5%
3125.01	Belvidere	1,791	1,712	79	95.6%
3125.02	Belvidere	1,694	1,607	87	94.9%
3883.00	Acre	1,929	1,669	260	86.5%
City of Lowell		**41,431**	**38,470**	**2,961**	**92.9%**

Source: U.S. Census Bureau, 2010 Redistricting Data (P.L. 94-171) Summary File
Note: Census Tracts 3108 and 3110 were combined to create 3883 in the 2010 Census

7.1 AGE OF HOUSING STOCK

Nearly 50 percent of Lowell's 2000 housing stock was constructed before 1940. New housing construction from 1990 to 2000 accounted for only 1.8% of Lowell's housing stock in 2000. New housing construction during this period was concentrated in Pawtucketville and portions of the Highlands.

Table 7.1.4
Lowell Housing Stock by Age and Tenancy

Age	Renter		Owner		Total units
Built 1980 and up	3,183	8.4%	2,513	6.6	5,696
Built 1970 to 1979	2,624	6.9%	900	2.4	3,524
Built 1960 to 1969	2,368	6.3%	1,804	4.8	4,172
Built 1950 to 1959	2,163	5.7%	1,720	4.5	3,883
Built 1940 to 1949	2,030	5.4%	1,129	3.0	3,159
Built 1939 or earlier	9,189	24.3%	8,264	21.8	17,453
TOTAL	21,557	56.9%	16,330	43.1%	37,887

Source: US Census 2000

American Community Survey data estimates that an additional 1,399 new housing units have been built since 2000.

Table 7.1.5

YEAR STRUCTURE BUILT	
Total housing units	**41,028**
Built 2005 or later	476
Built 2000 to 2004	923
Built 1990 to 1999	1,435
Built 1980 to 1989	4,478
Built 1970 to 1979	4,302
Built 1960 to 1969	3,081
Built 1950 to 1959	3,302
Built 1940 to 1949	1,962
Built 1939 or earlier	21,069

Source: 2005-2009 American Community Survey Data
Note: ACS Data uses sample data to conduct its analysis thus the total number of units reportedly built since 2000 will be slightly less than the numbers included in the 2010 Census.

After a virtual stagnation of the market in the early 1990s Recession, new residential construction increased in the early to mid-2000s. The recent economic downturn, changes in the housing market, and growing incidence of foreclosure in the later half of the last decade however saw a drop once again in the production of new units.

Table 7.1.6
City of Lowell Building Permit Profile

Year	Permits Issued for New Construction			Total New Residential Units Permitted
	Single Family	Two-Family	Multi-Family	
2010	25	2	54	81
2009	14	4	22	40
2008	33	37	16	86
2007	18	16	49	83
2006*	48	33	108	189
2005	77	20	16	308
2004	51	29	17	201
2003	75	16	16	176
2002	35	13	8	88
2001	34	11	5	76
2000	84	2	2	106
1995	52	3	0	58
1990	36	4	0	44

*Since 2006 the City has required individual units to be permitted separately rather than issuing permits per building as was the previous practice.
Source: City of Lowell Inspectional Services Department

7.2 HOUSING MARKET CONDITIONS

The housing market in Lowell mirrors trends throughout the Commonwealth. The City saw a significant housing boom in the early 2000s with an increase in home prices and a strong market. The booming real estate market was also a source of economic development for the city as investors and developers began building in the City. The increased sale prices also reflected an influx of new residents with greater purchasing power that benefited Lowell's neighborhoods and businesses. More recently however the market has seen a drop in both single family and condominium sales prices. A national foreclosure crisis coupled with high unemployment rates has significantly impacted the housing market.

Table 7.2.1
City of Lowell Median Home Sale Prices

Year	1-Family	Condo
2009*	185,000	126,125
2008	194,900	155,900
2007	251,000	175,000
2006	265,000	202,000
2005	274,900	193,500
2004	248,000	165,000
2003	218,000	144,900
2002	195,000	129,000
2001	170,000	104,900
2000	140,000	85,000
1995	80,000	34,000
1990	110,000	85,500

*Data available from January-June
Source: Banker and Tradesman

Table 7.2.2
City of Lowell: MLS Property Listings

	Jan-10		Dec-04		% Change	
Property Type	No. of Listings	Med. List Price	No. of Listings	Med. List Price	No. of Listings	Med. List Price
Single Family	160	$239,900	162	$277,924	-1%	-14%
Multi Family	107	$230,000	83	$390,160	29%	-41%
Condominium	156	$162,500	151	$196,999	3%	-18%

Source: Coldwell Banker, www.newenglandmoves.com, Multiple Listing Service (MLS)

The early-mid 2000's saw a period of significant increases in home sales prices as indicated in the tables below. Recent economic conditions however have caused housing prices to drop again.

Although the cost of buying a home remains reasonable in certain sections of Lowell compared to the surrounding suburbs located along the Interstate 495 corridor, the poverty and low-income rates keep home buying out of reach for many residents.

Table 7.2.3
Median Single Family Sales Prices (1989-2009)

	Billerica	Chelmsford	Dracut	Dunstable	Groton	Lowell	Pepperell	Tewksbury	Tyngsboro	Westford
2009*	304,000	320,000	240,000	477,000	443,625	185,000	268,000	299,900	342,500	427,500
2008	305,000	325,000	263,000	441,500	400,000	194,900	292,000	319,450	328,000	420,000
2007	342,500	353,500	285,000	399,900	501,450	251,000	322,500	338,500	381,100	498,500
2006	345,000	370,000	305,000	478,500	465,000	265,000	322,500	365,000	388,750	465,000
2005	374,000	373,700	314,000	570,000	472,000	274,900	365,000	380,000	384,950	515,000
2004	356,250	355,000	295,500	414,300	455,000	252,250	339,900	354,450	365,000	464,000
1999	199,900	230,000	164,000	286,475	318,828	130,000	194,900	215,400	232,140	302,400
1994	141,750	165,150	123,125	179,950	213,750	89,000	150,350	155,000	159,950	225,000
1989	152,500	179,000	145,000	260,000	217,900	127,000	165,000	166,500	196,750	229,950
%Chng '05-09	-18.7%	-14.4%	-23.6%	-16.3%	-6.0%	-32.7%	-26.6%	-21.1%	-11.0%	-17.0%

Source: The Warren Group (www.thewarrengroup.com, March 2009)
* 2009 Data for Jan - Jun only

Table 7.2.4
Median Condominium Sales Prices (1989-2009)

	Billerica	Chelmsford	Dracut	Dunstable	Groton	Lowell	Pepperell	Tewksbury	Tyngsboro	Westford
2009*	225,450	195,000	155,000	0	383,351	126,125	0	257,000	160,625	245,250
2008	244,900	218,500	165,500	0	217,500	155,900	181,000	280,000	185,000	289,000
2007	195,000	245,250	179,950	0	312,500	175,000	168,500	265,000	182,000	210,000
2006	270,000	250,000	190,000	0	337,500	202,000	249,000	285,000	222,000	340,000
2005	190,500	272,000	193,248	0	270,200	193,500	249,900	287,000	209,000	369,900
2004	167,000	255,000	176,500	0	263,000	165,950	190,000	273,450	181,000	369,900
1999	76,398	142,000	84,000	0	144,000	70,950	93,000	154,400	87,125	249,000
1994	42,000	104,000	66,000	0	132,000	39,500	65,750	103,500	67,500	245,963
1989	105,000	130,000	99,900	0	113,760	99,999	101,000	115,321	98,000	234,500
%Chng '05-09	18.3%	-28.3%	-19.8%	--	41.9%	-34.8%	--	-10.5%	-23.1%	-33.7%

Source: The Warren Group (www.thewarrengroup.com, March 2005)
* 2009 Data for Jan - Jun only

Table 7.2.5
Lowell, MA-NH PMSA: % of Annual Income Spent on Housing

Year	AMI	Median Single-Family Housing Price	Interest Rate	% of Annual Income
2005	$80,400	$274,900	5.77%	22.80%
2006	$81,600	$265,000	6.21%	22.70%
2007	$82,400	$251,000	6.18%	21.22%
2008	$84,800	$194,900	6.07%	15.83%
2009	$88,400	$192,550	5.01%	13.35%

Source: HUD, Warren Group

The cost of renting an apartment has also skyrocketed as the city-wide rental vacancy rate of 1.8% limits supply. The average cost of renting a two bedroom home in Lowell during the period Dec, 1998 – May 1999 was $714 not including utilities, as reported in the City's 2000 Consolidated Plan. These costs have increased by approximately 10 -15 percent since the 1999. The Lowell Housing Authority has commented that 10 -15% of

recent Section 8 and voucher recipients are unable to find apartments within the HUD Fair Market Rate structures. Table 7-6 below shows rental rates reported by the Lowell Housing Authority as of January 2001. Figures do not include utilities except as noted.

Table 7.2.6
Rental Rates & HUD Fair Market Rents

Rental Rates				2001 Maximum Fair Market Rent**		
Unit size	**1999**	**2001**	**Percent Change**	**Section 8**	**State MRVP**	**Voucher Payment**
1 Bed -Old	$558	$689	12.3%	659	511	725
1 Bed-New	$624	$810*	13%	659	511	725
2 Bed-Old	$714	$786	11%	796	600	876
2 Bed-New	$699	1045*	15%	796	600	876
3 Bed	$739	$908	12.2%	997	696	1097
4 Bed	$866	$1221	14%	1115	818	1227
5 Bed	$900	$957	10.6%	1282	947	1410

*includes heat **includes utilities

Source: US Department of Housing and Urban Development

7.3 HOUSING AFFORDABILITY

Household incomes have failed to keep pace with the increases in housing costs in the Lowell area, causing a decrease in housing affordability. These trends mirror those in the Commonwealth as a whole. The lack of affordable housing options is particularly detrimental to those families with low and moderate incomes.

2010 Family Income						
Location	**2010 Estimated Median Family Income (HUD)**		**Maximum Affordable Monthly Housing Cost by % of Family AMI**			
	Annual	**Monthly**	**30%**	**50%**	**80%**	**100%**
Massachusetts	$65,200	$5,433	$489	$815	$1,305	$1,630
Lowell, MA-NH PMSA	$72,300	$6,025	$542	$904	$1,446	$1,808

Fair Market Rents By Number of Bedrooms, 2005-2011					
	Efficiency	One-Bedroom	Two-Bedroom	Three-Bedroom	Four-Bedroom
Final FY 2011 FMR	$852	$1,020	$1,311	$1,565	$1,717
Final FY 2010 FMR	$843	$1,009	$1,297	$1,549	$1,699
Final FY 2009 FMR	$835	$1,000	$1,285	$1,534	$1,683
Final FY 2008 FMR	$801	$958	$1,232	$1,471	$1,614
Final FY 2007 FMR	$761	$911	$1,171	$1,398	$1,534
Final FY 2006 FMR	$738	$883	$1,135	$1,355	$1,487
Final FY 2005 FMR	$715	$856	$1,102	$1,316	$1,437

Source: US Department of Housing and Urban Development

Income Needed to Afford FMR										
Location	Amount					Percent of Family AMI				
	Zero Bedrooms	One Bedroom	Two Bedrooms	Three Bedrooms	Four Bedrooms	Zero Bedrooms	One Bedroom	Two Bedrooms	Three Bedrooms	Four Bedrooms
Massachusetts	$36,968	$40,659	$48,602	$58,289	$64,875	44%	48%	58%	69%	77%
Lowell, HMFA	$33,720	$40,360	$51,880	$61,960	$67,960	38%	46%	59%	70%	77%

Housing Wage								
Location	Hourly Wage to Afford FMR *(40 hrs/wk)*				% of Minimum Wage *($6.75/hr)*			
	Zero Bedrooms	One Bedroom	Two Bedrooms	Three Bedrooms	Zero Bedrooms	One Bedroom	Two Bedrooms	Three Bedrooms
Massachusetts	$17.77	$19.55	$23.37	$28.02	222%	244%	292%	350%
Lowell, MA-NH PMSA	$16.21	$19.40	$24.94	$29.79	203%	243%	312%	372%

Source: National Low Income Housing Coalition, *Out of Reach Report*, 2010
HMFA = HUD Metropolitan FMR Area

Location	Work Hours/Week Necessary at Minimum Wage to Afford FMR *(MA=$6.75)*				
	Zero Bedroom FMR	One Bedroom FMR	Two Bedroom FMR	Three Bedroom FMR	Four Bedroom FMR
Massachusetts	89	98	117	140	156
Lowell, MA-NH PMSA	81	97	125	149	163

- Maximum Affordable Housing Cost represents the generally accepted standard of spending not more than 30% of income on housing costs.
- AMI = Area Median Income (HUD, 2001, trended forward by NLIHC to estimate for 2002).
- FMR = Fair Market Rent (HUD, 2002).

Source: National Low Income Housing Coalition, *Out of Reach*

Although the situation is not as severe as in the Commonwealth as a whole, rental housing in Lowell is too expensive for many households to afford. Locating affordable housing in Lowell is particularly challenging for those with lower incomes compared to the area median incomes. Area incomes also are not keeping pace with the costs of purchasing a home in Lowell or its neighboring towns. With the exceptions of Billerica and Dracut, it is not possible to afford the costs of owning the average single-family home on an average income in any of the towns in the Greater Lowell area.

7.4 SUBSIDIZED & AFFORDABLE HOUSING

According to the Department of Housing and Community Development's Subsidized Housing Inventory, 12.6 % or 5,212 units of the City's total housing stock of 41,431 units are subsidized to assist low-income residents. In addition, the Lowell Housing Authority and Community Teamwork Inc., a regional affordable housing agency, manage about 2,030 Section 8 rental assistance vouchers. When these vouchers are factored into the subsidized housing units, the total percentage of affordable housing in Lowell increases to 17.5%. According to the latest American Community Survey data, this represents 38% of the total rental units in the City.

Lowell is one of only a handful of communities that exceeds the State's goal of 10% affordability under Chapter 40B.

Table 7.4.1
Subsidized Housing for the Cities and Towns that make up the Lowell PMSA

City/Town	Population	Housing Units	Subsidized Housing	Percent Subsidized	Units for 10% State Goal of Subsidized Housing
Lowell	106,519	41,431	5,212	12.6%	3,947
Dracut	29,457	11,351	590	5.2%	1,135
Tewksbury	28,961	10,848	967	8.9%	1,085
Billerica	40,243	14,481	1,186	8.2%	1,448
Chelmsford	33,802	13,807	966	7.0%	1,381
Westford	21,951	7,876	347	4.4%	788
Tyngsboro	11,292	4,206	194	4.6%	421
Pepperell	11,497	5,446	122	2.2%	545
Groton	10,646	3,989	197	4.9%	399
Dunstable	3,179	1,098	0	0.0%	110
Totals	**297,547**	**112,570**	**9,781**	**9%**	**11,257**
Lowell %	38.20%	41.10%	53.3%		

Source: Massachusetts Department of Housing and Community Development, 2010 Census

Of the 5,212 total units of subsidized housing in Lowell in 2010, 1,896 are located in public housing developments. 984 of these units are reserved for elderly residents, while the remaining 912 are set-aside for families. A total of 69 units are handicapped accessible, of which 47 are located in elderly developments and 22 are located in family developments. Of the total public housing units in Lowell, 90% of the units are occupied. The vacancies are due to resident turnover and upgrading of units for new tenants. Detailed information is provided for each public housing development in Lowell in Table 7-10.

Table 7.4.2: Lowell Public Housing Units								
Housing Development	Total Units	Occupied Units	Type of Units	# Accessible Units	% White	% Hispanic	% Black	% Asian
Archie Kenefick Manor	42	41	Elderly	3	92.68%	4.88%	2.44%	0%
Bishop Markham Villiage	399	394	Elderly	28	51.52%	31.73%	5.33%	11.17%
Dewey Archambault Towers	189	188	Elderly	2	65.96%	14.89%	5.85%	12.77%
Fr. Morrissette Manor	57	57	Elderly	3	73.21%	17.86%	3.57%	5.36%
Fr. Norton Manor	112	113	Elderly	0	80.53%	10.62%	4.42%	3.54%
Francis Gatehouse Mill	90	87	Elderly	9	94.25%	3.45%	0%	2.30%
Lawrence- Faulkner St.	28	27	Elderly	1	96.30%	0%	0%	3.70%
Scattered Sites	67	66	Elderly	1	59.09%	25.76%	1.52%	13.64%
Total - Elderly	984	973		47				
705-1 705-2 Dublin St (formerly Larange) 705-3 Lane-Liberty-Walker St	23 10 32	56	Family	0	32.14%	41.07%	12.50%	14.29%
George W. Flannagan Villiage	169	166	Family	7	30.72%	46.39%	5.42%	16.87%
Harold Hartwell Crt.	27	25	Family	0	16.00%	64.00%	0%	20%
North Common Village	524	492	Family	10	19.31%	53.86%	3.66%	22.76%
Scattered Sites (3Community Residences)	-	-	Family	0	100%	0%	0%	0%
Scattered Sites	127	-	Family	5	22.73%	40.91%	0%	29.55%
Total- Family	912	739		22				
TOTAL	**1896**	**1712**		**69**				

Source: Lowell Housing Authority 2010

7.5 UMASS LOWELL & MIDDLESEX COMMUNITY COLLEGE

According to the UMass Lowell-Lowell Plan Downtown Initiative Report, in 2009-2010, over 13,000 students were enrolled at UMass Lowell, a 20% increase from 2007-2008. Of the total student body, 4,558 (approximately 35%) lived in Lowell, either on or off-campus. Middlesex Community College, similarly, has seen an increase in enrollment over the past several years. Approximately 25% of those enrolled live in Lowell. Other students commute to class from other cities or towns.

Table 7.5.1: Middlesex Community College Student Enrollments					
Year (Fall Semester)	**Total Students Enrolled (Lowell & New Bedford)**	**Total Living in Lowell**	**% Living in Lowell**	**Total Living in Other City/Town**	**% Living in Other City/Town**
2006	8110	1886	23%	6224	77%
2007	8124	1884	23%	6240	77%
2008	8522	2057	24%	6465	76%
2009	9516	2313	24%	7203	76%
2010	9710	2361	24%	7349	76%
2011	9808	2452	25%	7356	75%

Source: Middlesex Community College, Office of the Registrar, 2011

7.6 FORECLOSURES

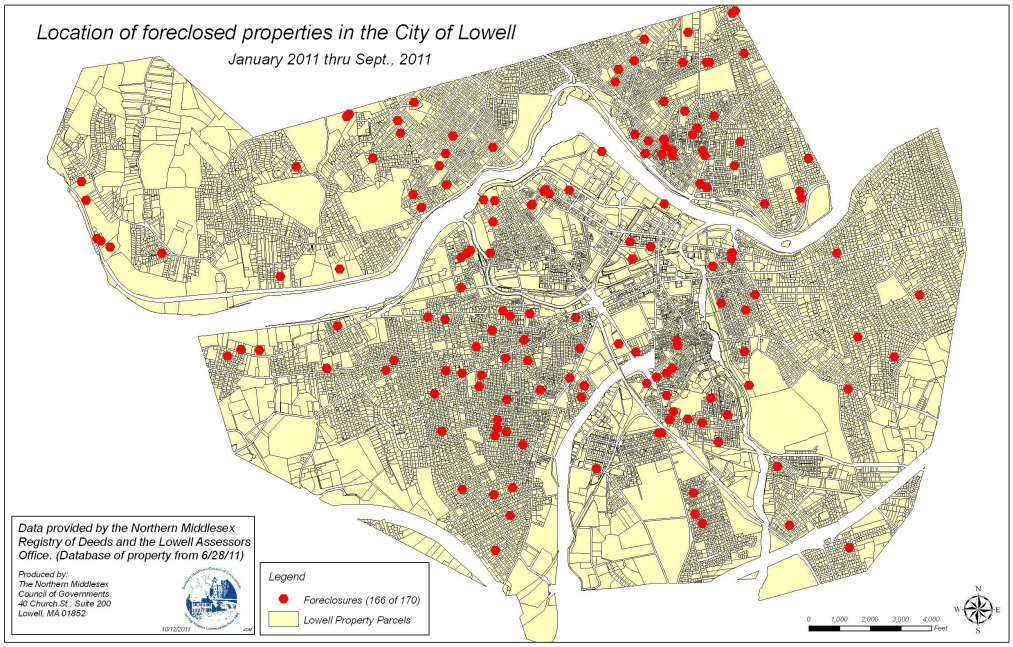
Although Lowell has been impacted by the foreclosure crisis in recent years, the City has benefited from strong local partnerships and other avenues of support to address the situation proactively. In 2008, Lowell ranked 5th among Massachusetts communities qualifying for Neighborhood Stabilization Program (NSP) funding and received support through the State's initial round. Within a short time, however, Lowell's ranking fell considerably. By the time NSP II funds were made available through the American Recovery and Reinvestment Act in 2009, only two census tracts (3111 and 3112) qualified for assistance. No areas qualified for NSP III funds, released a short time later. A combination of efforts by the City, neighborhood groups, lending institutions, and non-profit providers involved with the Foreclosure Prevention Task Force had a significant impact on this quick turn around. Providers include the Merrimack Valley Housing Partnership, which offers pre-purchase counseling programs administered in multiple languages and the Coalition for a Better Acre and Community Teamwork, Inc which provide services through Home Preservation Center, among others. Through the establishment of a Development Services Division within the Department of Planning and Development, the City has been better able to enforce the existing ordinances with respect to vacant and foreclosed properties, and develop a Receivership Program to incentivize the rehabilitation of troubled buildings throughout the city. The following table and map contain recent foreclosure data.

