South Hadley Development Standards Health Impact Assessment

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Pioneer Valley Planning Commission

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Disclaimer:

The conclusions of this report are those of the authors and do not necessarily represent the official position of or endorsement by the Centers for Disease Control and Prevention or the Massachusetts Department of Public Health.

South Hadley Development Standards Health Impact Assessment

Guide to This Document

This is a Health Impact Assessment (HIA) that investigates the relationship between health and:

- changes to subdivision regulations under consideration by the Planning Board of South Hadley, MA,
- design guidelines for the recently adopted South Hadley Falls Smart Growth District (40R) in South Hadley, MA.

Part I provides background on the regulatory changes that this HIA evaluates, reviews what an HIA is, discusses the HIA process, and provides background information about the people of South Hadley and their health. Part II examines the pathways to health that might be impacted by the regulations, explaining our methodology and describing the expected changes in health outcomes. Finally, Part III summarizes the conclusions from Part II and provides recommendations for the Town of South Hadley related to the regulatory changes under consideration. The Appendix provides additional supporting, including the full text of the Development Standards.

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Part I: Background

Background on the Project and Health Impact Assessment (HIA)

Project Overview

This Health Impact Assessment (HIA) evaluates potential health consequences of changes to South Hadley's subdivision regulations that are under consideration by the Town's Planning Board and recently adopted design guidelines for the South Hadley Falls Smart Growth District (40R). For shorthand, we refer to the combination of these regulatory changes as "Development Standards." The HIA was conducted by Pioneer Valley Planning Commission (PVPC), with support from Metropolitan Area Planning Council (MAPC) and funded by a mini-grant from the Massachusetts Association of Health Boards (MAHB) in partnership with Massachusetts Department of Public Health (MDPH). The HIA was active between March and July of 2016.

The HIA began while initial ideas were still being discussed for the changes to the Town's Subdivision Regulations. An early draft of changes to the regulations was developed late in the HIA period. The design guidelines had already been adopted, but decision makers expressed interest in revising them as needed to reflect the input of the HIA. As such, the project straddles the line between a Health Impact Assessment—which evaluates the health impact of a proposed plan, policy or project (a concrete proposal is on the table)—and a Health in All Policies project (HIAP), which seeks to inform decision makers while they are still in the decision making process (before a proposal has been formulated).

Goals

The goals of the HIA were to:

- inform key decisions related to changes to the Town's subdivision regulations;
- inform future revisions (if needed) to the design guidelines for the Town's South Hadley Falls Smart Growth District;
- elevate the standing of considerations of health in municipal decision making in South Hadley by
    - introducing HIA to Town staff and the Planning Board, and
    - increasing general knowledge of the links between health and the built environment among Town staff and the Planning Board;
- expand PVPC's capability to carry out Health Impact Assessments.

South Hadley Development Standards—Issues Under Consideration

Initial discussions with the project committee identified the following key issues under consideration:

Subdivision Regulations:

- What is the appropriate maximum length of a dead end road?
- What is the appropriate minimum width of a road?

- Should sidewalks be required on one or both sides of a street, or should the Planning Board create mechanisms by which sidewalks are waived in return for applicants paying for sidewalk construction elsewhere in Town or building pedestrian connections to open space or between subdivisions?
- What are appropriate tree requirements for subdivisions?

South Hadley Falls Design Guidelines

- Are there any changes to the South Hadley Falls Design Guidelines that should be considered based on potential health impacts?

Research Questions for this HIA

These issues under consideration formed the basis of the research questions for the HIA:

Health Profile of South Hadley

1. What are the current health conditions in South Hadley (broadly or in relation to conditions identified through research questions?
2. What is the current state of related health determinants in Hadley?
3. Who are the vulnerable populations in South Hadley? Who are those who could disproportionately benefit and/or lose out from proposed changes?

Health Impacts of Proposed Changes to Subdivision Regulations and Adopted South Hadley Falls Design Standards

1. What ways, if any, does street design—including block/road length, lane widths, pedestrian and bicycle facilities, and street network patterns—affect health determinants (or health outcomes)?
2. What ways, if any, does vegetation in public spaces—including street trees, landscaping and green space—affect health determinants (or health outcomes)?
3. What ways, if any, does the design of the public realm—including building massing, the physical appearance of buildings, lighting, and site design—affect health determinants (or health outcomes)?
4. What ways, if any, does new housing development affect health determinants (or health outcomes)?

How Do Planning Regulations Influence Health?

This HIA examines how changes in the Town's land planning regulations will impact the built environment and how those changes in turn will in turn impact the health of current and future residents of South Hadley. We define health broadly, using the definition adopted by the World Health Organization in 1946:

> ***Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.***

Factors that influence health are often called health determinants. It is generally accepted that there are five major categories of health determinants: genetics, behavior, social circumstances, environmental and physical influences, and medical care (McGovern, Miller, and Hughes-Cromwick 2014).

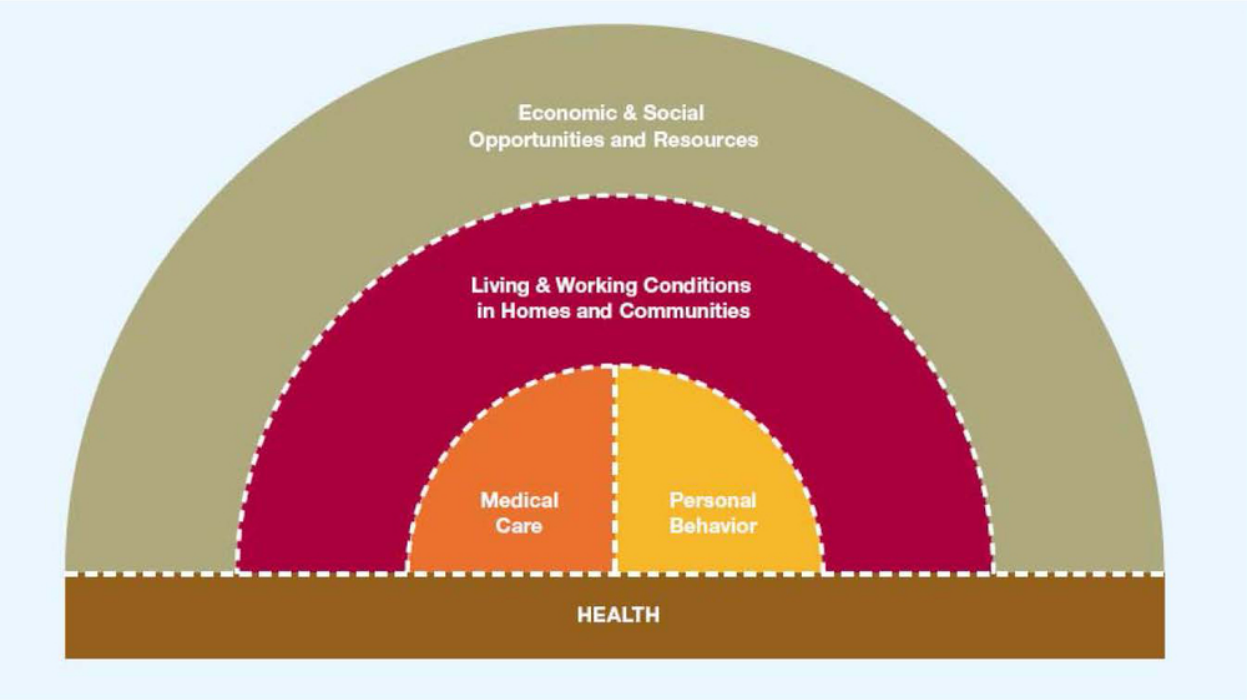


Figure 1: Determinants of health. This graphic highlights the four major categories of health determinants that are largely responsible for the stark health disparities between populations. People can influence these determinants, whereas genetics (not shown) are not modifiable.

The relative health impact of the categories of health determinants is an ongoing topic of study. Some examples of the results of studies are shown in Table 1.

Relative Contributions of Health Determinants to Health Outcomes					
Source	**Genetics**	**Behavior**	**Social Circumstances**	**Physical Environment**	**Medical Care**
RWJF County Health Rankings	--	30%	40%	10%	20%
DHHS, Public Health Service	20%	50%	--	20%	10%
J.M. McGinnis et al.	30%	40%	15%	5%	10%

Table 1: Relative Contributions of Health Determinants to Health Outcomes. Sources: row 1 ("Our Approach | County Health Rankings & Roadmaps" 2015); row 2 (Center for Prevention Services (U.S.) and Health Analysis and Planning for Prevention 1980); row 3 (McGinnis, Williams-Russo, and Knickman 2002)

Of the examples shown in Table 1, the RWJF County Health Rankings model is the most recent and the most useful from the perspective of this HIA. The model is validated by a robust nation-wide set of health indicators and is tied to a framework for planning and implementing evidence-based policies and programs to support health. For more information, see: http://www.countyhealthrankings.org/. In the County Health Rankings model, the physical environment (the built and natural environment) is responsible for 10% of population health, while behavior accounts for 30% and social circumstances account for 40% of population health. These three realms of health determinants are largely responsible for stark disparities in health among various populations. The good news is that they are modifiable by people. While the physical environment has less direct influence on health than the other determinants, it plays an important indirect role in shaping the other determinants—particularly behavior and social circumstances. Our neighborhoods and communities can make the healthy choice the easy choice. They can support our social connections. They often moderate the long-term educational and economic opportunities available to us.

> ***Long before we need medical care, our foundation for health begins in our homes, schools and neighborhoods.*** ***("Social Determinants of Health" 2016)***.

It is also important to note that the influence of each of these realms of health determinants varies widely by the kind of health outcome being evaluated. So, for example, injury due to violent crime is largely shaped by behavior and social circumstances, while motor vehicle injury may be more influenced by the physical environment.

While planning regulations clearly influence the built environment, the connection is complicated by a variety of factors including local and regional economic trends, local cultural preferences (e.g., preferences for one style of development over another), natural environment characteristics (e.g., wetlands, topography), other local, state and federal regulations, and the way the regulations are implemented by the planning board. Changes to planning regulations can have an immediate impact on specific projects, influencing the development of a site or neighborhood. But it generally takes decades for the regulations to have a noticeable impact on the overall character of the built environment of a community. This is especially true in a community, like South Hadley, with relatively slow growth. South Hadley adds about 22 housing units to its existing stock of 7,435 housing units per year. That is about a .3% annual change, compared to .45% for the state as a whole.[1]

The causal pathways between built environment changes and population health are equally complex. Impacts vary widely depending on the kind of built environment intervention (housing, transportation, park, etc.), the dimensions of health being examined (acute conditions, disease, overall life span, quality of life), and the population segment of concern (e.g. young people vs. older people, poorer people versus richer people). Multiple causal pathways influence each other and there are reinforcing loops between the built environment, human behavior and individual health.

Despite these complications, several previous HIAs have studied changes to land use regulations and concluded that they do have significant health impacts (Lowitt, Angus, and Cho 2014; "Zoning for a Healthy Baltimore: A Health Impact Assessment to of the Transform Baltimore Comprehensive Zoning Code Rewrite | Active Living Research" 2016). In addition, a recent HIA examined several issues under consideration by this HIA—whether to require sidewalks on one or both sides of a street and the relative merits of grid-like street networks versus cul-de-sac based networks. It concluded that there were health impacts from these regulatory decisions (Lesnar 2016).

What is a Health Impact Assessment?

A Health Impact Assessment (HIA) aims to describe the potential health effects of a plan, policy, program, or project (National Research Council 2011). HIAs use a variety of procedures, methods and tools, including quantitative and qualitative analysis to judge the effects of the plan, policy, program, or project. HIAs typically inform decisions made in non-health sectors—they strive to judge the effects of the study topic on population health, with a focus on health equity and minimizing disparities in health within populations. HIAs typically take inform decisions; they recommend actions to maximize the positive health impacts and minimize or mitigate the negative health impacts of the plan, policy, program or project under consideration. For more information on Health Impact Assessments, see: http://www.humanimpact.org/new-to-hia/

[1] Data sources: Total housing units: 2010-2014 ACS; Building Permits: HUD SOCDS database

HIA Process

The standard steps of an HIA include screening, scoping, assessment, recommendations, reporting, and monitoring.

Screening

Screening determines if the HIA will add value to the decision-making process and whether or not there is a potential for significant health impacts of the proposed policy/plan/project. The screening process for this HIA took place in December-January 2016. Cognizant of a mini-grant opportunity from MAHB, PVPC issued a call to communities within its region for appropriate topics for an HIA. Potential topics were screened for:

- whether there was a decision under consideration that was likely to impact health
- whether the timing of the decisions aligned with the mini-grant period
- whether key stakeholders were interested and able to participate in the HIA
- whether there appeared to be sufficient evidence about the health impact of the decision to enable meaningful input
- whether the key stakeholders included representatives from multiple municipal departments and/or outside groups, especially the Health Department
- whether PVPC had current or recent projects underway in the community that would enable us to leverage current planning work in the HIA

Richard Harris, Town Planner, proposed a HIA of the Town's Development Standards. The project met all of the criteria above. PVPC and the Town of South Hadley jointly applied for a grant from MAHB and the grant was awarded.

Scoping

The objective of scoping is to create a plan and timeline for conducting an HIA that identifies priority issues, research questions, methods, and participant roles. Scoping was conducted between March and April, 2016. The scope was developed through initial research by PVPC, a meeting with the project committee, and subsequent refinement by PVPC. At the committee meeting, the project committee shared the key decisions that they were wrestling with, PVPC sketched out how those relate to health pathways, and the project committee prioritized the key pathways to be studied. Research questions and methods were further defined in a meeting with the Advisory Committee and subsequent meetings between PVPC and MAPC.

This scope of this HIA was limited due to its short timeframe and limited resources available. This narrowed the breadth of issues we could consider, our ability to collect original data, and the level of analysis we could accomplish. We focused on a small set of health-related pathways—concentrating on those that were most relevant to the pending decisions of key stakeholders. In other words, we focused on informing the discrete decisions on which the HIA was most likely to have impact.

Despite its limited scope, this HIA is based on a comprehensive HIA framework developed by the Metropolitan Area Planning Council (MAPC) for their HIA, *Transit Oriented Development and Health: A*

Health Impact Assessment to Inform the Healthy Neighborhood Equity Fund (hereafter HNEF). The HNEF framework includes a set of pathways that apply to most neighborhood development and transportation plans, policies and projects. The combination of the comprehensive HNEF framework and a limited-scope HIA provides a unique format to quickly provide relevant information to decision makers in a timely manner.

Assessment and Recommendations

The assessment step provides a profile of existing conditions and evaluates the potential health impacts of the Development Standards. To conduct the assessment with the time and resources available for this HIA, we focused on desktop analysis using readily available resources. Assessment (Part II) is followed by evidence-based and theory-based recommendations (Part III) to mitigate negative and maximize positive health impacts of the project.

Reporting

Reporting communicates the findings and recommendations reached through the HIA process to stakeholders and decision-makers. The report summarizes the key health impact issues, which consider the nature and magnitude of the potential health impacts as well as their distribution in the target population. This is then followed by recommendations to maximize positive heath determinants and outcomes. For the present HIA, the audience for the report includes decision makers in the Town of South Hadley—especially the Planning Board, South Hadley residents, PVPC staff, and other Town staff, board members, and elected officials in the PVPC region.

Monitoring

Once HIA findings are disseminated in a report, the monitoring phase begins. The objective of monitoring is to review the effectiveness of the HIA, if decisions were implemented as planned, and track and evaluate the actual health outcomes as a result of the project. Monitoring will include ongoing discussions within PVPC, integration of the HIA findings into future PVPC work in South Hadley, and tracking the implementation of HIA recommendations in the Town's Development Standards.

Stakeholder Engagement

An advisory committee was established early in the project and was a prime means of enabling stakeholder involvement in the project. The advisory committee included the following members:

- Richard Harris, Town Planner
- Sharon Hart, Health Department Director
- Jim Reidy, DPW Superintendent

That the committee was made up solely of Town staff limited the diversity of viewpoints reflected in the HIA. On the other hand, the small committee format provided a neutral meeting ground in which key Town staff could speak openly and take the time to debate key decisions.

The advisory committee met three times during the project period and generated valuable feedback and direction.

We did not gather additional new public input for this project. PVPC has conducted extensive public input for recent, relevant projects and we leveraged that public input for the HIA: especially public input from an ongoing "Comprehensive Bicycle and Pedestrian Plan" for South Hadley being developed by Pioneer Valley Planning Commission (PVPC).

Health and Population Profile for South Hadley

The information below presents a baseline picture of health determinants and indicators in South Hadley. It introduces the basic demographic and health characteristics of the people of South Hadley.

The information for South Hadley is presented in comparison to Massachusetts and three communities in the Pioneer Valley: Agawam, Belchertown, and Easthampton. The comparison communities help us see what is unique about South Hadley, what to consider when assessing health impacts. The comparison communities were selected based on their relative similarity to South Hadley in terms of land use pattern and demographic characteristics. Each of these communities has experienced a significant amount of suburban-style subdivision development.. Easthampton and South Hadley are similar in that they both have a recognizable urban/industrial centers and suburban/rural lands. Both also have adopted 40R Smart Growth zoning districts. South Hadley and Belchertown and have low-medium percentages of affordable housing (6.5% and 6.4 % respectively), while Easthampton and Agawam have a low percentage of affordable housing (1.9% and 3.9%).

Demographics of South Hadley

The basic demographic profile of South Hadley and comparison communities is presented in the table below. Individual characteristics, including gender, age, and race, are well known to impact health. In addition, socio-economic factors like income and education play a powerful role in shaping individual and population health ("Our Approach | County Health Rankings & Roadmaps" 2015). Higher income, greater social status, and high education level are linked to better health ("WHO | The Determinants of Health" 2016).

Population					
	South Hadley	**Agawam**	**Easthamp-ton**	**Belcher-town**	**MA**
Total Population in 2014	17,745	28,626	16,066	14,774	6,657,291
Sex (males per 100 females)	64.1	91	94.8	98.3	93.8
Population by Age (%)					
0 - 4	3.9	4.7	4.8	5.5	5.5
5 - 9	4.5	5.2	4.9	7.3	5.7
10 - 14	5.1	6.3	5	7.5	6.0
15 - 19	9.9	6.3	5.3	7	7.0
20 - 24	11.1	5.1	5.2	4.9	7.3
25 - 34	9.5	10.3	13.7	9.5	13.4
35 - 44	11.4	13.1	13.8	15	12.9
45 - 54	14.6	16.7	16.9	18.7	15.1
55 - 59	6.6	7.6	8.5	8.2	6.9
60 - 64	6.1	6.7	7.4	6.2	5.9
65 - 74	7.8	8.2	6.9	5.9	7.6
75 & over	9.4	9.9	7.5	4.4	6.8
Asian	2.70%	2.30%	3.50%	1.80%	5.80%

Population					
	South Hadley	Agawam	Easthamp-ton	Belcher-town	MA
Black	3.80%	1.20%	0.80%	1.10%	7.00%
Other	2.40%	3.00%	3.80%	2.80%	7.20%
White	91.10%	93.40%	91.90%	94.20%	80.00%
Latino (any race)	4.60%	5.60%	4.50%	2.60%	10.20%

All data from the American Community Survey, 5-year estimates, 2010-2014

Table 2: Basic Population Charecteristics

Unlike the comparison communities, South Hadley has significantly more females than males with 64.1 males for every 100 females. This likely reflects the presence of Mount Holyoke College—an all female school, whose 2,255 students represent about 12% of South Hadley's population. The College also likely explains why South Hadley has about twice as many 20-24 year olds than the comparison communities. And it is likely the source of the community's relatively high percentage of African Americans compared to Agawam, Easthampton or Belchertown (but not the state). An analysis of race by age reveals that a 16% of African Americans (16%) and 41% of Asians in South Hadley are females between the ages of 18 and 24. Interestingly, there are also spikes of African Americans aged 35-44, and African American males between the ages of 10-14, but not females. Overall the female population of South Hadley is more racially diverse than the male population, and the young adult and middle-aged population is more diverse than the older adult population.

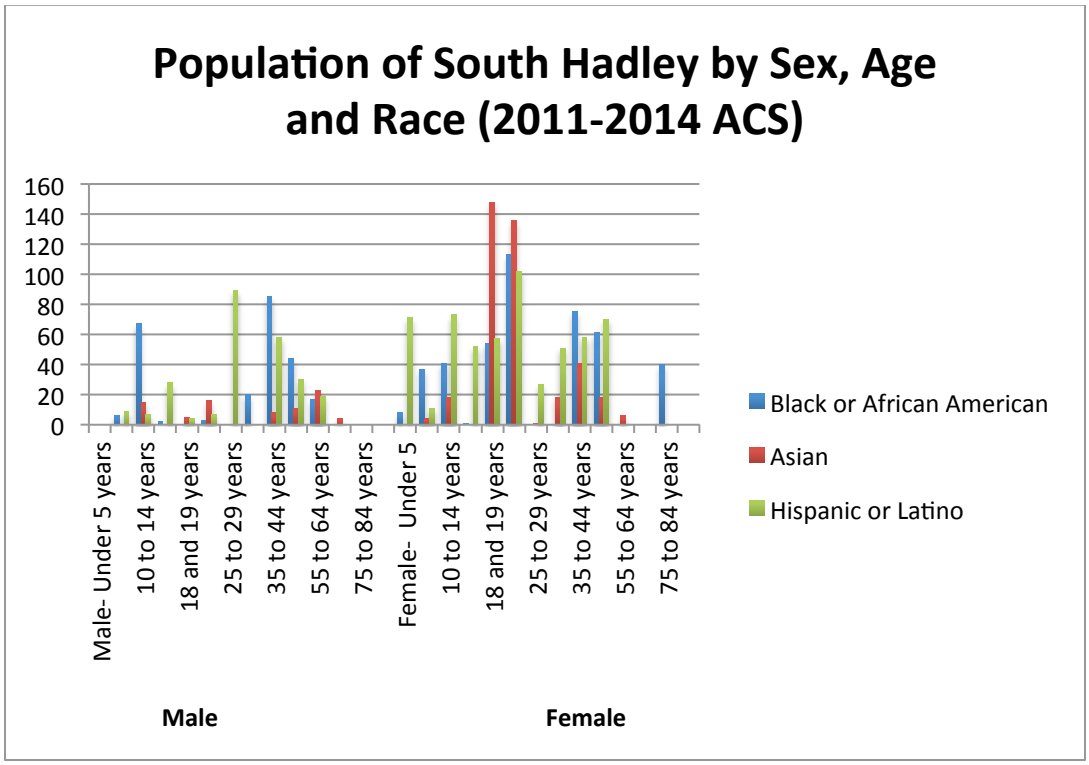


Figure 2: The racial diversity of the population of South Hadley varies widely by age and gender. Whites are shown on a separate graph.

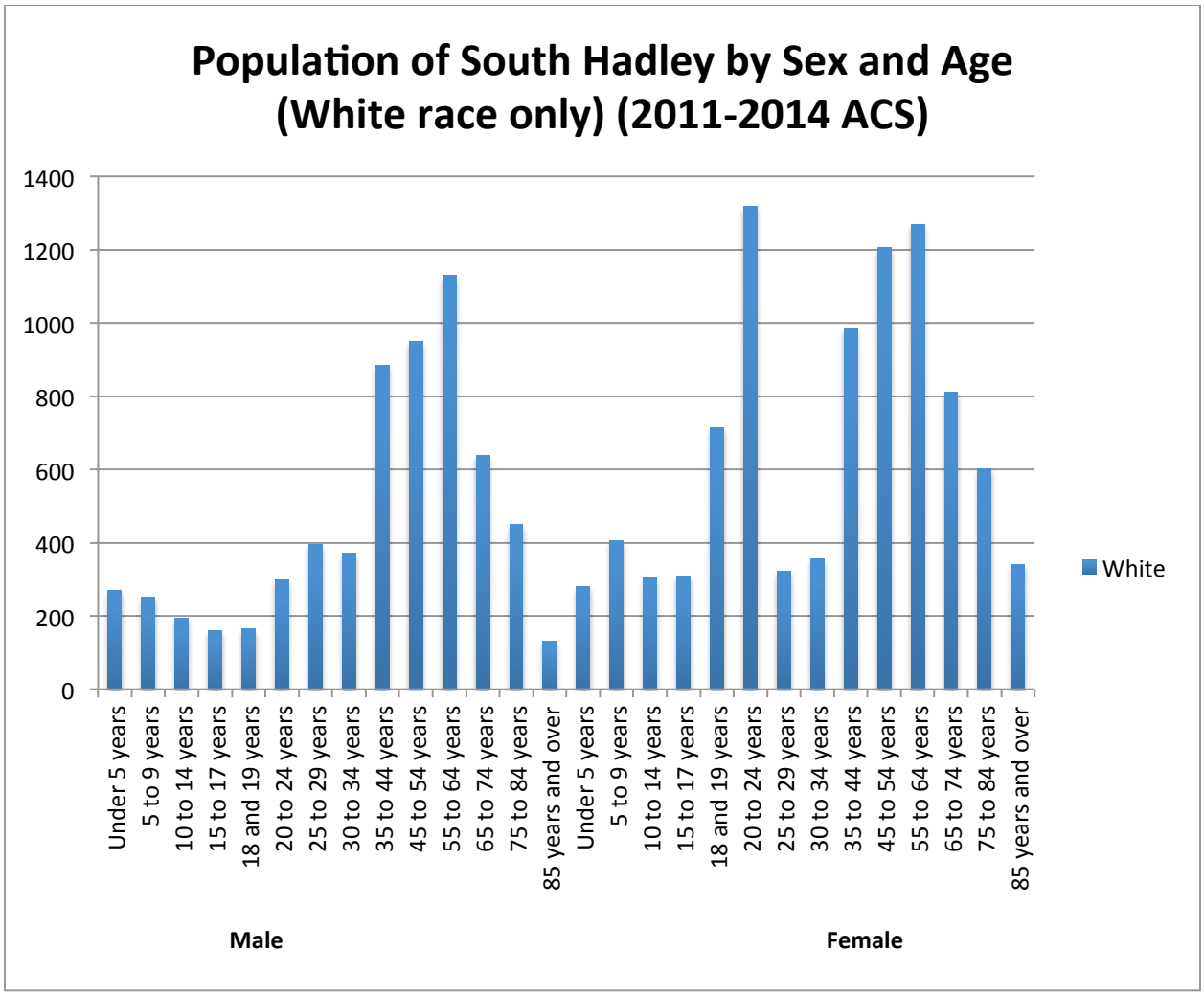


Figure 3: White population broken down by age and gender. Note that 20-24 year old females are the largest age-gender cohort in the town. In addition, there are more females in each age group except 25-29 year olds and 30-34 year olds.

South Hadley has a smaller percentage of young adults than the comparison communities: 20.9% of the population is 25-34, compared to 23.4% (Agawam), 27.5% (Easthampton), 24.5% (Belchertown) and 26.5% (Massachusetts). Likewise the middle-aged population is smaller than the comparison communities but on par with the state as a whole. 45-64 year olds make up 27.3% of South Hadley compared to 31%, 32.8%, 33.1%, and 27.9% for Agawam, Easthampton, Belchertown and Massachusetts respectively. Agawam's population of older adults (aged 65+) is slightly higher than South Hadley's (18.1% vs. 17.2%), but South Hadley's percent older adult is higher than Easthampton (14.4%), Belchertown (10.3%), or the state as a whole (14.4%).