Table 7.6.1: Foreclosures in Lowell (2008 - 2010)

January - July 2008		January - July 2009		January - July 2010	
Lowell	District	Lowell	District	Lowell	District
229	149	141	84	220	180

Source: Northern Middlesex Registry of Deeds, August 2010

Figure 7.1: Foreclosures in Lowell (January 2011 – September 2011)



7.7 LEAD PAINT

All housing units built before 1980 are considered likely to have lead-based paint hazards. 1978 was the first year that Federal law prohibited the use of lead-based paint in residential property. Detailed housing age information is available in increments of 10 year time periods in each Census. Additionally, housing age estimates are provided incrementally between each Census by The American Community Survey. As not all supplies of lead-based paint were used up immediately after the enactment of this law, there will be instances when paint with lead was used in properties built soon after the passage of the law. Thus, to be conservative and not to leave out potentially hazardous housing units, housing units built through 1980 are included in this estimate.

Based on the age of housing stock data provided by the American Community Survey for the City of Lowell, the vast majority of housing units (82%) were built before 1980. These total approximately 33,716 units out of 41,028. The City of Lowell continues to be designated as a high risk community by the Massachusetts Department of Public Health. According to the Massachusetts Childhood Lead Poisoning Prevention Program a high risk community is where blood lead levels >= 20 mcg/dl incident rate per 1000 children screened per year is above the overall state rate.

Table 7.5.1: High Risk Communities for Childhood Lead Poisoning (2005-2010)							
Rank	Community	5-Year Cases	Rate: Cases per 1000	% Low Income	% Structures pre-1950	Adjusted Rate	% Screened
1	New Bedford	45	1.8	58%	66%	4.5	95%
2	Lynn	44	1.8	47%	66%	3.6	89%
3	Chelsea	22	1.6	56%	60%	3.5	>99%
4	Somerville	19	1.5	36%	78%	2.7	82%
5	Springfield	57	1.4	56%	52%	2.6	81%
6	Brockton	47	1.9	44%	46%	2.5	91%
7	Lawrence	23	1.0	59%	61%	2.3	80%
8	Boston	113	1.0	45%	67%	2.0	88%
9	Lowell	**29**	**1.1**	**45%**	**54%**	**1.7**	**81%**
10	Worcester	34	0.9	49%	57%	1.6	80%
	MA High Risk	433	1.3	48%	62%	2.5	86%
	Massachusetts	836	0.7	35%	44%	0.7	73%

Source: MA Dept of Public Health, Childhood Lead Poisoning Prevention Program

DESCRIPTION OF THE LOWELL LEAD PROGRAM

Lowell has had a highly active program for the evaluation and reduction of lead paint hazards in residential properties since 1998. With grant funding from the HUD Office of Healthy Homes and Lead Hazard Control the Lowell Lead Program has been able to provide financial and technical assistance to low income homeowners and owners that rent to low-income tenants in order to achieve compliance with HUD requirements and the Massachusetts Lead Law. Housed in the Division of Planning and Development, the Lowell Lead Program is an integral part of the services offered in combination with the Housing Rehabilitation Program, the First Time Home Buyer Program and CDBG rehabilitation funds. The Lowell Lead Program is also supported by MassHousing "Get the Lead Out" loan and contributions from property owners receiving deleading assistance.

In order to preserve and encourage affordable housing in the City of Lowell, in exchange for grant funds, the Program requires a three year affordable housing deed restriction for all investor units. The restriction encourages landlords to rent deleaded units to families with children under 6 years old and requires that units are offered at rents affordable to low and moderate income households.

Other key components of the Lowell Lead Program are public health education regarding lead poisoning prevention, outreach regarding the availability of funds, technical training and certification in lead related employment opportunities and free blood lead testing for low income families with children under 6 years old. The education and outreach components are essential to modify behaviors in a way that ultimately help reduce the incidence of childhood lead poisoning.

Partnerships with the following agencies have been established to successfully reach the Lowell Lead Program goals:

- Lowell Health Department
- Merrimack Valley Housing Partnership (MVHP)
- Community Teamwork Inc., YouthBuild Program
- Greater Lawrence Community Action Council (GLCAC)
- MassHousing Get the Lead Out Loan Program
- Lowell Five Cent Savings Bank
- Institute for Environmental Education

The Lowell Lead Program will continue, as funding levels allow, working with partners and the Massachusetts Childhood Lead Poisoning Prevention Program to identify lead based paint hazards and assist property owners to obtain compliance with the Mass Lead Law.

8.0 PARKS, RECREATION & OPEN SPACE

Over the course of the past decade, significant progress has occurred within the realm of parks, recreation, and open space in the City of Lowell. Major projects have included the development of the Concord River Greenway (CRG), improvements and extensions to canal and river walkways, and the enhancement of existing open space across all neighborhoods. In 2005, the City updated its Open Space Plan to better assess and address community needs and to secure funding for relevant projects.

The Concord River Greenway development, which is well underway, currently consists of 2,700 linear feet of trail and 1.3 acres of open space. Public art and interpretive signage line the multi-modal path, and an online classroom can be utilized by visiting school programs. Completion of the CRG is expected within the next several years, at which time it will connect to the regional and state-wide network of trails.

The city has worked collaboratively with the Lowell National Historical Park to secure funding for and manage the development and redevelopment of many canal walkways throughout the downtown and Acre neighborhood. Since 2001, 6,662 linear feet of canal walkway have been restored or constructed, and an additional 11,360 linear feet are currently underway.

Through the City Manager's Neighborhood Initiative and other various planning processes, the city has worked closely with community stakeholders to best determine open space needs and address the changing demographics of Lowell's most urban neighborhoods. Improvements to athletic facilities and amenities have been made in McPherson, Clemente, and Armory Parks, among many others. In addition to refurbishing dozens of parks across all neighborhoods, nearly 10 new parks have been established throughout the city, including Jollene Dubner, Muldoon, and Olga Nieves. In total Lowell currently has 438.81 acres of publically owned open space, an increase of 13.32 acres since 2001.

The following parks have been dedicated in the City of Lowell.

Site Name	Acres
ALUMNI FIELD	5.94
BOATHOUSE SITE & GREENWAY	4.28
EDSON CEMETERY	50.95
ED WALSH SOCCER COMPLEX	6.10
FRANCIS GATE PARK	11.42
HAMBLET CEMETERY	0.54
HILDRETH FAMILY CEMETERY	2.25
HUNT CEMETERY	0.66
JANAS SKATING RINK	7.95
JOLLENE DUBNER PARK	2.72
LOWELL CEMETERY	82.64
LOWELL HERITAGE STATE PARK	118.0

McDermott RESERVOIR	17.14
MERRIMACK RIVER BIKE PATH	1.01
MULDOON PARK	.55
OLD CEMETERY	0.53
OLGA NIEVES PARK	.23
OLD ENGLISH CEMETERY	6.26
PAWTUCKETVILLE CEMETERY	0.20
POLISH CEMETERY	7.83
REGATTA FIELD	22.29
RIVER GREENWAY	1.30
RIVERFRONT PARK	5.00
ROBERTO CLEMENTE PARK	3.00
SCHOOL STREET CEMETERY	1.11
SHEEHY PARK	.40
SPAULDING HOUSE PARK	.42
ST PATRICKS CEMETERY	38.24
ST. PETER'S CEMETERY	23.19
SWEENEY PARK	.20
VANDENBURG ESPLANADE	0.62
WESTLAWN CEMETERY	38.66
WOODBINE CEMETERY	0.76
WYMAN BIRD SANCTUARY	9.08
Total Acres	471.47

Although 471.47 acres may seem like a lot of open space, it should be noted that approximately one quarter of that number is located in the Lowell-Dracut-Tyngsborough State Forest and 253.8 acres is cemetery land. If you deduct the amount of cemetery land from the total acres at today's population you would have less than 2 acres per 1000 resident of open space.

8.1 PUBLIC CONSERVATION AND RECREATION RESOURCES

This section includes all lands within the City of Lowell with current and potential conservation and recreation value to the residents of Lowell. City properties are under the management of the following authorities:

* School Department
* Parks Department
* Fire Department
* Water Department
* Department of Public Works
* Sewer Department
* Building Administrator
* Cemeteries

There are also a number of tax possessions under the jurisdictions of the city. These parcels of land and buildings could provide further recreational opportunities for neighborhood residents. Under current tax title regulations in the city a private

developer can petition the city to purchase property through this program. Once the petition is made, other agencies can comment on the parcel in question and can recommend for or against the purchase. This plan recommends that when the city acquires several parcels at a time, a list and description of the parcels be circulated to various departments for comment. This will allow the recreation department to identify parcels suitable for open space use and automatically take that parcel off the list of for sale properties. By pursuing this procedure, the various departments will know firsthand what parcels are available and make provisions so that they are kept in the city's possession.

State lands are predominately under the administration and management of the Department of Environmental Management (DEM); University of Massachusetts – Lowell; and the Department of Public Works (DPW). DEM Properties include much of the Locks and Canal areas and the state parks. DEM maintains and operates the 1,015 acre Lowell/Dracut/Tyngsborough State Forest s well as the 118 acre Lowell Heritage State Park. These two sites allow a plethora of recreational and passive activities for all ages and disabilities. Federal properties consist primarily of United States Government buildings including the Courthouse, Postal Facility, and National Park Service property. They comprise only a very small percentage of the land area in Lowell.

To determine the extent and need for new park facilities citywide, existing amenities were reviewed. This analysis was applied to all major neighborhoods.

8.2 NATIONAL STANDARDS FOR RECREATIONAL FACILITIES

In the past, the National Recreation Parks Association (NRPA) guidelines have been followed to determine open space needs by location and population. Traditionally, the NRPA looked at three park systems: mini-park, neighborhood park, and community park; and determined how much acreage should be supplied per 1,000 residents. NRPA designated between 6 and 10 acres per 1,000 residents. Over the past decade, however, the guidelines have shifted and taken on a different focus. Instead of measuring the amount of space in acreage, cultural and social requirements are taken into account. To better accommodate demographic shifts that have occurred over the past decade, the NRPA has changed its guidelines and now uses the following as a means of measurement:

- The need to accommodate different cultures
- The need to include citizen opinion in the process
- The identification of the wellness movement

Since 2003, there have been great strides taken to address all three of these guidelines through the development and refurbishment of open space. This chapter will outline some of those efforts on a neighborhood level basis.

8.3 PUBLIC CONSERVATION AND RECREATIONAL RESOURCES BY NEIGHBORHOOD

8.3.1 THE ACRE (CENSUS TRACTS 3107, 3108, 3883, 3111, and 3110)

The 2000 Census figures show a population of 12,072 for the Acre, where as the 2010 figures show 12,271. Since 2001, four new parks and 7.52 acres have been added to the neighborhood: Olga Nieves Park, Sheehy Park, Spaulding House Park, and Stoklosa School Park. The neighborhood had 21.5 acres in 2001 and now has 29.02 Acres.

Adams Park	1.0 Acres
Bartlett Field	4.0 Acres
Harmony Park	0.2 Acres
Moody Street Playground	1.0 Acres
North Common	11.3 Acres
Western Canal	4.0 Acres
Olga Nieves Park	.23 Acres
Sheehy Park	5.33 Acres
Spaulding House Park	.42 Acres
Stoklosa School Park	1.5 Acres
	28.58 Acres

Located in the above mentioned parks are the following passive and active recreational facilities. Since 2001, 2 new playgrounds, 1 skate park, 5 basketball court, and 34 benches have been added to the neighborhood. One set of bleachers and one tennis court have been removed.

1 Baseball diamond
1 little league baseball diamond
2 Playgrounds
1 Skate Park
1 multipurpose field
3 tennis courts (lighted)
8 Basketball courts (1 lighted)
6-chess/checker game tables
1 sandbox area
2 tot areas
73 benches
1 Softball diamond

All of these parks are developed and are well distributed throughout the neighborhood. Given the lack of available open space within the neighborhood, any additional facilities would have to be put into the existing parks and playgrounds. The Western Canal walkway improvements have helped provide the neighborhood with much needed open space in addition to provided residents with safer multi-modal transportation routes (walking, biking and jogging). The walkway also provides passive recreation where one can sit or picnic. Sheehy Park and Spaulding House Park have been tremendous additions along the waterfront, allowing for a variety of recreational uses. The Stoklosa School playground has provided much needed basketball courts and open space to the

center of the Acre Olga Nieves and park improvements on Moody Street have added 2 new playgrounds. The Latino community, which is the predominant ethnic group in the Acre, has been the greatest proponent of playgrounds of any ethnic group. The adoption of Harmony Park by The Revolving Museum between 2008-2010 resulted in a substantial amount of public art within the neighborhood, including a Cambodian mosaic and a South American totem pole. This art helped celebrate the cultures represented by the neighboring residents.

8.3.2 BACK CENTRAL (CENSUS TRACTS 3119, 3120)

The 2000 Census figures show a population of 5,643 for Back Central, where as the 2010 census show a population of 5367. Two new parks and .37 acres have been added to the neighborhood since 2001: Dubner Park and Sweeney Park. The neighborhood currently has 30.88 acres of parks contained in the following parks:

Carter Street Playground	0.50 Acres
Concord Riverbank Park	2.72 Acres
Dubner Park	2.72 Acres
Father Kirwin Park	1.54 Acres
Martin Portuguese Park	.1 Acres
Oliveria Park	1.83 Acres
Rotary Club Park	0.86 Acres
South Common	20.31 Acres
Walter Lemieux Park	.1 Acres
Sweeney Park	.2 Acres
	30.88 Acres

Located in the above parks are the following selective facilities. Since 2001, a skate park, 2 picnic tables, a basketball court, and 20 benches have been added to the neighborhood. One lighted basketball court was removed to create the skate park.

1 baseball diamond
1 soccer field
1 skate park
4 basketball courts (2 lighted)
3 tennis courts
1 swimming pool
1 running tract
1 fitness course
4 tot areas
2 picnic tables
36 benches

While not located directly within the Back Central neighborhood, the Concord River Greenway has enhanced the quality of life for residents by providing a trail system, benches, and other amenities directly across the river, which gives this section of Lowell a fine passive recreational area. The Concord River, in certain sections, drops in elevation providing an excellent area for whitewater rafting and kayaking. This section

along with a bike/pedestrian path, once connected to the regional network of trails, will provide a multitude of recreational activities for both local and regional residents. Additionally, two large parks (Fort Hill and Shedd) in neighboring South Lowell provide recreational sites for the residents of Back Central.

8.3.3 BELVIDERE / SOUTH LOWELL (CENSUS TRACTS 3123, 3124, 3125)

The 2000 Census shows a population total for these two neighborhoods of 19,380. The 2010 Census, by contrast, shows a population total of 19,951. While there have been many significant improvements to the green spaces in these neighborhoods, the single largest project of note has been the Concord River Greenway expansion, which is currently 2,700 linear feet of trail and 1.3 acres of green space. The neighborhood currently has 121.80 acres of open space contained in the following parks:

Alumni Field	5.50 Acres
Cawley Park	13.92 Acres
Commonwealth Avenue Playground	0.50 Acres
Concord River Greenway	1.30 Acres
Donahue Park (formerly Stratham)	5.00 Acres
Ducharme Park	.51 Acres
Fayette Street Playground	0.70 Acres
Fort Hill Park	34.40 Acres
Kitteridge Park	1.80 Acres
Knott Park	1.17 Acres
Reily School Park	3.17 Acres
Shedd Park	53.83 Acres
	121.80 Acres

Located in the above parks are the following selective facilities. Since 2001, there have been additions of two new playgrounds, one unlit basketball court, a lighted multi-use field, two unlit softball fields, a spray park and water playground, a public fountain, and forty benches. One storage facility has been removed.

2 baseball diamonds (1 lighted)
3 little league baseball diamonds
2 softball fields (unlighted)
4 multi-purpose playing fields – football/soccer
1 football field
8 tennis courts (lighted)
5 basketball courts (4 lighted, 1 not lighted)
2 ¼ mile running tracks
2 picnic areas
2 playgrounds
1 spray park and water playground
1 swimming pool
5 tot areas
4 sets of bleachers
98 benches

According to the NRPA standards used in 2001 and earlier, the section of Lowell containing Belvidere and South Lowell has and continues to have a sufficient amount of recreational land. The CRG expansion has further contributed to the existing open space available. The spray park and pavilion at Shedd Park has also added tremendously to the neighborhood by allowing for a multitude of recreational uses in a single location. The expansion of athletic field space in these neighborhoods now allows for area teams to play and practice soccer, softball, and other field sports.

8.3.4 CENTRALVILLE (CENSUS TRACTS 3102, 3103, 3104)

The 2000 Census figures show a population of 15,808 for Centralville. The 2010 Census show a population of 15,237. The neighborhood currently has 66.53 acres contained in the following parks, which is the same acreage it had in 2001.

Christian Hill Reservoir	14.96 Acres
Centralville Memorial Park	.13 Acres
Dog Park (formerly First Street Park)	1.48 Acres
Ferry Landing Park (Formerly Lyons)	.13 Acres
Gage Field	21.08 Acres
Hovey Field	8.54 Acres
McPhearson Playground	8.57 Acres
Monsignor Keenan Playground	0.33 Acres
St. Louis Playground	9.30 Acres
Tenth Street Reservoir	1.33 Acres
Varnum Park	0.50 Acres
Veterans Memorial Park	0.18 Acres
	66.53 Acres

Since 2001, a multi-use soccer complex, a lighted basketball court, a lighted little league field, a lighted baseball field, a lighted volleyball court, two soccer fields, two new playgrounds, a mural, a shade structure, a refurbished basketball court, and four benches have been added to the existing parks. Two little league baseball diamonds have been removed. At the neighborhood's request, First Street Playground was also transformed into the city's first dog park. The eight parks in this section of Lowell contain the following selective facilities.

1 little league baseball diamond
3 baseball diamonds (one lighted)
5 softball diamonds (1 lighted)
4 football/soccer fields
1 multi-use soccer complex
6 basketball courts (1 lighted, 1 refurbished)
8 tennis courts (3 lighted)
2 Volleyball courts (lighted)
1 swimming pool/wading pool
6 tot areas
1 picnic area

3 play areas
2 sets of stands
1 shade structure
1 Storage location
47 benches

When examining the facilities available to Centralville residents, it is quite apparent that this particular neighborhood has the most facilities in the City. Gage Field lost approximately 5 acres for a new school to serve the Centralville residents. However, new athletic facilities have been built since that time to make up for this loss. The City Manager's Neighborhood Initiative in Centralville targeted McPherson Playground, and took into account the input from the community when redesigning that space. The reservoir on Christian Hill has been capped. In the winter, this site could be an excellent skating area if the water freezes adequately.

8.3.5 DOWNTOWN (CENSUS TRACT 3101)

The 2000 Census figures show a population of 3,881 for Downtown Lowell. The 2010 Census figure show a population of 5,267. Since 2001, one new park and .47 acres were created downtown. The new park was named Creegan Park. This section of the city contains approximately 2.86 acres of open space found at the following locations:

Creegan Park	.47 Acres
Kerouac Park	1.02 Acres
Lucy Larcom Park	1.27 Acres
Victorian garden	.1 Acres
	2.86 Acres

Additional park facilities are needed in this section of Lowell. As it contains much of the central business district, little room is available to install new equipment or acquire open space. The playground at Mack plaza has provided play space for younger children. The downtown area also contains a large elderly population who has different recreational needs. Accordingly, the city needs to properly plan for this segment and provide more passive recreational opportunities where the elderly can sit and meet with friends. Since 2001, 20 benches, several public art sculptures, a small play area, and 6 new green spaces have been added to the neighborhood.

8.3.6 HIGHLANDS (CENSUS TRACTS 3112, 3113, 3114, 3115, 3116, 3117, 3118)

According to the 2000 Census, the population of the Highlands is 29,631. According to the 2010 Census, the population in this neighborhood is 30,190. The neighborhood currently has 65.31 acres contained in the following parks:

Armory Park	0.75 Acres
Callery Park	5.50 Acres
Clemente Park	3.00 Acres
Colburn Park	0.25 Acres
Crowley Park	0.50 Acres
Daley School Field	12.0 Acres

Doane Street Park	1.40 Acres
Durkin Playground	1.55 Acres
Edwards Soccer Field	8.00 Acres
Finneral Park	.08 Acres
Hadley Field	5.88 Acres
Highland Park	19.6 Acres
Lincoln Square Park	0.50 Acres
Morey Street Playground	1.20 Acres
Mulligan Park (was Avenue A)	2.78 Acres
Perry Playground	0.32 Acres
Tyler Park	2.00 Acres
	65.31 Acres

Most parks in the Highlands neighborhood are well distributed. Since 2001, the following amenities have been added to the existing parks: 4 playgrounds, 1 concession stand, 1 shade shelter, 6 volleyball courts, 1 skate park, 1 basketball cour tand 48 benches. 1 Tennis court was removed. The city has worked closely with the neighborhood, and the Cambodian community in particular to better meet recreational needs in this part of the city. As part of the City Manager's Neighborhood Initiative, the volleyball courts at Clemente Park were refurbished and lights were turned on to accommodate night time use. A refreshment stand was also built in an architectural style to match the values of the local community. Many other park improvements have also been implemented, such as the addition of skate parks to provide this type of recreational option for youth. Located in the parks and playgrounds listed above are the following selective facilities:

5 baseball diamonds
1 football/soccer field
2 softball diamonds (lighted) 1 little league baseball diamond
1 volleyball court
1 street hockey court
8 basketball courts (5 lighted)
9 tennis courts (7 lighted)
1 swimming pool (unusable)
6 volleyball courts
10 tot areas
3 sets of bleachers
1 concession stand
1 shade shelter
4 playgrounds
2 skate board parks
104 benches

The recreational needs of the Highlands can be provided at existing parks and playgrounds. In addition, Mount Pleasant Golf course provides a large amount of open space that is accessible to the public in the winter for cross country skiing and sledding.

8.3.7 PAWTUCKETVILLE (CENSUS TRACT 3105, 3106)

The 2000 Census figures show a population of 14,355 for Pawtucketville. The 2010 Census figures show a population of 15,020. The neighborhood currently has 95.36 acres contained in the following parks:

Bourgeois Park	0.25 Acres
Campbell Park	2.53 Acres
Father McGuire Playground	4.58 Acres
Fells Playground	0.30 Acres
Flaggies Park	4.50 Acres
LeBlanc Park	60.0 Acres
Pawtucket Memorial Park	1.20 Acres
Wang Parcel	20.0 Acres
Wannalancit Park	2.00 Acres
	95.36 Acres

Since 2001, 2 new playgrounds and a little league baseball diamond were built. A baseball field was also upgraded and one swimming pool was removed from this neighborhood. Located in the above parks are the following selective facilities:

2 baseball diamonds (1 lighted)
1 softball diamond
2 little league baseball diamond
4 basketball courts (lighted)
2 tennis courts
1 volleyball court
1 swimming pools
4 tot areas
2 playgrounds
1 set of bleachers
4 picnic areas
21 benches

A vital asset to this neighborhood, Lowell and the towns of Dracut and Tyngsborough is the presence of the 1,015-acre Lowell/Dracut/Tyngsborough State Forest located in the northwest portion of Lowell. This major park provides a variety of recreational opportunities such as biking and mountain biking, hiking, nature walking, picnicking, fishing, field sports and winter sports such as ice skating, sledding, cross-country skiing, and birding. The Boulevard also provides an excellent place for walking and jogging, as well as other outdoor community events.

8.3.8 SACRED HEART (CENSUS TRACTS 3121, 3122)

In 2000, Sacred Heart contained a population of 7,853. The 2010 Census shows a population of 7,458. Since 2001, one new park has been built in this neighborhood: Muldoon Park. This park has yielded .55 acres to the neighborhood. The neighborhood currently has 26.46 acres of recreational land contained in the following parks:

Manning Field	11.0 Acres
McInerney Playground	0.35 Acres
Muldoon Park	.55 Acres
O'Donnell Park	14.56 Acres
	26.46 Acres

One new playground has been built in this neighborhood since 2001. Located in the above parks are the following selective facilities:

1 little league baseball diamond
1 softball diamond
3 basketball courts (lighted)
1 baseball diamond (lighted)
1 football field
1 swimming pool
2 tot areas
1 handball court
1 playground
5 tennis courts
22 benches

Park facilities that do exist are well supplied with passive and active recreational facilities, however, more developed parks is needed to serve the entire population. Most of these additional facilities can be provided on existing parks and playgrounds. There are extensive open acres in the form of cemeteries, which compromise much of the land area in the Sacred Heart. These sites can be valuable for passive recreation such as walking, jogging, biking, and cross-country skiing. The development of the CRG will also play an important role in enhancing the quality of life for this neighborhood.

Table 8.3.1: Public Space by Neighborhood

Neighborhood	2001	2011
Acre	21.5	29.02
Back Central	27.99	30.88
Belvidere/South Lowell	120.5	122.43
Centralville	66.53	66.53
Downtown	2.39	2.86
Highlands	65.31	65.31
Pawtucketville	95.36	95.36
Sacred Heart	25.91	26.46
Total	**425.49**	**438.81**

8.4 COMPARISONS OF RECREATIONAL FACILITIES OVER TIME

There has been a significant investment in athletic facilities and amenities over the past decade. With the exception of tennis courts and swimming pools, there have been additions to all types of facilities in the city. At the request of the local community, a couple of tennis courts have been converted repurposed as skate parks, a new type of amenity that has been introduced to the city in more recent years. The addition of the city's first spray park has helped ensure that needs of youth and families are met in the warmer Summer months in spite of the loss of one swimming pool.

Table 8.4.2: Comparison of Facilities

Activity	Number of Facilities	
	2001	2011
Basketball Courts	30	38
Handball Courts	1	1
Softball Fields	10	11
Tennis Courts	39	38
Swimming Pools	7	6
Tracks	2	3
Volleyball Courts	3	10
Baseball Fields	22	23
Football/Soccer Fields	11	13
Skateboard Parks	1	4
Play Areas	34	46
Spray Park	0	1

8.5 CANAL WALKWAY IMPROVEMENTS

The following table and map detail the progress made on canal walkways, as well as the work that is pending.

Figure 8.1: Canal Walkways

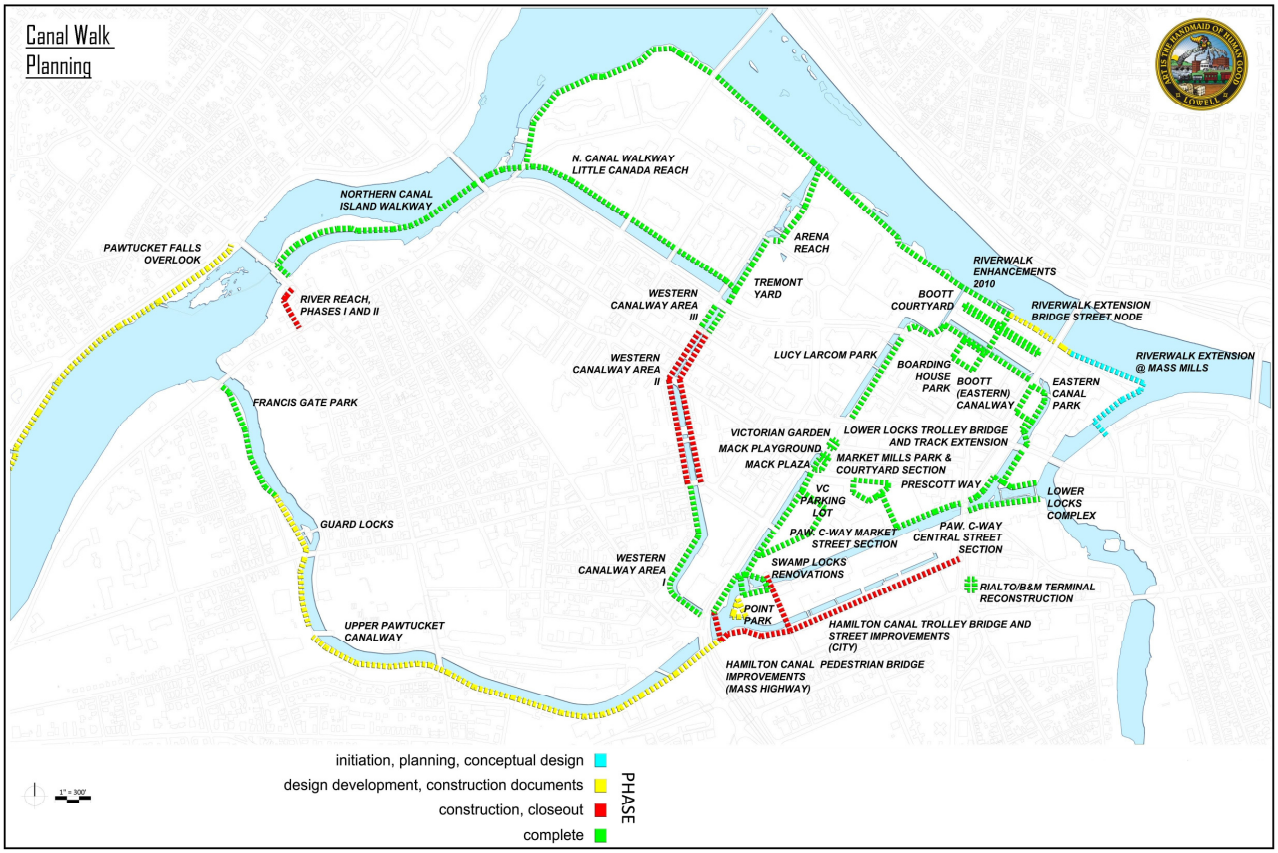


Table 8.5.1: OPEN SPACE, CANALWAY AND RIVERWALK PLANNING, DESIGN AND CONSTRUCTION

Name	Category	Neighborhood	Year Built	Size SF	Size LF	Description
BUILT 2001+						
Red Cross River Reach Phase 1 Park	CANALWAY	ACRE	2001+		275	Construction of pedestrian walkway connecting the Upper Pawtucket Canalway with the Northern Canal Walkway. Work includes construction of a small park behind Spaulding House.
Northern Canal Island Walkway	CANALWAY	DOWNTOWN	2001+		2,325	Re-establishment of a walkway on the island; reconstruction of stairs at School Street Bridge; and installation of railings along the Great River Wall walkway.

Western Canal Area 1	CANALWAY	ACRE	2001+		1,289	Design and construction of Canalway along Western Canal, from Dutton to Broadway.
Western Canal Area 2	CANALWAY	ACRE	2001+		2,473	This project rehabiltates seating areas, lighting, landscaping and select areas of the canal wall.
Western Canal Area 3	CANALWAY	ACRE	2001+		300	Installation of walkway, amenities, ADA features and landscaping.
			TOTALS BUILT 2001+	**Size SF**	**Size LF**	
				0	**6,662**	
PENDING						
Pawtucket Fall Overlook	CANALWAY	ACRE	2001+; Still in design phase		3,200	Development of a walkway, with two overlooks, along the north side of the Merrimack River.
Upper Pawtucket Canalway	CANALWAY	PAWTUCKETVILLE	2001+; Still in design phase		4,500	Construction of walkway along the southern edge of the Pawtucket Canal.
Riverwalk Extension Bridge Street Node	RIVERWALK	DOWNTOWN	2001+; Still in design phase		620	Extension of Riverwalk from Boot Mills to Lower Locks.
Red Cross River Reach Phase 2 Pump and Stairs	CANALWAY	ACRE	2001+; Still in design phase		200	Replacement of pumping station by City, construction of stairs from bas of wall at boat landing to new park at Spaulding House.
Hamilton Canal District Streetscape Improvements (Revere to Central) (City)	CANALWAY	DOWNTOWN	2001+; Under construction		1,960	Construction of streetscape along Jackson Street, including sidewalks and landscaping.
Hamilton Canal District Swamp Locks Pedestrian Bridge and Hamilton Canalway (State)	CANALWAY	DOWNTOWN	2001+; Under construction		880	Rehabilitation of pedestrian bridge over the Pawtucket Canal, linking the Visitor Center area with the Hamilton Canal District, and new streetscaping along the canal in the Hamilton Canal District.
			TOTALS PENDING	**Size SF**	**Size LF**	
				0	**11,360**	
BUILT PRE-2001						

Arena Reach	CANALWAY	ACRE	Pre-2001		768	Landscaped walkway west of the Tsongas Arena, from Hall Street to the Riverwalk, along the Western Canal Wasteway.
Boarding House Park	CANALWAY	DOWNTOWN	Pre-2001	45,000		Design and construction of a new performing arts area.
Boott Canalway	CANALWAY	DOWNTOWN	Pre-2001		1,230	Design and construction of walkway with amenities along the Eastern Canal.
Eastern Canal Park	CANALWAY	DOWNTOWN	Pre-2001		44,000	Design and construction of new park, commemorating Jack Kerouac, adjacent to Eastern Canal and the Concord River.
Eastern Canalway	CANALWAY	DOWNTOWN	Pre-2001		650	See Eastern Canal Park.
Lower Locks Complex	CANALWAY	DOWNTOWN	Pre-2001		1,535	Multiple developments in the Lower Locks area: training facility; hotel; canal wall and lock restoration.
Lucy Larcom Park	CANALWAY	DOWNTOWN	Pre-2001		800	Rehabilitation of a historic linear park along the Merrimack Canal.
Mack Plaza and Victorian Garden	CANALWAY	DOWNTOWN	Pre-2001	8,615		Design and construction of public space via the demolition of buildings abutting the east and west sides of the Mack building.
Market Mills Park and Courtyard	CANALWAY	DOWNTOWN	Pre-2001	35,000		Design and construction of public spaces associated with the rehabilitation of the mill complex that became the Market Mills commerical and residential development.

Northern Canal Walkway: Little Canada Reach	CANALWAY	DOWNTOWN	Pre-2001		2,000	Design and construction of a walkway, bridge and landscaping along the Northern Canal at Little Canada.
Pawtucket Canalway: Central Street Section	CANALWAY	DOWNTOWN	Pre-2001		230	Extensive rehabilitation of the "Industrial Canyon" area of the Pawtucket Canal.
Pawtucket Canalway: Market Street Section	CANALWAY	DOWNTOWN	Pre-2001		670	Construction of a walkway and amenities, linking the Canalway at Industrial Canyon with Market Street.
Prescott Way	CANALWAY	DOWNTOWN	Pre-2001		300	Design and construction of canal-side improvements.
Upper Pawtucket Canalway: Francis Gate Park	CANALWAY	PAWTUCKETVILLE	Pre-2001		1,610	Construction of walkway along the southern edge of the Pawtucket Canal.
Riverwalk	CANALWAY	DOWNTOWN	Pre-2001		5,400	The Riverwalk currently runs along the Merrimack River from just west of Bridge Street to the Boott Hydro Plant at Pawtucket Street, where it connect to the Northern Canalway.
Swamp Locks	CANALWAY	DOWNTOWN	1997	700	1,300	Design and construction of a new boat landing and trolley stop; new pedestrian bridge across the head of the Merrimack Canal; and landscaped nodal area at the junction of the Merrimack and Lower Pawtucket Canal.
Tremont Yard	Canalway	DOWNTOWN	Pre-2001		732	Landscaped walkway and railings along the upper portion of the Western Canal Wasteway, at Tremont Gatehouse, from Hall Street to Father Morissette Blvd.
			TOTALS BUILT PRE-2001	**Size SF**	**Size LF**	
				89,315	**61,225**	

Source: Lowell National Historical Park, 2011

8.6 STATE-OWNED LAND

The Commonwealth of Massachusetts owns many parcels of land throughout the city for use by various agencies. The DEM, the University of Massachusetts – Lowell and the DPW collectively manage all of the state owned properties. All of the DEM holdings are associated with the Lowell/Dracut/Tyngsborough State Forest, the canal system and the Merrimack River Heritage Park system. The DPW maintains several parcels along the river as open space.

8.7 NON-PROFIT LANDS

The Lowell Parks and Conservation Trust, a local land trust, owns the following properties. Two of these properties, 520 Varnum Avenue and 95 Fairmount Street have been acquired since 2001.

- Spalding House, 383 Pawtucket St. - 5,000 sq. ft
- 48 Totman Road - 69,024 sq. ft
- 181 W. Meadow - 3.85 acres
- 95 Fairmount Street ~.25 acre
- 520 Varnum Ave ~ 5 acre conservation restriction
- 36 Merrill St. - Jollene Dubner Park (part of) - 2700 sq. ft
- 16 Nicole Drive - 1.88 acres

8.8 OTHER PUBLIC UNPROTECTED LANDS

The University of Massachusetts-Lowell is a major landholder in the city. The university occupies approximately 130 acres of land that it uses for academic, housing, university support and recreational purposes. The university is currently engaged in a program of facility growth and renewal to address increases in enrollment, planned growth in funded research, increased demand for on-campus undergraduate housing and a need for better academic community gathering spaces.

The university has increased the amount of property it owns by 640,000 square feet since 2008, having acquired the downtown Inn and Conference Center in 2009, the Tsongas Center in 2010, and the former St. Joseph's Hospital (now University Crossing) in 2011. The university plans to comprehensively modernize University Crossing, a centrally located building that has the potential to knit together the three UML campuses, as well as to provide increased travel between the campus and downtown Lowell's shops, restaurants and other attractions.

UML has two major projects currently in construction. The first, an 84,000 square foot Emerging Technologies Innovations Center on North Campus, will house state-of-the-art clean rooms, wet labs and engineering and biopharmaceutical labs to support R&D in nano-medicine, nano-manufacturing and other fields. The second, a new 69,000 square foot Health and Social Sciences Building, will be the first new academic building on

South Campus in over 30 years and will house the departments of psychology, criminal justice and nursing.

In early 2012, construction will begin on 472 beds of suite-style housing on East Campus and on a new parking garage on North campus. Another garage is also being planned for South Campus. As the university grows, it continues to focus on sustainability in its capital and operating programs. Further, a comprehensive campus transportation planning effort, now underway, will provide recommendations on ways to increase walking and bicycling, improve mobility to and between campuses, and to downtown Lowell.

8.9 PRIVATE RECREATION LANDS

Owners of recreational land are also eligible for taxpayer relief under state regulation. Chapter 61B applies to land not less than 5 acres that is maintained in its natural state. Allowed uses on the property include hiking, camping, nature study, boating, golfing, horseback riding, hunting, fishing, skiing, swimming, hang gliding, archery, and target shooting. In the City of Lowell, two properties are protected under Chapter 61B designation. One private country club, Mt. Pleasant Golf Course, operates an eighteen-hole course in the western part of the city, near the Chelmsford line. The second property is the United States Bunting Club, which is located on Boylston Street near the Billerica town line. Approximately 11.50 acres of this property are protected under 61B regulations. There is also a private recreational golf club located on the Lowell/Tewksbury town line. Access to the site is through Lowell, however, a majority of the property is located in Tewksbury.

8.10 MAJOR INSTITUTIONAL HOLDINGS

Several private, not-for profit institutions occupy large parcels of land throughout the city. Many of these parcels have recreational facilities on the premises that are not always open to the general public. A is to work with these landowners in order to open and maintain access to the facilities by the public. The Greater Lowell YMCA owns 5 acres of land. The Lowell Boys Club owns 2 acres of land that contains recreational sites. It provides sporting activities for area school age children. The Lowell Girls Club also owns several acres of land. Many religiously affiliated schools around the city own parkland for students and neighborhood residents.

The region is fortunate to have many fine hospitals that provide extensive medical care. These facilities also occupy large tracts of land. Lowell General Hospital owns 64 acres of land. LGH is in the process of acquiring the institutional lands previously owned by Saints Memorial Medical Center, which will add an additional 8 acres to its property. This land is adjacent to the Merrimack River. Other large institutional landholders include the churches, private parochial schools and several non-profit groups.

9.0 NATURAL RESOURCES & CONSERVATION

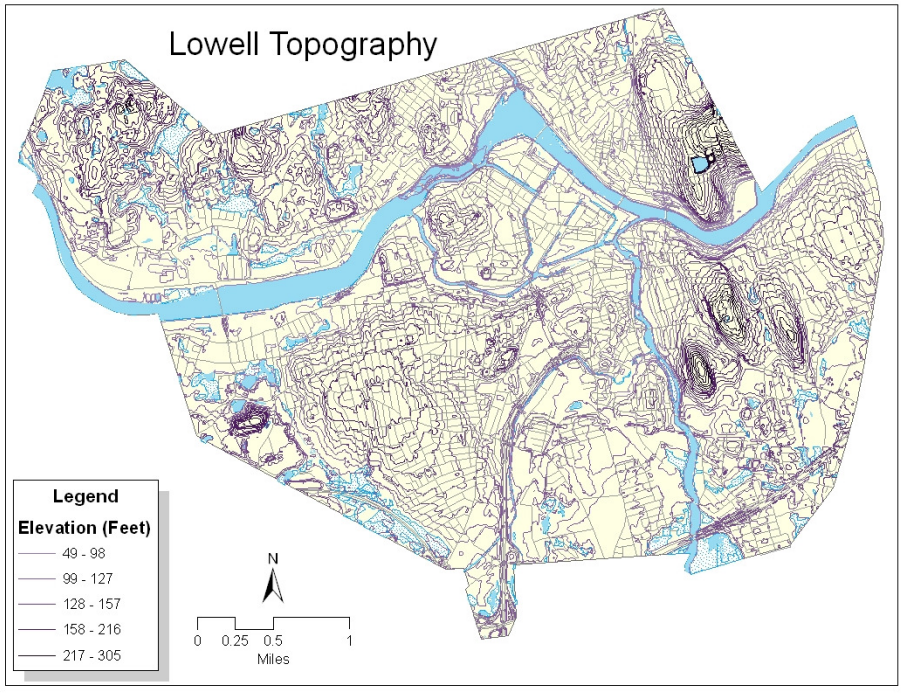
The City of Lowell has made great strides towards becoming more environmentally sustainable over the past decade. Protecting and conserving its distinctive natural resources has been a major priority.

In terms of the brownfields remediation program, which has been active since 1996, Lowell has been awarded over $4 million in assessment, cleanup and planning grants from the U.S. EPA. Since 2001, the city has been awarded over $2.4 million. One major focus has been the Silresim Chemical Corporation Site (Silresim), a 4.5 acre parcel located at 86 Tanner Street in the Sacred Heart Neighborhood. The Site is located approximately one mile south of downtown district and approximately 10,000 residents live within one mile of the Site. In 2010 the City of Lowell applied for and was awarded $175,000 in grant funds as part of the U.S. EPA's Area-Wide Planning Pilot to expand upon previous efforts to clean up and revitalize the area. These grant funds will assist in developing a planning and market study of the Tanner Street District, the area surrounding the Silresim site, with a focus on the redevelopment of Brownfield sites in the district.

To track energy consumption and the impact of greenhouse gas emmissions on the local environent, in 2008, DPD conducted a Greenhouse Gas Inventory. The 2008 report determined a citywide C02 emmission rate of over 1 million tons. Since this time, DPD has continued to track municipal and citywide emmissions.