Economic Indicators

Employment and Income					
	South Hadley	Agawam	Easthampton	Belchertown	MA
Employment status**					
Average weekly wage	$801	$839	$763	$684	$1,233
% unemployed	5.40%	5.80%	5.00%	4.80%	5.80%
Labor force	9569	15,816	9,433	8,276	3,557,500
Median HH Income	$62,803	$63,561	$56,927	$74,221	$67,846
% below Poverty	9.20%	9.30%	8.30%	7.80%	11.60%

All data given for 2014,
unless stated otherwise.
**Employment data from Massachusetts Executive Office and Labor and Workforce Development
All other data from the American Community Survey, 5-year estimates, 2010-2014

Table 3: Economic and Income indicators

Income and poverty are powerful predictors of health status. South Hadley's unemployment rate is relatively similar to the state and the comparative communities. The town's median household income is lower than the state's. It falls in the middle of the range of the comparison communities. Fewer residents of South Hadley are below the poverty line than residents of the state as whole, but more of them are in poverty than residents of Belchertown or Easthampton. The Average Weekly Wage shown in Table 3 is the wage for *jobs* located in South Hadley. It indicates that, on average, jobs in South Hadley pay slightly more than those in Easthampton and Belchertown, but less than Agawam or the State. In other words, South Hadley has some relatively attractive employment opportunities.

While the data above shows us the relative income of various communities, the Gini Index Income inequality, itself appears to impact all-cause mortality, with a .05 increase in the Gini Index (a common measure of inequality) being associated with an 8% increase in risk of premature mortality (N. Kondo et al. 2009). Gini Index results are shown in Table 4 below. We've included Holyoke (a relatively unequal community) and the two Pioneer Valley counties for comparison.

South Hadley is relatively equal compared to most of the other geographies. However, income inequality has increased faster in South Hadley than in any of the comparison geographies between 2006 and 2014 (both as a percent growth and raw number). Based on the rising inequality in South Hadley, we would expect to see a 7% increase in risk of premature mortality in the community over the same time period.

Gini Index (a measure of income inequality, where 0 is fully equal and 1 is fully unequal)		
	2010-2014	**2006-2010**
South Hadley	0.4084	0.364
Agawam	0.3991	0.397
Belchertown	0.4104	0.388
Easthampton	0.4100	0.395
Massachusetts	0.4801	0.469
Holyoke	0.5029	0.480
Hampden County, Massachusetts	0.4668	0.459
Hampshire County, Massachusetts	0.4529	0.435

Source: American Community Survey 5-year estimates

Table 4: Gini Index for South Hadley and comparison geographies

Digging further into inequality in South Hadley, it appears that the greatest disparity lies between Hispanics and other racial groups. While the unemployment rate for all people over 16 is 6.9%, the rate for Hispanic or Latino people is 39.8% (nearly six times the general population). This number has a very large margin of error given the small sample size for Hispanics in South Hadley. However, even with the margin of error the difference is numerically significant (the difference exceeds the margin of error). Furthermore, this race-based disparity is mirrored in other communities in the region. Also, of note, the unemployment rate for males is nearly three-times that of females. Bucking regional trends, the unemployment rate for African Americans is lower than the white population.

Unemployment in South Hadley			
	Population Size	**Unemployment rate**	**Margin of Error**
Population 16 years and over	15406	6.9%	+/-1.8
RACE AND HISPANIC OR LATINO ORIGIN			
One race	15,259	7.0%	+/-1.8
White	14,156	7.1%	+/-2.0
Black or African American	515	4.2%	+/-4.6
American Indian and Alaska	16	0.0%	+/-76.9

Unemployment in South Hadley			
	Population Size	**Unemployment rate**	**Margin of Error**
Native			
Asian	435	0.0%	+/-12.5
Native Hawaiian and Other Pacific Islander	23	100.0%	+/-64.2
Some other race	114	9.6%	+/-17.0
Two or more races	147	0.0%	+/-27.7
Hispanic or Latino origin (of any race)	651	39.8%	+/-20.8
White alone, not Hispanic or Latino	13,655	5.6%	+/-1.5
Population 20 to 64 years	10,785	5.7%	+/-1.6
SEX			
Male	4,475	9.2%	+/-3.1
Female	6,310	3.1%	+/-1.4
With own children under 6 years	651	5.1%	+/-5.8

Table 5: Unemployment Rate in South Hadley by race and age

Population Growth

The Donahue Institute at UMass makes population projections for every city and town in Massachusetts. They project that South Hadley's population will grow by about 1,000 people or 3.5% by 2035. Like many communities in the region, the population growth will be concentrated among older adults, while the number of middle-aged adults will drop. In other words, South Hadley is not expected to attract a large proportion of the millennial generation who will be age 35-55 in 2035.

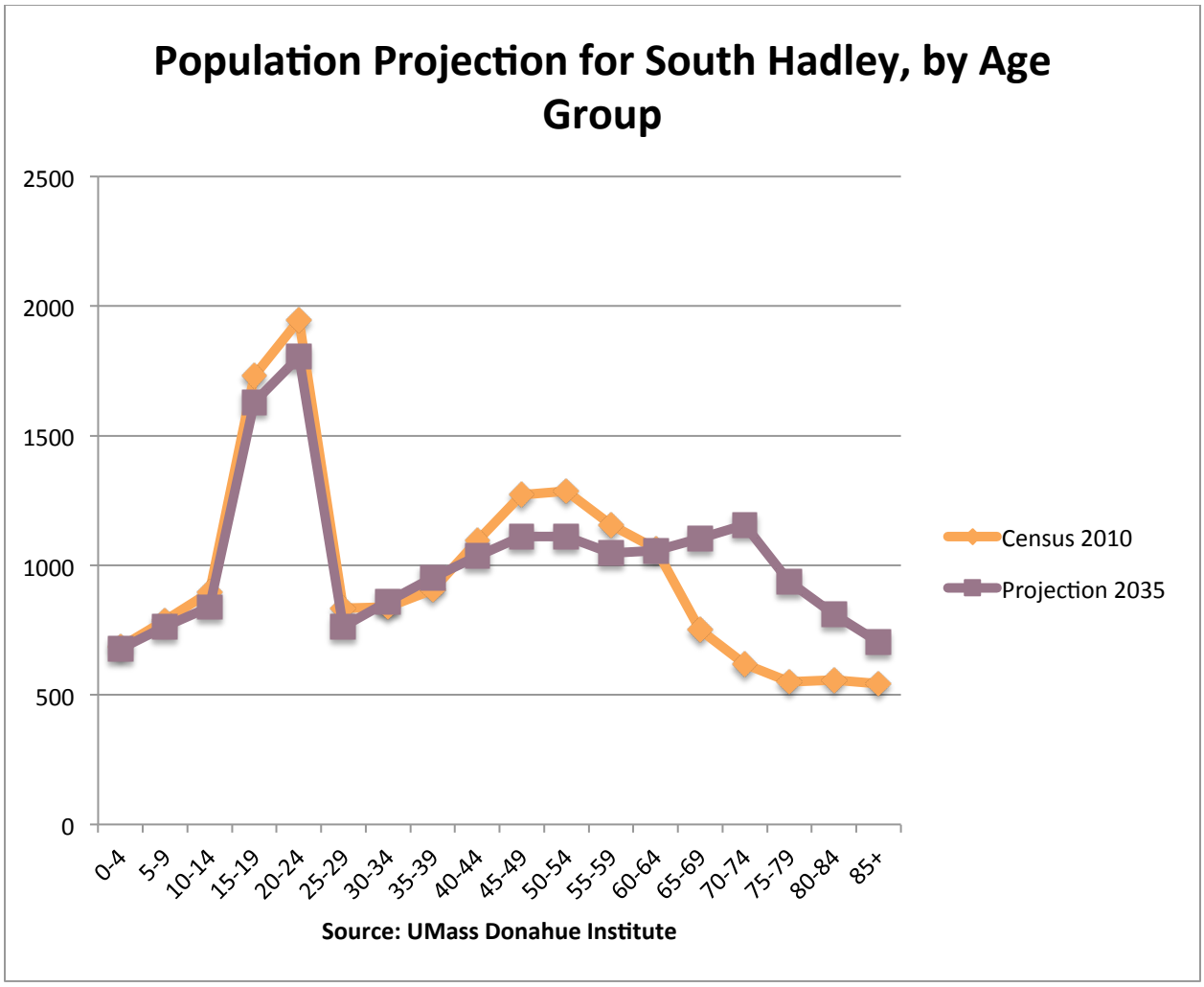


Figure 4: Population Projections for South Hadley

Implications of Demographic Data

- South Hadley has an unusual gender distribution with more females than males for most age groups. This is true, even after accounting for the large college age female population.
- Racial diversity in South Hadley for African Americans and Asians is concentrated in the college-age female population.
- Income inequality is rising in South Hadley and may have health impacts
- Hispanics/Latinos in the town are at a significant economic disadvantage. They are likely to be suffering health disparities between Hispanics and other racial groups
- Males are also at an economic disadvantage in the town.
- South Hadley's population is projected to grown by about 3.5% over the next 20 years. The population of older adults will grow, while the middle-aged adult population will shrink—despite the large millennial generation coming into middle age.

Health Indicators for South Hadley

We collected two types of health indicators for South Hadley and comparison communities. Data the Behavioral Risk Factor Surveillance System (BRFSS) tells us how residents of South Hadley report on their own health for various indicators. As such this data includes and element of how people perceive their own health. Hospitalization Data reports on residents of South Hadley who have visited hospitals in Massachusetts. Health data was provided by Massachusetts Department of Public Health.

Self Reported Health Indicators

Self-Reported Health Indicators from Behavioral Risk Factor Surveillance System (BRFSS)						
Town Name	**Question**	**Years / Type**	**%**	**LCL**	**UCL**	**Quintile**
Agawam	Stroke	BRFSS - SAEs (2012-2014)	**2.51**	**1.81**	**3.5**	5
Belchertown	Stroke	BRFSS - SAEs (2012-2014)	**1.88**	**1.33**	**2.67**	1
Easthampton	Stroke	BRFSS - SAEs (2012-2014)	**2.21**	**1.57**	**3.12**	3
South Hadley	Stroke	BRFSS - SAEs (2012-2014)	**2.11**	**1.5**	**2.99**	3
Agawam	Current Smoker	BRFSS - SAEs (2012-2014)	*18.67*	*13.56*	*25.11*	5
Belchertown	Current Smoker	BRFSS - SAEs (2012-2014)	*13.12*	*8.32*	*20.06*	2
Easthampton	Current Smoker	BRFSS - SAEs (2012-2014)	*15.78*	*10.09*	*23.78*	4
South Hadley	Current Smoker	BRFSS - SAEs (2012-2014)	*15.11*	*9.72*	*22.67*	4
Agawam	Prediabetes	BRFSS - SAEs (2012-2014)	**7.02**	**5.39**	**9.12**	5
Belchertown	Prediabetes	BRFSS - SAEs (2012-2014)	**6.2**	**4.69**	**8.15**	2
Easthampton	Prediabetes	BRFSS - SAEs (2012-2014)	**6.36**	**4.81**	**8.37**	2
South Hadley	Prediabetes	BRFSS - SAEs (2012-2014)	**6.08**	**4.59**	**8.02**	1
Agawam	Overweight or Obese	BRFSS - SAEs (2012-2014)	*62.95*	*56.22*	*69.24*	5
Belchertown	Overweight or Obese	BRFSS - SAEs (2012-2014)	*61.34*	*53.39*	*68.75*	4
Easthampton	Overweight or Obese	BRFSS - SAEs (2012-2014)	*55.88*	*47.28*	*64.15*	2
South Hadley	Overweight or Obese	BRFSS - SAEs (2012-2014)	*51.33*	*43.22*	*59.37*	1
Agawam	Obese	BRFSS - SAEs (2012-2014)	*22.14*	*17.06*	*28.19*	3
Belchertown	Obese	BRFSS - SAEs (2012-2014)	*22.31*	*16.49*	*29.44*	3
Easthampton	Obese	BRFSS - SAEs (2012-2014)	*18.69*	*13.24*	*25.69*	1
South Hadley	Obese	BRFSS - SAEs (2012-2014)	*17.96*	*12.8*	*24.57*	1
Agawam	15+ Days of Poor Mental Health	BRFSS - SAEs (2012-2014)	*11.12*	*8.07*	*15.13*	4
Belchertown	15+ Days of Poor Mental Health	BRFSS - SAEs (2012-2014)	*10.41*	*7.22*	*14.76*	4
Easthampton	15+ Days of Poor Mental Health	BRFSS - SAEs (2012-2014)	*9.83*	*6.71*	*14.17*	3

Self-Reported Health Indicators from Behavioral Risk Factor Surveillance System (BRFSS)						
Town Name	**Question**	**Years / Type**	**%**	**LCL**	**UCL**	**Quintile**
South Hadley	15+ Days of Poor Mental Health	BRFSS - SAEs (2012-2014)	*11.46*	*7.95*	*16.22*	5
Agawam	Chronic Drinking (60+ & 30+ for Men and Women respectively in the past 30 days)	BRFSS - SAEs (2012-2014)	*8.29*	*5.98*	*11.4*	4
Belchertown	Chronic Drinking (60+ & 30+ for Men and Women respectively in the past 30 days)	BRFSS - SAEs (2012-2014)	*8.06*	*5.68*	*11.32*	3
Easthampton	Chronic Drinking (60+ & 30+ for Men and Women respectively in the past 30 days)	BRFSS - SAEs (2012-2014)	*7.56*	*5.27*	*10.72*	1
South Hadley	Chronic Drinking (60+ & 30+ for Men and Women respectively in the past 30 days)	BRFSS - SAEs (2012-2014)	*8.67*	*6.1*	*12.19*	5
Agawam	Flu Shot Last Year	BRFSS - SAEs (2012-2014)	*41.4*	*36.01*	*47*	1
Belchertown	Flu Shot Last Year	BRFSS - SAEs (2012-2014)	*42.32*	*36.32*	*48.56*	1
Easthampton	Flu Shot Last Year	BRFSS - SAEs (2012-2014)	*48.9*	*42.5*	*55.36*	5
South Hadley	Flu Shot Last Year	BRFSS - SAEs (2012-2014)	*39.6*	*33.72*	*45.81*	1
Agawam	Diabetes	BRFSS - SAEs (2012-2014)	*7.66*	*5.22*	*11.05*	3
Belchertown	Diabetes	BRFSS - SAEs (2012-2014)	*7.09*	*4.63*	*10.65*	2
Easthampton	Diabetes	BRFSS - SAEs (2012-2014)	*5.61*	*3.51*	*8.76*	1
South Hadley	Diabetes	BRFSS - SAEs (2012-2014)	*5.71*	*3.64*	*8.79*	1
Agawam	Any activity (exercise) in the past 30 days	BRFSS - SAEs (2012-2014)	--	--	--	4
Belchertown	Any activity (exercise) in the past 30 days	BRFSS - SAEs (2012-2014)	--	--	--	2
Easthampton	Any activity (exercise) in the past 30 days	BRFSS - SAEs (2012-2014)	--	--	--	4
South Hadley	Any activity (exercise) in the	BRFSS - SAEs (2012-2014)	--	--	--	3

Self-Reported Health Indicators from Behavioral Risk Factor Surveillance System (BRFSS)						
Town Name	**Question**	**Years / Type**	**%**	**LCL**	**UCL**	**Quintile**
	past 30 days					
Data Source: Massachusetts Department of Public Health						
Notes:						
Data from 2011 and subsequent years are not comparable to 2010 and prior years due to methodology changes in 2011						
SAE=Small Area Estimate. Results have been interpolated from larger geography based on the community characteristics.						
In order to provide data for more Massachusetts communities, we include town level estimates that may be based on relatively few respondents or have standard errors that are larger than average. The confidence interval for results show in italics above are wider than the normal limits set by Massachusetts Department of Public Health (MDPH). Therefore, those estimates should be interpreted with caution. Results show in in bold have confidence intervals that are within the normal limits set by MDPH.						
QUINTILES: Caution must be exercised while interpreting quintiles. A number of "1" means the community has one of the lowest percentages of people reporting a health condition, risk factor, or protective factors. A 1 can be either positive for health or negative depending on the indicator. We have color-coded the quintile results for South Hadley above to show whether the health indicator is positive for health (green), negative (red), or middle of the road (no color).						

Table 6: Self-Reported Health Indicators from Behavioral Risk Factor Surveillance System (BRFSS)

Overall, it appears that self-reported health in Agawam is generally worse than in South Hadley. Self-reported health in Belchertown is generally better. Easthampton and South Hadley are very similar with Easthampton being slightly worse overall. These results are based on small area estimates and need to be interpreted with caution. To some degree, they simply reflect the population characteristics described in the previous section.

The quintile data compares the communities to all communities statewide. It is the easiest way to get a picture of where South Hadley falls among communities statewide.

South Hadley is in the first quintile (lowest rates) for the following indicators: pre-diabetes, diabetes, overweight and obesity, obesity. All of these conditions are sensitive to diet and exercise. They are key indicators for health behaviors that relate to the built environment. Despite the town's first quintile ranking, results for overweight and obesity (51%) and obesity (17%) leave much room for improvement.

On the other hand, South Hadley ranks in the last quintile (highest or lowest rates depending on indicator) for: current smoker, getting a flu shot last year, 15+ days of poor mental health, and chronic drinking. Smoking is well known to be associated with a wide-range of chronic health conditions including lung cancer. Getting a flu shot is a common indicator of the quality of preventative care.

Self-reported poor mental health and chronic drinking both indicate that mental health in South Hadley is in suffering. This mirrors regional indicators.

Of all of comparison communities, Belchertown is the only one where self-reported exercise in the past 30 days is better than the state average.

Casemix Data

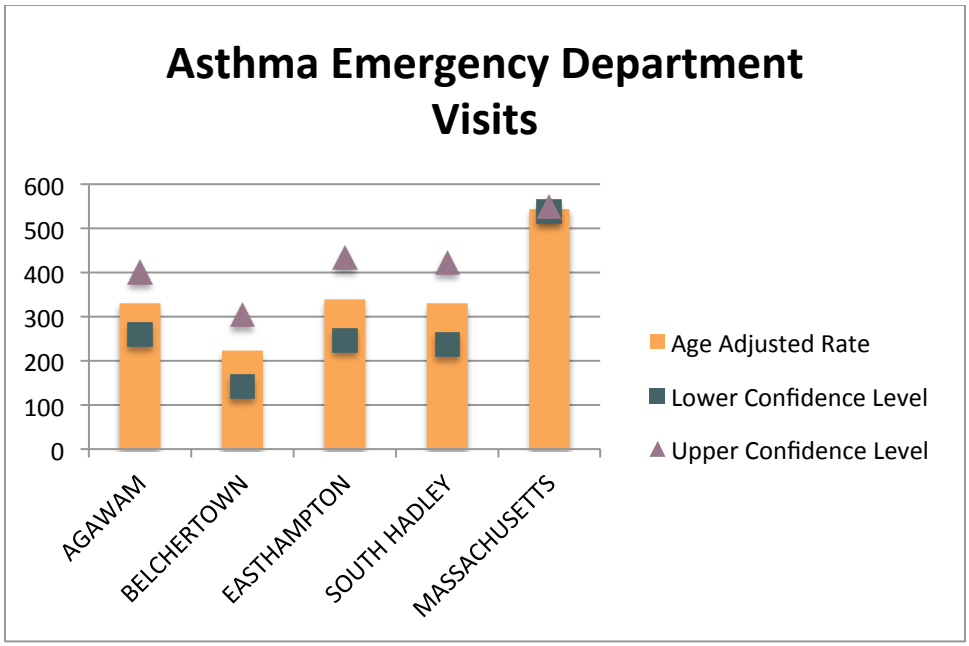
The data below presents information emergency department visits and hospitalizations for residents of South Hadley, the comparison communities and the state. Indicators were chosen to represent a variety of conditions that could be influenced by planning decisions—usually by influencing behaviors, or by long-term influence on socioeconomic factors.

Town	Age Adjusted Rate (per 100,000)	Lower Confidence Level	Upper Confidence Level
Asthma ED Visit			
AGAWAM	331	260	401
BELCHERTOWN	223	142	304
EASTHAMPTON	340	246	434
SOUTH HADLEY	330	236	423
MASSACHUSETTS	***543***	*537*	*549*
COPD Hospitalization			
AGAWAM	231	183	280
BELCHERTOWN	263	175	352
EASTHAMPTON	385	297	472
SOUTH HADLEY	225	160	291
MASSACHUSETTS	*313*	*309*	*317*
Cardiovascular Disease Hospitalization			
AGAWAM	1359	1249	1468
BELCHERTOWN	1071	896	1246
EASTHAMPTON	1101	956	1246
SOUTH HADLEY	1373	1225	1520
MASSACHUSETTS	*1233*	*1226*	*1241*
Stroke/ CVA Hospitalization			
AGAWAM	216	173	259
BELCHERTOWN	159	89	228
EASTHAMPTON	220	155	284
SOUTH HADLEY	299	231	368
MASSACHUSETTS	*219*	*216*	*223*
Diabetes Hospitalization			
AGAWAM	196	150	243
BELCHERTOWN	94	41	147
EASTHAMPTON	171	111	232
SOUTH HADLEY	92	51	133

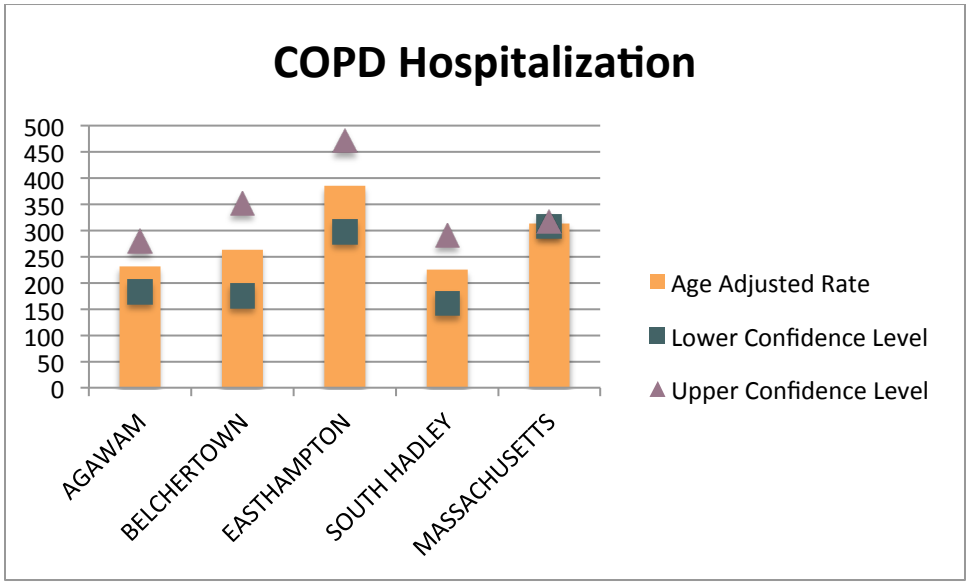
Town	Age Adjusted Rate (per 100,000)	Lower Confidence Level	Upper Confidence Level
MASSACHUSETTS	*137*	*134*	*140*
Cancer Hospitalization			
AGAWAM	317	260	374
BELCHERTOWN	313	224	401
EASTHAMPTON	314	239	389
SOUTH HADLEY	366	285	446
MASSACHUSETTS	*337*	*333*	*342*
Mental Health ED Visit			
AGAWAM	1978	1809	2146
BELCHERTOWN	1456	1258	1655
EASTHAMPTON	1760	1553	1968
SOUTH HADLEY	1660	1469	1851
MASSACHUSETTS	2398	2386	2409
Substance Abuse Hospitalization			
AGAWAM	704	603	805
BELCHERTOWN	501	380	623
EASTHAMPTON	491	382	600
SOUTH HADLEY	448	342	554
MASSACHUSETTS	*336*	*331*	*340*
Substance Abuse ED Visits			
AGAWAM	529	441	616
BELCHERTOWN	505	395	615
EASTHAMPTON	605	488	721
SOUTH HADLEY	468	369	567
MASSACHUSETTS	*968*	*960*	*975*

Table 7: Casemix data for South Hadley, comparison communities and the state

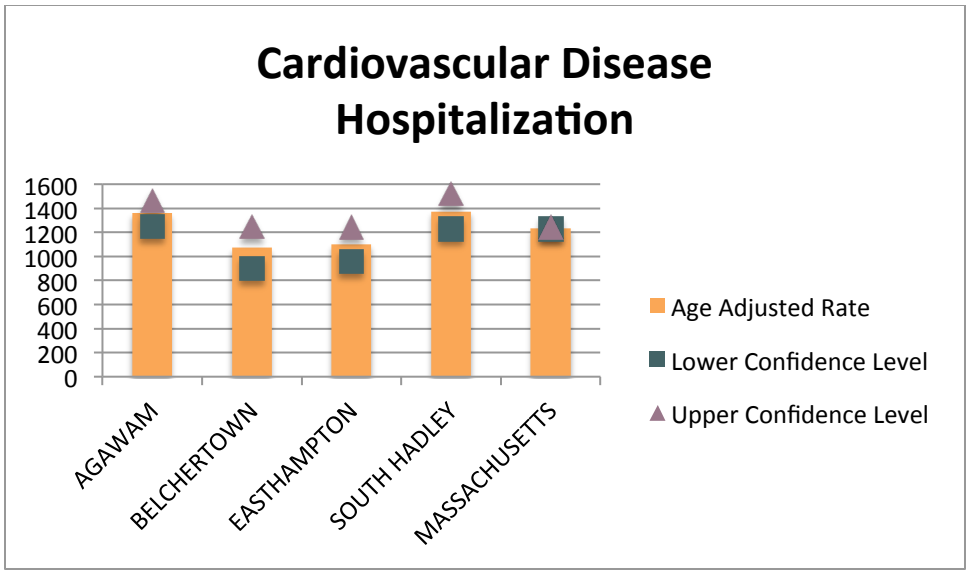
The data in the table above is also presented in graph form and briefly described below.



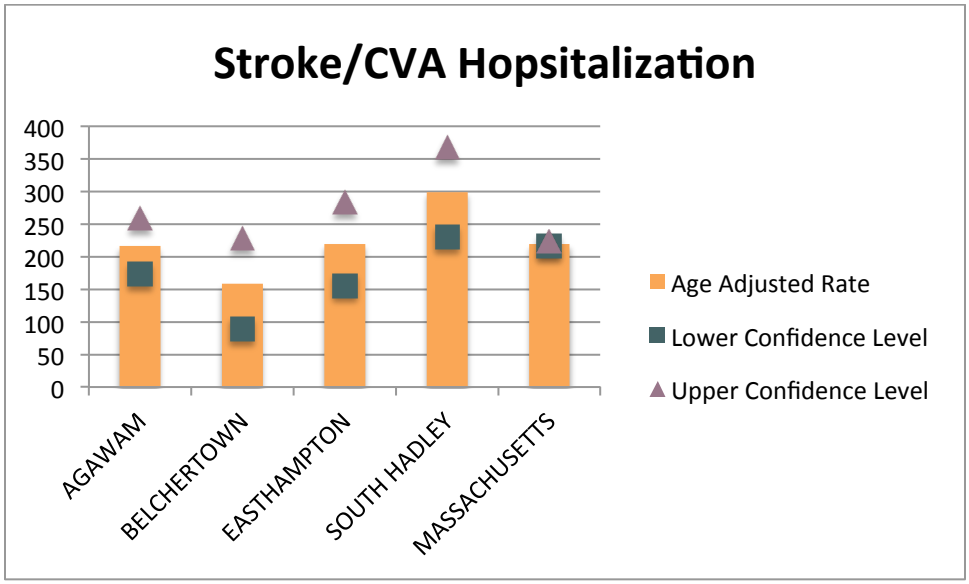
Differences between the comparison communities for Asthma emergency department visits are not statistically significant. Compared to Massachusetts the comparison communities have significantly **lower rates**. Risk factors for asthma include having a close relative with asthma, having another allergy, smoking, exposure to exhaust fumes, occupational chemicals, or other pollution, and being overweight.