9.1 GEOLOGY, SOILS AND TOPOGRAPHY

Figure 9.2: Lowell Topography



The City of Lowell is located at 42°38′22″N 71°18′53″W / 42.63944°N 71.31472°W and has a total area of approximately 14.5 square miles. Lowell is a city of hills and valleys with a maximum land relief of 250 feet. The low point of 50 feet above mean sea level (msl) is at Duck Island along the Merrimack River. The higher elevations are concentrated in the eastern portion of the City. Christian Hill rises to an elevation of 300 feet above msl. Other prominent topographic features include Fort Hill, north of the Lowell Cemetery, which rises to 270 feet above msl and contains a scenic park. To the northeast of the park is a residential area in the neighborhood of Belvidere, which reaches 260 feet above msl and is the site of a fire suppression reservoir, which was constructed by the proprietors of the locks and canals to protect the mills. The former landfill located near the Drum Hill Rotary, was previously capped and could be a potential recreation site. This mound of refuse is approximately 200 feet high and offers excellent views of the region as well as downtown Boston. In general, the remainder of the City is a plateau surrounded by elevations of 100-250 feet.

Lowell sits at the confluence of the Merrimack and Concord Rivers. These rivers are considered major features which define the City's landscape. The Merrimack River flows easterly through the northern portion of Lowell and drops approximately 60 feet in its eight-mile course through the city. The three-mile stretch of the Pawtucket Falls accounts for 30 feet of the elevation drop for the river.

The Concord River flows northerly through Billerica and enters the Merrimack River near the Bridge Street Bridge, northeast of Lowell's Center. The Concord River's elevation drops very little over most of its length from Concord to Billerica and the floodplain tends to be broad. However, the Concord River drops markedly in Lowell as is evidenced by the three sets of falls.

The soils of Lowell are partially composed of deposits consisting of stratified sands and small amounts of silt and gravel found along the watercourses in Lowell. Bordering these deposits, and comprising the greatest extent of superficial material are ice-contact deposits. These consist of stratified sand and gravel with some silt, clay, and a few isolated boulders. The overall stratified material tends to follow the pre-glacial Merrimack River Valley, which extends southeast from the present valley. The ice-contact deposits are over 140 feet thick in places. Higher elevations are almost exclusively composed of glacial till. Till is a conglomeration of un-stratified clay, sand, silt, gravel, and boulders that overlie the bedrock found through the region.[1]

9.2 LANDSCAPE CHARACTER

The landscape of Lowell is characterized as an urban setting with several geological features that lend to its attractiveness. While much of the city is highly developed, Lowell does offer many attractive vantage points that are appealing to the eye. The many hills of Lowell allow for a varied view of the city and contrast nicely with the flat

relief around the two rivers. The two jewels of the city, the Merrimack and Concord Rivers, gave the city its founding and led to the birth of the Industrial Revolution. These two rivers served as the backbone for Lowell and the region's economy. Today, they continue to do so but also provide the city with a valuable recreational resource.

9.3 SURFACE WATER

The Merrimack River is the major water body found in Lowell. This river is formed by the confluence of the Pemigewasset and Winnipesaukee Rivers in Franklin, New Hampshire. The river flows southward through New Hampshire to Tyngsborough, Massachusetts then turns northeastward when it reaches Lowell. The river empties into the Atlantic Ocean at Newburyport after flowing through Lowell, Lawrence and Haverhill, three major cities, which historically relied on the river for power and transportation.

The river falls more than 90 feet during its 116-mile flow through Massachusetts. The river drains a land area of 5,010 square miles, 1,210 square miles of this basin are located in Massachusetts. The Merrimack River in Lowell has two access points. The boat ramp at the Bellegarde Boathouse is a private ramp used by the sailing program and the U-Mass Lowell crew team. The other boat ramp adjacent to the Vandenberg Esplanade is open to the public. During the summer numerous boats access the river through this ramp for the purpose of fishing, water-skiing, tubing, or just taking a leisurely ride up the river. A third boat ramp is in the planning stages further up the river just past the Rourke Bridge. The boat ramp is being built by the Public Access Board and is hoped to be opened within the next five years.

The Concord River originates at the confluence of the Sudbury and Assabet Rivers, and flows approximately 16 mile from Concord through Carlisle, Bedford and Billerica before it enters the Merrimack River at Lowell. The river drops 12 feet in the first 15 miles, then falls 50 feet in the final mile through Lowell. The drainage area for the Concord River basin is 62 square miles.

The Concord River is the site of some the best white water rafting in the state. Every spring the Lowell Parks and Conservation Trust run white water rafting trips down the Concord River. The season is usually sold out before it even starts. The Public Access Board is building a canoe ramp to provide access to the Concord River at 5 Billerica Street. Local residents have used the site for many years but now will be more accessible to everyone.

The second major tributary to the Merrimack River in Lowell is the Beaver Brook. The brook originates in New Hampshire and meanders southward through Dracut before flowing into the Merrimack River just east of the Pawtucket Falls. Additional tributaries of importance are located in the western part of Lowell. Black Brook begins in a wetland area of North Chelmsford. The brook flows northward, passing through the Middlesex Village area of Lowell before entering the Merrimack River. Claypit Brook

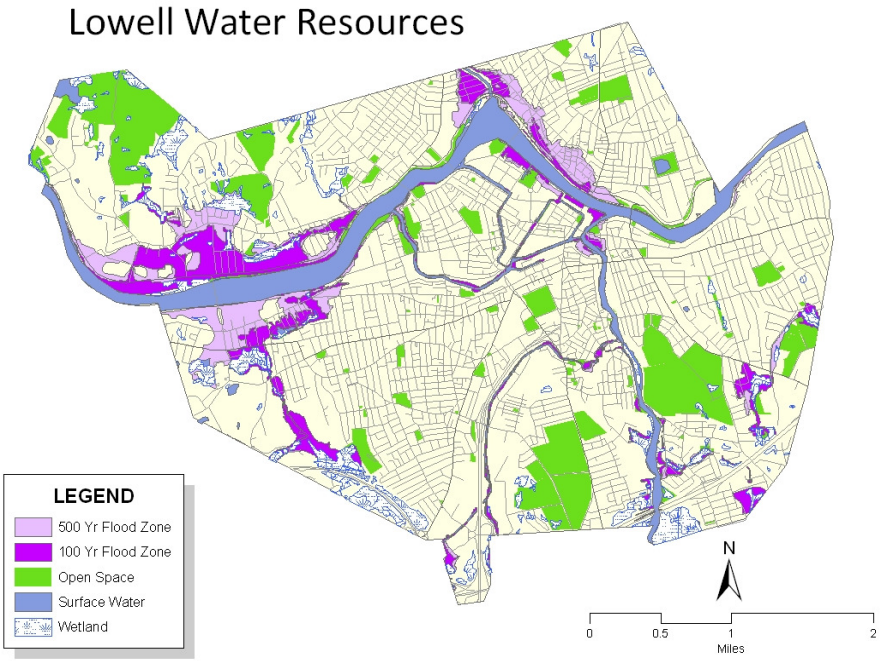
originates from a vast wetland in the Lowell/Dracut State Forest in Dracut and initially flows southward. After turning eastward, the brook expands into a small pond before continuing as an outlet stream, which flows into the Merrimack River west of the Pawtucket Dam. Scarlet Brook is a small tributary that originates in Tyngsborough and flows southward to compromise a portion of the Tyngsborough/Lowell border before entering the river. Flagg Meadow Brook, which originates in the Lowell/Dracut/Tyngsborough State Forest, is also a small tributary of the Merrimack River.

River Meadow Brook is the main tributary to the Concord River in Lowell. It begins in a vast wetland region located south of Chelmsford Center and receives a large amount of water form a wetland body, Hales Brook, located east of Route 3 and north of Route 129. It flows into the Concord River near Rogers Street.

Besides the two rivers and several brooks, Lowell is also interlaced with canals that have been in existence since the Industrial Revolution. All of the canals: Eastern Canal, Pawtucket Canal, Northern Canal, Western Canal and the Hamilton Canal are fed by the Merrimack River. The Pawtucket Canal was originally constructed as a transportation route around the Pawtucket Dam. The other canals were later constructed as branches of the Pawtucket Canal to feed additional mill complexes that wanted to use the power of the Canal. This power was generated through the controlled release of water through a series of dams along the canals. Today, Lowell's canals have the capacity to generate 22 megawatts of hydroelectricity.

9.4 FLOOD HAZARD AREAS

Figure 9.2: Lowell Water Resources



Seasonal flooding often occurs in the Lowell area during the yearly spring water cycle changes. Water levels rise across the city and throughout regional watersheds because of the snowmelt in headwaters and higher elevations and intense spring rain showers. Due to over development in Lowell and upriver, as well as poor floodplain construction standards in historical periods, much of the important flood storage area have since been filled and developed. These wetland bodies and low-lying areas provide valuable water storage areas for rainwater and impervious surface runoff. When river and stream channels can no longer hold rising water levels the banks are "over-topped" and water is carried into those adjacent, low-lying areas, also called the floodplain.

Certain types of urban development in a watershed change the entire system's response to precipitation. The most noticeable effects are significantly higher rates of runoff, higher flood peak stages and decreases in water quality resulting from the increase in construction and impervious surfaces (driveways and parking lots). Whereas natural lands can readily absorb water and transmit it to the water table, those impervious surfaces direct the flow of water and channels it to receiving sites. However, the rate and path of flow contributes to erosion and the movement of hazardous contaminants. The need to better accommodate automobiles and the desire to build on more marginal land has greatly reduced valuable water storage areas.

Flooding in Lowell is a problem in the Highlands, Pawtucketville, South Lowell, Belvidere, Centralville, Sacred Heart, Back Central and some parts of Downtown. Clearly, this issue is city-wide and will be difficult to ameliorate due to existing infrastructure, development pressures on storage areas and potentially more severe storms associated with climate change. Specifically, the low-lying areas adjacent to Black Brook, Beaver Brook, Marshall Brook Clay Pit Brook, Trull Brook (around Phoenix Ave and Cawley Stadium) have experienced flooding and erosion problems on an annual basis. Flooding associated with the Merrimack River and Concord River is also significant and associated with these tributaries as water can "back-up" from the main rivers into the smaller brooks.

Efforts should be made to protect the remaining parcels of wetlands, strictly enforce floodplain building standards and prevent further encroachment. Eliminating flood storage and infiltration areas or reducing their benefits by restricting water movement can lead to further damage and costly improvements to property owners that result from severe flooding.

9.5 WETLANDS

Wetlands provide numerous benefits to the community. These wetlands, which compromise a number of wet environments—defined by the Massachusetts Department of Environmental Protection to include marshes, wet meadows, ponds, bogs, wooded swamps and other types of water dominated areas determined by a hydrologic profile—provide many ecological functions. They help to maintain water

supplies, purify polluted waters, check the destructive power of flood and storm water, shelter wildlife and provide numerous recreational opportunities.

Most wetlands found in our urbanized area provide significant benefits in terms of storing water or reducing pollution in a variety of ways. Many of these benefits are related to the great absorptive capacity of wetlands. Water can be stored or retained in wetland basins and released slowly into the groundwater. The vegetation in wetlands frequently acts to filter and trap sediments and heavy metals. By trapping these nutrients and minerals, wetlands can purify water and provide healthier environments for fish and plant life. The wetland plants that thrive in wet environments further enhance the pollution attenuation capabilities of wetlands by reducing biological oxygen demand levels, and lowering nitrate and phosphate levels.

A number of factors influence to what degree wetlands function in water storage or pollution reduction. These factors include wetland type, vegetative density, size, and gradient. The previously mentioned storage capacity of wetlands is important for their role in flood control and storm damage prevention. Wetlands can reduce the force, speed and extent of floodwaters that often cause property damage. In this way, wetlands provide a secondary function by reducing the intensity of water flow from storms that would normally exacerbate water pollution through erosion. This factor is particularly important in highly urbanized areas such as Lowell where impervious surface intensifies water runoff and carries a highly pollutant load to water bodies.

Not only do wetlands provide important benefits for the urbanized environment, they are also necessary breeding and hunting grounds for plant and animal life. Many bird and mammals rely almost solely on wetlands and adjacent vegetative habitats for food, shelter, and reproductive purposes. The habitat value of a wildlife environment depends on the vegetation composition and structure, size and hydrologic relationship. In addition, these habitats provide important recreational opportunities for hunters, fishers, bird watchers and boaters as well as hikers, photographers and environmental educators. Without these important resources, many of our recreational opportunities would quickly disappear if further protection were not pursued.

In Lowell, the wetlands are generally shrub swamps or areas forested with hard wood species. The largest wetland areas in the City are located in the following areas: through the Clay Pit Brook watershed, including the Lowell/Dracut/Tyngsborough State Forest; throughout the Black Brook watershed, also known as the Middlesex Canal; and along the Concord Rivers and associated tributaries. Other minor wetland locations can be found throughout the city[2] including around the Cross Point Towers parking lots, near Wood Street and Westford Street, several locations along I-495 and near the Cawley Stadium (Route 38).

Efforts should be maintained and enhanced to protect these valuable resources, especially along the Concord and Merrimack Rivers, to preserve their many protective functions.

9.6 WATERSHEDS

The City of Lowell is in the Merrimack River Watershed and is the terminus of the Concord River Watershed. Some of the smaller watersheds in Lowell include Clay Pit Brook, Beaver Brook, Black Brook, and Humphreys Brook. The City works with the Merrimack River Watershed Council and the Lowell Parks and Conservation Trust to protect the river and brooks. The MRWC does stream and river monitoring and cleanups and the City of Lowell participates in river cleanups with the Lowell Parks and Conservation Trust.

9.7 WILDLIFE INVENTORY

Despite Lowell's limited amount of open space, the landscape, particularly along the Concord and Merrimack Rivers, provide a varied wildlife population. The Merrimack River also receives added protection as a priority habitat of rare species defined by the Natural Heritage and Endangered Species program run by the Massachusetts Division of Fisheries and Wildlife; bald eagles are now sighted yearly along the waterway, especially during the fall migration period. As Bald Eagles are abundant in the river's estuary, nesting sites should be built along the Merrimack River. Belted kingfishers, blackcrowned night herons, great blue heron, and green herons are also common bird species sighted during the summer months. A rookery of black crowned herons was, until recently, located on the Great Bunt of the Merrimack River, a reach at the foot of the Pawtucket Falls where the river makes a wide bend and is joined by beaver Brook. Construction of a sewer interceptor in the area and vandalism of the birds' nesting trees have caused the herons to leave the site. Discarded utility poles provide excellent nesting platforms for birds of prey and provide a way to recycle a necessary infrastructure component.

The State Forest, also a protected priority habitat of rare species, contains a diverse habitat that supports squirrels, cottontail rabbits, red fox, various songbirds and fishers that have traditionally been absent but are now returning to the woodland areas of Lowell. Tributaries to the Merrimack River have been home to beaver for a number of years as well as several types of waterfowl. The importance of wildlife habitat provided by wetlands has recently become a greater issue for determining wetland value.

9.8 WILDLIFE CORIDORS

A critical element to habitat survival is the narrow links, or corridors, between large habitat areas. Strips of undeveloped land provide essential links for animals and birds to move from one feeding or nesting spot to another and uninterrupted open space allows wildlife to move about and reach other necessary habitats. As new development cuts off

this link, animals ultimately face extinction as their habitat dwindles. Maintaining and protecting the vegetative corridors along the Merrimack River and tributaries can provide wildlife with access to the broader undeveloped tracts located outside the region. The Concord River, thickly vegetated on both banks of the river, is another wildlife corridor used by birds and animals that should be maintained and protected. Protected riverbanks can help birds and animals move in search of food and shelter. These corridors can also provide excellent spots for Lowell residents to view nature in a highly urbanized setting through critical access points. A completed salmon restoration project by the State has provided a fish ladder at the Pawtucket Dam on the Merrimack River and a fish elevator at the hydroelectric station. This lift and ladder system allows fish to continue their journey up river to spawning grounds in New Hampshire.

9.9 SCENIC LANDSCAPES

The City's most distinctive features are the Merrimack and the Concord Rivers. The wide Merrimack River contributes to a dramatic view and gives the city a general feeling of openness. The Pawtucket Falls, where the Merrimack plunges over the dam, is also a location of special interest. The more intimate Concord River, though heavily developed over much of its length in Lowell, provides many locations of natural beauty and historic interest. In April 1999, the Concord River received a federal designation as a Wild and Scenic River for the 8-mile segment from Egg Rock at the confluence of the Sudbury and Assabet Rivers downstream to the Route 3 Bridge in the town of Billerica. The Concord River Greenway, with several sections completed and several more in final planning stages at the time of report completion, is a dynamic and engaging new trail along the river for most of its run in Lowell.

Other scenic areas include the annual foliage viewed from the higher elevations in the city and the two large marshes that compromise approximately 30 acres located in the Lowell/Dracut State Forest. The Lowell Cemetery, designed after Mt. Auburn Cemetery in Watertown, is known for its distinctive plantings and tombstones.

9.10 HAZARDOUS WASTE SITES

Hazardous Waste Sites are locations where oil and/or hazardous materials (OHM) are stored, treated, incinerated or otherwise disposed of. Hazardous Waste Sites in Lowell are tracked by the Massachusetts Department of Environmental Protection (MassDEP) and are assigned Release Tracking Numbers (RTN) for each release of OHM discovered. According to the MassDEP, there have been 456 reported releases in Lowell from the years of 1985 through 2011. Currently, there are approximately 91 releases that are in various stages of investigation and/or remediation in the City.

Hazardous Waste Sites can vary in size and use, however; commonly known sites in Lowell include, but are not limited to:

- Current and former service/gas stations,

- Former dry cleaners,
- Factories/mills,
- Abandoned railroads, and;
- Former landfills.

Of the total number of releases, 39 are closed RTNs, 304 have a Response Action Outcome (RAO) on file, and 22 are reported to require no further action. This means that these sites no longer pose a threat to human health and safety. To ensure that many of these sites pose no further risk, there are currently 83 Activity and Use Limitations (AUL) active on properties throughout the City.

Hazardous Waste Sites pose significant challenges to the City of Lowell, in particular, three types of sites are described below.

Brownfields

In Lowell, it is challenging to create new open space, redevelop properties, and encourage new construction due to the fact that many available parcels in the City are or potentially are Brownfield sites. The term "Brownfield" typically refers to land that is abandoned or underutilized because of concerns about contamination. Many of these contaminated Brownfield sites have been unused for decades due to the high cost of clean up, however; as developable land has grown less available in Lowell, the need to put these sites back to productive use has become significantly more important.

Since the 1990's, many federal and state programs have been developed to assist municipalities in addressing the issues surrounding Brownfield sites. Lowell has a history of successfully utilizing these programs to address environmental problems, bring in new jobs, increase tax revenue, and revitalize neighborhoods throughout the City. The City of Lowell Brownfields Program has been active since 1996 when the City was selected as one of the U.S. EPA's demonstration pilots and designated a Brownfields Showcase Community. Since that time, Lowell has been awarded over $4 million in assessment, cleanup and planning grants from the U.S. EPA. Additionally, the City has been awarded over $200,000 in assessment fund from MassDevelopment.

To date, Federal and State funds have assisted in the investigation of over 70 properties on over 75 acres of land. Successes of the Brownfields Program include LeLacheur Stadium (home of the Lowell Spinners), Tsongas Arena, Ayer Lofts, Stoklosa Middle School, and the JAM Garage. Funds from the City's Brownfields Program have also contributed to the redevelopment of the Hamilton Canal District, 15 acres of underutilized land in the downtown area, which will be transformed into a vibrant mixed-use neighborhood.

National Priorities List (NPL)/ Superfund

The Silresim Chemical Corporation Site (Silresim) is a 4.5 acre parcel located at 86 Tanner Street in the Sacred Heart Neighborhood. The Site is located approximately one mile south of downtown district and approximately 10,000 residents live within one mile of the Site.

Under a permit provided by the State of Massachusetts, in 1971, Silresim Chemical Corporation reclaimed a variety of chemical wastes, waste oil, solvents, and sludges containing heavy metals. In 1977, the company declared bankruptcy, abandoned the property, and left behind approximately 30,000 decaying drums and several large storage tanks.

In 1978, the Massachusetts Department of Environmental Protection (at the time, Massachusetts Department of Environmental Quality Engineering) discovered the contamination remaining on the property and began the process of investigation and remediation. The Silresim Site was placed on the National Priorities List (NPL) on September 8, 1983 and officially became part of the Superfund program managed by the United States Environmental Protection Agency (U.S. EPA).

"Superfund" is the fund established under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) for the clean up of abandoned hazardous waste sites that pose a significant threat to human health and safety. The legislation under CERCLA allows the U.S. EPA to clean up these sites and to compel responsible parties to perform clean ups or reimburse the government for the cost of clean up. Remediation of the Silresim Site will cost more than $40 million. So far, the EPA has identified 223 parties as having been responsible for the hazardous wastes disposed of at the facility.

To date, the U.S. EPA has carried out a number of response actions which include the removal of all drums and storage tanks on the property, installation of a groundwater treatment plant, the installation of a protective cap and groundcover, and more recently; the installation of an electrical resistive heating (ERH) system funded by the American Recovery and Reinvestment Act (ARRA). The ERH system is expected to be online in May 2011 and will operate for approximately two years. This system is anticipated to speed up the clean up process at the Site in an effort to return the land to a productive use.

In addition to response actions performed in an effort to clean the Silresim site, in 2000 the U.S. EPA awarded the City of Lowell $100,000 as part of a new pilot program called the Superfund Redevelopment Initiative (SRI). This program is a nationally coordinated effort to facilitate the return of the country's Superfund sites to a productive use. Lowell utilized this grant to develop the Tanner Street Initiative. The goal of the Tanner Street Initiative was to evaluate possible short-term and long-term uses for the property post cleanup.

In order to expand upon the efforts made in the Tanner Street Initiative, in 2010 the City of Lowell applied for and was awarded $175,000 in grant funds as part of the U.S. EPA's Area-Wide Planning Pilot. These grant funds will assist in developing a planning and market study of the Tanner Street District, the area surrounding the Silresim site, with a focus on the redevelopment of Brownfield sites in the district.

Hazardous Waste Generators

There are several known hazardous waste generator storage and/or disposal facilities along the Merrimack River permitted under the Resource Conservation and Recovery Act (RCRA) program administered by the EPA. These are sources of potential contamination of the Merrimack River, however, unlike non-permitted facilities; they operate under established performance standards and are monitored by the EPA. The Massachusetts Department of Environmental Protection (DEP) has files listing all known RCRA sites in the city.

9.11 LANDFILLS

The Lowell Landfill, located at 1290 Westford Street, served as the City's primary solid waste disposal facility from 1947 to 1992. Today, the dump stands at approximately 200 feet high and occupies 56 acres. Historical records indicate that domestic, industrial, municipal, and hazardous wastes were disposed of at the facility and included asbestos, organic lead stabilizers, plating bath sludges and volatile organic compounds (VOCs).

Through a directive by DEP, the landfill has been properly capped with 18 inches of clay and a top layer of soil and grass. Initially, ventilation systems were installed to trap and release methane gas generated by decomposing trash. The City of Lowell later entered into an agreement with an energy company to install, operate, and maintain a gas-to-energy system at the landfill.

9.12 CHRONIC FLOODING

Flooding is a problem along the Concord River during heavy periods of rain. Flooding is also a problem along the northern banks of the Merrimack River near the water treatment plant. Areas of chronic flooding in the city include land around the Black Brook and the Trull brook tributary between Phoenix Avenue and Clark Road. There are several other areas around the city subject to chronic flooding. Many are located in the 100-year flood plain along major waterways of the city including the Concord River, Marginal Brook, River Meadow Brook, Beaver Brook, and Clay Pit Brook.

These wet areas provide many problems for home and business owners in the immediate vicinity through costly property damage. The city has solved some of the flooding problems and will continue to work with the other agencies to address the other areas. Fortunately, many of these areas are in the possession of the conservation

commission and therefore protected from further development. The conservation commission reviews all plans for building within a flood plain and uses criteria set up in the Massachusetts Wetlands Protection Act to decide if building will be allowed.

9.13 GROUND AND SURFACE WATER POLLUTION

Surface water discharges to the Merrimack and its tributaries results from both public and private sources to contribute to reducing water quality. Recent survey work by the Lowell Regional Wastewater Utility (LRWWU) and their contractors indicate that there are more than 300 stormwater outfalls in the City of Lowell, a figure which does not count the canals. There are nine permitted municipal National Pollution Discharge Elimination System (NPDES) outfalls to surface water as part of LRWWU's system. Lowell, as with most older cities, has a combined sewer and storm water system. The LRWWU is a secondary facility, which receives wastewater from Lowell, Chelmsford, Dracut, and Tewksbury. The nine-combined sewer overflow (CSO) structures that regulate flows to the LRWWU by discharging excess storm flows directly to the Merrimack River or its tributaries. As a result, the storm water runoff that combines with the raw sewerage in the drain pipes forces some of this untreated water to flow directly into the river. Seven of the overflows discharge directly into the Merrimack River, one into Beaver Brook, and one into the Concord River.

DEP also identifies eight industrial NPDES outfalls discharging into the Merrimack River or a major tributary within the city. Three of the outfalls discharge into the Merrimack River, two into the Pawtucket Canal, two into the Lower Lock Canal and one into the River Meadow Brook.

Non-point source pollution to surface and ground water supplies are caused by land use activities. Major categories of non-point source pollution affecting the waters of Lowell include urban runoff (storm drains, combined sewers and surface runoff) and land disposal (sludge, wastewater, landfills and hazardous waste sites). While it is hard to pinpoint actual locations that contribute to surface water pollution, it is possible to identify general locations throughout Lowell where such sources of pollution could be generated.

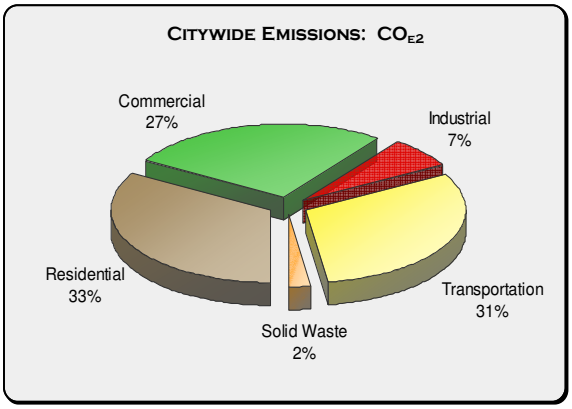
Structural controls like retention ponds and infiltration systems exist to control urban runoff to water bodies. Non structural controls rely on actions or best practices to control sources of pollution. These include employing conservation techniques, establishing buffer zones from streams, requiring development standards to control erosion and sedimentation during construction, encouraging community activities such as recycling, waste oil collection and redesigning road salting programs. Many of these practices are being implemented in Lowell. For example, the Concord River Greenway helps to reduce pollution impacts by limiting encroaching development.

One source of non-point source pollution is the extensive canal system in Lowell and the multitude of surface parking lots. In addition, many surface parking lots and other

impervious surfaces abut the canal resulting in easy collection sites for storm water runoff. Land use controls along the canals, preservation of the canal system, and greenways along the canals can help to filter out harmful pollutants and protect the water that flows through the canals. The significant canal walk creation around Moody Street and Jackson Street and the upgrades implemented along Suffolk Street are at preserving and developing an extensive pedestrian walkway system along the canals. This system is serving many benefits including: protecting canals from harmful land uses; providing interpretive educational resources for park visitors; and preserving an integral part of Lowell's industrial past.

9.14 GREENHOUSE GAS EMISSIONS ANALYSIS

The City of Lowell greenhouse gas (GHG) emissions analysis was conducted in 2009 in order to establish a baseline level of GHG emissions and energy consumption as well as future projected energy consumption and emissions for the community and municipal operations. The analysis was conducted using the Local Government Operational Protocol (LGOP) and the CACP software version 1 (2008) promulgated by ICLEI.



The baseline year was chosen as 2008 as this was the most recent year for which a comprehensive data set could be culled. One of the primary functions of the baseline inventory is to serve as a reference against which the City's GHG emissions could be forecast.

The purpose of the forecast emissions inventory was to estimate how GHG emissions are expected to change under business-as-usual conditions and from which sectors this growth is likely to occur. The analysis identifies which sectors within the City produces the greatest amount of GHG emissions, assisting City officials in crafting a strategy that will most effectively reduce emissions and provide a baseline with which progress will be measured.

Emissions Baseline Inventory

City-wide Emissions Inventory

The total amount of greenhouse gas emissions (measured as Carbon Dioxide equivalent; CO_2e) for the City of Lowell was calculated to be about 1.004 million tons of CO_2e in 2008. This is roughly 9.55 tons of CO_2e per person in Lowell. These emission values are comparable to several other Massachusetts cities that have completed GHG analyses using ICLEI's Cities for Climate Protection (CCP) program.

Residential buildings are the single greatest contributor of emissions generating over 335,000 tons of CO_2e, a third of the City's total emissions. Transportation accounted for the second largest amount of GHG emissions with 310,074 tons of CO_2e. Commercial

	Energy (MMBtu)	Equiv. CO_2 Production (tons)	Cost
Buildings	272,239	23,762	$7,059,885
Vehicles	37,432	3,002	$711,884
Operations[1,2]	78,300	9,794	$2,184,740
Total	**387,971**	**36,558**	**$9,956,509**

and Industrial buildings contributed 269,397 and 69,651 tons of CO_2e, a combined 34% of total emissions. Solid waste disposal was responsible for 21,841 tons of total emissions[3].

Municipal Emissions

Municipal emissions analysis is to be viewed as a separate inventory than citywide analysis to prevent "double counting" CO_2e emissions already counted in the citywide emissions analysis. For example, municipal buildings are already accounted for in the commercial sector of the citywide analysis. The purpose of conducting an analysis for municipal operations in conjunction with citywide emissions is to provide more detailed analysis thereby providing greater insight into where the best opportunities for GHG emissions reduction, and cost savings, exist.

The local government GHG analysis resulted in total municipal energy use of 387,991 MMBtu and 36,558 tons of CO_2 equivalent emissions in 2008. Analysis included energy consumption for municipal buildings, vehicle fleets, and operations, which include the water and wastewater utilities, streetlights, and traffic signals. Total municipal emissions account for approximately 3.6% of the total citywide emissions.

More data on citywide emissions is being collected on an on-going basis by various City Departments and will be more readily available in the coming years. The following charts detail 2008 air pollutants, projected air pollutants for 2025, and projected citywide emissions for 2025.

Figure 9.3: City Air Pollutants 2008

Green House Gas Inventory: City Air Pollutants 2008								
		Residential	Commercial	Industrial	Building Totals	Transportation: Vehicles	Transportation: Rail Transit	Transportation: Total
Electricity	Nox (lbs)	169,389	292,320	86,828		-	2	
	SOx (lbs)	342,328	590,765	175,476		-	5	
	CO (lbs)	262,903	453,698	134,763		-	4	
	VOC (lbs)	29,552	50,998	15,148		-	0	
	PM10 (lbs)	228,514	394,354	117,136		-	3	
Electricity2*	Nox (lbs)	12,561	-	-		-	-	
	SOx (lbs)	25,385	-	-		-	-	
	CO (lbs)	19,495	-	-		-	-	
	VOC (lbs)	2,191	-	-		-	-	
	PM10 (lbs)	16,945	-	-		-	-	
Natural Gas	Nox (lbs)	430,098	210,614	75,374		-	-	
	SOx (lbs)	16,396	8,391	36,110		-	-	
	CO (lbs)	106,269	54,383	21,376		-	-	
	VOC (lbs)	22,667	11,600	3,781		-	-	
	PM10 (lbs)	12,584	6,440	2,671		-	-	
Oil	Nox (lbs)	4,357,930	921,222	81,175		-	-	
	SOx (lbs)	286,576	60,579	5,338		-	-	
	CO (lbs)	938,783	198,449	17,487		-	-	
	VOC (lbs)	345,867	73,113	6,442		-	-	
	PM10 (lbs)	306,340	64,757	5,706		-	-	
Gasoline	Nox (lbs)	-	-	-		1,292,800	1	
	SOx (lbs)	-	-	-		81,599	0	
	CO (lbs)	-	-	-		15,783,025	17	
	VOC (lbs)	-	-	-		1,581,431	2	
	PM10 (lbs)	-	-	-		29,678	0	
Diesel	Nox (lbs)	-	-	-		660,288	1	
	SOx (lbs)	-	-	-		29,965	0	
	CO (lbs)	-	-	-		561,370	1	
	VOC (lbs)	-	-	-		75,672	0	
	PM10 (lbs)	-	-	-		24,132	0	
						Total-Vehicles	Total-Rail	Grand Total
Total	Nox (lbs)	4,969,978	1,424,156	243,377	6,637,511	20,119,960	36	20,119,996
	SOx (lbs)	670,685	659,735	216,924	1,547,344			
	CO (lbs)	1,327,450	706,530	173,626	2,207,606			
	VOC (lbs)	400,277	135,711	25,371	561,359			
	PM10 (lbs)	564,383	465,551	125,513	1,155,447			

* This is identified in Summary Calculations as Electricity for heat (need to find out if it has been included in the total)

Figure 9.4: City Air Pollutant Projections for 2025

Green House Gas Inventory: City Air Pollutants 2025								
		Residential	Commercial	Industrial	Building Totals	Transportation: Vehicles	Transportation: Rail Transit	Transportation: Total
Electricity	Nox (lbs)	181,095	336,075	99,825		-	2	
	SOx (lbs)	365,746	678,748	201,610		-	5	
	CO (lbs)	280,888	521,268	154,833		-	4	
	VOC (lbs)	31,526	58,505	17,378		-	0	
	PM10 (lbs)	244,147	453,085	134,581		-	3	
Electricity2*	Nox (lbs)	13,429	-	-		-	-	
	SOx (lbs)	27,121	-	-		-	-	
	CO (lbs)	20,829	-	-		-	-	
	VOC (lbs)	2,338	-	-		-	-	
	PM10 (lbs)	18,104	-	-		-	-	
Natural Gas	Nox (lbs)	459,520	241,981	86,600		-	-	
	SOx (lbs)	17,518	9,640	41,488		-	-	
	CO (lbs)	113,538	62,482	24,559		-	-	
	VOC (lbs)	24,218	13,328	4,344		-	-	
	PM10 (lbs)	13,445	7,399	3,069		-	-	
Oil	Nox (lbs)	4,656,054	1,058,421	93,264		-	-	
	SOx (lbs)	306,181	69,601	6,133		-	-	
	CO (lbs)	1,003,005	228,004	20,091		-	-	
	VOC (lbs)	369,528	84,002	7,402		-	-	
	PM10 (lbs)	327,296	74,401	6,556		-	-	
Gasoline	Nox (lbs)	-	-	-		1,121,421	1	
	SOx (lbs)	-	-	-		73,146	0	
	CO (lbs)	-	-	-		17,403,046	19	
	VOC (lbs)	-	-	-		1,618,423	2	
	PM10 (lbs)	-	-	-		29,924	0	
Diesel	Nox (lbs)	-	-	-		658,627	1	
	SOx (lbs)	-	-	-		33,399	0	
	CO (lbs)	-	-	-		626,027	1	
	VOC (lbs)	-	-	-		83,287	0	
	PM10 (lbs)	-	-	-		13,466	0	
						Total-Vehicles	**Total-Rail**	**Grand Total**
Total	**Nox (lbs)**	**5,310,098**	**1,636,477**	**279,689**	**7,226,264**	**21,660,766**	**38**	**21,660,804**
	SOx (lbs)	**716,566**	**757,989**	**249,231**	**1,723,786**			
	CO (lbs)	**1,418,260**	**811,754**	**199,483**	**2,429,497**			
	VOC (lbs)	**427,610**	**155,835**	**29,124**	**612,569**			
	PM10 (lbs)	**602,992**	**534,885**	**144,206**	**1,282,083**			

* This is identified in Summary Calculations as Electricity for heat (need to find out if it has been included in the total)

Figure 9.5: Citywide Emissions Projections for 2025

Green House Gas Inventory: Citywide Emissions 2025

		Residential	Commercial	Industrial	Building Totals	Transportation: Vehicles	Transportation: Rail Transit	Transportation	Waste		Solid Waste	TOTALS
Electricity	CO2 (tons)	109,949	204,042	60,607		-	1					
	N2O (lbs)	4,030	7,478	2,221		-	-					
	CH4 (lbs)	20,385	37,830	11,237		-	-		City Program	CH4 (lbs)	708,148	
	Energy Use (MMBtu)	808,996	1,501,326	445,942		-	10			Disposed (tons)	33,509	
	Equiv. CO_2 (tons)	110,788	205,599	61,069		-	1			Equiv. CO_2 (tons)	7,436	
Electricity2*	CO2 (tons)	8,153	-	-		-	-					
	N2O (lbs)	299	-	-		-	-					
	CH4 (lbs)	1,512	-	-		-	-		Residential 4+	CH4 (lbs)	245,926	
	Energy Use (MMBtu)	59,990	-	-		-	-			Disposed (tons)	11,637	
	Equiv. CO2 (tons)	8,215	-	-		-	-			Equiv. CO2 (tons)	2,582	
Natural Gas	CO2 (tons)	153,080	84,242	17,228		-	-					
	N2O (lbs)	577	318	65		-	-					
	CH4 (lbs)	28,850	15,877	649		-	-		Comm/ Indus	CH4 (lbs)	850,196	
	Energy Use (MMBtu)	2,617,262	1,440,321	294,550		-	-			Disposed (tons)	40,231	
	Equiv. CO2 (tons)	153,472	84,458	17,245		-	-			Equiv. CO2 (tons)	8,927	
Oil	CO2 (tons)	85,133	19,353	1,705		-	-					
	N2O (lbs)	1,397	317	28		-	-					
	CH4 (lbs)	25,604	5,820	140		-	-		Landfill	CH4 (lbs)	34,000	
	Energy Use (MMBtu)	1,055,795	240,005	21,148		-	-			Energy Use (MMBtu)	N/A	
	Equiv. CO2 (tons)	85,618	19,463	1,711		-	-			Equiv. CO2 (tons)	0	
Gasoline	CO2 (tons)	-	-	-		270,475	-					
	N2O (lbs)	-	-	-		38,037	-					
	CH4 (lbs)	-	-	-		32,294	-					
	Energy Use (MMBtu)	-	-	-		3,461,772	4			Energy Use (MMBtu)	-	
	Equiv. CO2 (tons)	-	-	-		276,709	-			Equiv. CO2 (tons)	-	
Diesel	CO2 (tons)	-	-	-		56,926	-					
	N2O (lbs)	-	-	-		336	-					
	CH4 (lbs)	-	-	-		346	-					
	Energy Use (MMBtu)	-	-	-		705,985	1			Energy Use (MMBtu)	-	
	Equiv. CO2 (tons)	-	-	-		56,982	-			Equiv. CO2 (tons)	-	
Total	Energy Use (MMBtu)	4,542,043	3,181,652	761,640	8,485,335	4,167,757	15	4,167,772		Disposed (tons)	85,377	12,653,107
	Equiv. CO2 (tons)	358,093	309,520	80,025	747,638	333,691	2	333,693		Equiv. CO2 (tons)	18,945	1,100,276

* This is identified in Summary Calculations as Electricity for heat (need to find out if it has been included in the total)

10.0 ARTS, CULTURE, & HISTORIC PRESERVATION

Lowell continues to flourish as a place that cherishes arts, culture and its rich historic roots. The arts and cultural scene has grown substantially in the past decade, with the Cultural Organization of Lowell linking closely to the City's Cultural Affairs and Special Events Office. Since 2001, the Discover Lowell Series has been established, bringing over 3 million tourists to the city annually. The city's partnership with the University and Middlesex Community College has also become stronger, as is evident from jointly presented events such as the Kerouac Festival and Riverfest. Over 130 artists live/work spaces have been established in the Hamilton Canal District. The city currently is home to 23 museums, galleries and cultural centers, 35 creative businesses, 209 festivals, 206 artists work spaces, 5 rehearsal studios, and 14 performance spaces and theatres.

Historic preservation, which was a high priority at the time the original 2003 Master Plan was adopted, has continued to prove so to this day. The city is home to 260 historic buildings. In addition to the downtown historic districts, 9 new design review districts have been established in neighborhoods throughout the city.

10.1 CULTURAL & HISTORIC AREAS

The bricks and mortar of Lowell's past is an integral component of the community's sense of place and character. The past has been used in a variety of ways to help become the driving force for much of Lowell's economic development efforts. Historic buildings have been rehabilitated for new residential, commercial, and retail uses. A variety of historic and cultural institutions as well as special events lay the foundation for Lowell's tourist economy. Much of this activity is focused around the Lowell National Historical Park in the downtown area, spreading out throughout the city's 5.6 mile National Historic Landmark power canal system, and extending outward along the banks of both the Merrimack and Concord Rivers. Other reminders of the past can be found throughout Lowell's various neighborhoods where many Victorian-era streets, homes, and parks reflect the rapid growth of the community throughout the 19th and early 20th centuries. The growth of these neighborhoods is reflected not only in architecture but in the successive waves of immigrants and others attracted to Lowell by economic opportunity.

10.2 DOWNTOWN LOWELL ARTISTS DISTRICT

Created in December 1998, the Artist Overlay District part of the City Zoning Ordinance allowing artists to both live and work in the same space (live/work space). A Special Permit is required from the Zoning Board of Appeals (ZBA) for Artist Live/Work Space.

- The Artist Overlay District was established with the intent and purpose of encouraging artists to both live and work in the downtown area, thereby promoting a venue for and encouraging further concentration of art, cultural and entertainment attractions in the downtown.
- As a zoning overlay district the rights of the underlying zone remain intact.