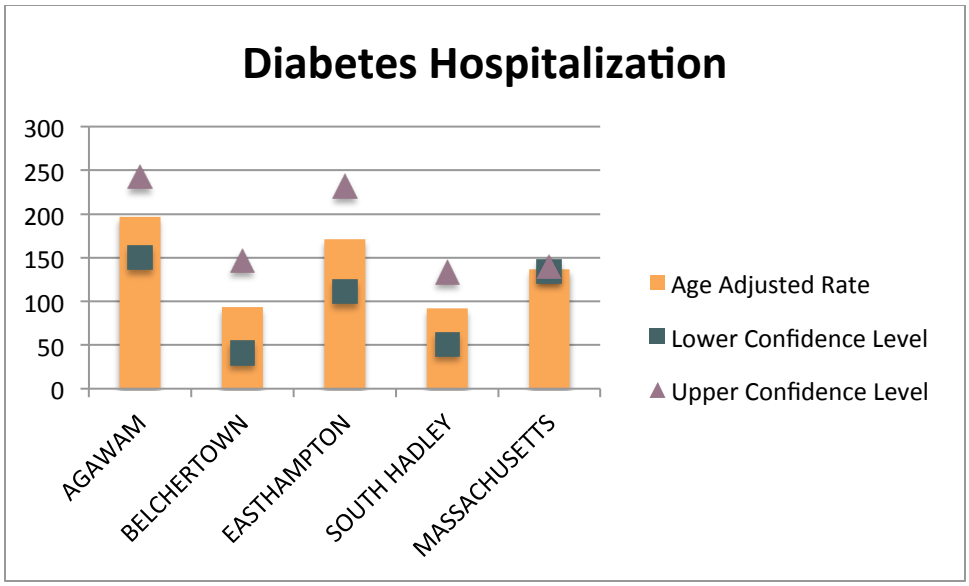
COPD age-adjusted rates in South Hadley are significantly **lower** than Easthampton or the state as a whole. Risk factors for COPD include smoking, occupational exposure to dust and chemicals, age (over 40 years old), and genetics.



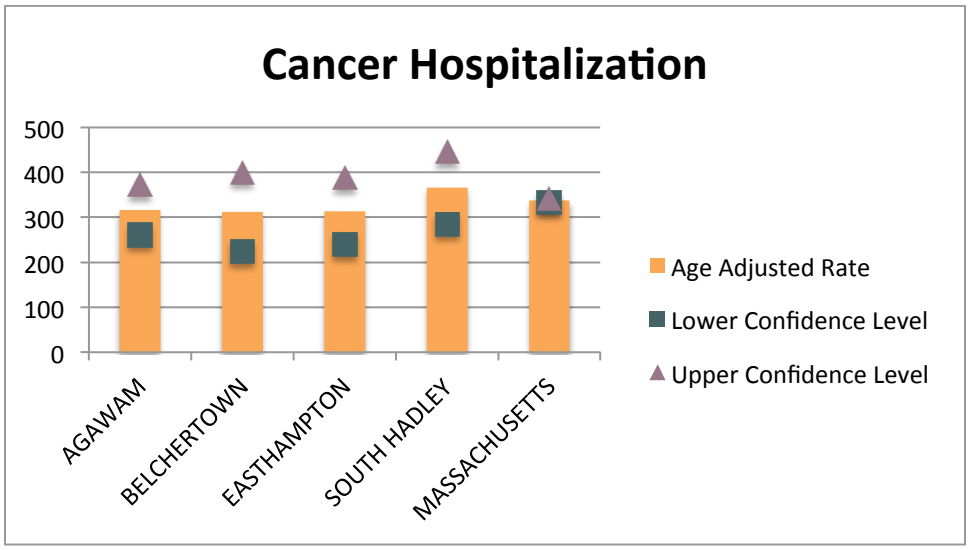
The age-adjusted rate of Cardiovascular Disease hospitalization for South Hadley residents is **not significantly different** from the comparison communities or the state. However it is very close to being significantly higher than the state, Belchertown, and Easthampton. Risk factors for Cardiovascular Disease include a high fat diet, low physical activity, being poor, chronic stress, anxiety and depression, hypertension, type 2 diabetes, male gender, older age.



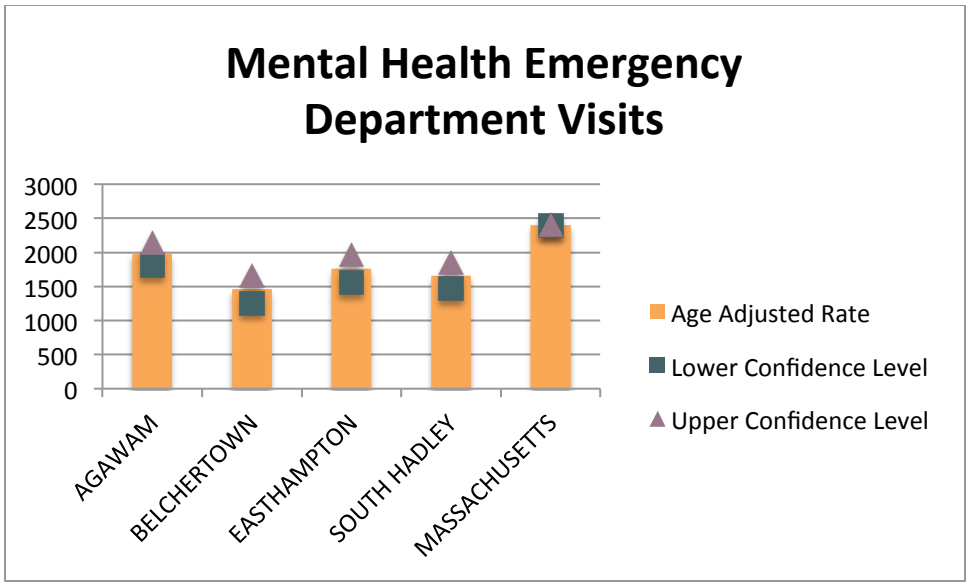
The age-adjusted rate of Stroke/CVA hospitalization for South Hadley residents is **significantly higher** than the state as a whole and Belchertown. Risk factors include smoking, older age, female gender, and black race.



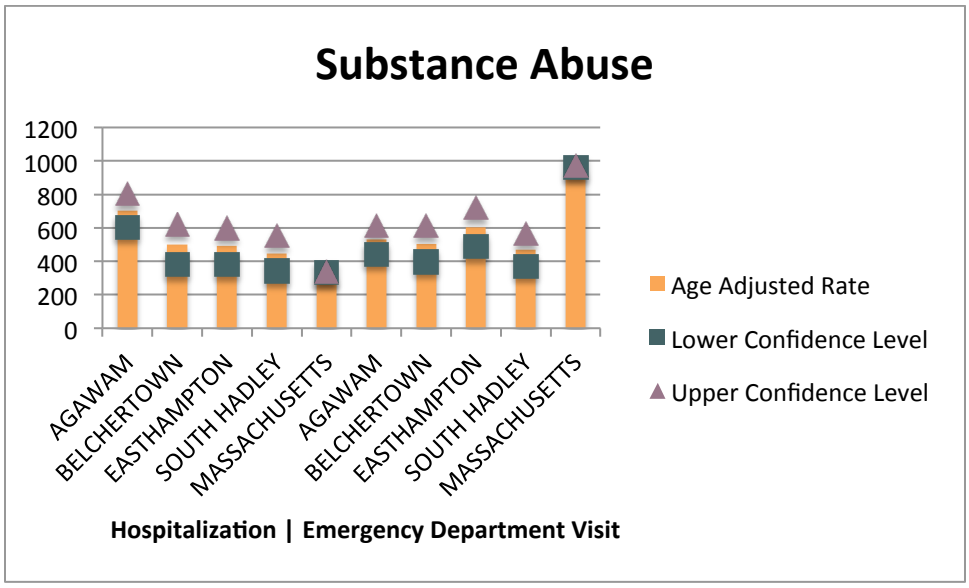
The age-adjusted rate of Diabetes hospitalization for South Hadley residents is **significantly lower** than Agawam and the state as a whole. Risk factors vary depending on the type of diabetes. For prediabetes and type 2 diabetes risk factors include being overweight or obese, physical inactivity, black, Hispanic or Asian race, older age, hypertension, and abnormal cholesterol.



The age-adjusted rate of Cancer hospitalization for South Hadley residents is **not significantly different** than the comparison communities or the state. Risk factors for cancer include alcohol, diet, obesity, exposure to cancer-causing substances, tobacco use, and excess exposure to sunlight.



The age-adjusted rate of Mental Health Emergency Department visits for South Hadley and the comparison communities are all **significantly lower** than the state average. Risk factors for mental health include exposure to violence, low income and poverty, difficulties at work or school, unemployment, discrimination, social and gender inequalities (World Health Organization 2012)



The age-adjusted rate of Substance Abuse hospitalization for South Hadley residents is **significantly lower than Agawam**. The rates for all of the comparison communities are **significantly higher than the state rate**.

The age-adjusted rate of Substance Abuse emergency room visits for South Hadley residents and the comparison communities are **significantly lower than the state rate**.

Based on the casemix indicators, the health of residents of South Hadley appears to be relatively good compared to the state as a whole and better than Easthampton or Agawam for some indicators. South Hadley does have high rates of Stroke/CVA. The high smoking rate shown in the BRFSS data and the high percentage of females in the town may contribute to this stroke rate. While not statistically significant, South Hadley's rate of cardiovascular disease is high compared to Easthampton, Belchertown and the state. While Agawam and South Hadley have very similar racial and economic characteristics, South Hadley appears to perform better on several indicators.

Implications of Health Indicators

Together the BRFSS and Casemix data show that South Hadley is a relatively healthy community. However, there are indications of poor mental health and substance abuse (chronic drinking and smoking), as well as potentially poor preventive care, including taking advantage of medical care (flu shot), and getting adequate physical activity.

Part II: Assessment

Development Standards under consideration

Changes to the subdivision regulations under consideration and the adopted design guidelines for the South Hadley Falls Smart Growth District are summarized below. For the full text of the development standards see the Appendix.

Subdivision Regulations

Changes under consideration:

- Type "A" Subdivisions Changes:
  - Definition: Revises definition of Type "A" subdivisions to specify that roadways are not longer than 800 feet and not ending in a dead-end or turn-around. This definition applies to single-family residential purposes only.

- Type "B" Subdivision Changes:
  - Definition changes: None. Type "B" applies to a subdivision for apartments, business or industrial purposes
  - Length of a dead-end street: if all lots have a street frontage width 125' or greater, then dead-end or cul-de-sac streets could exceed the current maximum of 800 feet, extending up to 1500 feet.
    - Additional provisions establish that:
      - *Emergency or pedestrian connections.* The Planning Board may require pedestrian and/or emergency vehicle connections to a permanent cul-de-sac or dead-end street in excess of eight hundred (800) feet.
      - *Fire Department Concurrence.* The Planning Board may require that an applicant obtain the appropriate Fire Department Fire Chief and Water Superintendent concurrence with the length of the permanent cul-de-sac or dead-end street when it is beyond 800 feet in length.

- Type "C" Subdivisions Changes:
  - Definition: This is a new definition which reads, "**TYPE "C" SUBDIVISIONS:** A subdivision for single-family residential purpose only with roadways ending in a dead-end or turn-around but with adjoining lots having a lot width of no less than 125 feet." [2]

- [2] 125 feet is the minimum required frontage for uses other than Flexible Development or uses by special permit in the Residence A-1 Zoning District. It is also the minimum frontage for Flag Lots by special permit in the A-2 Zoning District. The minimum lot frontage in the Agricultural Zoning District is 150 feet, except for Flexible Development. 125' is the minimum frontage in Business A-1 Zoning District. All other districts allow smaller lot frontages. Type "C" Subdivisions would apply to all single-family subdivisions in the above zones. It would also

- Length of a dead-end street: Type C Subdivisions, by definition, would be allowed to exceed the current maximum length of a cul-de-sac or dead-end street. The maximum length would be extended to 1,500 feet.
    - Additional provisions establish that:
        - *Emergency or pedestrian connections.* The Planning Board may require pedestrian and/or emergency vehicle connections to a permanent cul-de-sac or dead-end street in excess of eight hundred (800) feet.
        - *Fire Department Concurrence.* The Planning Board may require that an applicant obtain the appropriate Fire Department Fire Chief and Water Superintendent concurrence with the length of the permanent cul-de-sac or dead-end street when it is beyond 800 feet in length.
- Type "C" Subdivisions would be required to meet the following street standards:
    - Right-of-way width: 50 feet
    - Paved roadway width: 18-20 feet
    - Grades: must be between .5% and 9% (the same as the current requirement for Type "A" subdivisions)
    - Horizontal Alignment: minimum center line radii of horizontal street curves shall be 100' (the same as current requirement for Type "A" subdivisions)
- Driveway aprons: minimum width within the right-of-way shall be 12 feet with at least a two-foot curb radius. This is the same as the current requirement for Type "A" subdivisions.

- Type "O" Developments Changes:
    - Definition: This is a new definition that reads, "**TYPE "O" DEVELOPMENTS:** Developments which do not meet the definition of a subdivision but are subject to these regulations because they involve development of more than one building for dwelling purposes on a single lot or parcel."
        - This definition change explicitly extends the coverage of subdivision regulations to developments with more than one dwelling per parcel. This is a common form of development in South Hadley—it includes "condo" developments with multiple free-standing dwellings.
        - The zoning for developments with more than one dwelling on a lot is somewhat ambiguous South Hadley's Zoning. See Footnote 10 in the Assessment section of this document.
    - Length of a dead-end street: if all lots have a street frontage width 125' or greater, then dead-end or cul-de-sac streets could exceed the current maximum of 800 feet, extending up to 1500 feet.

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apply to single-family subdivisions in other zones if an applicant chooses to develop lots with a 125' of frontage width (or more).

        - Additional provisions establish that:
            - *Emergency or pedestrian connections.* The Planning Board may require pedestrian and/or emergency vehicle connections to a permanent cul-de-sac or dead-end street in excess of eight hundred (800) feet.
            - *Fire Department Concurrence.* The Fire Department Fire Chief and Water Superintendent must approve the length of a permanent cul-de-sac or dead-end street when it is beyond 800 feet in length.
    - Type "O" Subdivisions would be required to meet the following street standards:
        - Paved roadway width: 18-20 feet
        - Note: Right-of-way width is not specified
        - Grades: must be between .5% and 9% (the same as current requirement for Type "A" subdivisions)
        - Horizontal Alignment: minimum center line radii of horizontal street curves shall be 100' (the same as current requirement for Type "A" subdivisions)
    - Driveway aprons: minimum width within the right-of-way shall be 12 feet with at least two-foot curb radius. This is the same as the current requirement for Type "A" subdivisions.

- Sidewalks. Changes to sidewalk requirements apply to all subdivisions. The changes under consideration require sidewalks on both sides of the street except as waived by the Planning Board. Currently sidewalks are required on one or both sides, "when in the opinion of the Planning Board such sidewalks are necessary."
    - Sidewalk/Bikeway Construction fund: changes establish that if the Planning Board waves sidewalk construction, the applicant will pay an equivalent amount to a town fund to be used for sidewalk/bikeway construction.
    - With the Planning Board's approval, the developer may substitute construction of all or part of a required sidewalk for construction of a pedestrian/bikeway that is consistent with the Town's Complete Streets" policy and Comprehensive Bicycle and Pedestrian Plan. The pedestrian/bikeway path must connect to other publicly accessible and usable pedestrian/bikeway paths. If the Planning Board suggests this option to an applicant during the public hearing, the applicant must comply. [Note: the proposed language does not specify whether the pedestrian/bikeway path must be constructed on the site of the subdivision or it can be built elsewhere in town].

- Street Trees
    - Adds requirement that there must be two trees (existing or newly planted) for each dwelling in "Type O" Developments. [Note: proposed language says "Other Developments." We assume this means Type "O" Subdivisions]. [Note: while the section is called "Street Trees" the requirements do not specify that trees must be located adjacent to streets or specify their spacing.

Design Guidelines for South Hadley Falls

- The Design Guidelines establish numerous standards relating to buildings. Requirements cover:
    - Massing
    - Appearance
    - Entries
    - Fenestration (windows)
    - Materials
- The Design Guidelines establish requirements for sidewalks:
    - Requires continuity with existing sidewalks but allows special materials and articulation for outdoor uses like dining
    - Requires amenities to improve pedestrian comfort including lighting, projecting canopies, and street trees
    - Encourages usable open spaces for dining, farmers markets, etc.
    - Encourages improvements to adjacent crosswalks and sidewalks
- The Design Guidelines establish requirements for driveways and parking:
    - Driveways should not interrupt continuity of sidewalks especially on primary commercial streets
    - Parking should be located behind buildings and should not face primary commercial streets
    - Parking should be shared where possible
    - Below grade parking is encouraged
    - All parking and driveways must be designed to maximize pedestrian and vehicle safety.
    - No driveway shall be within 50' of an intersection
    - See the appendix for additional standards
- The Design Guidelines establish requirements for Landscaping:
    - Encourages providing street trees
    - Landscaping shall not interfere with connections between sidewalks and interior uses (for commercial uses), or continuity of sidewalks.
    - Requires one tree for every 5 cars in a parking area. And parking must be buffered from adjoining residential uses
    - Encourages landscaping that "creates usable public space, or continues existing public open space"
    - Requires preservation of four 6" caliper or greater trees per acre, or one per lot, where such healthy trees exist
- The Design Guidelines establish requirements for Lighting:
    - Shall articulate building entries and reinforce public nature of public realm
    - Sidewalk lighting shall be primary
    - Lighting of parking areas shall not spill into adjacent properties
    - Lighting shall conform to "dark skies" standards

    - Several kinds of lighting are prohibited (neon, mercury vapor, low and high pressure sodium, searchlights and flashing or changing lights.
- The Design Guidelines establish requirements for Utility Areas and Utilities, Drainage and Stormwater Management, and Signage, which were not examined in this HIA.

Intro to Health Pathways

This HIA is based on a model developed by Metropolitan Area Planning Council (MAPC) for the HIA, *Transit-Oriented Development and Health: A Health Impact Assessment to Inform the Healthy Neighborhood Equity Fund,* hereafter HNEF ("Healthy Neighborhoods Equity Fund HIA | Metropolitan Area Planning Council" 2015). The HNEF HIA identified 12 key determinant categories linking neighborhood development to health outcomes based on stakeholder input and literature reviews. The determinant categories are broadly applicable to HIAs that relate to land use, economic development, or transportation planning. The determinants represent a systems approach to evaluating the potential impacts that a plan, policy, or project may cause, from immediate impacts to long-term health outcomes. They provide a manageable schema for categorizing complex and inter-related relationships between health determinants and health outcomes.

Figure 5: Determinant linking neighborhood development and health from HNEF HIA

Based on the key issues that were under consideration by the Planning Board and our understanding of how those might impact health, we narrowed our investigations to the following determinants:

- Walkability/Physical Activity
- Safety from Injury (including safety from traffic and emergency response)
- Green Space (includes parks, open space, and vegetation)
- Housing (including housing quality, and affordability)

Additional determinants are worthy of exploration, but were beyond the scope of this limited HIA.

The detailed pathway diagram shown in Figure 6 presents our working hypothesis of how South Hadley's Development Standards could impact health. The pathway diagram shows how the proposed regulations might result in "Direct Impacts" (changes in the built environment) and how those Direct Impacts may affect health determinants or health outcomes as measured through key indicators. Key indicators are shown on the pathway diagram under the heading Behavioral/Environmental Impacts. Due to the limited scope of the HIA, the pathways related to Economic and Environmental impacts were not assessed. They warrant future investigation.

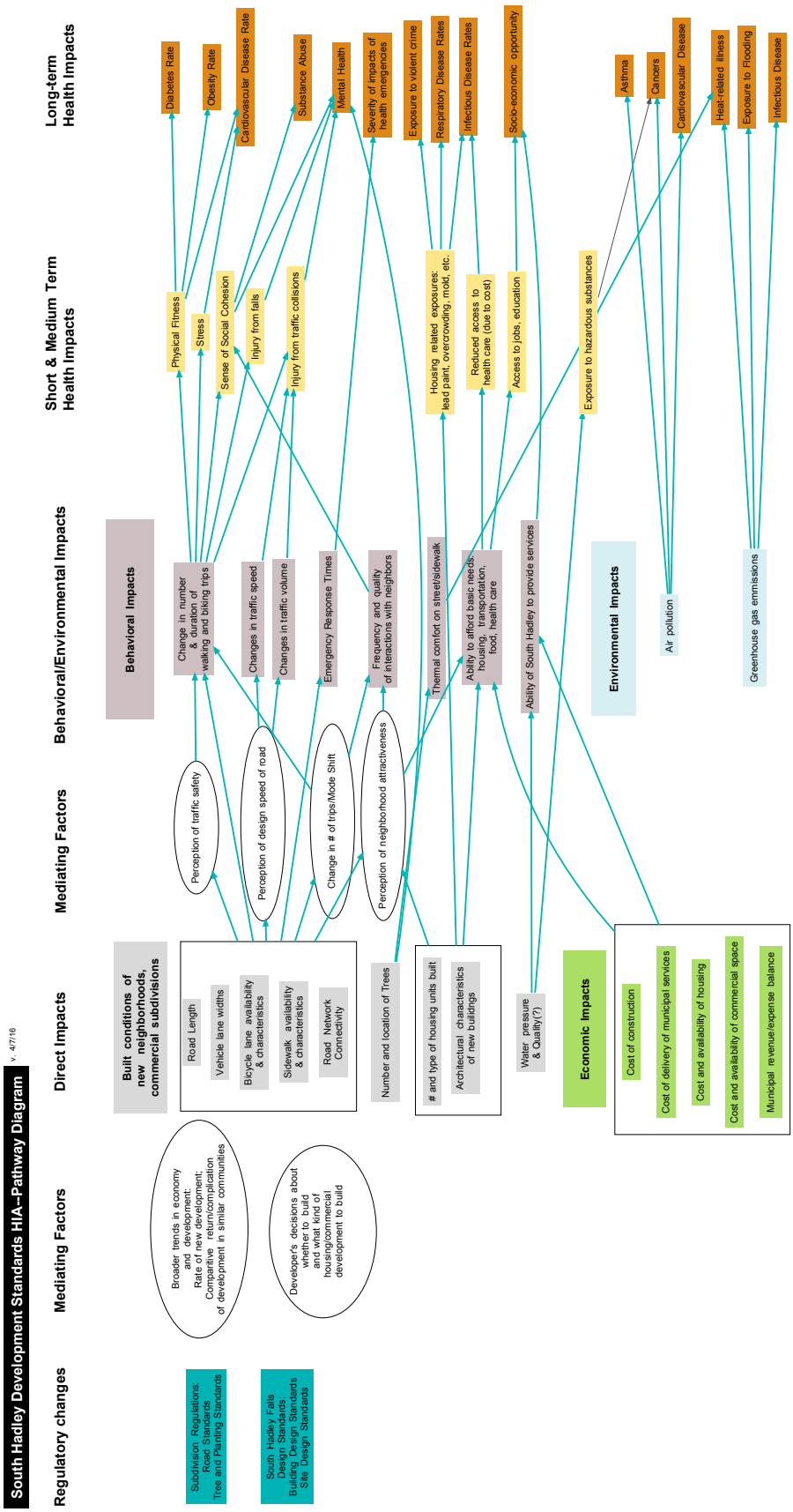


Figure 6: Pathway Diagram for South Hadley Development Standards

In subsequent sections, we discuss the selected determinants and the pathways sketched above. For each determinant, we describe the evidence linking the determinant to potential health outcomes, and profile the existing conditions relevant to the determinant. Following that, we explore specific built environment changes that may result from the Development Regulations. We present the evidence that links each built environment change to health, and evaluate either quantitatively or qualitatively how the built environment change will impact health.

Regional Context of South Hadley

Before diving into an exploration of the determinants, we present a brief overview of the land use and population context of South Hadley and the region. This context has intimately tied to the potential health impacts of the Development Standards.

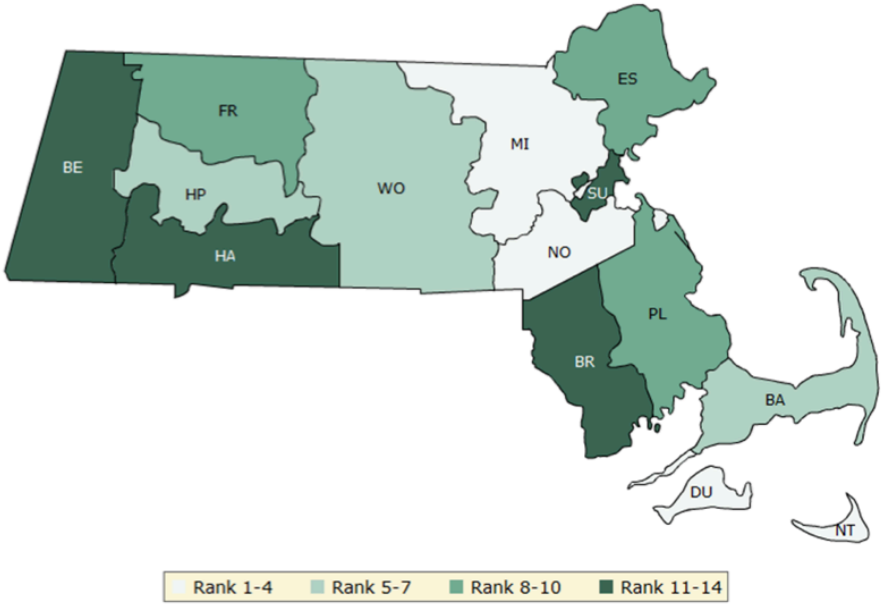
South Hadley, Massachusetts is a medium-sized town in the Pioneer Valley of Western Massachusetts (see map in Figure 8). South Hadley occupies a transitional place in the Pioneer Valley on several levels. Its population of approximately 17,743 people makes it significantly larger than some of the rural communities in the Pioneer Valley, but also significantly smaller than cities like Holyoke (population: 40,684), or Springfield (population: 154,341). South Hadley is on the southern edge of Hampshire County, bordering on Hampden County. While the eastern and western portions of both counties are relatively similar in their rural land uses and population characteristics, the central portions of the two counties are more different from each other. The central cities and towns of Hampden County are generally more urbanized than their counterparts in Hampshire Counties. They are generally more racially diverse, and have a greater percent of people with low socioeconomic status. Most significant for this HIA, Hampden County ranks as having the worst heath outcomes in the state, while Hampshire County falls in the upper third (see Figure 7) ("Massachusetts Rankings Data" 2016).

The county-wide land use and demographic patterns also hold for the communities that immediately neighbor South Hadley. Chicopee and Holyoke, to the south and west, are heavily urbanized. Granby and Hadley, to the east and north, are rural and/or suburban. Chicopee and Holyoke are both more racially diverse, have higher unemployment rates, and lower property values than South Hadley. Hadley and Granby and South Hadley are more similar in their demographic make up.

HOW DO COUNTIES RANK FOR HEALTH OUTCOMES?

The green map below shows the distribution of Massachusetts's **health outcomes**, based on an equal weighting of length and quality of life.

Lighter shades indicate better performance in the respective summary rankings. Detailed information on the underlying measures is available at **countyhealthrankings.org**.



County	Rank	County	Rank	County	Rank	County	Rank
Barnstable	6	Essex	9	Middlesex	4	Suffolk	12
Berkshire	11	Franklin	8	Nantucket	1	Worcester	7
Bristol	13	Hampden	14	Norfolk	3		
Dukes	2	Hampshire	5	Plymouth	10		

Figure 7: Massachusetts Counties Ranked by Health Outcomes. South Hadley sits on the southern edge of Hampshire County. Hampshire County's health outcomes are ranked 5th best out of 14 counties in the state, while Hampden County, just to the south ranks worst at number 14. ("Massachusetts Rankings Data" 2016)

The health disparities between South Hadley and its less privileged regional neighbors—especially Holyoke and Chicopee—are crucial context of this HIA. The impacts of development standards in South Hadley could have outsized health impact if they positively or negatively influence already vulnerable populations in neighboring communities. For example, new affordable housing options in South Hadley could provide an escape from exposure to violent crime for residents of Holyoke. On the other hand Development Standards in South Hadley could impact the rate of development in South Hadley, with a subsequent impact on traffic through neighboring communities, potentially increasing air pollution or traffic-related injuries in those communities. The stark economic and racial segregation of the Pioneer Valley is likely one of its most significant long-term health determinants. Whether South Hadley's Development Standards leave that segregation unchanged, or mitigate it, will likely be the Development Standards most significant regional health impacts.

Development patterns of South Hadley

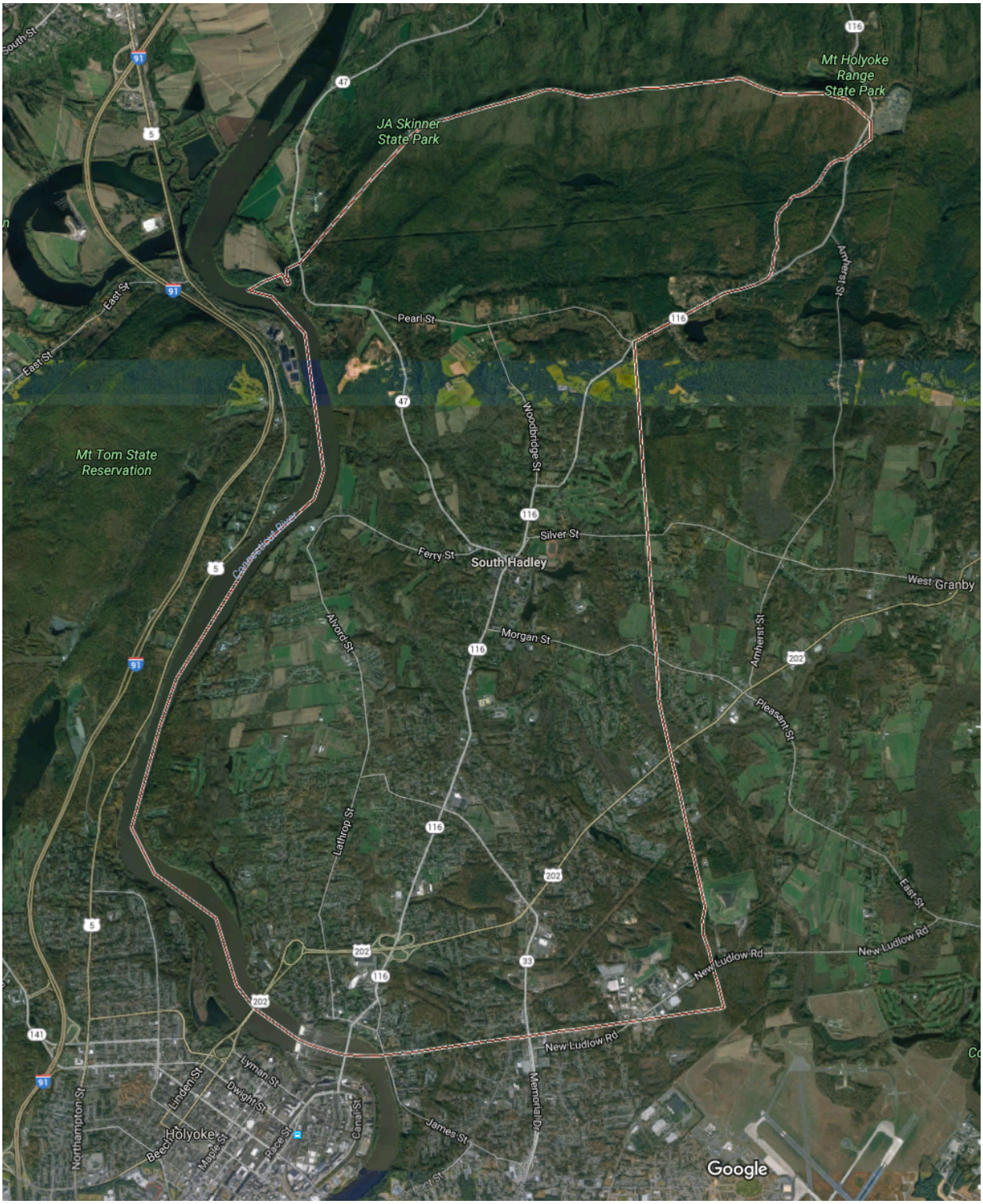


Figure 8: Town of South Hadley

The pattern of land use of neighboring communities is also generally reflected in the development patterns of South Hadley itself. South Hadley Falls, in the southwest corner of the town adjacent to

Chicopee and Holyoke is the most urbanized portion of the Town with a relatively grid-like network of streets, moderate density development and a mix of uses including commercial, residential, industrial and civic. The town generally becomes more suburban to the north with some portions of town—especially west of Alvord St, and north of Pearl St. having an almost rural character. The Town has a second center in the vicinity of Mt. Holyoke College, and a nascent center at the intersection of Route 116 and Route 33.

The Connecticut River forms the western edge of the Town, while the Holyoke Range occupies its northern edge. Both land forms have had a profound influence on the Town's development. There are limited routes into the town from the west (two bridges) and the north (two roads). A small number of major roads connect these entry points and carry most of the traffic in the town. This shapes the experience of the town for all modes of transportation (motorist, pedestrian, bicyclist , transit). It also shapes the Town's overall land use pattern.

To some degree, this HIA can be seen as an examination of the relative consequences of future development in South Hadley following a more urban pattern versus a more suburban one. The direction of that trend will influence the day-to-day lives of residents and impacts their health. At the same time, the town's future development pattern will also influence *who* will live in South Hadley—its future population make up (for example, by incentivizing some forms of housing over others, development standards can influence whether the town attracts new residents with larger or smaller families, greater or lesser income, etc.). This will have a significant impact on the population level health of the town as different populations bring different health backgrounds, different attitudes and expectations for the built environment, and different behaviors in responses to the built environment.

Literature Review Methods

Literature review was one of the primary methods of this HIA. While there are numerous planning and transportation studies, guides and standards documents that have recommendations related to the topics of this HIA, we focused on peer-reviewed primary studies that documented tangible links between the changes under consideration and health indicators or outcomes. In the process we found that the evidence base for common planning and transportation recommendations related to the topics of concern is less robust than might be expected. Literature searches were primarily conducted through PubMed, Google Scholar, Transportation Research International Documentation (TRID), and UMASS Library World Cat. Literature and research focused on peer-reviewed articles augmented by gray literature and official government documents. We reviewed several hundred peer-reviewed articles with a focus on review studies. Additional methods and/or search focus areas for each individual determinant are listed below.

Determinant	Additional Determinant-Specific Literature Review Methods
Wakability/Active Transport	Within the Active Transport literature review, the team examined the body of evidence exploring "correlates of walking and biking"—how physical activity rates relate to the built environment and population characteristics. We then researched how elements of street design can affect health behaviors related to active transport, including routine walking and bicycling. We focused on street network types, culs-de-sac and dead ends, block length, proximity to paths, trails and greenspace, sidewalk availability, and urban form.
Safety from Traffic	For the Safety from Traffic pathway, we conducted a literature review to identify how street design can reduce the potential for motor vehicle collisions with fixed objects, other motor vehicles, pedestrians and cyclists. We examined the role of street network characteristics (connectivity, culs-de-sac and dead ends, block length), lane widths, street trees, adjacent land use and urban form in collision frequency and severity.
Housing	The literature review for the affordable housing pathway focused on the links between housing density, access to affordable housing, and housing quality and health.
Green Space (including Street Trees and Parklets)	For this pathway, we assessed the emerging literature linking exposure to green spaces, including street trees, parks, and open spaces, to health outcomes, including physical activity, mental health, air quality, thermal comfort, social cohesion, and crime.

Table 8: Literature Review Methods for Determinants

Determinant 1: Active Transportation

Literature Review

Active Transportation, Physical Activity and the Built Environment

The health benefits of routine physical activity have been well established, yet less than half (48%) of all adults meet the Surgeon General's recommended minimum of 30 minutes of moderate intensity physical activity on most days of the week (Centers for Disease Control and Prevention 2010; Besser and Dannenberg 2005; Freeland et al. 2013). A recent study by Lee et al. (2012) estimates that physical inactivity causes 6% of the global burden of disease from coronary heart disease, 7% of type 2 diabetes, 10% of breast cancer, 10% of colon cancer, 9% of premature mortality. If inactivity were decreased by 10% to 25%, between 533,000 and 1.3 million deaths could be prevented worldwide every year (Lee et al. 2012).

In recent years, consistent research has linked features of the built environment to active transport, defined as walking, biking, and public transportation (which typically requires some walking or biking). Conceptually, land use patterns shape the proximity of trip origins and destinations while transportation systems connect those destinations in ways that privilege one or more modes of transportation. Together land use and transportation systems determine the feasibility of walking, cycling, or mass transit use. The literature demonstrates that active transport correlates with built environment characteristics including: density, mixed land-use, availability of destinations, street design, and distance to transit (Ewing and Cervero 2010; Freeman et al. 2012; Giles-Corti et al. 2013; McCormack and Shiell 2011; Litman 2013).

Previous HIAs have revealed that the health economic benefits of increased physical activity are quite substantial and that these benefits are typically larger than the health economic value of the other pathways that this HIA assesses (Mueller et al. 2015).

In sum, there is convincing evidence that the built environment is associated with physical activity and active transport, although it is important to note that most studies are cross-sectional and observational (Ewing and Cervero 2010; Freeman et al. 2012; McCormack and Shiell 2011; Ding and Gebel 2012). It also worth noting that most studies linking the built environment to active transportation have been based on broad geographic areas—for example the metropolitan or county level. We will examine links between neighborhood and site scale built further in subsequent sections.

Walking for Active Transportation

The built environment does seem to influence the prevalence of walking for active transportation. The most important built environment factors for increasing utilitarian walking include proximity to destinations, land use mix or diversity, intersection density, and connectivity (McCormack and Shiell 2011; Sallis, Spoon, et al. 2015; Ewing and Cervero 2010). Residential density has shown mixed results, with some studies showing increased density positively influence walking levels while and others show the opposite (Sallis, Spoon, et al. 2015). Mixed results may reflect the concentrated pockets of crime and poverty in some high-density areas. Both high- and low-income individuals benefit from more walkable neighborhoods with increases in overall physical activity (Sallis et al. 2009). Use of

buses and trains is related to the distance from residences to transit stops (Ewing and Cervero 2010; Giles-Corti et al. 2013) and the average user of transit walks 19 minutes per day to and from transit (Besser and Dannenberg 2005). Street-scale pedestrian design including the presence of amenities such as street furniture, lighting and shading is moderately related to general walking and improvements in health (McCormack and Shiell 2011; Sallis, Spoon, et al. 2015; Heath et al. 2012). A lack of free workplace parking influences uptake in walking to work; pleasant routes predict its maintenance (Panter et al. 2013). Some quasi-experimental studies have shown increased walking after installation of greenways or trails, while others have not (McCormack and Shiell 2011). Recreational walking is associated with proximity to recreational destinations and positive perceptions of neighborhood aesthetics (Giles-Corti et al. 2013; McCormack et al. 2013).

Self-selection is a factor in neighborhood-level rates of walking for active transportation. Walkable neighborhoods attract people who want to walk. On the other hand, nationwide, there is a undersupply of walkable places: there are more people who want walkable places than places for them to live (Lawrence D. Frank et al. 2015; Leinberger and Alfonzo 2015; Lawrence Douglas Frank et al. 2007). If a person who wants to walk lives in a low-walkability neighborhood, he or she is unlikely to walk frequently. People who prefer low-walkability neighborhoods, but who live in high walkability neighborhood also have low walking rates. Both the desire to walk and the presence of a supportive environment are required for high rates of walking (Lawrence Douglas Frank et al. 2007).

Bicycling for Active Transportation

Overall the physical activity from bicycling outweighs risks from injury or air pollution based on a cost-benefit approach. (Teschke et al. 2012). This topic is increasingly being studied. Bicycling has significant health benefits including overall fitness, decreased cardiovascular risk, and decreased mortality (Oja et al. 2011; Andersen L et al. 2000). Bicycling is generally more vigorous than walking. For example, biking to work requires about 6.8 METs[3], while walking to work requires about 4.0 METS (Ainsworth et al. 2015).

Bicyclists are a relatively small segment of the overall population. Bicycle facilities, have a high impact for a relatively small population.

Broad land use patterns, including residential density, proximity to jobs and services, and connectivity do not appear affect bicycling rates as much as they affect walking rates (Muhs and Clifton 2015).

Climate, hilliness, weather and local culture are also major determinants of bicycling (Heinen, van Wee, and Maat 2010). Convenient routes are associated with uptake of cycling to work (Panter et al. 2013). Some quasi-experimental studies have found that installation of cycle tracks, greenways and bike paths results in increased bicycling, others studies have not (McCormack and Shiell 2011). Several studies of route choices by regular bicyclists have found that bicyclists prefer dedicated bicycle facilities including bike lanes, separated paths, and cycle tracks, and bicycle boulevards, or streets with low-traffic volumes and slow speeds (Stinson and Bhat 2003; Dill 2009). Bicycle use for active

[3] A MET, or metabolic equivalent, is a measure of how much energy a physical activity requires.

transportation has increased significantly in the United States in recent years. Gains are concentrated in a small number of places and almost all the increase has been amongst men aged 25-64 (Pucher, Buehler, and Seinen 2011). Communities that have invested in bicycle interventions including physical infrastructure, land use policy reform, and bicycle promotion programs have experienced significant increases in bicycling (Pucher, Buehler, and Seinen 2011; Pucher, Dill, and Handy 2010).

The decision whether to bike or not seems to be strongly tied to concerns about traffic safety, which are in turn shaped by specific infrastructure designs and personal preferences. In general bicyclists prefer low volume roads with no more than one lane of traffic in each direction, they dislike on-street parking, and they strongly prefer separate facilities such as bike paths or cycle tracks (Heinen, van Wee, and Maat 2010). Bicycle safety improvements attract proportionately more people to bicycling than the actual safety reduction, "i.e. a 10% increase in safety results in a greater than 10% increase in the share of people bicycle commuting (Noland 1995)." While men currently make up the majority of very active bicyclists, the biggest opportunity to increase physical activity through bicycling is among casual or infrequent bicyclists, especially women, older adults, and children. These populations may be more sensitive to perceptions of unsafe traffic and may require dedicated bicycle infrastructure (like separated bicycle lanes) before they will be willing to bicycle more. This is discussed more in the section on Traffic Safety for bicycling below.

The relationship between infrastructure, perceived safety and bicycling rates is very complex as illustrated in the diagram by Macmillan et al in Figure 9. For the purpose of our assessment we have not taken feedback loops into account.

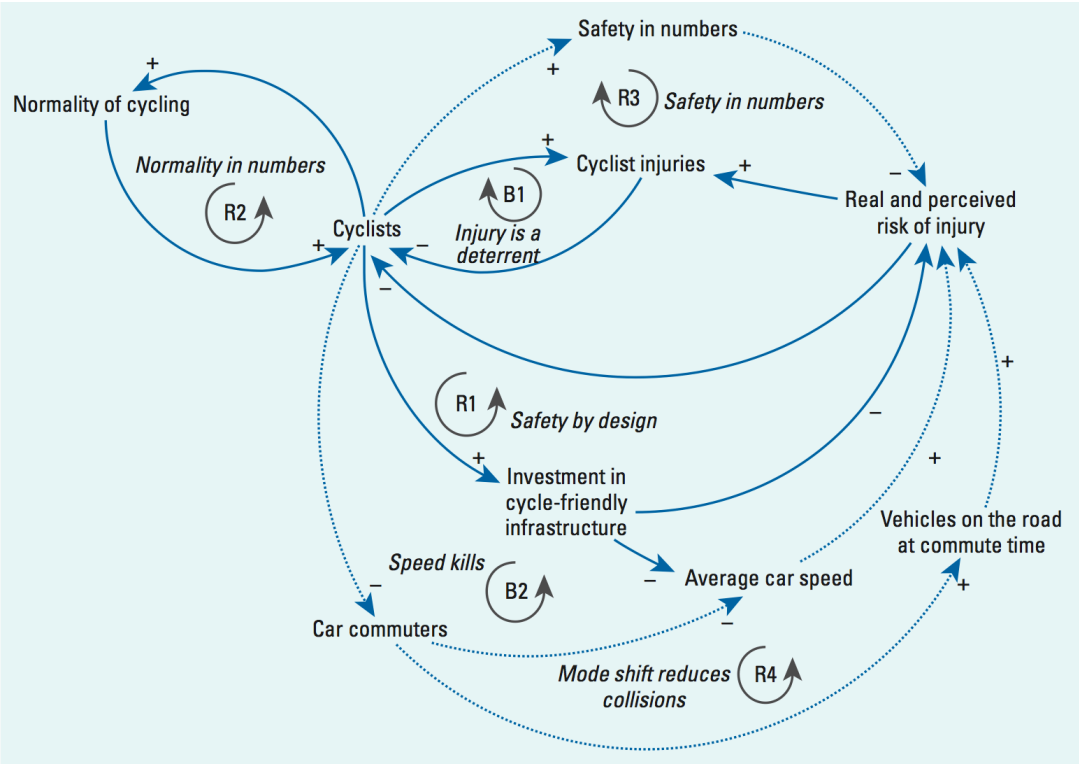


Figure 9: A causal loop diagram for bicycle commuting illustrates the complex pathways that affect levels of bicycle commuting and its safety. "Dotted lines denote loops identified by stakeholders and the literature, but where local data suggests they are currently inactive. Arrows with a positive sign (+) indicate that a change in the originating variable leads to a corresponding change in the variable at the arrowhead. Arrows with negative signs (–) indicate that a change in the originating variable leads to a change in the opposite direction for the arrowhead variable (R, reinforcing or positive feedback loop; B, balancing or negative feedback loop)." (Macmillan et al. 2014)

Baseline Conditions—Active Transportation

Existing Mode Share

The best available data for travel patterns in South Hadley comes from two sources. The American Community Survey (ACS), administered by the US Census Bureau, measures the breakdown of "means of transportation to work for adults over 16" and was available at the town level. The Massachusetts Travel Survey included several measures of active transportation. Data is only available at the regional level.

MEANS OF TRANSPORTATION TO WORK										
Subject	South Hadley		Agawam		Belchertown		Easthampton		Massachusetts	
	%	#	%	#	%	#	%	#	%	#
Workers 16 years and over		9,168		14,420		7,525		8,946		3,284,998
Car, truck, or van	82.3%	7,545	96.1%	13,858	92.1%	6,931	89.8%	8,034	79.7%	2618143
Public transportation (excluding taxicab)	1.0%	92	0.4%	58	1.3%		0.3%	27	9.5%	312075
Walked	8.8%	807	1.0%	144	0.4%	30	3.8%	340	4.7%	154395
Bicycle	0.1%	9	0.0%	-	0.2%	15	1.6%	143	0.8%	26280
Taxicab, motorcycle, or other means	0.8%	73	0.3%	43	0.8%	60	0.7%	63	0.9%	29565
Worked at home	7.0%	642	2.1%	303	5.2%	391	3.8%	340	4.4%	144540

Table 9: Commute mode in South Hadley

South Hadley has a much greater percent of workers who commute by walking than the other comparison communities. South Hadley's rate is also nearly double the state rate. The high rate of walking to work may be due to the presence of Mount Holyoke College—colleges and universities are often associated with high rates of active commuting. The highest walking commute rate in the region is in Amherst 17.6%, while Northampton's is 11.4%. Other large employers located in mixed residential and commercial/industrial neighborhoods like, E Ink in South Hadley Falls may also play a role in the high rate of walking to work.

The rate of bicycle commuting in South Hadey, is remarkably low—just .1%. Easthampton, by comparison has a rate of 1.6%, while Northampton (not shown) has a rate of 4.1% and Hadley has a rate of 1.4%. It is worth noting that those communities all have multi-use paths.

There are striking differences between the rates of active commuting for males and females in South Hadley. 13.1% of Females walk to work while only 2.1% of males do. Females bicycle to work at twice the rate of males .2% versus .1%. This is somewhat unusual, because nationwide, almost all of the growth in bike commute share has come from males between the ages of 25 and 64 and currently females represent only about 24% of U.S. bike commuters (Pucher, Buehler, and Seinen 2011).

Local data for active commuting by various income groups or races is not available. Nationwide people who identify as "some other race" or "two or more races" have the highest rates of walking followed by Asians, Hispanic/Latinos, and Blacks, with Whites having the lowest rates. Nationwide people who identify as "some other race" or "two or more races" have the highest rates of bicycling followed by Whites, Asians, and Hispanic/Latinos, with Blacks having the lowest rates. (McKenzie 2014). Meanwhile, people with lower socioeconomic status walk more for utilitarian purposes than people with higher status. This population has generally has worse health outcomes and so may benefit more from investments that facilitate walking for utilitarian purposes.

PVPC-60: All Trip Modes (Weighted)

Transportation Mode	Count	Percent
Walk	321837	13.6%
Bike	29757	1.3%
Auto/Van/Truck Driver	1295841	54.8%
Auto/Van/Truck Passenger	558839	23.6%
Public Bus	75832	3.2%
Train	3525	0.1%
Dial-A-Ride/Paratransit	8062	0.3%
Taxi	5094	0.2%
School bus	60887	2.6%
Motorcycle Driver	2280	0.1%
Motorcycle Passenger	678	0.0%
Other, SPECIFY	3802	0.2%
Total	2366432	100.0%

PVPC-61: Mode to Work (Weighted)

Mode to Work	Count	Percent
Works from home	15493	5.5%
Walk	12485	4.5%
Bike	3726	1.3%
Auto/Van/Truck Driver	211362	75.6%
Auto/Van/Truck Passenger	20511	7.3%
Bus / Public Transit	10716	3.8%
Dial-A-Ride/Paratransit	644	0.2%
Motorcycle Driver	159	0.1%
Other, SPECIFY	2857	1.0%
Don't Know	1067	0.4%
Refused	682	0.2%
Total	279701	100.0%

Table 10: Mass Travel Survey. Selected tables showing results for PVPC region

In the Pioneer Valley region as a whole, people report walking far more for non-work trips than for work trips (Table 10). They walk for about 13.6% of all trips, while they only walk for 4.5% of work trips. It is important to note that in the Pioneer Valley only 7.6% of trips are related to work, so mode share for "all trips" is far more representative of overall travel behavior than mode share for work commute trips. **If the regional pattern holds true for South Hadley—that people make about 3 times as many non-work walking trips as work walking trips—then we can estimate that residents of South Hadley may make upwards of 25% of all trips by walking.**[4]

There is no data source that documents the overall number of bicycle trips made by residents of South Hadley. The Massachusetts Travel Survey provides the best available data for non-work bicycle trips—with data available for the region and state, but finer scales. For the region as whole, the bicycle mode

[4] Walking commute share for South Hadley is 8.8%. The percent of all trips made by walking in South Hadley is unknown. So we can extrapolate from the regional pattern to the local one. The regional ratio of "walking for all trips" to "walking for work trips" in the Pioneer Valley is 13.6% / 4.5 = 3.02. We multiply 3.02 by 8.8%, which gives us 26.6% as an estimate of the percentage of all trips made by walking in South Hadley.

share for work-trips and "all trips" was the same (1.3%). By contrast, for the state overall, the percentage of bicycle trips to work was higher than percentages of bicycle trips for "all trips." This contradictory evidence points to the difficulty of extrapolating from bicycle mode share to mode share for all trips.

The lack of data recording overall bike trips is a well-known problem. A study published in the Transportation Research Record proposed a method for estimating overall bicycle trips from census commute to work data (Barnes and Krizek 2005). The study compared census commute to work data with actual counts of bicyclists in the Twin Cities, Minnesota as well as data from 15 metropolitan statistical areas (MSAs) and 34 states. They found that commute trips were a good indicator of the overall level of bicycling—in other words one can extrapolate from commute trips to get a reasonable estimate of all trips by bicycle per day. Their study showed that following equation provided a reasonable estimate of bicycle trips:

$$A = 0.3\% + 1.5 * C$$

A is the percentage of adults who ride a bicycle in a day and C is the bicycle commute share from the census "Means of Transportation to Work" table.

Using the formula above for South Hadley, **we can estimate that .45% of adults make a bicycle trip daily** (.45%= .3% + 1.5 *.1%). In 2014, the adult population of the South Hadley was 13,416 (ACS 2010-2014), so **about 60 adult residents of South Hadley ride a bicycle per day**.

Health-Economic Value of Current Rates of Walking to Work and Bicycling

We used the HEAT Tool from the World Health Organization to estimate the current health-economic value of walking-to-work commuting done by residents of South Hadley.

The HEAT tool provides an order of magnitude estimate of the health impacts of active transportation (either a steady state or a change as a result of an intervention). Based on data entered by the user, it calculates the monetary value of a given amount of walking or bicycling. The model and data underlying the HEAT Tool is based on a robust review of peer-reviewed published journal articles conducted by leading experts in the field (Kahlmeier et al. 2014). Essentially, HEAT estimates changes in all-cause mortality due to changes in physical activity levels. It then calculates a monetary value of the change in mortality based on "the value of statistical life." The value of statistical life is "most commonly derived using a method called willingness to pay. The willingness to pay shows how much a representative sample of the population (who, in this instance, are potential victims) would be willing to pay (in monetary terms) for example for a policy that would reduce their annual risk of dying from 3 in 10,000 to 2 in 10,000" (Kahlmeier et al. 2014). Numerous HIAs have used the HEAT Tool to assess the health benefits of changes in levels of bicycling or walking and the practice is well accepted (Mueller et al. 2015).

The results of the HEAT Estimate for the health-economic benefits of current rates of walking to work and bicycling in South Hadley are below.

Health-economic benefits of current rates of walking-to-work in South Hadley

Reduced mortality as a result of current walk-to-work physical activity

The walking data you have entered corresponds to an average of **1.54** km per person per day.[5]

This level of walking provides **an estimated** protective benefit of: **9 %** (compared to persons not walking regularly)

From the data you have entered, the number of individuals who benefit from this level of walking is: **807**[6]

Out of this many individuals, the number who would be expected to die if they were not walking regularly would be: **5.04**

The number of deaths per year that are prevented by this level of walking is: less than 1

Economic value of current walking-to-work physical activity (*Currency: USD, rounded to 1000)*

The value of statistical life in your population is:	**$9,600,000**[7]
The annual benefit of this level of walking, per year, is:	**$4,269,000**
The total benefits accumulated over **20** years are:	**$85,380,000**
If future benefits are discounted by 5% per year, the current value of the total benefits accumulated over **20** years are:	**$53,201,000**

[5] Average length of a walking trip to work from the National Household Travel Survey is .67 miles. This is multiplied to 2 trips per day for 5 days a week.
[6] Number of people who say they walk to work from 2010-2014 ACS
[7] The value of statistical life is based on an estimate from the US Department of Transportation (Trottenberg 2013)

Health-economic benefits of current rates of bicycling in South Hadley

Reduced mortality as a result of current rates of cycling activity

The cycling data you have entered corresponds to an average of **1,328** km per person per year.[8]

This level of cycling provides **an estimated** protective benefit of: **11 %** (compared to persons not cycling regularly)

From the data you have entered, the number of individuals who benefit from this level of cycling is: **60**[9]

Out of this many individuals, the number who would be expected to die if they were not cycling regularly would be: **0.37**

The number of deaths per year that are prevented by this level of cycling is: less than 1

Economic value of cycling. *Currency: USD, rounded to 1000*

The value of statistical life applied is: $**9,600,000**	
The annual benefit of this level of cycling, per year, is:	**$394,000**
The total benefits accumulated over **20** years are:	**$7,870,000**
If future benefits are discounted by 5% per year, the current value of the total benefits accumulated over **20** years are:	**$4,904,000**

[8] Average length of a bicycling trip from the National Household Travel Survey is 2.26 miles.