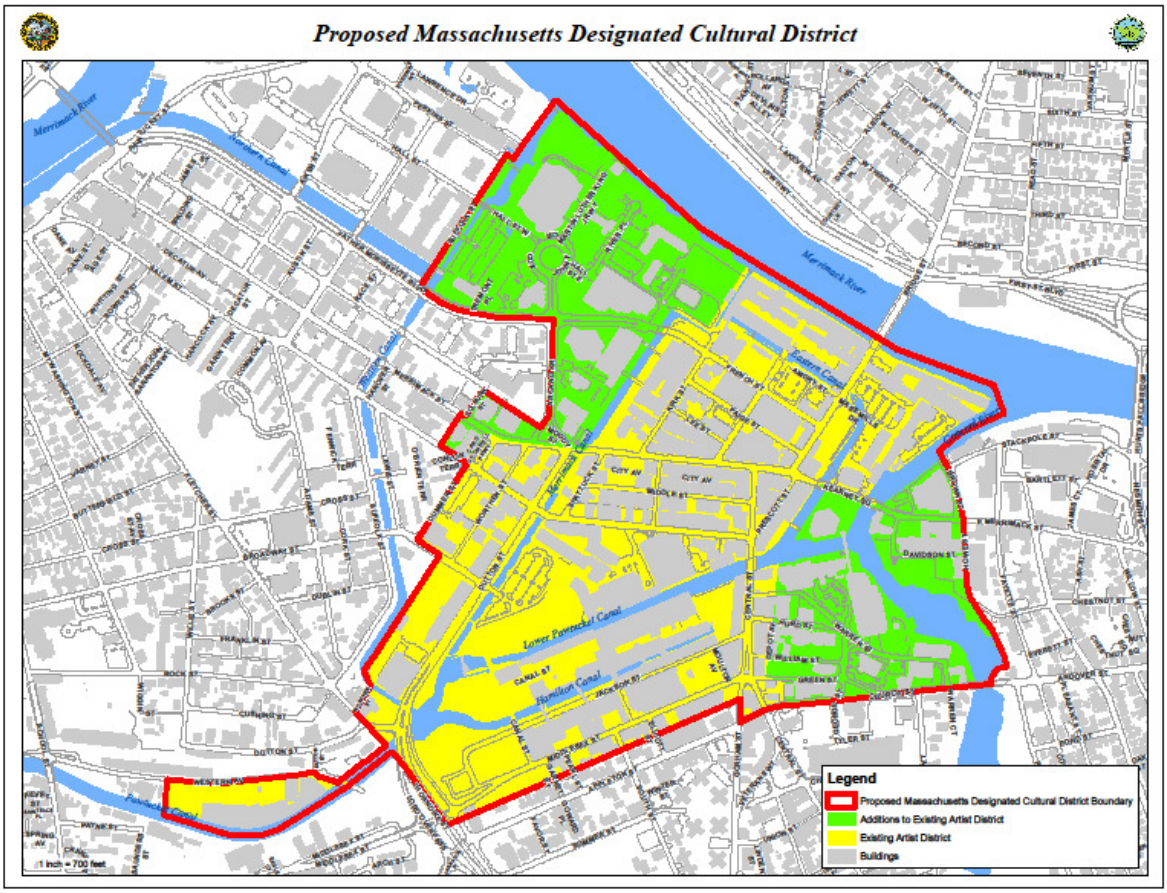
- The Special Permit applies to the use of a building or part of a building as artist live work space and addresses access, parking, loading, noise, and the intent and purpose of the Zoning Ordinance.
- Development Specifications and code requirements made necessary by a particular type of art use, such as welding, painting, etc., are addressed through building codes and regulations during a separate application for building permits and occupancy permits.
- The district encompasses the entire downtown area from Middlesex Street along Thorndike Street and Dutton Street to the Merrimack River, along the Concord River to the Middlesex Community College and back along Central Street to Middlesex Street.
- The Boott Mills, Massachusetts Mills, Appleton Mills, CMAA and Canal Place are in the district.
- The Zoning Ordinance defines an artist as:

    "A person regularly engaged in and who derives a substantial portion of his/her annual income from art or creative work either written, composed, created or executed for a "one of a kind, limited production," exclusive of any piece or performance created or executed for industry oriented distribution or related production.

- Tenant and condominium associations will also have the ability to control occupancy through their own rules and bylaws.

Since its creation, dozens of artist living and studio spaces have been created in several prominent buildings in downtown Lowell. The success of the initial projects and a continuing demand for this type of specialized housing suggests that additional artist live/work space is likely to be created in the coming years. The city has recently (2011) applied for a Cultural Districts designation through the Massachusetts Cultural Council, which would further define the downtown district as a destination and provide incentives to track the arts and cultural activities that take place within it.

Figure 10.1: Lowell Downtown Cultural District



10.3 HISTORIC PRESERVATION

Lowell has proven that historic preservation and urban economic development can work hand-in-hand for the betterment of a community. Urban disinvestment and decline were a familiar sight in America's older cities in the mid-twentieth century. Lowell was no exception to this phenomena as the collapse of Lowell's once-thriving textile industry in the 1920s and 1930s resulted in empty mill buildings and a decaying central business district. During the 1950s and 1960s, federal urban renewal funding became available to Lowell. Unfortunately, these efforts did not stimulate economic renewal and resulted in the demolition of some of the city's most significant millyards and tore apart several ethnic neighborhoods.

However, some in the community saw the city's history as a means to its revitalization. In the early 1970s, city planning efforts began to focus on preservation as a core element of its revitalization strategy. The establishment of the Lowell Heritage State Park in 1974 added credibility to Lowell's efforts to establish a National Park in the city. The first Historic District Commission and two local design review districts were created downtown by the City in the1970s. Much of the downtown, millyards, and canal system

were placed on the National Register of Historic Places. The City invested in pedestrian improvements downtown that reinforced the area's 19th century flavor and provided design assistance for owners of historic properties. Finally, Lowell National Historical Park was established in 1978 in a federal law that also established the Lowell Historic Preservation Commission, which during its existence assisted with much of the historically sensitive building rehabilitation that took place between 1979 and 1995.

For the past quarter century, the Lowell National Historical Park (LNHP) and the City of Lowell have served as stewards of Lowell's historic and cultural resources, systematically assisting in the rehabilitation of its many historic downtown buildings so that they once again contribute to the city's character and economy. The LNHP has played a leadership role in making historic preservation the theme of the community's economic development program. The City's comprehensive economic development program likewise, has been dedicated to fostering community pride in its industrial and working heritage and providing new hope for and commitment to its economic future. In doing so, the LNHP and City in concert with a host of public and private partners have created a vibrant living, learning, and working environment that respectively preserves and tells the story of the industrial revolution in Lowell.

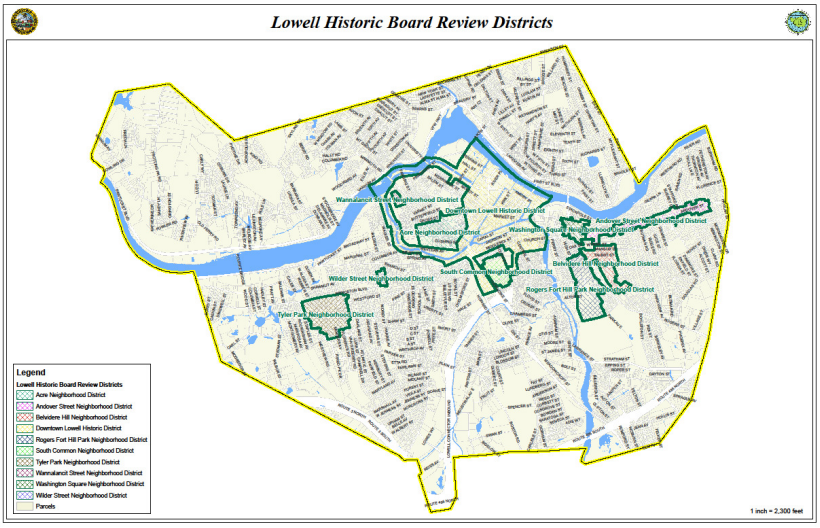
The City's numerous historic districts contain a critical mass of structures from the 19th century when Lowell was America's textile capital. Lowell contains a total of 14 districts listed on the National Register of Historic Places and 27 individually-listed National Register properties scattered throughout the community in the downtown and neighborhoods. Lowell has the fifth highest number of properties in Massachusetts included on the state's inventory of historic resources. The Lowell Canal System, which provided the framework that shaped the entire development of Lowell, is listed as a National Historic Landmark and is also been designated a Civil and Mechanical Engineering Landmark. Also included in the city are ten local architectural and design review districts. Lowell's physical resources include the original 5.6 mile power canal system, major cotton textile millyards, and evolutionary streetscapes of commercial and residential structures.

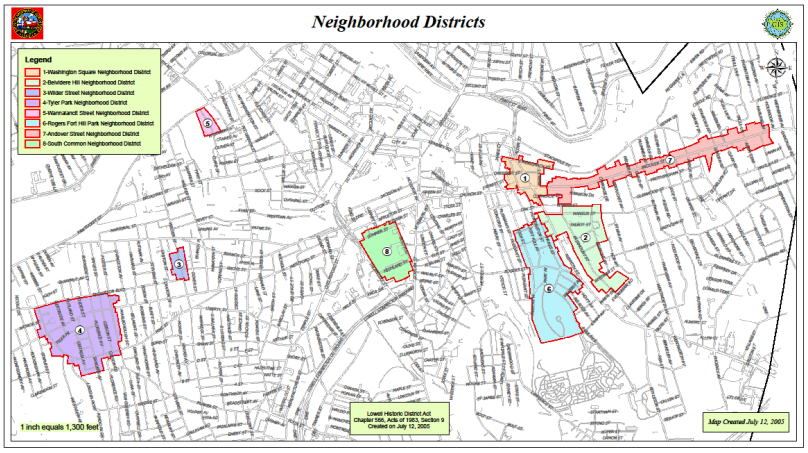
The LNHP and City have been part of an active public/private partnership that has been responsible for the rehabilitation of over 250 structures downtown and the creation of extensive public programs to preserve and interpret the city's cultural resources. Several major mill complexes have been successfully renovated into housing and office space. Aluminum and stucco facades have been removed from downtown buildings revealing attractive 19th century commercial storefronts. The banks of Lowell's canals have been largely reclaimed providing areas of recreational enjoyment and interpretation of the city's rich history. Streetscape improvements including brick pavement, granite pavers, and period lighting and benches grace the downtown, enhancing the 19th century urban character of the city.

Strengthening and expanding historic preservation review and regulations in Lowell was a requirement of the federal law creating Lowell National Historical Park in order to

ensure community actions would not be inconsistent with the preservation goals of the Park. Since the establishment of the Lowell Historic Board by the Massachusetts Legislature in 1983, over 2,200 permits have been issued within the Downtown Lowell Historic District indicating an extraordinary level of change within the downtown. A second design review district also overseen by the Board, the Acre Neighborhood District, was created in 1999 to assist in the implementation of the Acre Neighborhood Revitalization & Development Plan. Eight additional design review districts under the purview of the Board were created in 2005 in the already existing neighborhood National Register districts for purposes of demolition and new construction. One additional neighborhood design review district was established in 2011.

Figure 10.2 & 10.3: Lowell Historic Board Review Districts





Extensive public programming, interpretive and educational programs, waysides, and public art add to the vibrancy of the city and reinforce Lowell's history and culture. Waysides and public art help to weave together the significant areas, vistas, and structures along the Canalway, Riverwalk, and throughout the downtown historic district. Cultural events such as the Lowell Folk Festival, Boarding House Park Summer

Music Series, Doors Open Lowell, and Winterfest encourages the community to celebrate its rich heritage while participating both as actors and audience in the midst of Lowell's most historic buildings and sites.

Lowell's revitalization is a tribute to the highly successful public/private partnerships that have been a central ingredient in every project undertaken by the City. The Lowell Heritage State Park played a key role in preserving Lowell's history by securing the recreational and air rights to the canal system as well as much of the right-of-way needed to develop the Canalway. The Lowell Historic Preservation Commission, the Park's former sister agency, also played a pivotal role in the city's impressive revival. The Commission provided over $5 million in preservation grants and loans for façade rehabilitation during its 17 year tenure. This investment generated over $50 million in private investment in 63 nationally significant historic structures. The Commission set the standard for high quality rehabilitation and restoration within the downtown historic district and creatively invested its cultural funding to help bring the district alive.

Within Lowell's neighborhoods an active historic home marker and brochure program has been established by the Lowell Historic Board. Other efforts have included survey and identification of historic resources and National Register listings as well as technical assistance and outreach to homeowners regarding preservation. The City has been instrumental in the preservation and rehabilitation of historic landscapes including Tyler Park and Rogers Fort Hill Park through partnerships with neighborhood groups and various state grant sources.

Very little could have been accomplished in Lowell without the consistent support of the community's business and governmental leadership. Effective leadership through the years was delivered by seven city managers; numerous city council members; Lowell's bankers; and officials from the nonprofit banking consortium, the Lowell Development and Financial Corporation. Of critical importance has been the advocacy and support of the Lowell Plan, Inc., the community's prominent business advocacy organization. Together, these entities have been responsible for implementing the urban cultural park vision.

For its efforts, Lowell was recognized by the National Trust for Historic Preservation with one of its distinguished National Preservation Honor Awards in 2002 as well as one of America's initial Dozen Distinctive Destinations in 2000. In 2004, Lowell was designated a Preserve America community by the White House and Advisory Council on Historic Preservation. Lowell has succeeded where many other communities have failed in reclaiming the attributes that make communities special places. One important lesson Lowell has learned is that insistence upon quality rehabilitation and historic integrity can pay off. Through this practice, Lowell has set a standard and model of excellence that other communities have sought to follow. The Lowell model emerged out of a clear vision and has been kept alive through multi-agency support and commitment to promoting quality of life issues in the city. This vision and commitment will ensure the

continued focus over the coming years necessary to complete and maintain the accomplishment of the city's reclamation of its historic and cultural resources.

10.4 MUSEUMS, THEATRES & CULTURAL INSTITUTIONS

Lowell offers performances, and award-winning theater, outstanding historic sites, and a number of notable museums. This cultural richness includes the world's largest textile museum, the American Textile History Museum, ALL Arts Gallery, the New England Quilt Museum, the Brush Art Gallery, 119 Gallery, the Whistler House Museum of Art, the National Streetcar Museum, and UMass Lowell's University Galleries. The Lowell National Historical Park includes the Boott Cotton Mills Museum and the Tsongas Industrial History Center among its attractions. In addition, at Western Avenue Studios over 200 artists hone their craft within a nexus of artist work studios.

Performing Arts are showcased at the Merrimack Repertory Theater and the touring shows hosted at the Lowell Memorial Auditorium and the UMass Lowell Tsongas Center. Throughout the summer live entertainment can heard at the Lowell Summer Music Series at Boardinghouse Park. UMass Lowell's College of Fine Arts also offers top-notch concerts and a popular children's performance series. The City of Lowell's 2007 Creative Economy Plan: *On the Cultural Road* identified the importance of developing a community-based multi-use cultural arts center to support the many performing and visual arts of the City. A number of locations have come to mind to house an innovative multi purpose arts center, including the Smith Baker Center. The City's Department of Planning and Development, Cultural Organization of Lowell (COOL) and local stakeholders are working together to consider and support such a venture.

Lowell also plays host to a number of annual festivals. The most prominent of these is the Lowell Folk Festival, the nation's largest free folk festival. Other major events include the Discover Lowell Series, Lowell Film Festival, Doors Open Lowell, African Festival, Latin American Festival, Greek Festival, Puerto Rican Festival, One Lowell World Cup, Lowell Quilt Festival, Southeast Asian Water Festival, Lowell Open Studios, Lowell Celebrates Kerouac, and the City of Lights Parade and Winterfest. The Lowell community and visitors can also enjoy a self-guided tour of Lowell's substantial and varied collection of permanent public art that includes pieces like "The Jack Kerouac Commemorative," "The Worker" and "Lucy Larcom Park: Industry Not Servitude." These institutions and annual events draw over two million visitors each year.

The Cultural Organization of Lowell (COOL) housed within the City's Office of Cultural Affairs & Special Events (CASE) serve as a focal point for the promotion of arts and culture in Lowell. With the mission to help create a high quality cultural environment that offers appealing experiences to the city's diverse population, COOL efforts also work to stimulate economic development, the cultural economy and creative entrepreneurs in the City, and support and encourage people to participate in the culture of the community. As both a service and presenting organization, COOL accomplishes this mission by stimulating public awareness of and support for the arts,

preserving and celebrating the City's diverse cultural and historical heritage, planning yearly community events and supporting local festivals.

COOL also supports and incubates new cultural and creative projects within the community. In recent years some of these include Where Elephants Weep Cambodian Rock Opera, On the Road in Lowell Exhibit and Summer Program Series, Massachusetts Poetry Festival, the Jack Kerouac Literary Festival, and More Than a Number Cambodian Exhibit. Combined these programs attracted over 50,000 attendees and help bring new revenues and patronage to local businesses, restaurants and establishments. These projects create an opportunity for collaboration, cultural tourism and larger community engagement.

11.0 MUNICIPAL FACILITIES & SERVICES

In spite of diminishing resources, most municipal facilities and services have remained stable and in many cases have improved over the course of the past decade. Although there have been staff reductions in the Police and Fire Departments both departments have maintained a high quality of service, seeking to strengthen their relationships with the local community. The Police Department has received over $1.2 million dollars in grants in 2010 alone. In addition to acquiring a new police garage this past year, both departments have upgraded their radio systems, a change which has improved communication between and among city staff. There is a study currently underway to determine whether a regionalized 911 system would be effective.

The Lowell Public School system has made great progress on a number of fronts. The new Stoklosa Middle School has been built in an under-served neighborhood. Many other upgrades have also been made, including the installation of photovoltaic panels on 4 schools, as part of a 20-year, $21 million energy performance project to 47 municipal facilities. Test scores have also risen over the past several years, with 4 schools being ranked among the top in the state for narrowing the achievement gap. As a general trend, public and private school enrollments have decreased over the past decade where as charter school enrollments have increased.

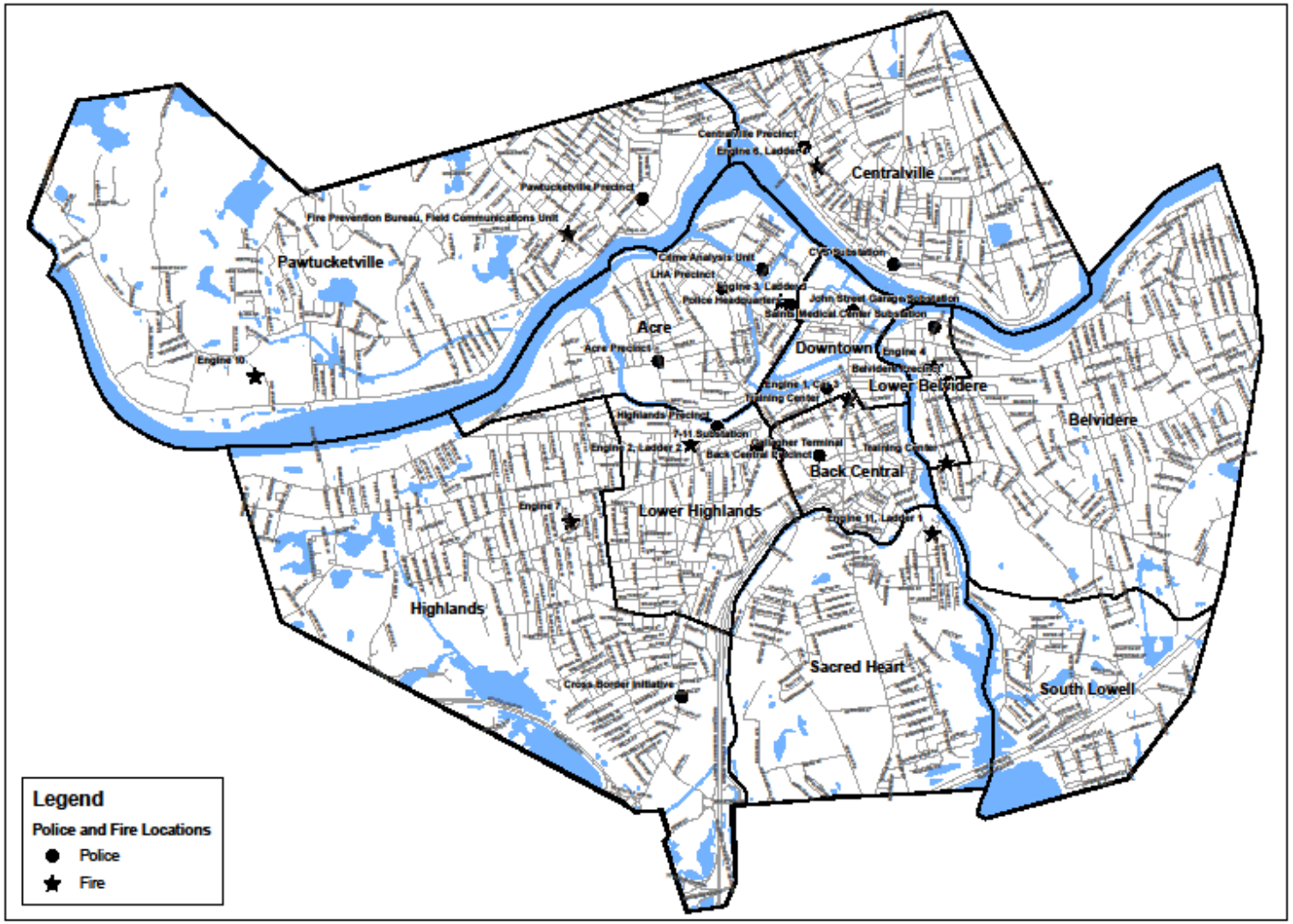
Substantial progress has also been made in the Solid Waste and Recycling Department. The transition to a 'pay as you throw' collection program has resulted in significant reductions in solid waste disposal. Since 2002, the annual solid waste tonnage has been reduced from 45,000 – 30,000, and recycling rates have increased proportionally, due in large part to the public outreach and education efforts undertaken by this department.

11.1 LOWELL POLICE & FIRE DEPARTMENTS

The Fire Department operates out of the JFK Civic Center and 9 fire stations throughout the city. The following chart summarizes the equipment contained in each location. A map of all Police and Fire locations is located on page 80.

Table 11.1.1: Lowell Fire Department Locations and Equipment

Locations of Fire Stations	Year Built	Equipment/Use
45 Branch St	1877 (1994)	Engine 2, Ladder 2
803 Gorham St	1876	Engine 1, Car 3
198 High St	1889	Engine 4, Spare Engine
751 Lawrence St	1891	Engine 11, Ladder 1, Zodiac
93 Mammoth Rd	1891	Fire Prevention Bureau, Field Communications Unit
99 Moody St	1877	Engine 3, Ladder 3, Rescue Company, Car 2, Spare Ladder, Emerg Mgmt Bus, HazMat Truck, Rescue Boat, Zodiac Drive Truck
57 Old Ferry Rd	1977	Engine 10, Brush Truck, Spare Engine
275 Stevens St	1922	Engine 7
500 Rogers St	1924	Training Center
280 West Sixth St	1900	Engine 6, Ladder 4



City of Lowell Police and Fire Locations

Since 2001, in addition to inheriting a new police garage, the LPD has secured a new rental-free precinct location along Broadway Street in the Acre, and sub-stations at 7-11, CVS, Saints Medical Center, and the John Street Garage. The LPD has also established a Crime Analysis Unit on Suffolk Street. In 2010, LPD fleet consisted of 126 unmarked, marked and specialty vehicles, including 8 motorcycles and 7 vans.