[9] This number is based on the results of the formula above for converting bike-to-work census results to an estimate of total number of adults who bicycle per day

The HEAT Tool shows that the health-economic value of walking and bicycling are quite significant. The value to society of even modest increases in walking or bicycling among a small population is enough to justify large investment in programs or infrastructure to increase walking or bicycling.

The estimated total health-economic benefit of current rates of walking in bicycling per year in South Hadley is: $4,663,000.

Determinant 2: Traffic Safety

Literature Review

Motor vehicle crashes are responsible for more than 30,000 fatalities each year in the United States (National Center for Environmental Health 2012). Automobile collisions are one of the leading causes of death among people 34 years old and younger, and account for 3.2 million nonfatal injuries annually. Motor vehicle crashes impact pedestrians and bicyclists as well as motorists. In 2013, 743 cyclists and 4,735 pedestrians were killed in traffic crashes in the United States (National Highway Traffic Safety Administration 2015b). In 2013, males accounted for 69% of pedestrian fatalities and 87% of pedalcyclist fatalities. Children aged 5 to 9 have the highest population-based fatality rate, while older pedestrians (65+) are more likely than younger pedestrians to be struck at intersections (Retting, Ferguson, and McCartt 2003).

Large numbers of pedestrians and cyclists are injured in motor vehicle collisions each year: 66,000 pedestrians and 48,000 cyclists nationwide in 2013 (National Highway Traffic Safety Administration 2015b). In Massachusetts, the fatality rate for pedestrians involved in motor vehicle traffic crashes is 1.02 per 100,000 pedestrians, which is lower than the national average of 1.5 per 100,000. However, pedestrians account for 20.0% of motor vehicle traffic crash fatalities in the state, compared to 14.5% nationwide (National Highway Traffic Safety Administration 2015a). The fatality rate for pedalcyclists in Massachusetts is .9 per million people compared to 2.35 per million for the U.S.

	Injury Rate (U.S.)	**Fatality Rate (MA)**	**Fatality Rate (U.S.)**	**Percent of Total Traffic Fatalities (MA)**	**Percent of Total Traffic Fatalities (US)**
Pedestrian	21 per 100,000	1.02 per 100,000	1.05 per 100,000	20.9%	14.5%
Pedalcyclist	152 per million people	.9 per million people	2.35 per million people	1.8%	2.3%

Figure 10: Injury and fatality rates for pedestrians and pedalcyclists. Source: National Highway Traffic Safety Administration

Alcohol involvement is a major factor in pedestrian injuries and fatalities (both for the motor vehicle operators and the pedestrians) (Retting, Ferguson, and McCartt 2003). Populations who walk or bicycle frequently will have increased exposure to motor vehicles and therefore increased risk of injury or death—this includes active commuters, and poorer people who tend to do more utilitarian walking.

The speed of a motor-vehicle is a major factor in traffic collisions. Increased speed reduces a driver's cone of vision, reduces their available reaction time, and increases stopping distances once a driver detects the need to avoid an accident. Chance of injury also rises disproportionately with greater

speed (Rosén and Sander 2009). As an example, a pedestrian hit at 35 mph is nearly three times more likely to die than if they are hit at 25 mph (Tefft 2013). A recent Massachusetts HIA found that reducing the default speed limit on local roads from 30 mph to 25 mph statewide would prevent 2,200 crashes, 18 fatalities and 1,200 injuries per year ("Speed Limit Reduction on Local Roads | Metropolitan Area Planning Council" 2015).

Figure 11: A simulation of a driver's cone of vision based on speed of travel. At 15mph (top) the entire street and sidewalks are visible. At 25mph the cone of vision narrows to the vehicular travel lanes and the driver is less likely to see pedestrians entering a crosswalk. Simulation from NAACTO.org based on these studies: A. Bartmann, W. Spijkers and M. Hess, "*Street Environment, Driving Speed and Field of Vision*" Vision in Vehicles III (1991).
W. A. Leaf and David F. Preusser. **Literature review on vehicle travel speeds and pedestrian injuries**. (Washington, D.C.: U.S. Dept. of Transportation, National Highway Traffic Safety Administration, 1999).

Increased numbers of pedestrians and bicyclists out and about is associated with decreased injury and fatality rates per pedestrian or bicyclists—an effect know as "safety in numbers." Some hypothesize that drivers pay more attention to pedestrians and bicyclists when they are more common; others believe the causal mechanism has not been determined (Jacobsen 2015; Bhatia and Wier 2011). Reducing the number of vehicles on the road, by replacing driving trips with walking or biking trips could reduce traffic injuries and fatalities, but it would require a very large mode shift (50% plus shift from driving to walking and bicycling) to accomplish this (Elvik 2009). The change in overall system safety accompanying mode shift is related to the infrastructure available to pedestrians and cyclists; for example, a shift from short driving trips to bicycling on dangerous roads may increase the overall number of traffic accident injuries, whereas a shift to cycling on separated bicycle facilities might reduce the number of traffic accidents injuries (Wegman, Zhang, and Dijkstra 2012).

The configuration of the street network itself may play a major role in traffic safety. More dense grid-like street networks appear to have lower fatality rates for all modes of transportation—motor vehicles, pedestrians, and bicycles. The working theory is that dense grid-like networks result in lower speeds (Marshall and Garrick 2011). This type of network is also a strong predictor of increased rates of walking and bicycling and so provides a win-win with increased physical activity and decreased accident fatalities.

Adjacent land uses appear to be associated with traffic safety for all modes. A study of motor vehicle crashes in San Antonio, Texas found that, big box stores, and strip commercial were associated with increases in motor vehicle crash incidence, including for pedestrians and bicyclists. Pedestrian-scale retail uses were associated with decreases in the incidence of motor vehicle crashes. "Each additional strip commercial use is associated with a 2.2% increase in motorist crashes, and each additional big box store is associated with a 7.7% increase in motorist crash incidence. Stated another way, each additional strip commercial use increases motorist crash incidence by about four times as much as adding one million miles of vehicle travel, and each additional big box store increases crash incidence by roughly 14 times as much as adding one million miles of vehicle travel (Dumbaugh and Li 2010)." For reference, there are about 11 million vehicle miles traveled per day in the Pioneer Valley (PVPC 2015).

Pedestrian injuries and fatalities can be reduced through three means:

- reducing the speed of motor vehicles,
- separating vehicles and pedestrians,
- and making pedestrians more visible (Retting, Ferguson, and McCartt 2003).

The same framework likely applies to cyclists as well.

Baseline Conditions—Traffic Safety

South Hadley's rate of motor vehicle related deaths is significantly higher than the statewide rate: 17.1 per 100,000 versus the statewide rate of 5.8 per 100,000 persons (dph 2009). This data is from MassCHIP however, and may be out of date.

Data from the MassDOT crash portal shows that South Hadley had an average of 82 injury crashes per year, and .67 fatal injuries per year.

Motor Vehicle Injuries and Fatalities in South Hadley (2012-2014)		
	Non-Fatal Injury	Fatal Injury
2012	93	1
2013	68	0
2014	86	1
Total	**247**	**2**
Average	**82.33**	**0.67**

Table 11: Motor Vehicle Injuries and Fatalities in South Hadley (2012-2014)

The location of crashes mapped by the MassDOT's crash portal is below.

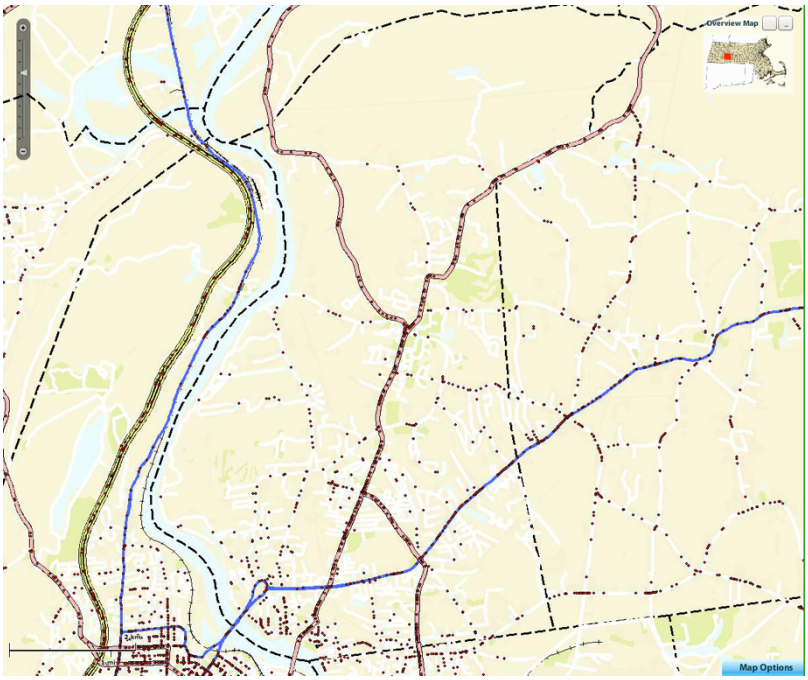


Table 12: Motor vehicle crash locations (2012-2014)

The vast majority of traffic collissions occur on major roads in South Hadley, especially Route 116, Route 33, and Route 202. This is likely because the roads handle the vast majority of traffic in South Hadley.

Cost of Motor Vehicle Crashes

We estimated the annual cost of moter vehicle crashes in South Hadley using a CDC tool called WISQARS. The latest year that WISQARS has cost of injury data for is 2013. We entered data for South Hadley crashes from 2012 and 2013 into WISQARS (data source: MassDOT crash portal). WISQARS collects data on three levels of injury: Emergency Department treated and released, Hospitalization, Fatal Injury. MassDOT crash data only provides whether a crash resulted in "non-fatal injury" or "fatal injury." For data entry into WISQARS, we assumed that all crashes coded "non-fatal injury" by MassDOT resulted in an Emergency Department visit. This may result in either an over-estimation of costs (if injuries did not require any hospital attention), or an overestimation (if injuries required hospitalization).

WISQARS Results

Nonfatal Emergency Department Treated and Released Injuries, Both Sexes, All Ages , United States, 2012 – 2013. Costs Expressed in 2013 U.S. Prices

Estimated cost of Non-Fatal Motor Vehicle Injuries in South Hadley (all non-fatal injuries were assumed to result in ED Visits)				
Year	Mechanism			
2012	Motor Vehicle Occupant	Number of ED Visits	--	92
		Medical Cost	Total	$313,000
		Work Loss Cost	Total	$384,000
		Combined Cost	Total	$696,000
	Pedal Cyclist	Number of ED Visits	--	1
		Medical Cost	Total	$3,000
		Work Loss Cost	Total	$4,000
		Combined Cost	Total	$8,000
	Pedestrian	Number of ED Visits	--	0
		Medical Cost	Total	$000

Estimated cost of Non-Fatal Motor Vehicle Injuries in South Hadley (all non-fatal injuries were assumed to result in ED Visits)				
		Work Loss Cost	Total	$000
		Combined Cost	Total	$000
	Total	**Number of ED Visits**	**--**	**93**
		Medical Cost	**Total**	**$316,000**
		Work Loss Cost	**Total**	**$388,000**
		Combined Cost	**Total**	**$704,000**
2013	Motor Vehicle Occupant	Number of ED Visits	--	64
		Medical Cost	Total	$217,000
		Work Loss Cost	Total	$267,000
		Combined Cost	Total	$484,000
	Pedal Cyclist	Number of ED Visits	--	3
		Medical Cost	Total	$9,000
		Work Loss Cost	Total	$13,000
		Combined Cost	Total	$23,000
	Pedestrian	Number of ED Visits	--	1
		Medical Cost	Total	$3,000
		Work Loss Cost	Total	$3,000
		Combined Cost	Total	$7,000
	Total	**Number of ED Visits**	**--**	**68**
		Medical Cost	**Total**	**$230,000**

Estimated cost of Non-Fatal Motor Vehicle Injuries in South Hadley (all non-fatal injuries were assumed to result in ED Visits)				
		Work Loss Cost	Total	$284,000
		Combined Cost	Total	$514,000

Table 13: Cost of non-fatal crashes, 2012-2013

The average annual cost of motor vehicle crashes resulting in non-fatal injuries in South Hadley is $609,000

Estimated cost of Fatal Motor Vehicle Injuries in South Hadley, 2012 (cost expressed as 2013 U.S. prices			
Year	Population	Deaths	1
2012	Motor Vehicle Occupants	Medical Cost	$7,000
		Work Loss Cost	$1,171,000
		Combined Cost	$1,179,000

Table 14: Cost of motor vehicle crash fatalities

For the three years of data that we collected, 2012-2014, there was an average of .66 Fatal Crashes per year (1 fatal crash each year for 2 out of 3 years). Based on that rate, the average annual cost of fatal crashes in South Hadley is: $778,140

The average annual cost for motor vehicle crashes resulting in injury or fatality in South Hadley is $1,387,140

Determinant 3: Greenness/Trees

Literature Review

There is significant evidence that the vegetation (especially physical activity in the presence of vegetation) has positive health impacts, including increases in physical activity, decreased cardiovascular disease, increased feelings of well-being, improved attention, decreased stress and anxiety (James et al. 2015). Recent studies have found that green spaces, such as parks, parklets, trails, and other open spaces, and vegetation, including street trees, improve individual health and the community-social environment (Weich et al. 2002; James et al. 2015). Access to parks, open space, and greenery may protect against poor mental health outcomes (Parra et al. 2010; Sugiyama et al. 2008) by encouraging more socializing and thus fostering greater social support and encouraging more socializing, particularly among women (Fan, Das, and Chen 2011; Leventhal and Brooks-Gunn 2003; Truong and Ma 2006; Maas et al. 2006). Access to green space in particular may also provide opportunities for physical activity or provide members of a community with sanctuary from stress (Stigsdotter et al. 2010; van den Berg et al. 2010; Maas et al. 2009). Communities with greater levels of social cohesion have better health outcomes than those with low levels. Providing a community recreation spot that promotes social interaction could reduce social isolation, which causes greater stress levels and other negative health impacts (Berkman and Kawachi 2000; Kawachi and Kennedy 1997)

Further research suggests that the presence of trees themselves, in addition to other vegetation, may also promote community health. Trees and other vegetation remove air pollutants and promote cleaner and more breathable air (Jim and Chen 2008). Trees have significant environmental benefits such as "carbon sequestration, air quality improvement, storm water attenuation, and energy conservation (Roy, Byrne, and Pickering 2012)." By providing shade for streets and buildings, trees reduce the presence of heat islands, UV exposure and skin cancer risk (Grant, Heisler, and Gao 2002; Stanton et al. 2004). Reduced temperatures provided by tree cover provide both actual and perceived thermal comfort for people—both in immediate proximity and in areas downwind (Klemm et al. 2015; Klemm et al. 2013). Finally, trees more so than bushes or shrubs may also play an important role in promoting positive mental health outcomes and positive social behavior (Taylor, Kuo, and Sullivan 2001) and have even been linked to reductions in crime (Kuo and Sullivan 2001)— a study of Baltimore City and County, MD found that "a 10% increase in tree canopy was associated with a roughly 12% decrease in crime…[and that] the magnitude was 40% greater for public than for private land (Troy, Grove, and O'Neil-Dunne 2012)."

The presence of greenspace and trees may be linked to increased walking. A study of school children in London, Ontario found that likelihood of active travel to school by children increased the more street trees there were along the route (Larsen et al. 2009). While analysis of a cohort study in Paris found that green spaces and quality open spaces were associated with higher levels of recreational walking (Chaix et al. 2014).

Finally, a study of the impacts of stormwater infiltration through green infrastructure, found that new installation of green infrastructure was associated with lower rates of narcotics possession (18%-27%

less), narcotics manufacture (15-21%) and burglaries (5-6%) up to ½ mile away from the installation. The study controlled for a variety of neighborhood and demographic characteristics. (M. C. Kondo et al. 2015).

Table 8: Open Spaces / Parks / Trails Summary Scores						
Built Environment Attribute	Physical Health	Mental Health	Social Benefits	Environmental Sustainability	Safety / Injury Prevention	Economic Benefits
Presence, proximity	54+ 3.5(0)	88.5+	26.5+ 4(0)	16+ 4(0)	11+	7.5+ 4(0)
Design features	3.5+		7.5+			
Trails						11.5+
Physical activity programs/ promotion		4.5+	4+	4+	4+	
Incivilities					3.5+	
Public gardens			4.5+		4.5+	

Figure 12: Table showing range of benefits from Open Space/Parks/Trails. A + in a cell indicates positive impacts, 0 indicates nuetral impact, - indicates negative impacts (not shown here). The number next to the + or 0 indicates the strength of existing evidence. The table shows very strong evidence for benefits from the proximity of green space related to physical health, mental health and social benefits. (Note: this table also includes effects of vegetation in general) (James F. Sallis et al. 2015).

The literature on the impacts of greenness is somewhat inconsistent in its application of terms—it is difficult to discern whether positive impacts result from vegetation in general, or public open space. That said, **it is clear that greenness has substantial health benefits—particularly with regard to mental health, which appears to be a concern in South Hadley—and greenness has substantial additional social, environmental and economic benefits, all of which are also strongly related to population health.**

Baseline Conditions—Green space (Open Space, Trails, Trees)

The Comprehensive Bicycle and Pedestrian Plan survey queried respondents about use of trails in South Hadley. About 3.7% of the respondents use the trails daily, 7.6% weekly, and 18% a few times a month. Trails seem to be a valuable source of physical activity in the town, but their usage is less than might be expected:

How often do you use existing recreational trails in South Hadley?	Response Percent	Response Count
Almost every day	3.7%	19
Few times a week	7.6%	39
Few times a month	18.0%	92
Few times a year	31.8%	163
Less than once a year	38.9%	199

Table 15: Recreational trail use, survey results

We analyzed the survey's trail use responses to see if frequency of trail use was associated with proximity to green space. There was no significant correlation. This suggests that neighborhood proximity to trails does not play a major role in the rate of trail use. There also was not a significant correlation between frequency of trail use and overall time spent walking. This indicates that trail use is not a significant source of physical activity on the population level in South Hadley—though it may make a meaningful impact on the health of individuals.

Meanwhile, 61.3% of survey respondents indicated that South Hadley would be better for walking if the town made improvement for an "extended network of recreational trails." This was the most highly ranked choice for potential walking improvements in South Hadley.

Which of the following improvements would you like to see in South Hadley to make it better for walking?	Response Percent	Response Count
Extended network of recreational trails	61.3%	313
Safer, better marked shoulders on roadside where sidewalks are not available.	57.1%	292
Sidewalks on every block	50.9%	260
Sidewalks in good condition	47.9%	245
Lighting	29.4%	150

Which of the following improvements would you like to see in South Hadley to make it better for walking?	Response Percent	Response Count
Pedestrian cross walks	28.6%	146
Calming traffic to slow vehicles	22.5%	115
Clean streets	14.9%	76
Curb cuts	7.4%	38

Table 16: Desired improvements for walking, survey results

When we analyzed the survey results, there was not a significant correlation between a respondent's desire for "an extended network of trails" and their current use of recreational trails.

The mismatch between the strength of desire for more trails with their relatively low rate of use may be explained by the open-ended responses to the survey—many residents indicated that they were unaware of the town's walking trails. Increased publicity of South Hadley's existing trails may increase trail use more than expansion of the trail network. On the other hand, "network" may be the operative word in what people want. Currently South Hadley's recreation trails are largely isolated and discontinuous (with the exception of the range trails). Public input for the Bike/Ped plan indicates that residents strongly desire long distance trail connections, especially multi-use trails that connect to those in neighboring communities.

Determinant 4: Affordable Housing

Literature Review

A 2007 review of the health benefits of affordable housing reveals myriad health benefits of affordable housing (Lubell, Crain, and Cohen 2007). Families who spend greater than 30% of their gross household income on housing costs may have insufficient funds to meet other essential needs. This can have a disproportionate impact on the health of children, as children in low-income households not receiving housing subsidies are more likely to suffer from iron deficiencies, malnutrition and underdevelopment than children in similar households receiving housing assistance (Frank et al. 2006; Alan Meyers et al. 2005; A Meyers et al. 1993). Affordable housing may improve health outcomes by redirecting household financial resources for the purchase of nutritious food and for health care expenditures. By providing families with greater residential stability, affordable housing reduces frequent moves, overcrowding, eviction and foreclosure, which may reduce stress levels, depression and feelings of hopelessness (Guzman, Bhatia, and Durazo 2005; Kappel Ramji Consulting Group 2002; Bartlett 1997). Households with limited affordable housing options may live in substandard and inadequate housing which increases the risk of lead poisoning in children, asthma attacks, and injury (Jacobs et al. 2002). Poor quality or poorly maintained housing may also contain mold, dust mites, cockroaches and rodents: allergens that contribute to asthma and other respiratory illnesses (Cohn et al. 2006; P. Breysse et al. 2004). Emerging research suggests that affordable housing may help individuals living with chronic diseases such as HIV/AIDS, diabetes and hypertension better maintain their treatment regimens and achieve higher rates of medical care (Aidala et al. 2001; Kinchen and Wright 1991; National AIDS Housing Coalition 2005; Riley et al. 2005; Ledergerber et al. 1999).

By providing households with access to neighborhoods of opportunity, certain affordable housing strategies can reduce stress, increase access to amenities and generate important health benefits. Families who can only find affordable housing in very high-poverty areas may be prone to greater psychological distress and exposure to violent or traumatic events. Randomized trials have demonstrated that adults who were offered the opportunity to move to a low-poverty area experienced significant improvements in mental health at levels comparable to those achieved with "some of the most effective clinical and pharmacologic mental health interventions"(Kling, Liebman, and Katz 2007)." Girls who were offered the opportunity to move to a low-poverty area also had better mental health, showed benefits in the education domain, and engaged in fewer risk behaviors compared to children remaining in high-poverty neighborhoods (Leventhal and Dupéré 2011).

In HUD's "Moving to Opportunity" experiment, several thousand randomly selected families who lived in public housing were offered vouchers to move to better neighborhoods. Results showed significant health benefits for those who moved to better neighborhoods including a "reduction of extreme obesity and diabetes by fully 40-50% (Ludwig et al. 2013)." Recent follow up on the participants of the study showed significant economic advantages for pre-teen children who moved to low-poverty areas. Compared to control groups, they went on to earn 31 percent more per year by their mid-twenties, were more likely to attend college, were more likely to live in a better neighborhood as adults (Chetty, Hendren, and Katz 2015). Because socioeconomic characteristics are some of the most

influential determinants of health, these results indicate that enabling children to move to a better neighborhood may result in long-term health improvements—which could span generations.

Affordable housing can also help victims of domestic violence escape the physical and mental health trauma caused by abuse and avoid the health risks associated with homelessness by providing permanent or transition housing options (Moracco et al. 2004; Menard 2001; Eisenstat and Bancroft 1999).

Baseline Conditions—Housing

Data about housing conditions in South Hadley are below:

SELECTED HOUSING CHARACTERISTICS		
2010-2014 American Community Survey 5-Year Estimates		
Subject	South Hadley town, Hampshire County, Massachusetts	
	Estimate	Percent
HOUSING OCCUPANCY		
Total housing units	7,435	7,435
Occupied housing units	6,988	94.00%
Vacant housing units	447	6.00%
Homeowner vacancy rate	3	(X)
Rental vacancy rate	2.1	(X)
HOUSING TENURE		
Occupied housing units	6,988	6,988
Owner-occupied	5,154	73.80%
Renter-occupied	1,834	26.20%
UNITS IN STRUCTURE		
Total housing units	7,435	7,435
1-unit, detached	4,721	63.50%
1-unit, attached	399	5.40%
2 units	589	7.90%
3 or 4 units	504	6.80%
5 to 9 units	522	7.00%
10 to 19 units	239	3.20%
20 or more units	461	6.20%
Mobile home	0	0.00%
Boat, RV, van, etc.	0	0.00%
YEAR HOUSEHOLDER MOVED INTO UNIT		
Occupied housing units	6,988	6,988
Moved in 2010 or later	1,302	18.60%
Moved in 2000 to 2009	2,449	35.00%
Moved in 1990 to 1999	1,231	17.60%
Moved in 1980 to 1989	671	9.60%

SELECTED HOUSING CHARACTERISTICS		
2010-2014 American Community Survey 5-Year Estimates		
Subject	South Hadley town, Hampshire County, Massachusetts	
	Estimate	Percent
Moved in 1970 to 1979	778	11.10%
Moved in 1969 or earlier	557	8.00%
YEAR STRUCTURE BUILT		
Total housing units	7,435	7,435
Built 2010 or later	9	0.10%
Built 2000 to 2009	457	6.10%
Built 1990 to 1999	713	9.60%
Built 1980 to 1989	791	10.60%
Built 1970 to 1979	583	7.80%
Built 1960 to 1969	900	12.10%
Built 1950 to 1959	1,563	21.00%
Built 1940 to 1949	739	9.90%
Built 1939 or earlier	1,680	22.60%
OCCUPANTS PER ROOM		
Occupied housing units	6,988	6,988
1.00 or less	6,920	99.00%
1.01 to 1.50	57	0.80%
1.51 or more	11	0.20%
SELECTED MONTHLY OWNER COSTS AS A PERCENTAGE OF HOUSEHOLD INCOME (SMOCAPI)		
Housing units with a mortgage (excluding units where SMOCAPI cannot be computed)	3,614	3,614
Less than 20.0 percent	1,326	36.70%
20.0 to 24.9 percent	488	13.50%
25.0 to 29.9 percent	628	17.40%
30.0 to 34.9 percent	199	5.50%
35.0 percent or more	973	26.90%
Housing unit without a mortgage (excluding units where SMOCAPI cannot be computed)	1,532	1,532
Less than 10.0 percent	576	37.60%
10.0 to 14.9 percent	232	15.10%
15.0 to 19.9 percent	145	9.50%
20.0 to 24.9 percent	253	16.50%
25.0 to 29.9 percent	44	2.90%
30.0 to 34.9 percent	30	2.00%
35.0 percent or more	252	16.40%
GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME (GRAPI)		
Occupied units paying rent (excluding units where GRAPI cannot be computed)	1,697	1,697

SELECTED HOUSING CHARACTERISTICS		
2010-2014 American Community Survey 5-Year Estimates		
Subject	South Hadley town, Hampshire County, Massachusetts	
	Estimate	Percent
Less than 15.0 percent	222	13.10%
15.0 to 19.9 percent	236	13.90%
20.0 to 24.9 percent	252	14.80%
25.0 to 29.9 percent	131	7.70%
30.0 to 34.9 percent	163	9.60%
35.0 percent or more	693	40.80%
Median Sales Price (source: Warren Group)	$210,000	
Median Contract Rent	$795	

Table 17: Selected housing characteristics for South Hadley. Source ACS 2011-2014, except where noted

Vacancy and Turnover

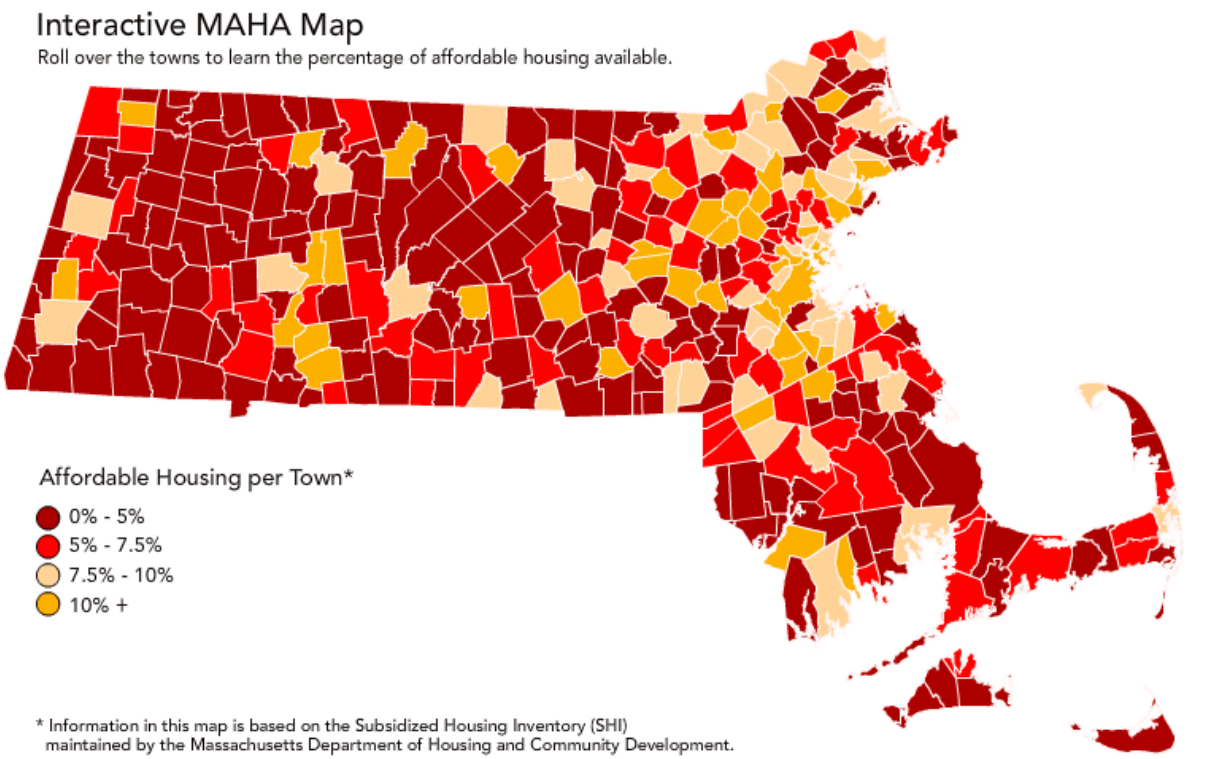
The process of finding housing and moving can be stressful. Frequent moves and housing instability are associated with a variety of negative health outcomes, including depression, and hopelessness. Children without stable housing are more likely to use the Emergency Department as a result of lack of a regular doctor. Very young children who move often have been found to have a lower weight than their peers, while adolescents who engage in illicit drug use at an early age (Maqbool, Viveiros, and Ault 2015).

South Hadley has low vacancy rates, especially for rental housing, indicating that there may be some stress for those looking for housing. About 19% of households moved since 2010. It is unknown how many of these were repeat moves. This rate is slightly higher than rates for Belchertown (15.4%) and Belchertown (15.7%), though lower than Easthampton's (20.5%).

Housing Cost

Renters make up about a quarter of the households in South Hadley. They are more often cost-burdened than homeowners, with 41% of renters paying more than 35% of their income for housing expenses, vs. 27% for homeowners with a mortgage and 16.4% for homeowners without a mortgage.

Affordable housing in South Hadley is in short supply. Only 490 units, or 6.5% of the town's housing, is listed on the state's Subsidized Housing Inventory. Comparison to other communities in the state can be seen in the map below:



The Subsidized Housing Inventory (SHI) is used to measure a community's stock of low- or moderate-income housing by the Department of Housing and Community Development. A housing development is eligible to be included if it is approved for federal or state subsidy to assist in creating housing that is affordable and the affordable housing units are subject to a long-term use restriction that restricts occupancy to households eligible for low- and moderate-income housing for a specified term. In a rental development, if at least 25% of units are affordable, then all units in the rental development are included on the SHI. For more details on Chapter 40B, Massachusetts' affordable housing law, click here.

Figure 13: Subsidized Housing Inventory by City/Town (source: http://www.massaffordablehomes.org/mahamap.html)

Lead Poisoning

Lead paint was banned in 1977 due to its health hazards. Lead Poisoning can cause permanent damage to a child's brain, kidneys, and nervous system and cause developmental issues. 73% of South Hadley's housing was built before 1979. Unless lead paint has been remediated, the occupants of any of these 5,645 housing units, are at risk for lead exposure. In 2015, 88% of the children in South Hadley between 9-47 months were screened for lead poisoning. Of the 350 children screened, 7 had blood lead levels "of concern" greater than or equal to 5 µg/dL. None had "elevated" blood lead levels greater than 10 µg/dL. No lead blood level is "safe" (dph 2016).

Overcrowding

Overcrowding in housing has been linked to a variety of health conditions including child mortality, respiratory conditions, meningococcal disease in children under 5 years old, mental health conditions,

accidents, and child maltreatment ("The Impact of Overcrowding on Health and Education : A Review of the Evidence and Literature" 2004). Various health risks have various thresholds of overcrowding which is often measured in persons per room (varying between 1 and 1.5 persons per room). Data from the ACS shows that 1% of households in South Hadley experience overcrowding (>1 person per room).

Assessment of Potential Impacts Development Standards on the Built Environment of South Hadley (as viewed through selected determinants)

South Hadley has a relatively diverse built environment for the Pioneer Valley. While the land area of the town is predominantly suburban tending toward rural, there is a wide variety of variation within the built-out portions of the town. One can find a variety of densities, land use mixes, street types, and building types. The Development Standards under consideration will impact this built environment in a variety of ways. This section traces the potential impact of the Development Standards on the built environment and subsequently on health.

Where are changes likely to occur and how many people will they impact?

Locations and Populations Impacted by Subdivision Regulations Changes

Based on a recent analysis by PVPC for housing planning, there is a handful of large parcels in South Hadley that are likely to be subdivided. See Figure 14. Proposed subdivision regulation changes will impact a small portion of the land area of South Hadley.

Parcels that are likely to be subdivided are dispersed throughout town and sit in diverse land use settings. The surrounding land use patterns are likely to have a more significant impact on the health of future residents than the specific characteristics of a subdivision itself. Furthermore, surrounding land uses, transportation features, and open space features, will constrain or intensify the health impacts of specific subdivision design characteristics, especially those related to physical activity, motor vehicle injury, emergency response, and green space. In other words, the health impacts of proposed changes to subdivision regulations will vary depending on the context of the subdivision.

Approximately 3,300 current residents of South Hadley live within walking distance (1/4 mile) of a large parcel with potential for subdivision (approximately 19% of South Hadley's population). In addition, the changes stand to influence XX potential future residents of the subdivisions themselves.

Locations and Populations Impacted by Smart Growth District Design Guidelines

The South Hadley Falls Smart Growth District is within walking distance of 1,900 current residents of South Hadley—about 10% of South Hadley's population. See Figure 15 for a map of the district.

Total Population potentially Impacted by Development Standards

For this HIA, we classify population impact size as:

- Small population: less than 5% of South Hadley's population (0-875 people).
- Medium population: 5-19% of population of South Hadley (876-3,300 people)
- Large population: 20%-49% of South Hadley's population (3,301-8,600 people).
- Very large population: 50%+ of South Hadley's population or greater (8,601 or more).

The total population potentially impacted by the Development Standards is large: 5,200 current residents of South Hadley.

Figure 14: Potential locations for large scale development in South Hadley. These locations have potential for subdivision development.

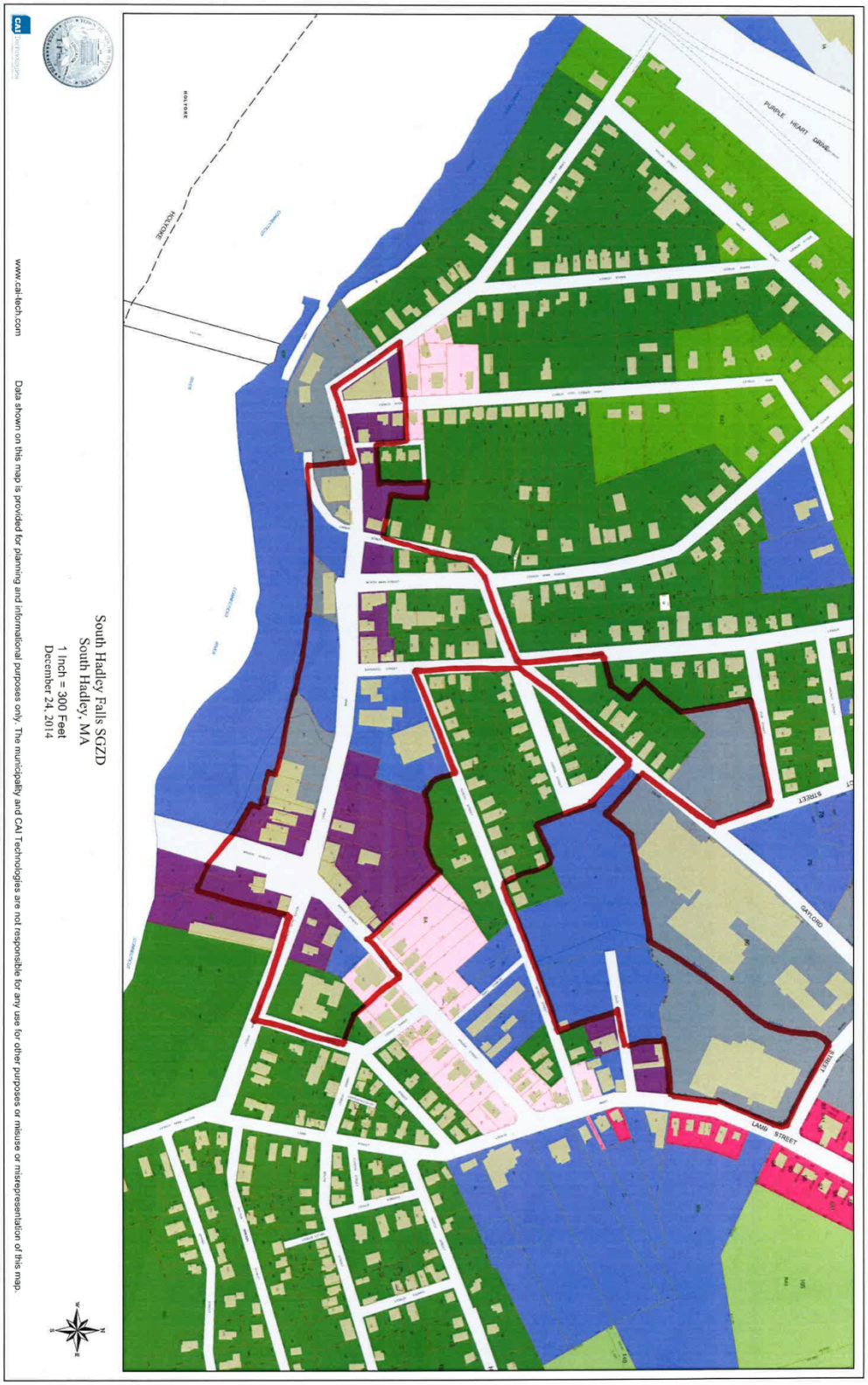


Figure 15: Map of South Hadley Falls Smart Growth District

Street Network Impacts

Existing Conditions

Development off major roads in South Hadley generally has low connectivity and is characterized by a "loops and lollypops," or "lollypops on a stick" pattern (Figure 16).

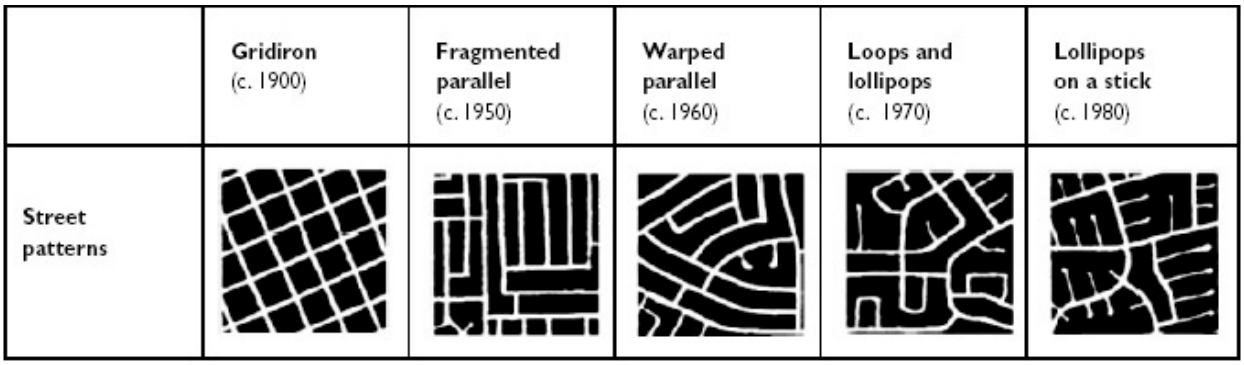


Figure 16: Evolution of street patterns since 1900

Figure 17 shows roads in South Hadley characterized by connectivity. For more information on the road network of South Hadley see the town's *Comprehensive Bicycle and Pedestrian Plan* (draft available from PVPC).

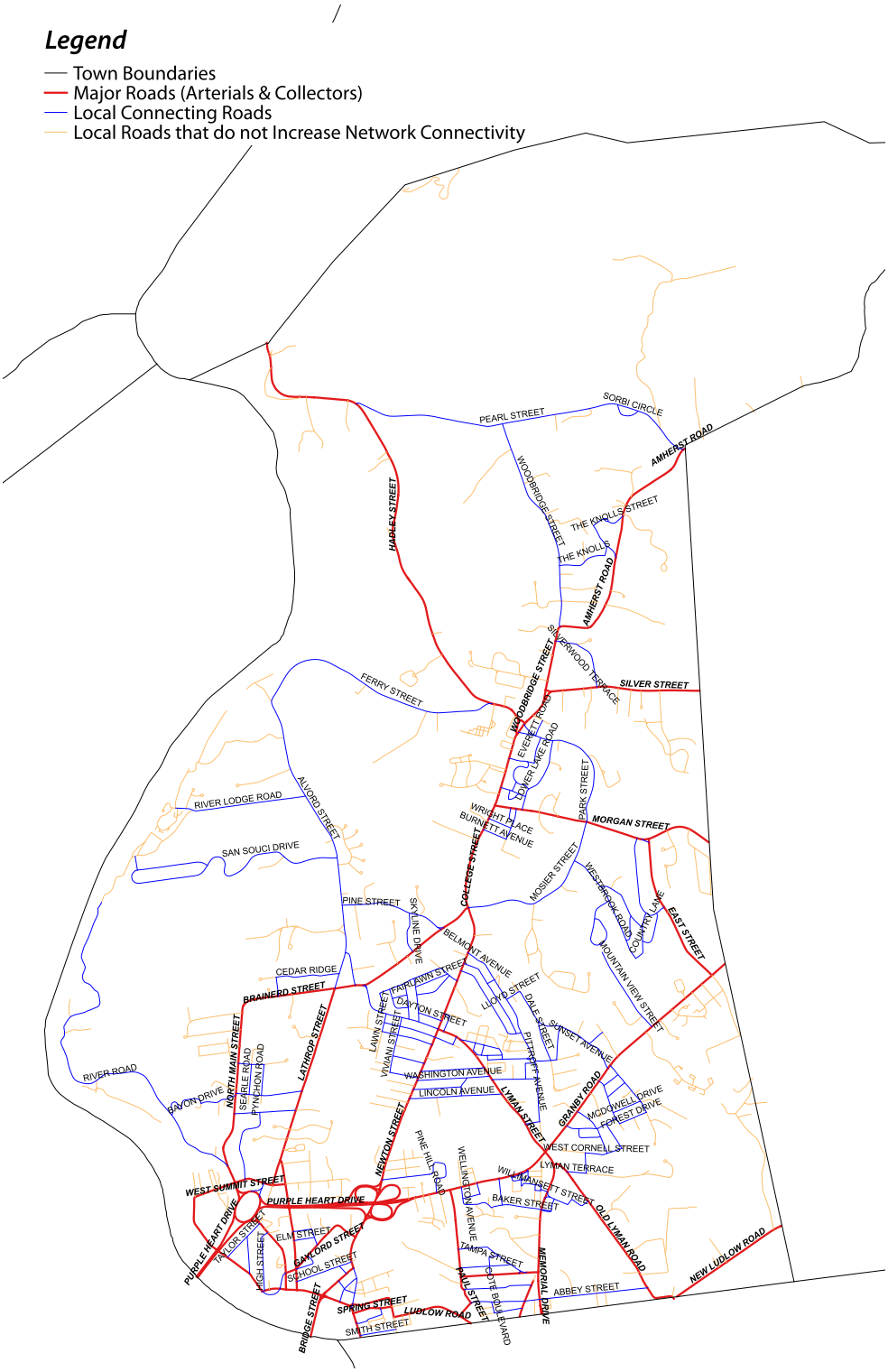


Figure 17: South Hadley's road network. Roads in red provide the major connections within the Town and to neighboring communities. The roads in blue provide some degree of connectivity between major roads. Roads that do not provide connectivity are shown in orange. These include dead ends and culs-de-sac. This map does not infer public ownership of roads shown. Map from a draft of South Hadley's "Comprehensive Bicycle and Pedestrian Plan."

How might street networks be impacted by Development Standards?

The revisions to the Subdivision Regulations under consideration propose allowing longer dead-end-streets in limited circumstances. This provision could result in a greater number of culs-de-sac and/or reduced network connectivity. The changes could also result in a greater number of houses built on culs-de-sac by increasing the housing yield of a given street segment.

Culs-de-Sac vs. Connected Street Network

The relative merits of culs-de-sac versus more interconnected street networks has received ample attention in planning, transportation and health literature. The health literature indicates that the relative impacts of culs-de-sac versus more networked streets may be nuanced and vary by population.

On the macro-scale (city or greater), there is strong evidence that compact and connected street networks are associated with increased walking, biking and transit use (Marshall, Piatkowski, and Garrick 2014), (Saelens, Sallis, and Frank 2003) as well as "reduced rates of obesity, diabetes, high blood pressure, and heart disease among residents" (Marshall, Piatkowski, and Garrick 2014). Culs-de-sac have been shown to decrease connectivity and increase walking distances to destinations. In addition there is some evidence that culs-de-sac increase vehicle miles traveled (VMT), which has health impacts via time spent driving, emissions, and links to global climate change. Given this, many health advocates and planners recommend that communities develop compact and connected street networks and by extension that they limit culs-de-sac.

The impacts for the residents of the culs-de-sac themselves, however, are more complex. We review the evidence relevant to selected pathways below.

Physical Activity

While numerous planning reports advocate for limiting culs-de-sac because they increase distances between trip origins and destinations (which has a variety of negative consequences), there is conflicting evidence for the relationship between residing on a culs-de-sac and physical activity overall. Some studies have found that culs-de-sac are associated with more walking, while others have found they are associated with less walking(Wells and Yang 2008),(Rajamani et al. 2007). Overall, residing on a cul-de-sac alone is likely not significantly associated with either an increase or a decrease in rates of walking trips (Ewing and Cervero 2010).

Likewise there is conflicting evidence about whether residing on a cul-de-sac is associated with increases or decreases in overall moderate-vigorous physical activity. It appears that some segments of the population—especially children may benefit from residing on a cul-de-sac. Van Loon et al. found that "girls living in neighbourhoods with more culs-de-sac and a higher proportion of low speed limit streets, were found to engage in more average daily MVPA than their counterparts" (van Loon et al. 2014). However, the same study found that residing on a cul-de-sac was *negatively*

associated with physical activity for boys (van Loon et al. 2014). Carver, Timpiero and Crawford (2008) found that "for adolescent boys, residing on a cul-de-sac, compared with a through road, was associated with increases in MVPA of 9 min after school, 5 min in the evenings, and 22 min on weekend days" (Carver, Timperio, and Crawford 2008).

Several studies have found residing on a cul-de-sac is associated with decreased screen time or sedentary behavior. (Veitch et al. 2011; Veitch, Salmon, and Ball 2010),(Timperio et al. 2012). Other studies have found correlations between cul-de-sac residence and increased free-play on a child's own street (Veitch, Salmon, and Ball 2010) with a greater proportion of moderate-vigorous physical activity occurring in a neighborhood setting than in other settings (including settings primarily oriented toward physical activity like parks or sporting facilities) (Kneeshaw-Price et al. 2013).

The best evidence appears to be that residing on a cul-de-sac has some benefit for some children, and null to negative impacts for people of other ages. For children, the moderating factor is likely not the built environment itself, but a parent's perception of the safety of the street. Thus younger children and girls (who are postulated to be more under the control of their parents) show stronger benefit from residing on a cul-de-sac, if their parent's strongly believe that their cul-de-sac neighborhood is safe and therefore allow their children to play freely in the neighborhood.

Assessment

Because perception of safety appears to be linked to how residing on a cul-de-sac influences physical activity, we attempted to determine whether South Hadley residents perceive culs-de-sac as safe or unsafe more or less often than residents of other street configurations. We used survey data collected for the South Hadley Ped/Bike Plan, which had over 500 respondents, to conduct our assessment. One question asked whether a respondent felt their neighborhood was "safe for walking." Using GIS, we geocoded survey responses based on the respondent's stated nearest intersection to their home. We found that there was a significant spatial correlation between neighborhood location and whether a respondent thought their neighborhood was safe for walking or not (z-score: 3.761038; p-value: 0.000169). Overall, residents who identify intersections along major roads indicate their neighborhood is unsafe more often than residents of the more grid-like residential neighborhoods. Examples of clusters of perceived unsafe neighborhood mentions include the vicinity of Newton Corner, the vicinity of Morgan Street and 116, Silver Street and 116, and 116 and Lathrop Street between 202 and Lyman. Overall, 2.3 times more residents of South Hadley said that their neighborhood was safe than said it was unsafe. When we isolated only responses from intersections that include a cul-de-sac or dead end road segment, we found that three times as many residents of culs-de-sac said their neighborhood was safe than unsafe (48 vs.16). That result is comparable to the ratio of safe-to-unsafe responses for of respondents for all local/local road intersections and. In conclusion, residents of neighborhoods off of major roads and residents of culs-de-sac are more likely to say their neighborhood is safe than residents of neighborhoods where the closest intersection includes a major road. It appears that residents of culs-de-sac and residents say their neighborhood is safe at about the same rate as residents of more grid-like local road networks.

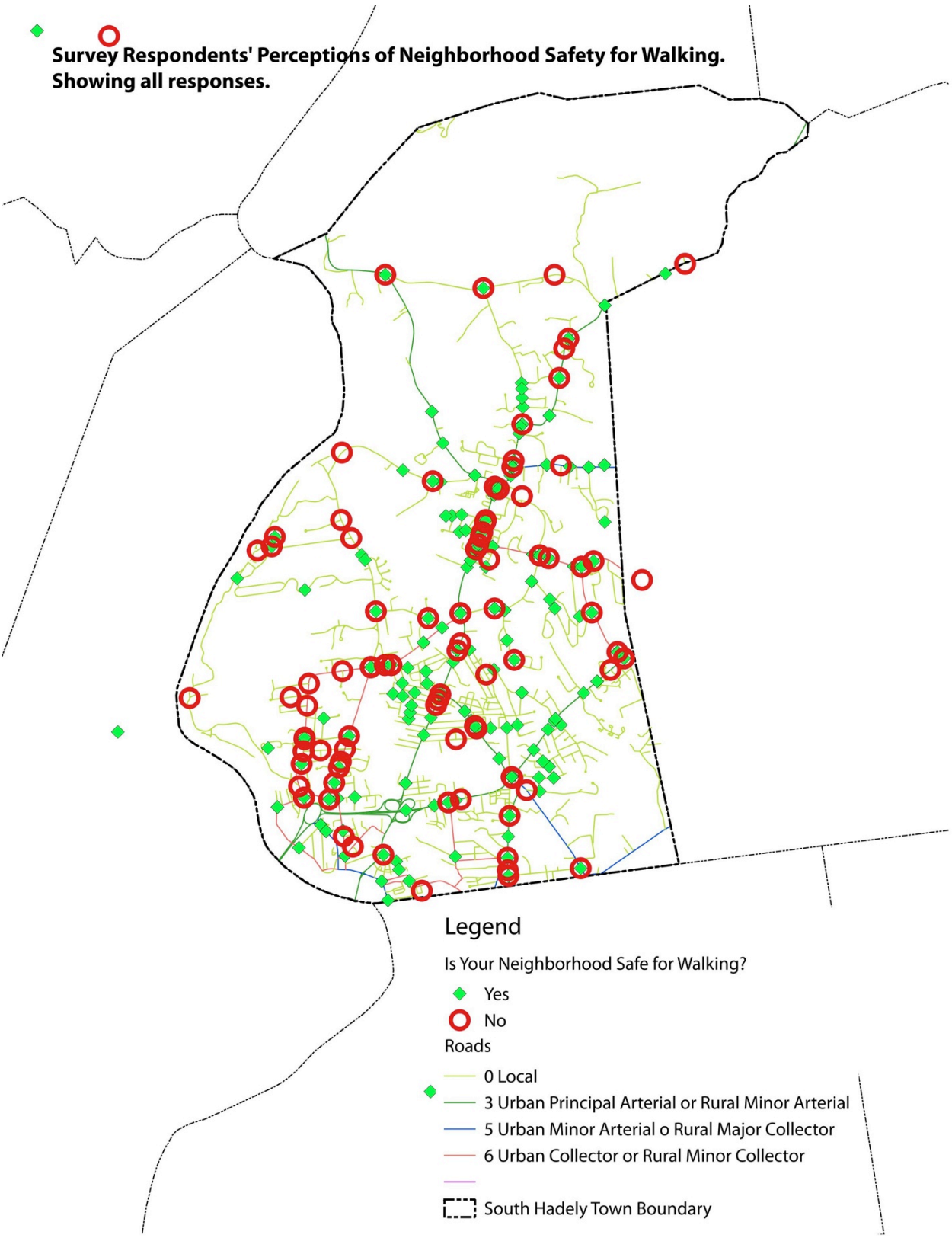


Figure 18: Perceptions of neighborhood safety for walking. Showing all respondents to survey for Comprehensive Bicycle and Pedestrian Plan

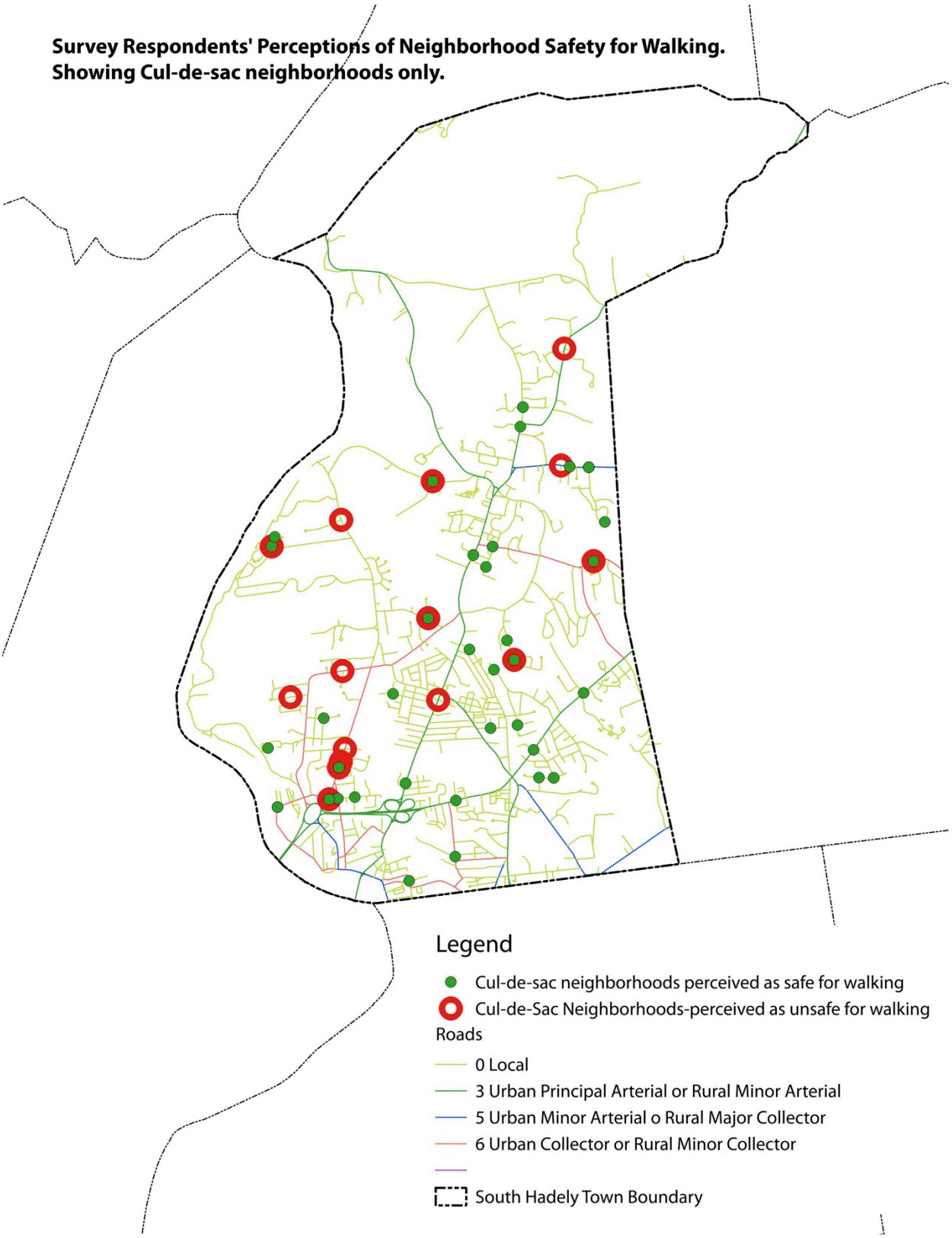


Figure 19: Perceptions of neighborhood safety for walking. Showing all respondents to survey for Comprehensive Bicycle and Pedestrian Plan

In addition, we tested whether survey respondents walked more if they resided near a cul-de-sac. There were no significant correlations between living near a cul-de-sac and self-reported time spent walking.