Table 11.2.1 Lowell Police Department Locations		
Site	**Location (2001)**	**Location (2011)**
7-11 Substation	N/A	55 Chelmsford Street
Acre Precinct	N/A	605 Broadway Street
Back Central Precinct	739 Central St	43 Highland Drive
Belvidere Precinct	151 Andover St	151 Andover Street
Centralville Precinct	480 Bridge St	333 West Sixth Street
Crime Analysis Unit	N/A	660 Suffolk Street
Cross Border Initiative	700 Chelmsford St	Cross Point Towers
CVS Substation	N/A	336 Bridge Street
Domestic Violence Resource Center	15 Hurd St	N/A
Gallagher Terminal	145 Thorndike St	145 Thorndike Street
Headquarters	50 Arcand Drive	50 Arcand Drive
Highlands Precinct	657 Middlesex St	657 Middlesex Street
John Street Garage Substation	N/A	75 John Street
LHA Precinct	21 Salem St	21 Salem Street
Pawtucketville Precinct	114 University Ave	97 University Ave
Training Center	700 Chelmsford St	99 Middlesex Street
Saints Medical Center Substation	N/A	1 Hospital Drive

The LPD responded to 78,714 CAD dispatch calls in 2010, split fairly evening between the East, West and North Sectors. There was no significant change between 2008 – 2010 in terms of the calls received and responded to.

License requests increased between 2009-2010, with 53 new taxi license requests in 2010, a 21% increase from 2009, and 33 new peddler license applications, a 11% increase from the previous year. Additionally, there were 249 new or renewal firearm licenses in 2010, a 22% increase from 2009. The LPD successfully received 10 grants in 2010 totaling $1.2 million.

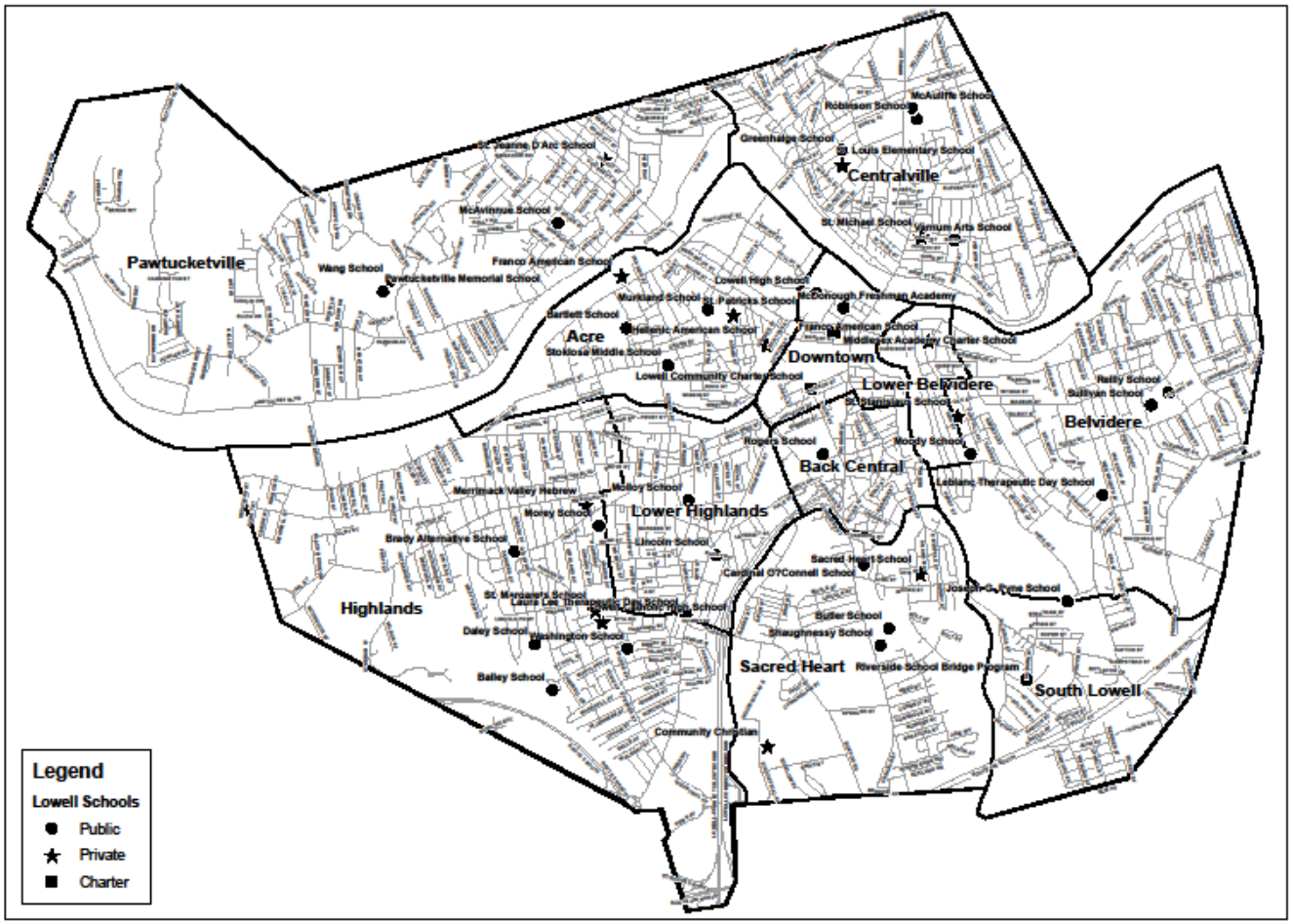
11.2 ELEMENTARY & SECONDARY SCHOOLS

In 2001, the City of Lowell School Department educated 15,953 students in 31 schools. Now in 2011, the School Department educates 13,421 in 26 schools. Total enrollment in the city's two charter schools rose from 489 in 2001 to 784 in 2011. Private school enrollment decreased from 3,618 in 13 schools in 2001 to 2842 in 11 schools in 2011. Since the endorsement of the original Master Plan in 2003, the Morey School has been built, and a series of capital improvements have been made, including the installation of photovoltaic panels on 4 schools as part of a 20-year, $21 million energy performance project to 47 municipal facilities.

Table 11.2.1: Public Schools				
Public Schools Name	**Address**	**Grades**	**Enrollment 2001**	**Enrollment 2011**
Abraham Lincoln School	300 Chelmsford Street	PK - 4	516	505
B.F. Butler Middle School	1140 Gorham Street	5th - 8th	629	500
Bartlett School	79 Wannalancit Street	PK - 8th	574	460
Cardinal O'Connell School	21 Carter Street	5th - 8th	165	N/A
Charles W. Morey School	114 Pine Street	PK - 4	501	420
Charlotte M. Murkland Elem. School	350 Adams Street	PK - 4	520	460
Dr. An Wang School	365 West Meadow Rd.	5th - 8th	721	620
Dr. Gertrude Bailey School	175 Campbell Drive	PK - 4	461	460
E. N. Rogers School	43 Highland Street	5th - 8th	806	N/A
Greenhalge School	149 Ennell Street	PK - 4	558	450
Henry J. Robinson Middle School	110 June Street	5th - 8th	749	660
Hugh J. Molloy School	125 Smith Street	10th - 12th	200	70
Hugh F. Brady Alternative School	341 Pine Street	5th - 8th	38	N/A
James S. Daley Middle School	150 Flemming Street	5th - 8th	928	600
James Sullivan Middle School	150 Draper Street	5th - 8th	671	586
John J. Shaughnessy School	1158 Gorham Street	PK - 4	531	500
Joseph G. Pyne School	145 Boylston Street	PK - 8	211	500
Joseph McAvinnue School	117 Mammoth Road	PK - 4	545	489
Kathryn P Stoklosa Middle School	560 Broadway Street	5th - 8th	N/A	485
Laura Lee Therapeutic Day School	235 Powell Street	1st - 8th	15	50
Leblanc Therapeutic Day School	58 Sycamore Street	9th - 12th	161	53
Lowell High School	50 Fr. Morrisette Blvd.	10th - 12th	3530	3212
McDonough Freshman Academy	40 Paige Street	K - 8	332	365
Moody Elementary School	158 Rogers Street	K - 4	316	187
Pawtucketville Memorial School	425 West Meadow Rd.	PK - 4	405	493
Peter W. Reilly School	115 Douglas Road	K - 4	651	530
S. Christa McAuliffe Elementary	570 Beacon Street	PK - 4	503	500
Varnum Arts School	115 Sixth Street	K - 4	354	N/A
Washington School	795 Wilder Street	PK - 4	334	220
Riverside School Bridge Program	73 Woburn Street	7th - 8th	38	36

Table 11.2.2: Charter Schools				
Charter Schools	**Address**	**Grade**	**Enrollment 2001**	**Enrollment 2011**
Middlesex Academy Charter School	67 Middle Street	9th - 12th	100	111
Lowell Community Charter School	206 Jackson Street	K - 5	389	673

Table 11.2.3: Private Schools				
Private Schools	**Address**	**Grade**	**Enrollment 2001**	**Enrollment 2011**
Hellenic American School	41 Broadway Street	PK - 6	125	119
Lowell Catholic High School	530 Stevens Street	12-Sep	300	400
St. Margaret's School	486 Stevens Street	PK - 8	435	229
St. Michael School	21 Sixth Street	PK - 8	330	415
St. Patrick's School	311 Adams Street	PK - 8	183	151
St. Stanislaus School	368 High Street	K - 8	150	234
Sacred Heart School	122 Andrews Street	PK - 8	212	202
Franco American School	357 Pawtucket Street	K - 8	365	230
Franco American School	218 East Merrimack Street	PK - 8	281	N/A
Merrimack Valley Hebrew	18 Academy Drive	PK - 6	45	N/A
St. Jeanne D'Arc School	68 Dracut Street	K - 8	491	398
St. Louis Elementary School	77 Boisvert Street	PK - 8	500	314
Community Christian	205 Industrial Ave. East	PK - 12	201	150



City of Lowell School Locations

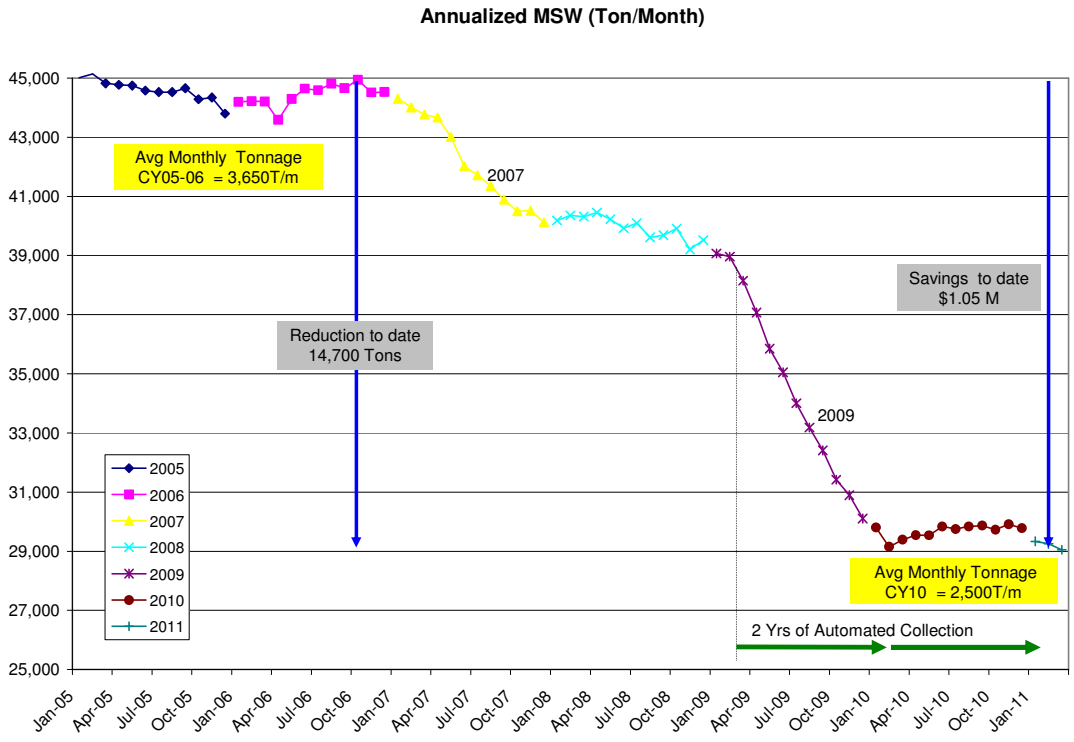
11.3 SOLID WASTE AND RECYCLING

From 2002 through 2006 the City of Lowell collected on the average of 45,000 tons of trash (per yr) from its 24,500 curbside customers. At $70 per ton, annual disposal cost exceeded $3.1 Million. Even though there were some rough regulations on the books, loose oversight and lacks enforcement gave the perception of 'unlimited' trash.

In 2007 trash eligibility rules were enforced; subsequently addresses that were not eligible were removed from collection routes. In addition, improvements were made to curbside recycling – including multimedia outreach and education. During 2008, disposal tonnage was reduced to nearly 40,000 tons; to a cost of $2.8 Million – achieving a savings of over $300,000.

In February of 2009 the 24,500 eligible curbside customers each received an automated trash collection cart. By the end of the year only 30,000 tons of Municipal Solid Waste (MSW) were collected for disposal at the regional incinerator –a 25% reduction. In addition, the disposal cost was renegotiated to $64 per ton. In 2009 incineration costs were $1.9 Million… a reduction of nearly $900,000 from the previous year.

From 2006 through March of 2011 the average monthly tonnage collected has been reduced by more than 1,100 tons. In FY10 the City was awarded a MassDEP Waste Reduction Grant in the form of funds for a Recycling Enforcement Coordinator. The goal is an additional 10% reduction in tonnage, saving an estimated $180,000 by cutting 3,000 tons of trash and increasing recycling.



11.4 OTHER MUNICIPAL FACILITIES AND SERVICES

Most city departments have offices in City Hall, located at 375 Merrimack Street. The Division of Planning and Development is located in the JFK Civic Center at 50 Arcand Drive. The Pollard Memorial Library, currently under renovation, is located adjacent to City Hall at 375 Merrimack Street. Departments whose responsibilities include operating and maintaining sites throughout the city typically have headquarters and garages located elsewhere. These are listed below.

- Parks Department – 1375 Gorham Street
- DPW – 1365 Middlesex Street
- Senior Center – 276 Broadway Street
- Water Division – 815 Pawtucket Boulevard (Headquarters)
- Waste Water Division – 415 First Street Boulevard

In addition to the City-owned property below, a number of City departments and programs occupy leased property, primarily in downtown locations. Lease agreements are generally for three-year terms.

12.0 UTILITIES AND INFRASTRUCTURE

The Water and Waste Water Utility, which serve Lowell and the region, have made substantial progress over the past decade in addressing both economic and environmental concerns. The drinking water quality has improved over the past several decades. Today, the Merrimack River is designated as class B, which means it is safe for fishing, swimming and boating. The Utility is in the midst of a $12.6 million dollar upgrade. The Lowell Regional Wastewater Utility (LRWWU) operates the City of Lowell's combined sewer, sanitary wastewater, and storm water collection systems. Approximately 50 percent of Lowell's sewer pipes are combined sewers that convey both storm water and sewerage, and approximately one half of the sewer system is over 100 years old. LRWWU prepared a Long Term Control Plan (LTCP) in February 2002 that evaluated a range of alternatives to reduce the city's CSO discharges, and since 2001, LRWWU has spent more than $90 million to implement the Phase 1 of its improvement plan, with program objectives of increasing the capacity of its wastewater collection and treatment systems and improving the ability to treat and store combined sewer flow.

In 2009, LRWWU completed a comprehensive evaluation of its aging wastewater treatment facilities (approximately 30 years old), which resulted in the preparation of a Capital Improvement Program (CIP) for both the treatment facilities and the collection systems. LRWWU is currently implementing the recommendations of the CIP, with the expectation that this work will be done over the next twenty years. LRWWU leveraged available federal and state funding, receiving a grant of $7 million under the 2009 American Reinvestment and Recovery Act (ARRA). The funding has been used to reduce the cost to sewer users for the CIP improvements, as well as to make green and sustainable improvements to the WWTF. LRWWU is installing new energy-efficient turbo blowers for its aeration system, green vegetated roofs on its buildings, photovoltaic arrays to generator power, passive solar walls to supplement heating requirements for two buildings, and storm water controls (pervious pavement and retention/detention ponds) around the WWTF campus. In April of 2011, Lowell was presented with the Mass DEP Clean Water SRF Pisces Award, for these improvements, which are estimated to result in an annual reduction of 400 tons of C02 and 90 kw of green power generation.

Lowell has also made improvements in its flood protection system in the past several years. In January 2007, US Army Corps of Engineers completed an inspection and identified deficiencies that had to be addressed by the city to maintain the "active" status of the flood protection system, the most pressing of which have been addressed in recent years to stabilize the system.

12.1 WATER SUPPLY SYSTEM

The Lowell water department was formed in 1872 and relies solely on the Merrimack River for supply. Conventional treatment is used with, sand, dual and carbon media filtration. Approximately 15 mgd (million gallons per day) are pumped with a maximum capacity of 30 mgd. The Lowell Regional Water Utility (LWRU) is responsible for supplying all of Lowell residents with safe potable water. The utility also supplies water to Dracut, Tyngsboro, East Chelmsford on a daily basis, as well as Tewksbury, North Chelmsford and Chelmsford Center Water on an as needed basis from its facility on Pawtucket Blvd. The other major user of water from the Merrimack is the Consolidated Power Company, which withdraws water to generate hydroelectric power. The LRWU system includes two underground storage tanks with a capacity of 11 million gallons which are located on Christian Hill in the Centralville section of the city, the Stackpole, Newbridge, Tenth Street booster Stations as well as two free standing storage tanks located on Wedge St (1mg capacity). In the Highlands section of the city and on Fox St. (.4mg capacity.) located on Christian Hill. There are over 210 miles of water mains consisting mostly of 6-inch cast iron pipe supported by 8,12 and 24-inch cast iron transmission mains; Most of the mains are between 60 and 100 years old. Lowell has 2200 hydrants and 22,000 house, business and industrial services. Approximately 15% of the service pipes where determined to be lead or galvanized iron, we have been replacing them as quickly as possible.

The Merrimack River provides ample water for Lowell's existing and future water supply demands. Significant improvements have been made all along the Merrimack River Utility Basin, whereas twenty years ago fish were hard to find along the river. Today, trout, bass and pan fish can be found in abundant supply. Water quality has improved and the river has been designated a class (B) river which means it is safe for fishing, swimming and boating. As an aside, the Utility sponsors a 2-mile race in the river every Fourth of July. However, as development continues in the basin, major efforts are needed to manage existing and potential contamination sources.

Much of this clean up effort gained important significance when in 1988 the Environmental Protection Agency (EPA) established the Merrimack River Initiative. This program coordinates clean up efforts between New Hampshire and Massachusetts. Since its inception, millions of dollars have been spent to update municipal sewage treatment facilities and to educate the public on the importance of water to prevent further degradation of the Merrimack River. This federal effort has trickled down to the local level where various students from area schools have been participating in water quality monitoring programs. Continued clean up of the Merrimack and Concord Rivers will result in expanding recreational opportunities for area residents and stimulating further economic development.

The Utility is in the midst of a 12.6 million dollar upgrade which will keep in compliance with all present and future regulations as well as completely automate all the operations of the treatment plant.

12.2 WASTE WATER & STORM WATER COLLECTION SYSTEMS

The Lowell Regional Wastewater Utility (LRWWU) operates the City of Lowell's combined sewer, sanitary wastewater, and stormwater collection systems. Approximately 50 percent of Lowell's sewer pipes are combined sewers that convey both stormwater and sewerage. The other portions of the city's wastewater and stormwater systems are separated systems where the sewer pipes only carry sanitary wastewater (to the downstream treatment facility) and the stormwater pipes carry stormwater that is discharged into the brooks, streams, canals and rivers throughout the city.

The sanitary and combined sewer collection systems are comprised of approximately 230 miles of sewer pipes, ranging in size from 6-inch diameter to 120 inches diameter, constructed of clay, reinforced concrete, brick, or PVC (plastic). Approximately one-half of the sewer system is more than 100 years old. The stormwater collection system consists of about 70 miles of drainage, with diameters that range from 6-inches to 84-inches in diameter. Manholes and catch basins in city streets provide access to the wastewater and stormwater collection system for maintenance. There are more than 5,000 manholes and catch basins maintained and operated by LRWWU.

Operation of the wastewater and stormwater collection systems is guided by federal permits issued under the National Pollutant Discharge Elimination System (NPDES) program. Each of the city's wastewater and combined sewer overflow (CSO) outfalls has a specific permit number assigned to it. These outfalls, particularly at the WWTF, are assigned specific water quality effluent standards for discharges that must be met in order to comply with the NPDES permit. The permit also contains numerous compliance requirements that guide the maintenance and operation of the collection system, performance of the industrial pretreatment program (potentially harmful discharges from industries and businesses), and implementation of an infiltration and inflow (I/I) removal program that reduces extraneous flows into the sewer system. Stormwater discharges are guided by the federal Phase II NPDES Stormwater Rule, which regulates the city as an MS4 (municipal separate storm sewer system) community. The compliance requirements and record keeping necessary to meet all of these federal permit provisions is a significant challenge for LRWWU.