Findings

- Overall, connected neighborhoods can encourage increased walking when coupled with other factors including higher residential densities, mixed land use with plentiful destinations, and coherent and safe sidewalk networks. Where those underlying characteristics exist in South Hadley, developing additional compact and connected street networks would likely have more physical activity benefits than developing cul-de-sac neighborhoods. Examples of areas to prioritize for compact connected networks include South Hadley Falls, Newton Corner, off of Route 33 near Big Y, and near Mt. Holyoke College/Village Commons.
- Anecdotal evidence appears to indicate at least some residents of South Hadley prefer cul-de-sac neighborhoods. For the children of these residents, culs-de-sac may have a small positive impact on total physical activity. Culs-de-sac may be more appropriate for the western and northern parts of the town, especially if the culs-de-sac provide for pedestrian connectivity between streets and/or enable development that better avoids sensitive environmental features.
- It is unlikely that encouraging or discouraging cul-de-sac neighborhoods will have a significant impact on existing residents within walking distance of new subdivisions—unless the new subdivision directly ties into an existing compact and well connected network of local roads.
- Regulations that encourage or discourage culs-de-sac could influence the number of units that can be built on a given property. This could have some influence on local traffic volumes and have a minor influence on walkability of adjacent neighborhoods, which includes 19% of South Hadley's population. However, given that most properties with significant subdivision potential are located on roads with relatively high traffic volumes already, the additional traffic will likely not have a major impact on walkability of those streets.

Injury

We were unable to find sufficient evidence about whether culs-de-sac had an impact on traffic safety.

Some studies argue that more networked streets result in lower VMT per road segment (because traffic is more dispersed) and therefore lower exposure time. They also that more grid like streets with higher intersection density result in lower travel speeds which reduces accident severity (Marshall, Piatkowski, and Garrick 2014). A study of pedestrian-bicycle crashes in 321 census tracts in Alameda County, California found that "decrease of pedestrian-bicyclist accidents is significantly related to higher block density, higher intersection density, higher street density, and shorter mean block length" (Zhang et al. 2012).

We found one study found that found that residing on a cul-de-sac is associated with an increased chance of driveway runovers. However, the same was true for driveways that exited onto local roads (Shepherd, Austin, and Chambers 2010).

Another study found that children who reside on poorly connected streets have higher rates of injury than those who reside on well-connected streets. "The population attributable risk was 20% for street injuries potentially caused by living in an area with low connectivity."(Mecredy, Janssen, and Pickett

2012) However most of the injuries were minor and were related to bicycling (Mecredy, Janssen, and Pickett 2012).

Assessment

We conducted an analysis of injury and fatal injury crashes in South Hadley using MassDOT crash data from 2002-2014. The analysis showed a low number of crash occurrences on minor roads compared with the Town's major roads. Furthermore, from, 2002 to 2014, only four out of 81 (5%) non-fatal injuries on local roads occurred on dead end roads (one each on John Lane, Applewood Lane, Attwood Road, and Carol Ann Drive). See Figure 20. It is unclear whether this is the result of the low number of miles of dead end roads compared to through roads in the town, lower traffic volumes on dead end roads, or other street design characteristics. About 73% of injury crashes in South Hadley did not occur at an intersection, so the lack of intersections on dead end roads is not likely the most significant factor contributing to the low number of injury crashes reported. The vast majority of injury crashes in South Hadley occur on major roads (collectors, arterials) where high traffic volumes and high traffic volumes are likely the most significant contributing factors.

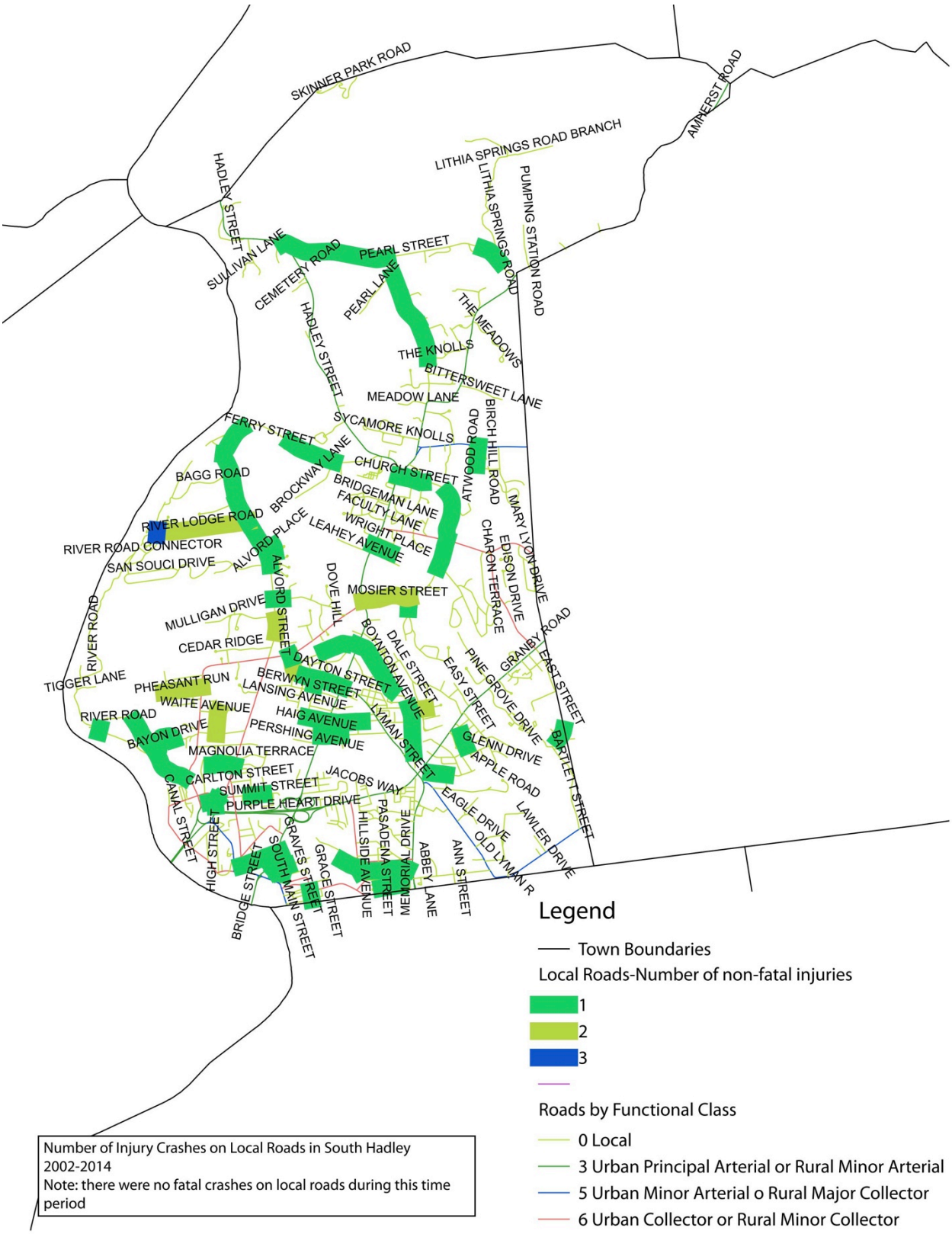


Figure 20: Crash injuries on local roads

Most local roads have had zero or one injury crashes. Several locations had 2 injury crashes, while one location had three. Locations with two or three injury-crashes warrant additional investigation. These include: River Lodge Road, and Riverboat Village Road, Mosier Street, Pheasant Run, Searle Road, and Woodlawn Street. River Lodge Road and Riverboat Village Road combined appear to have a relatively high number of injury crashes (2 and 3 respectively). Further investigation of the safety of these roads is warranted.

Findings

- Because the evidence linking culs-de-sac to injury is inconclusive, we were not able to predict any impacts related to injury.

Length of Dead-End Streets

We discussed the network connectivity impacts of allowing longer dead-end streets above. In this section we examine whether the length of a dead end road itself may have health impacts. This topic has not been studied as much some of the others explored by this HIA. There is some evidence that longer blocks provide more opportunity for drivers to increase their speed thereby increasing risk and severity of crashes (Ewing and Dumbaugh 2009). Longer block length appears to be a motor vehicle crash risk factor particularly for pedestrians and bicyclists (Zhang et al. 2012). In addition, there is anecdotal evidence that some fire departments might want to limit the length of a dead end road to no longer than their longest hose. There is also anecdotal evidence that water quality may suffer on long dead-end roads served by water without a loop connection. Richard Harris, Town Planner, reports that loop connections are routinely installed on dead end roads in South Hadley so this may be a non-issue.

Findings

- Increasing the allowed length of dead end roads may increase crash risk and severity. This is particularly problematic since dead-end roads may "invite" children to play in the street in some cases. We could not quantify the marginal increase in crash risk but expect it would be relatively small.
- If a goal of limiting the length of dead-end roads is to incentivize connected networks, alternative requirements may be more effective. Examples include setting a maximum block length (500-600ft), setting a minimum link to node ratio (greater than or equal to1.4), or a connected node ratio greater than or equal to .75.

Lane Widths

Appropriate motor vehicle lane width has been a hotly debated topic in transportation and planning literature for decades. There is not conclusive evidence linking lane width to increases or decreases in overall rates of motor vehicle injury. It appears that appropriate lane widths are context sensitive and dependent largely on the desired design speed of the road. On the one hand, there is some evidence

that narrower lanes are associated with increased crash frequency (particularly run-off-road crashes) ("Safety Effects of Road Geometry and Roadside Features on Low-Volume Roads in Oregon - Transport Research International Documentation - TRID" 2016). A Federal Highway Administration highway capacity manual states that crash risk for 9 foot lanes is 1.05 times that of 12 foot lanes at a average daily traffic volume less than 500 cars per day. That crash risk disparity rises to 1.5 times at 2000 vehicles per day ("Mitigation Strategies For Design Exceptions - Safety | Federal Highway Administration" 2016). On the other hand, there appears to be some consensus that narrower lanes result in slower speeds—especially if the roadside environment signals that slow speeds are appropriate, for example by having street trees (Macdonald, Sanders, and Supawanich 2008). The same Federal Highway Administration highway capacity manual just cited shows that 9 to 10 foot lanes with 0-2 foot shoulders result in a 6 mph speed reduction when compared to 12 foot lanes with 6 foot or greater lanes. National Association of City Transportation Officials (NACTO) Urban Street Design Guide includes the following graph showing the relationship between lane width and speed:

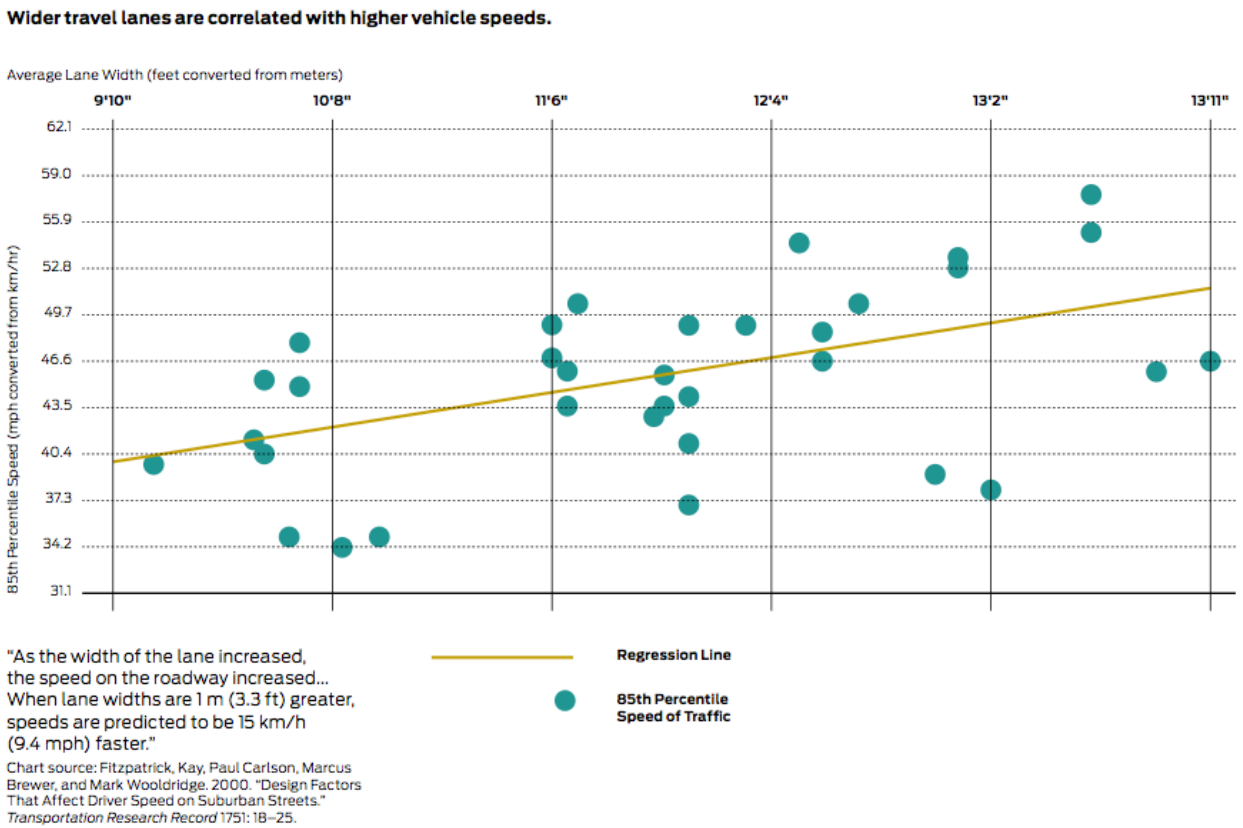


Figure 21: Relationship between travel lane width and vehicle speed. Source: NACTO Urban Street Design Guide

The association between speed and lane width is important because higher vehicle speed is strongly associated with accident severity. In addition, "higher vehicle speeds are strongly associated with a greater likelihood of crashes involving pedestrians as well as more serious pedestrian injuries" (Retting, Ferguson, and McCartt 2003). An oft-cited rule of thumb is "Nilsson's power functions": a 1% increase in speed results approximately in 2% change in injury crash rate, 3% change in severe crash rate, and 4% change in fatal crash rate (Aarts and van Schagen 2006). The traffic slowing effects of

narrow lanes are supported by other design elements such as street trees (Ewing and Dumbaugh 2009) . So if a nine-foot lane on a local low volume residential road reduces traffic speed from 46 mph to 40 mph (a 15% decline shown in graph above), it may reduce the fatal crash rate by 60%. In addition, there is supporting evidence that narrower lane widths are perceived as safer by pedestrians and so may impact physical activity rates.

Assessment

Changing the subdivision regulations to allow narrower lane widths in certain circumstances may reduce motor vehicle crash risk and injury severity, in particular for pedestrians and bicyclists. In addition, narrower lanes may increase the perception of safety by pedestrians and bicyclists and thereby support active transportation. Because the number of injury crashes occurring on local roads is relatively small, the overall health impact will also be small. However, each fatal or serious injury crash averted has significant impacts on individual, families and the community.

On the other hand, recent work on the Comprehensive Pedestrian and Bicycle plan showed that wider streets may be preferable in some circumstances if they provide for the opportunity for bike lanes on low volume, low speed streets that make key connections. For example, San Souci Drive, with a surface width of 24', was identified as a particularly valuable bicycle connection. There is an inherent tension between wider streets that provide accommodations for bicyclists with the possibility that those wider streets may induce faster speeds and undercut bike-friendliness. Regularly repainting striped lanes, establishing narrow vehicle lane, and providing buffering for bicycle lanes may help address this conflict. On the other hand, in new construction, there may be an alternative to reduce vehicle travel lanes and use that width elsewhere in the right of way for a separated bicycle lane—which would be strongly preferred by most riders. For example, reducing paved width from 24' to 18' would eliminate 6' of pavement. If this 6' of pavement was added to a 4' sidewalk, the resulting path would meet the minimum width for a bi-directional multi-use path.

There is some concern that narrowing allowed lane widths for subdivisions may impact access—particularly for emergency responders in winter when snow banks will further narrow lane widths. Emergency response is extremely important in acute situations. A common standard for emergency responders sets a response time goal of 5 minutes for Emergency Medical Services incidents, and five minutes 20 seconds for a fire suppression incident (Snyder et al. 2013). These goals clearly show that street design must be carefully consider emergency response. On the other hand, there is an order of magnitude difference between the number of fire-related fatalities and the number of traffic-related fatalities in a given year. And several orders of magnitude difference between fire-related injuries and traffic-related injuries. Acknowledging of course that emergency response plays a crucial role in the health outcome of traffic-related injuries and fatalities.

Injuries and Fatalities from Fires and Traffic Nationwide		
	Fire Related	Traffic-Related
Fatalities	2,640	32,885
Injuries	13,350	2,239,000

Table 18: Comparison of fire-related and traffic-related injuries and fatalities. Based on a table in Snyder et al. 2013.

We evaluated existing street widths in South Hadley to see how the proposed lane widths would compare to existing conditions in South Hadley. This analysis could be used in future conversations with emergency responders and the DPW to determine whether existing streets with lane widths similar to those proposed present significant problems with access in the winter. Motor vehicle lane widths in South Hadley are diverse, ranging from very narrow streets less than 15′ (e.g. River Road, River Lodge Road) to 40′ surface width (Lawler Drive in the industrial area). Of the road segments for which there is width data in the MassDOT GIS Roads layer, about ¼ are 21′ or less, about a ¼ are 21′-24′, about a ¼ are 24′-27′, and about a ¼ are greater than 27′.

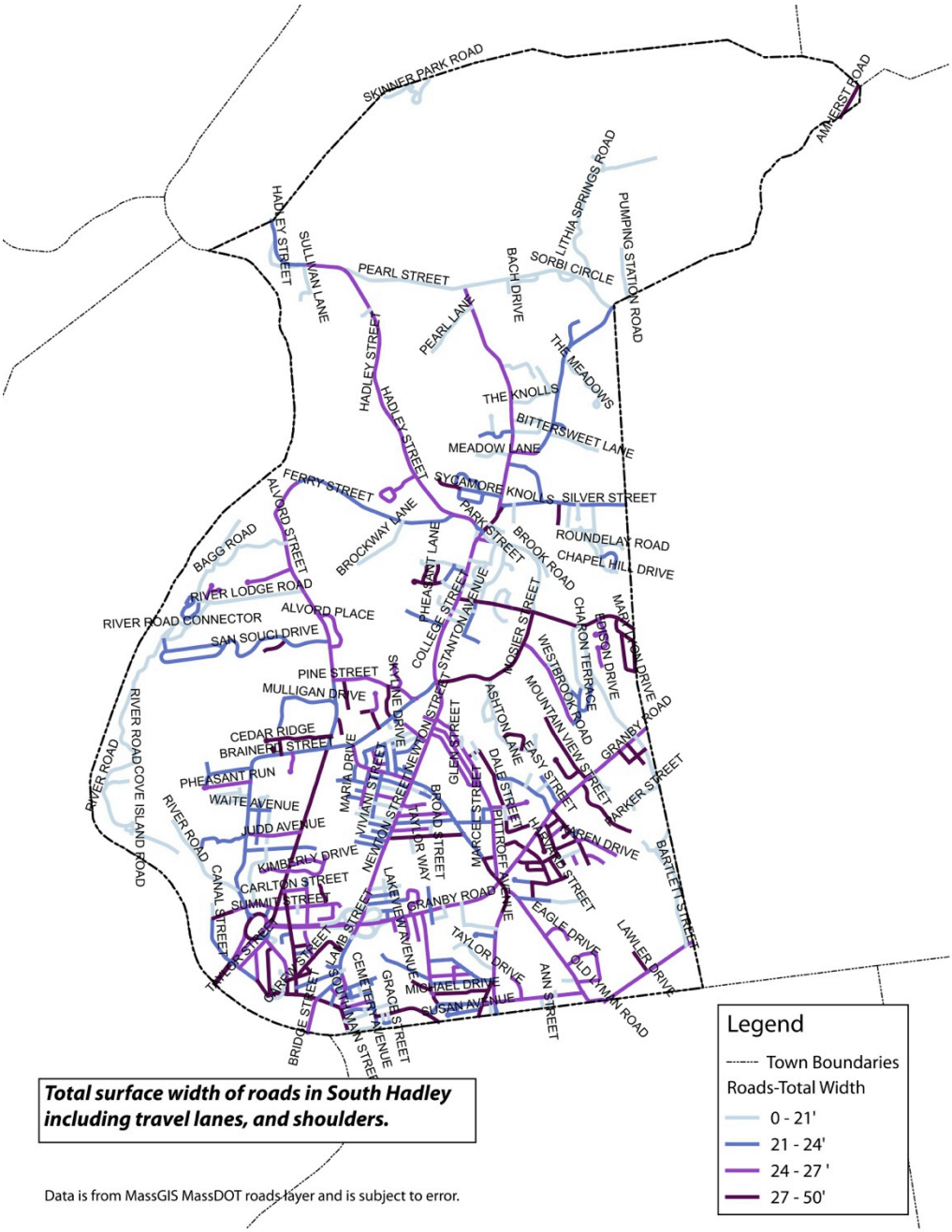


Figure : Surface Width of Roads in South Hadley

It appears that lane widths similar to those proposed are common in South Hadley. The potential combined impacts of longer dead-end roads with narrower lanes, however, should be examined more closely.

Findings

- Narrower lane widths will likely result in a slight decrease in motor vehicle accident severity particularly if narrow lanes are supported by other design features to slow traffic including street trees, and traffic calming measures such as chicanes. Narrower lane widths may result in a very slight increase in physical activity due to walking and bicycling.
- The impact of narrow lanes on emergency response and general access in winter should be further examined. A first step would be to evaluate the emergency response times for roads in South Hadley with similar widths to what is being proposed.
- Requiring connected networks with multiple access paths could improve emergency response and offset potential negative impacts of narrow lanes. In general, response times are faster in locations with interconnected street networks and emergency responders prefer interconnected streets (Snyder et al. 2013; Lesnar 2016).

Sidewalks

There is substantial evidence that sidewalks are linked with increased walking especially active transportation (Sallis, Cain, et al. 2015; Boarnet et al. 2011). Length of sidewalk in a neighborhood is associated with modest increases in time spent walking for transportation (McCormack et al. 2012). Given the choice, most pedestrians choose to use sidewalks ("Benefits of Street-Scale Features for Walking and Biking" 2016). Sidewalks are also linked with decreased rate of injury from motor vehicle crashes. Residents of communities without sidewalks often voice dissatisfaction with the lack of sidewalks ("Sidewalks Promote Walking | Bureau of Transportation Statistics" 2016). Sidewalks signal that a neighborhood welcomes walking. The influence on perception of walkability may have more influence on walking rates than the functional improvement provided by the infrastructure itself. Buffer strips between sidewalks and the street are also important. A recent study found they were significantly related to active transportation (Sallis, Cain, et al. 2015).

Assessment

Changes under consideration for the subdivision regulations would require sidewalks on both sides of the street unless waived by the Planning Board. This increases the likelihood that sidewalks would be built on both sides over the current language which sets a default requirement for sidewalks on one side of the street and requires the Planning Board to request sidewalks on both sides.

The changes to the subdivision regulations under consideration also establishes a fee-in-lieu mechanism; an applicant for a subdivision can pay into a "Sidewalk/Bikeway Construction Fund," in lieu of constructing sidewalks. Given South Hadley's numerous sidewalk gaps, and the complete lack of sidewalks on relatively major streets, use of in lieu payments may have more positive health impact

than constructing sidewalks on low volume residential streets—particularly if those streets are dead ends serving only a handful of houses. That said, one could make a strong case that, "all streets should have sidewalks," and advocate for increasing the use of the town's general fund or chapter 90 funds to pay for sidewalks throughout town, rather than saddling future occupants of subdivisions with the cost of deferred sidewalk investments at the expense of their own health (due to potential deceased walking and or increased or injury from traffic on streets without sidewalks).

Meanwhile, the language under consideration, allows the applicant to construct a "pedestrian/bikeway path" in lieu of constructing sidewalks. The "pedestrian/bikeway path" would need to be in accordance with the Town's Complete Streets Policy and the Comprehensive Bicycle and Pedestrian Plan. There is a striking overlap between locations for potential subdivisions and location prioritized for pedestrian and bike paths by the Bicycle and Pedestrian Plan. See Figure 22 and Figure 14. Parcels in the vicinity of The Ledges Golf Club and Bachelor Brook Conservation Area are particularly ripe for pedestrian/bikeway paths that could connect to very desirable loops or long distance trails.