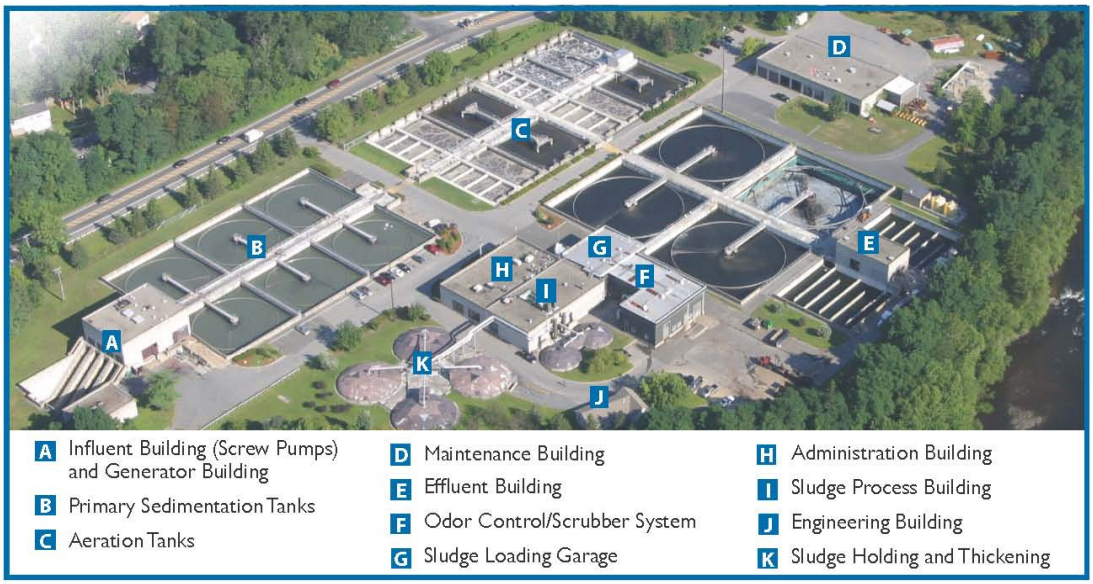
In 1999, LRWWU became an ISO 14001 certified organization in, one of the first municipal entities in the country to achieve this status. ISO certification is a rigorous process that is an industry standard in business and manufacturing. An ISO 14001-certified organization develops a business plan that dedicates the organization to environmental management system (EMS) protocols that provide a framework for a holistic, strategic approach to the organization's environmental policy, plans and actions. Certification must be renewed annually and is independently audited. LRWWU's philosophy, which fits nicely into ISO 14001 standards, is to optimize its operations in order to minimize the environmental impact of a wastewater treatment facility.

12.3 DUCK ISLAND WASTEWATER TREATMENT FACILITY

In 1980, a 32 million gallons per day (mgd) activated sludge wastewater treatment facility (WWTF) was opened on Duck Island to treat sanitary wastewater and combined sewer flow before it is discharged into the Merrimack River. The Duck Island WWTF is a regional treatment facility that serves the city of Lowell and the towns of Chelmsford, Dracut, Tewksbury, and Tyngsborough, a total service population of 180,000 persons.

There are three types of treatment at the Duck Island WWTF: physical, biological, and chemical processes. Physical treatment includes screening and grit removal, as well as sedimentation (settling of solids) and scum removal. The biological treatment process is referred to as an activated sludge process, in which air is introduced into large tanks in order to accelerate the growth of beneficial microorganisms that cleanse the wastewater stream. Chemical treatment refers to the disinfection of wastewater before it is discharged to the Merrimack River. The figure below provides an overview of the WWTF buildings, site, and processes.

Figure 12.1: Duck Island Wastewater Treatment Facility



Sewage and stormwater flow to the Duck Island WWTF through large-diameter interceptors located along the Concord and Merrimack rivers. The WWTF has the capacity to provide treatment for combined sewer flow up to a short-term peak rate of 110 mgd during wet weather conditions. Peak wet weather flow only receives physical and chemical treatment at the WWTF. It is not practical to provide activated sludge treatment to the wet weather flow because the high flow rate can dilute and upset the biological process. All flow discharged from the WWTF is disinfected to remove harmful bacteria from the effluent.

WWTF biological processes are impacted by the quality and flow of the incoming wastewater. Daily changes in temperature and waste strength or variable flow rates must be incorporated into the process operations to optimize treatment. The WWTF employs a computerized Supervisory Control And Data Acquisition (SCADA) system to continually monitor and adjust the treatment processes. The SCADA system is also used to control the amount of wastewater that reaches the facility to prevent an overload of the facility. The system incorporates an over-ride function so that an operator may manually control processes and operate equipment.

Until recently, most of the equipment at the wastewater treatment facility had reached the end of its useful life. The continuous breakdown of equipment at the plant created persistent odors and caused process upsets that sometimes resulted in NPDES permit violations. In some cases, aging sewers failed, causing sewer backups and street flooding. In 2009, LRWWU completed a comprehensive evaluation of its aging wastewater treatment facilities (approximately 30 years old), which resulted in the preparation of a Capital Improvement Program (CIP) for both the treatment facilities and the collection systems. The CIP recommended a phased and prioritized program of improvements. LRWWU is currently implementing the recommendations of the CIP, with the expectation that this work will be done over the next twenty years.

To date, LRWWU is completing Phase 1 of its CIP. These improvements have focused on replacing aging critical equipment and updating processes to reduce chronic odors from the WWTF. In 2010, the existing gravity thickeners were upgraded to improve a portion of the solids handling process. Currently, LRWWU is completing two large construction projects at the WWTF that will address odor control, other portions of the solid train, rehabilitation of the influent pumping station, overhaul of the WWTF electrical system (including primary power and standby power), and enhancement of the biological treatment process. A new odor treatment system has been installed at the WWTF to increase the capture and treatment of process odors. LRWWU is modifying its solids handling approach to avoid process upsets and resulting odors, and decrease dewatering and sludge disposal costs. A new septage-receiving and hauled-waste facility will also be constructed to improve LRWWU's side-stream capacity and increase potential new revenues to the utility. The Phase 1 project also includes the complete overhaul of the aging electrical system because it was unreliable (resulting in frequent plant shutdowns), difficult to repair (the equipment was no longer manufactured and replacement parts were hard to find), and a safety hazard (staff at the plant were exposed to potential electrocution).

LRWWU is installing improvements to the activated sludge process (integrated with the SCADA system) that will further enhance biological treatment. The Administration Building will be renovated to address safety concerns (fire alarm/protection system), replace inefficient lighting and HVAC, update the building interior, and to improve handicap accessibility. Finally, the Influent Pumping Station, considered the heart of the operations, is being completely overhauled and all four large-diameter screw pumps are

being replaced. Recently, the aging screw pumps experienced coincidental and catastrophic failures (three of the four pumps were inoperable), which resulted in violations of the NPDES permit conditions.

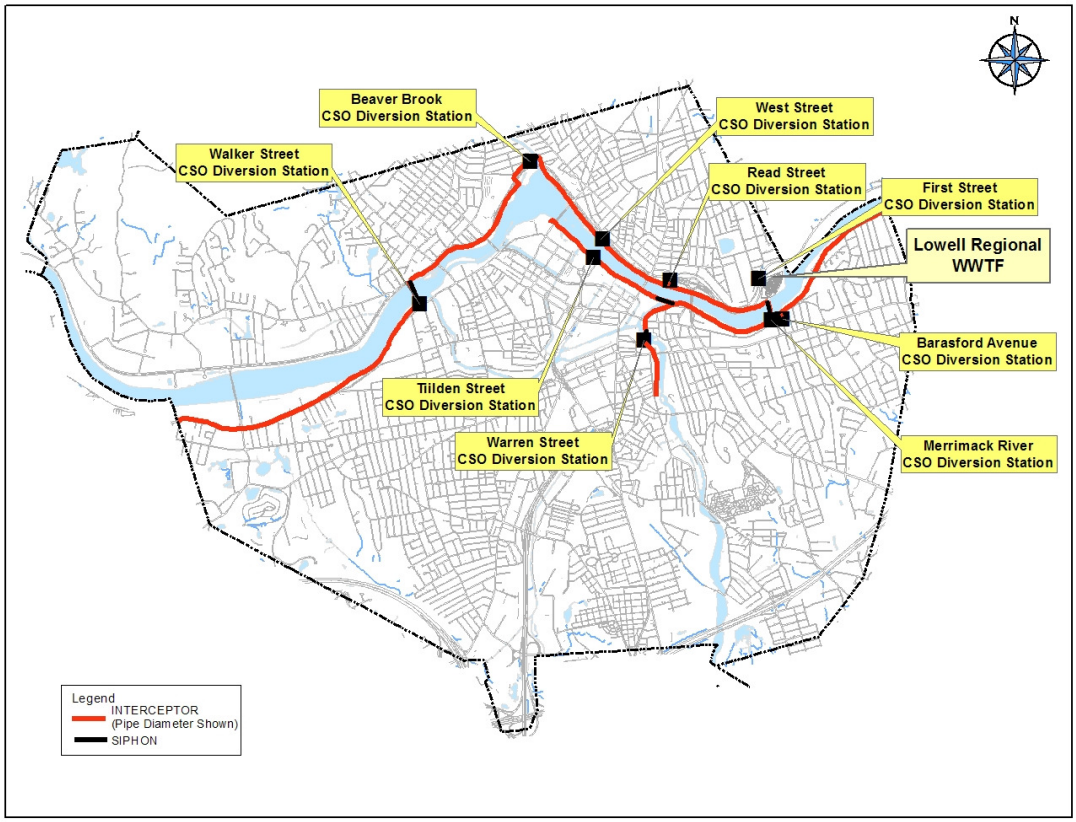
LRWWU leveraged available federal and state funding, receiving a grant of $7 million under the 2009 American Reinvestment and Recovery Act (ARRA). The funding has been used to reduce the cost to sewer users for the above improvements, as well as to make green and sustainable improvements to the WWTF. LRWWU is installing new energy-efficient turbo blowers for its aeration system, green vegetated roofs on its buildings, photovoltaic arrays to generator power, passive solar walls to supplement heating requirements for two buildings, and storm water controls (pervious pavement and retention/detention ponds) around the WWTF campus. These improvements will help LRWWU reduce its overall energy costs (by lowering energy use, producing energy, and lessening heating and cooling costs). In addition, LRWWU intends to facilitate public tours of the green technologies to promote sustainable practices at other facilities – both public and private - throughout the City of Lowell and the surrounding area.

12.4 COMBINED SEWER OVERFLOW SYSTEM

Combined sewer systems designed to carry wastewater and storm water in the same pipe are common in older urban communities. In the 19th and early-20th centuries, before the impact of sewage discharges into local streams was fully understood, combined sewers were the standard for public sewer systems. These combined sewers discharged directly into local streams without treatment.

In 1972, the Clean Water Act was passed by the U.S. Congress to address pollution in the nation's water bodies. To meet the requirements of the Clean Water Act, Lowell retro-fitted its combined sewer system with an interceptor system, installed along the rivers, that intercepted the old direct sewer discharges and carried the combined flow to the Duck Island WWTF. The interceptor system and WWTF were completed in 1980. As a result of this interceptor system, there are no more sanitary sewer discharges into local streams during dry weather conditions. The figure below depicts an overview of the city's interceptor system.

Figure 12.2: Overview of City of Lowell Inception System



The inherent problem with combined sewer systems is the highly variable flow that they collect during wet weather conditions. There is a technological limit and cost implication that prohibits the conveyance and treatment of all of the flow captured by the city's combined sewer system. Accordingly, the interceptor system was constructed in the early 1970s to convey only a portion of the combined sewer flow that could be adequately transported and treated at the Duck Island WWTF. Excess combined sewer flows had to be discharged from the interceptor system as untreated CSOs into local streams during heavy rainfall. Thus, today, when the wastewater treatment facility reaches capacity, CSOs could be discharged from any of nine locations (CSO diversion stations) into the Merrimack River, Concord River or Beaver Brook. During wet weather, this condition still contributes to water pollution and some restrictions in use of the rivers and streams.

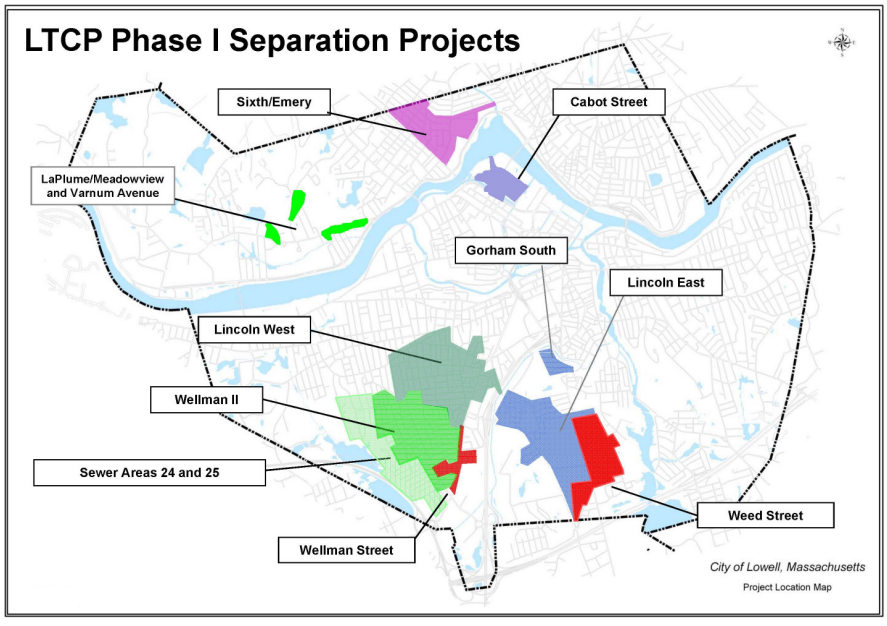
This CSO problem is not unique to the city of Lowell; it exists upstream in Nashua and Manchester, NH, and downstream in Lawrence and Haverhill, where the Merrimack River is also used as a public drinking water supply. All five communities are under administrative orders from the United States Environmental Protection Agency (USEPA) and Massachusetts Department of Environmental Protection (MADEP) to mitigate their CSO discharges. In 2001, representatives from the five "CSO communities" along the

Merrimack River formed the Merrimack CSO Coalition, a collective effort to lessen the impacts of CSOs and protect the quality of the Merrimack River.

Pursuant to its EPA administrative order, LRWWU prepared a Long Term Control Plan (LTCP) in February 2002 that evaluated a range of alternatives to reduce the city's CSO discharges. The USEPA, MADEP, and the city negotiated an approach to implement the LTCP in phases. Since 2001, LRWWU has spent more than $90 million to implement the Phase 1 of its LTCP, with program objectives of increasing the capacity of its wastewater collection and treatment systems and improving the ability to treat and store combined sewer flow. The city has funded these improvements locally, through sewer user fees, with assistance from the state revolving fund program (SRF) and some federal grant assistance obtained by the local congressional delegation.

The LTCP Phase 1 program has focused on upgrades to the Duck Island WWTF, the CSO diversion stations along the interceptor system, as well as the sewerage and drainage collection systems. WWTF upgrades have targeted the grit and screening facilities, the biological treatment system, the disinfection process, and the SCADA system to improve the reliability and increase the capacity of the wet weather treatment processes. CSO diversion station improvements have included improvements to flow control gates, instrumentation, screening equipment, HVAC upgrades, and safety improvements that have increased the capability to monitor and store wet weather flow in the interceptor system. However, the emphasis of the LTCP Phase 1 program has been on multiple large-scale sewer separation projects as shown in the figure below.

Figure 12.3: LTCP Phase I Separation Projects

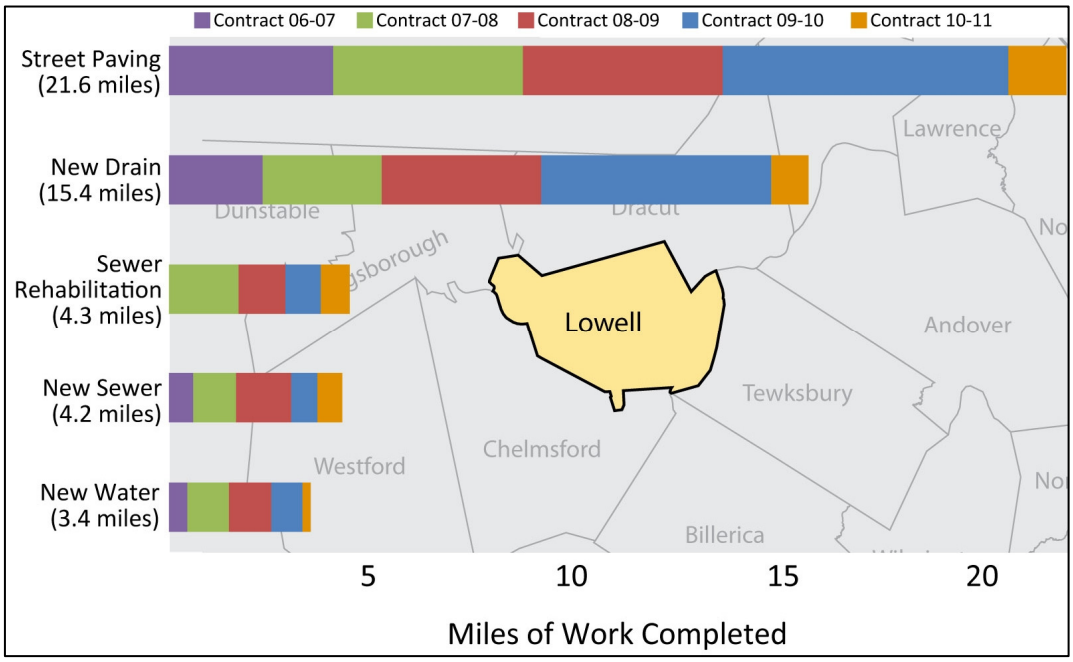


More than $50 million has been invested in new drain lines, sewer rehabilitation, utility replacement, and various street improvements. These improvements have been necessary to put sanitary wastewater and

stormwater flows into separate pipes and relieve the existing combined sewer interceptor system, which has reduced street flooding and sewer surcharging. The figure below summarizes the major infrastructure related to sewer separation that has been installed in the LTCP Phase 1 program.

While there is still much work to be done to eliminate CSOs in Lowell, significant progress has been made by upgrading existing facilities and building new infrastructure. Collection and treatment processes have been vastly improved and neighborhoods that once experienced recurrent sewer surcharging problems now have new utilities and newly paved streets. The city of Lowell is a more attractive place to work and live as a result of this LTCP program.

Figure 12.4: Lowell Regional Wastewater Utility
Phase I LTCP Sewer Separation Program
Summary of City Infrastructure Replacement



12.5 FLOOD PROTECTION SYSTEM

The city owns and operates a flood protection system in the Centralville neighborhood, approximately bounded by Beaver Brook, the Merrimack River, and Bridge Street. The local protection project (LPP) for flood control was constructed by the United States Army Corps of Engineers (USACE) in 1944, under the 1936 US Flood Control Act, in response to the historic 1936 and 1938 flooding events that devastated the City of Lowell and other communities along the Merrimack River.

In Lowell, the USACE constructed a system of earthen levees and concrete I-walls along both Beaver Brook and the Merrimack River to protect the low lying areas of Centralville. The earthen levee along the Merrimack River extends for about 2,700 feet, but is somewhat difficult to distinguish because it is located under the Veterans of Foreign Wars (VFW) Highway. There is also a 900-foot long I-wall near Bridge Street along the river. The 790-foot long concrete I-wall (near Beaver Street) and 810-foot long earthen levees along Beaver Brook are easily distinguishable and were utilized in the recent river floods of 2006 and 2007 to protect the area from high stream levels. After construction, the city was required to operate and maintain the LPP system.

In January 2007, USACE completed an inspection of the LPP and identified three deficiencies that had to be addressed by the city to maintain the "active" status of the flood protection system: 1) removal of brush and trees from the earthen levee; 2) fortification of the levee and I-wall system; and 3) replacement of the inoperable West Street Flood Pump Station (located in the median of VFW Highway). The city completed the brush and tree removal immediately, but the other two deficiencies require significant expenditures and time to be properly corrected. Coincidental to Lowell's LPP improvements, the Federal Emergency Management Agency (FEMA) was re-drawing its flood protection mapping for the area. Because the LPP was deemed "inactive" by the USACE, FEMA determined that the Centralville area behind the LPP is unprotected from flood hazards. Residents in this area are now required to obtain flood hazard insurance until the LPP can be recertified by USACE and FEMA.

The city is actively working on the improvements to address levee stability and the pumping station. An engineering assessment that evaluated the stability of the levee, including field testing and computer modeling, has been completed. This assessment recommended fortification of the earthen levee and I-wall along Beaver Brook. In spring 2011, these stability improvements were completed for the Beaver Brook portion of the LPP. Efforts are now underway to replace the West Street Flood Pumping Station. Once this deficiency is corrected, the LPP will be re-certified and property behind the system will be protected from future flooding events. To date, the most pressing structural problems have been addressed and the LPP system is stable.

12.6 PRIVATE UTILITIES

Electric power is provided by Mass Electric, a division of National Grid. Local telephone service is provided by Verizon. Customers can choose their long distance service from a variety of providers. Internet service is provided over Verizon's copper and fiber optic lines. Broadband service, which allows faster connections, utilizes these same lines. Natural Gas is provided by National Grid to 28,529 accounts. Every section of Lowell has gas mains, although a few blocks in some residential neighborhoods do not have gas mains in them.