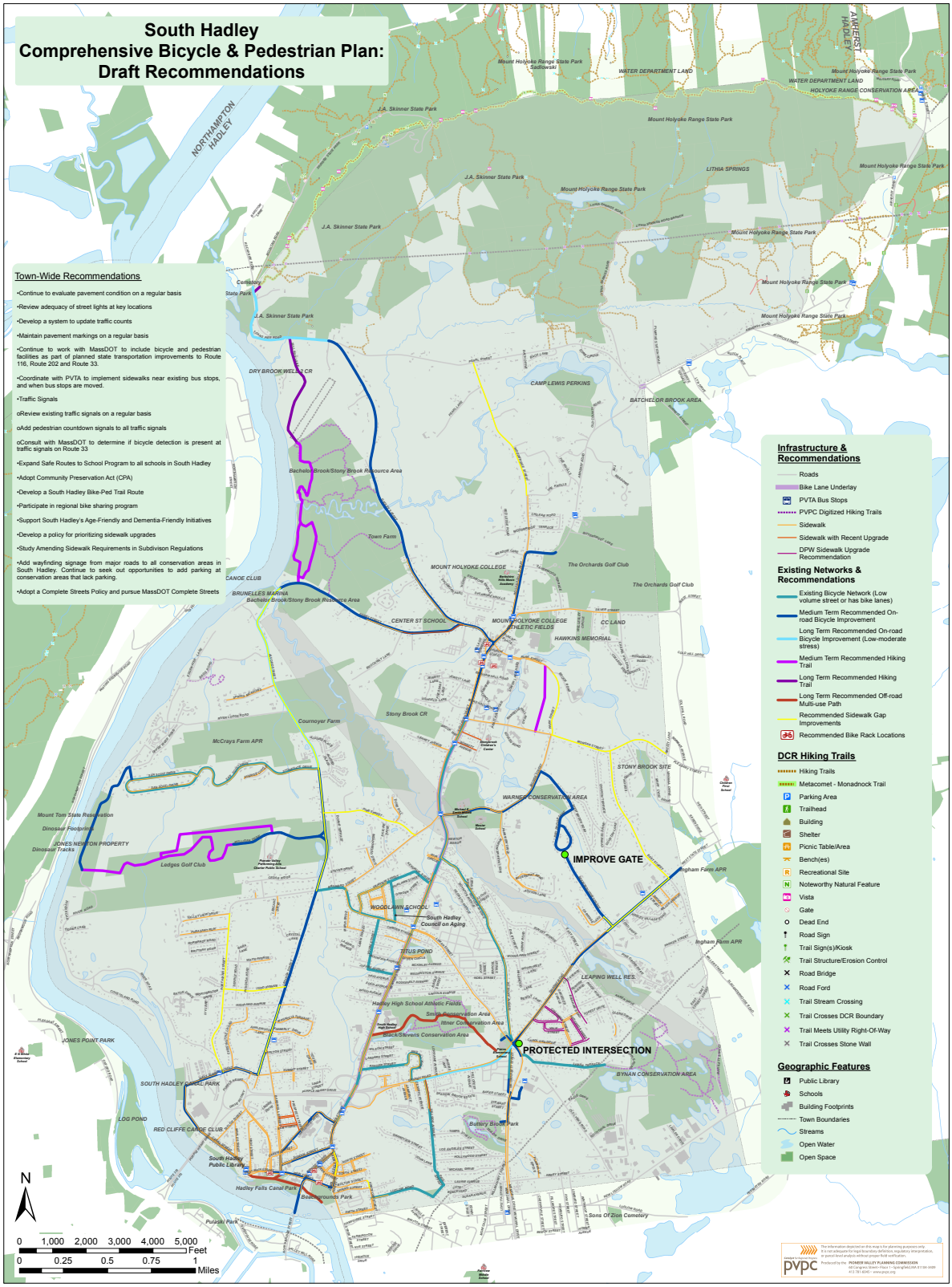


Figure 22: Draft Recommendations Map, Comprehensive Bicycle and Pedestrian Plan

Findings

- The revisions to the subdivision regulations' sidewalk requirements that are under consideration will have a positive impact on active transportation in South Hadley, in that they will result in additional miles of sidewalk or bikeway constructed. They will also have a positive impact on safety from traffic.
- The proposed provisions create multiple options for what kind of infrastructure (sidewalk or pedestrian/bikeway paths) will be built, and where the infrastructure will be constructed. This flexibility makes it difficult to predict who will be impacted and in what ways. On the one hand, the flexibility makes it possible for the Town to address their greatest needs for walkability and bikeability improvements. On the other hand, the proposed in-lieu mechanisms will leave future "sending" neighborhoods without adequate pedestrian and bicycle infrastructure for the foreseeable future.
- The built environment context for use of in-lieu mechanisms will shape their health impact. Sidewalks and multi-use paths may be have more positive health impact in neighborhoods with the pre-conditions for walkability—including, high residential densities, high network connectivity and mixed land uses—than in neighborhoods that are likely never going to reach the threshold for active transportation. In addition, positive health impacts from sidewalk/path construction will be greater in neighborhoods where there is a pent up desire for walking or bicycling that is constrained by the perception or reality that the street environment is not safe due to traffic.
- In-lieu mechanisms could exasperate disparities in health if future subdivisions serving vulnerable populations opt for one of the in-lieu mechanisms and those funds are used to construct infrastructure in a higher-status neighborhood. Use of in-lieu mechanisms should be carefully evaluated when it is proposed for multi-family or affordable housing developments.
- While it is difficult to predict who will live in a new neighborhood, self-selection may provide some indication of the utility of sidewalks in a future neighborhood. If a future resident of a neighborhood freely chooses a low-walkability neighborhood, then we can expect that they will not walk (and therefore benefit from presence of sidewalks) as much as a person who freely chooses a high-walkability neighborhood. One must be conscious of economic disparities that results in "freedom to choose housing" when making this evaluation. In general, more wealthy individuals will have more freedom to choose housing that suits their desires and so self-selection of neighborhood type will be more evident for wealthy people than poorer people. This indicates that the most appropriate locations to use the in-lieu provisions are high cost, large lot subdivisions far from any destinations. Sidewalks and paths should be "sent" from this type of neighborhood to locations with precursors for walkability combined with high traffic volumes and speeds and a more vulnerable population whose health stands to benefit more from the investment in infrastructure.
- For sending neighborhoods, the negative impacts of in-lieu mechanisms could be mitigated by designing streets that aggressively calm traffic—for example, by using shared street or "woonerf" designs—or by providing alternative infrastructure for walking and biking—for example, recreational trails.

Streetscale Design and Urban Form

Study of the relationship of streetscale design and urban form and health is a rapidly growing field. Many recent studies use walk audit instruments to document local street conditions and then link them to measures of physical activity or other health outcomes. Because this method requires time-consuming data collection, the number of completed studies is limited but their results are compelling. Street-scale pedestrian design including the presence of amenities such as street furniture, lighting and shading is moderately related to general walking and improvements in health (Giles-Corti et al. 2013; McCormack et al. 2013). A recent study of streetscale features of the built environment found that, "the implication is that making one improvement to streetscape environments would probably have a small effect, but making several improvements could have cumulatively large effects on walking and bicycling for transportation." Overall, aesthetics have been linked with recreational walking, while functional infrastructure (sidewalks, crosswalks, etc.) are more strongly associated with transportation walking (Boarnet et al. 2011).

Street enclosure has been associated with safety and perceived safety. A recent study of 240,000 crashes in New York City "indicated that crashes on smaller, more enclosed streetscapes were less likely to result in injury or death compared with those on larger, more open streetscapes. These results point to in-fill development and street tree planting as safety countermeasures that are consistent with additional livability goals such as walkability, high-quality design of the public realm, and provision of natural amenities" (Harvey and Aultman-Hall 2015). Another study found that trees positively affect perceived safety more than buildings-related features, and that "tall, narrow streetscapes were perceived as safer than short, wide streetscapes" (Harvey et al. 2015).

Planting strips are associated with walking activity and pedestrian satisfaction (Choi et al. 2015; Sallis, Cain, et al. 2015). Opportunities to rest (benches) are associated with increased physical activity in older adults (Moran et al. 2014).

Assessment

The design guidelines for South Hadley Falls make numerous recommendations for streetscale design and urban form. Without concrete development proposals on the table it is difficult to predict how the guidelines will play out in practice. However, the general direction of the guidelines appears to be in keeping with the emerging literature on positive health impacts of micro-scale streetscape features.

Findings

- South Hadley Falls Design Guidelines will likely have a positive impact on physical activity, perception of safety from crime, social cohesion, and possible reductions in motor vehicle crash injuries.

Density

Density is associated with active transportation, with greater residential density associated with higher rates of walking. Recent studies show that this association crosses age groups including children. "Greater residential density was associated with more activity among children and may emerge as an

important factor in urban locales and a potential predictor of youth activity associated with neighbourhood play with friends" (McGrath, Hopkins, and Hinckson 2015). There is no clear threshold at which density begins to increase walking. It is possible, that there is a certain minimum density that must be achieved before impacts are seen and this may be connected to other aspects of the built environment that are also associated with active transportation, for example, transit supportive densities, or densities that support walkable neighborhood retail. In addition, residential density may be associated with safety from traffic, in that residents of higher density locations tend to drive fewer miles. That decreases exposure to motor vehicle risk. Residential density can be related to affordable (lower cost) housing when higher residential densities allow more housing units to share the cost-burden of development infrastructure, including roads, sidewalks, and utilities. In addition, there is likely a very small impact on housing property tax rates for the same reason—fewer linear feet of town infrastructure to maintain per housing unit.

Assessment

Lot sizes in South Hadley range from small lots of approximately 6,000 square feet to large lots over 200 acres. As shown in Parcels in South Hadley are divided equally the following size ranges:

- less than .23 acres
- .23-and .34 acres
- .34-.52 acres
- .52-.93 acres
- .93 or greater

The parcel map below (Figure 23) clearly shows that smaller parcels—a proxy for density—are clustered in the southern half of the Town, especially in South Hadley Falls, and the area around the intersection of Route 116 and Route 33 (Newton Corner). While ½ of the Towns parcels are less than ½ an acre and 4/5ths are less than 1 acre, the vast majority of the land area of the Town sits in parcels that are greater than 1 acre. In other words a relatively small number of parcels make up the majority of the town's land area. Much of this land area is conserved or constrained by environmental features including wetlands, and steep slopes.

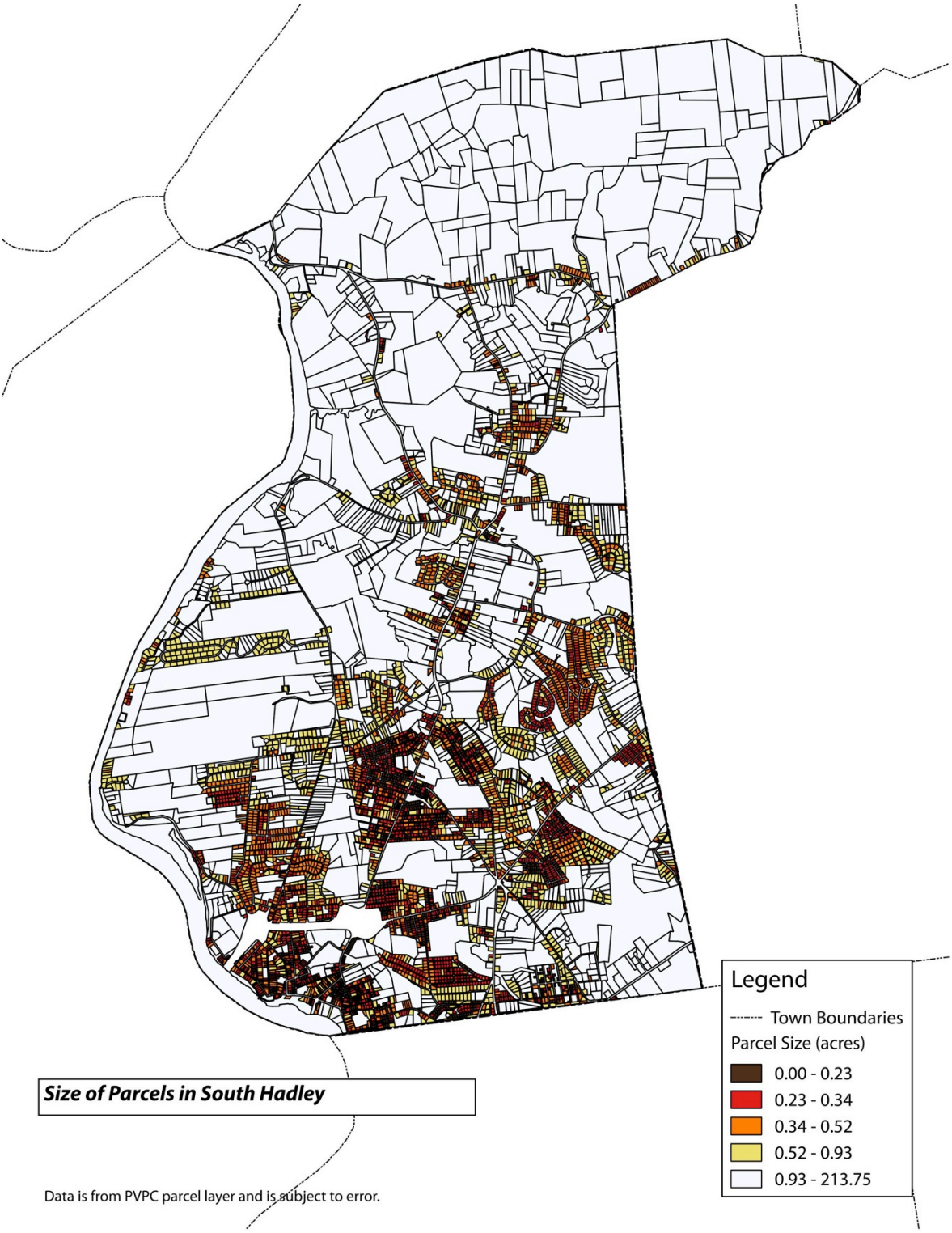


Figure 23: Parcel Sizes in South Hadley. There are about the same number of parcels in each of the size ranges shown in the map key. 4/5 of the parcels in Town are less than 1 acre, while the majority of the landmass is occupied by a small number of very large parcels.

Residential density in South Hadley will be indirectly influenced by changes to subdivision regulations by influencing the relative desirability of various development types/methods—including, conventional subdivision, flexible development via special permit, and multi-family via special permit, which includes detached dwellings.[10] Density requirements vary depending on these development types/methods. It is not possible to predict how development standards will impact residential density.

Even if residential density increases in South Hadley as a result of subdivision changes, the location of the subdivision, the adjacent mix of land uses, and its street network and sidewalk characteristics will likely play a significant role in whether the increased density supports increased walking. Increased density in the vicinity of Newton Corner and the Town Center will likely have more positive impact on walking rates than increased density west of Alvord Street or near Bachelor Brook.

The South Hadley Smart Growth District allows greater residential density. There currently are 87 housing units in the district. The build-out of the district is expected to include up to 387 housing units. The zoning specifies that, the density for Multi-Family Residential shall be 20-24 units per acre, "the Single-Family Residential Density shall be a maximum of up to 8 units/acre, and Two-Family and Three-Family Residential Density shall be a maximum of up to 12 units/acre." These densities are within the range that appears to be correlated with increased rates of walking. The positive influence of residential density will be supported by the Falls' reasonably grid-like street network, its diverse mix of land uses, and its reasonably complete sidewalk network. Overall the Smart Growth District should support increased walking.

Findings

- There is insufficient evidence to predict the health impact of possible changes in residential density resulting from Subdivision Regulations.
- The South Hadley Falls Smart Growth District will support increased residential density and should support increased rates of walking for its current and future residents.

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[10] Note: the Town's zoning contains contradictory language on this topic. On the one hand, the Definitions section says: "Dwelling, Multi-Family. A dwelling containing three or more dwelling units. A single parcel containing detached or attached single-family and/or two-family, dwellings is not a Multi-family Dwelling. (See Section 7F.)." On the other hand, the use table for residential uses, has a footnote 'g' attached to Multi-family dwellings, which reads "Includes detached dwellings where the underlying and/or adjacent land is owned in common by an association of the dwellings' owners." Note: Section 7F is "Conversion of Single-Family to Two-Family Dwellings" and does not apply to more than one dwelling on a lot. Zoning changes which were rejected in 2013 would have created a section 7F to read, "**(F) More than One Dwelling on a Parcel**
Only as allowed by Section 5E (Use Table), a parcel may contain more than one dwelling, provided that the parcel has sufficient acreage to comply with applicable density limitations. Density of such developments shall not exceed that allowed under the Flexible Development provisions in Section 7J(7). Such a parcel may not be later subdivided unless the subdivided lots conform to the dimensional regulations in effect when the subdivision is proposed. In the Residence A-1, Residence A-2, and Agricultural districts, no parcel of any size may contain more than 4 dwelling units on it except pursuant to the Flexible Development provisions of Section 7J." It appears that the definition of Multi-family was mistakenly changed to include reference to a Section 7J that was not adopted.

Mixed Land Use

Assessment

The map below shows locations in South Hadley with some degree of mixed-land use. Areas circled in dashed red lines are ¼ mile pedestrian sheds around "destinations": commercial or public locations that could inspire someone to make a utilitarian walking trip. Some of the potential locations for subdivisions fall within pedestrian sheds of existing destinations. While others do not. In general mixed-use is concentrated in the southern half of the town, and in the town center near the intersection of Route 116 and Route 47.

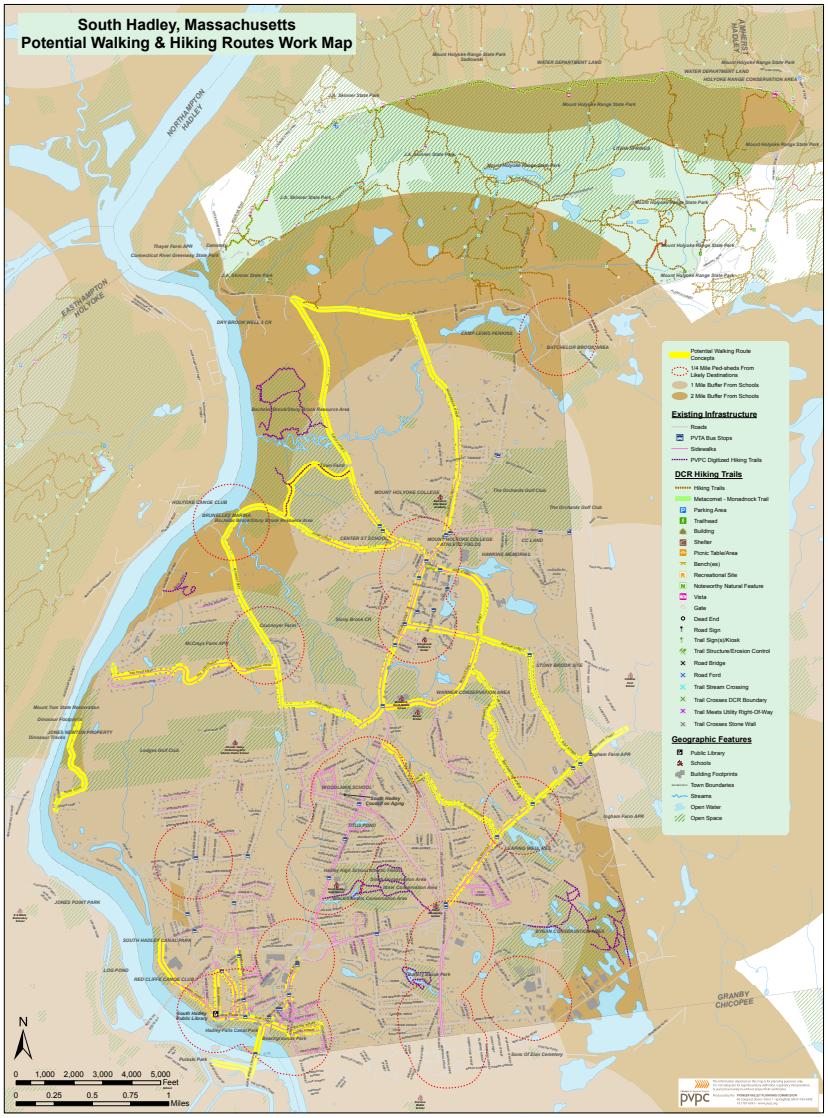

Figure 24: Destination pedestrian sheds

Findings

- Changes to the subdivision regulations that result in increased residential density, support walkability, or reduce risk of traffic injuries will likely have more positive health impact in the areas circled in red in Figure 24, than in areas outside of those circles. This rough analysis needs to be tempered, however, by an examination of population characteristics such as age, race, and income.
- The South Hadley Falls Smart Growth District falls within an existing mixed-use neighborhood and will further increase mixed-use and residential density, while improving the quality of the pedestrian realm. These features will all work together to result in significant positive health impacts of the district and its design guidelines.

Greenspace Health Impacts

See above for literature review and existing conditions

Assessment

Changes to the subdivision regulations will likely not have a significant impact on the rate of development of South Hadley—and thereby the conversion of significantly vegetated land into developed land. Increasing the allowed length of a dead-end streets may result in the removal of additional trees beyond what would occur under the existing regulations. This change will apply to limited circumstances and it is not possible to quantify its impact.

The changes to sidewalk requirements, under consideration in the subdivision regulations, could increase access to green space by substituting trail construction for sidewalk construction. However, it appears that the existing trails in South Hadley are under-utilized and there does not seem to be compelling evidence that residents who live within proximity of trails walk more than residents who do not.

The proposed tree requirements will have slight positive benefits compared to development that would occur under the existing regulations. However, the net result of development overall is likely to be fewer trees after development than before.

Findings

- Requiring tree preservation and establishment of new trees through subdivision regulations should result in positive health impacts due to carbon and stormwater storage, temperature modulation, and air quality improvement.
- New trees will likely have positive mental health impacts on stress and anxiety levels, attention, and feelings of well-being.
- New trees will support active transportation and safety from traffic.
- New trees will likely have economic benefits including potential for increased property values, reductions in building energy costs, and the creation of a sense that South Hadley is a desirable place to live, work, and play. These economic benefits could in turn have positive health impacts for a broad range of people through a variety of pathways.
- If new trees were required to be street trees (as opposed to yard trees), the health benefits would increase. Street trees provide shade to sidewalks, protect pedestrians from errant vehicles, may reduce traffic speeds, which results in decreased crash injury severity, and have been linked to lower crime rates than comparable places without street trees.

Housing Health Impacts

See above for literature review and existing conditions

Assessment

- Changes to subdivision regulations are unlikely to influence availability of affordable housing in South Hadley unless they incentivize multi-family housing over single-family housing. In which case they may increase the supply of rental housing, but not necessarily reduce its cost.
- Proposed changes that allow a greater dead-end street length for lots with a large width may encourage large lot subdivisions and have a minor impact on availability of housing for middle to upper income households. However, this is just one factor that will be considered by developers who have multiple methods of development available to them in South Hadley.
- Changes to the subdivision regulations may result in a very small increase in the number of dwelling units built in South Hadley (due to the increased length of dead end roads, and the potential for reduced cost road infrastructure). If the subdivision regulations increase the number of units built, this will increase the percentage of lead-free units in the town by an equal amount. Though impossible to predict, we expect the increase in the number of units due to subdivision regulations revisions to be small. That said, living in lead-free housing will be a significant improvement for anyone who relocates from a lead contaminated house. This is an example of change that results in a significant positive health impact for a very small population.
- The South Hadley Falls Smart Growth District should result in the creation of additional units of affordable housing and will have significant positive health impacts for the residents of those units. The district is zoned for 387 units and the district requires that "Twenty percent (20%) of all Dwelling Units and twenty-five percent (25%) of all rental Dwelling Units constructed in a Development Project shall be Affordable Units. Provided however, for Development Projects in which all of the Dwelling Units are limited to occupancy by elderly persons and/or by persons with disabilities, twenty-five percent (25%) of the Dwelling Units shall be Affordable Units, whether the dwelling units are rental units or ownership units." If we estimate conservatively that 20% of units built will be affordable, then the build out of the district would result in the creation of 77 affordable units. This would be a 15.7% increase in the town's affordable housing supply.
- The creation of a high quality public realm in South Hadley Falls that should result from the adopted design guidelines for the smart growth district will increase the positive health impacts associated with the creation of affordable housing. And the positive impacts of the design guidelines will be further amplified for low-income populations who generally benefit more from health supporting activity—like increased walking—than higher income populations.
- New housing units likely to result from the South Hadley Falls Zoning District should reduce exposure to lead paint for the occupants of many of the new units. At build out, the district should increase the supply of lead-free housing units in South Hadley by about 20%.

Findings

- Housing-related health impacts resulting from potential changes to the subdivision regulations are difficult to estimate—largely because the nature of the housing build out itself, including the number, type, and cost of units is difficult to predict.

- The housing related health impacts of the South Hadley Falls Zoning District will have significant long-lasting positive health impacts for a small verging on medium population (870 people).[11]

[11] 387 units x 2.25 people per unit=871 people

Part III:

Recommendations

Recommendations

Network Connectivity/Dead-ends or Cul-de-sacs

1. Consider specifying appropriate locations for greater or lesser street network connectivity when revising the subdivision regulations. Require compact and connected neighborhoods in locations with the precursors for active transportation including high residential density, mixed land-use, and existing interconnected streets (or the possibility of improving network connectivity. Prioritize compact and connected neighborhoods in the following locations:
    a. South Hadley Falls and adjacent neighborhoods
    b. Newton Corner
    c. off of Route 33 near Big Y
    d. and near Mt. Holyoke College/Village Commons.
2. Set minimum network connectivity standards in the subdivision regulations for areas where compact and connected neighborhoods are desired. Metrics to consider include:
    a. a minimum link-to-node ratio of 1.4. Links are the street segments between intersections. Nodes are the intersections themselves.
    b. a ratio of intersections/intersections+dead ends of at least .75
    c. a maximum block length of approximately 500' to 650'
3. Limit the areas in which culs-de-sac and dead-end streets are allowed to outlying areas of town that have no nearby commercial or public destinations, limited existing network connectivity, and where traffic volumes are expected to be so low that parents will feel safe allowing their children to play freely in the neighborhood. Examples, include:
    a. west of Alvord Street
    b. near Bachelor Brook Conservation Area
    c. and north of Pearl Street.
4. Design culs-de-sac to aggressively calm traffic such that children are safe to play in the neighborhood unattended.
5. Provide pedestrian and bicycle connections between culs-de-sac and adjacent neighborhoods to reduce travel distances (e.g. distance to a friend's house, school, or conservation area).
6. Reserve ROW for street stubs on all new streets to prepare for future street connections if adjacent parcels are developed. Space stubs approximately 500-650' apart. Stubs should run from the street right of way to the edge of the parcel(s) being developed.
7. Set a design speed of 20MPH for all residential neighborhoods.
8. Designate bicycle boulevards in new compact and connected neighborhoods.

Figure 25: Bicycle boulevard . Combines several traffic calming features including chicanes, low profile speed humps that flatten toward the outside edges, shared lane markings, trees, on-street parking, and stop signs for cross-traffic to give priority to bicyclist through traffic. Source: Payton Chung via Flickr.

Length of Dead-end Streets

Employ aggressive traffic calming on dead-end streets. Consider requiring:

- A design speed of 15MPH
- Chicanes, which are traffic calming measure in which curb extensions are offset on opposite sides of the street to create a curved pathway that slows moving vehicles.

Figure 26: example of a chicanes (right side of street) and a center island designed for horizontal deflection of traffic. Source: NACTO

Lane Widths

Adopt provisions to reduce the required motor vehicle lane widths in new subdivisions. Work with emergency responders and DPW to develop street cross-sections that balance the needs of limiting traffic speeds, and providing access. A variety of potential cross section are presented below to serve as a starting point or discussions:

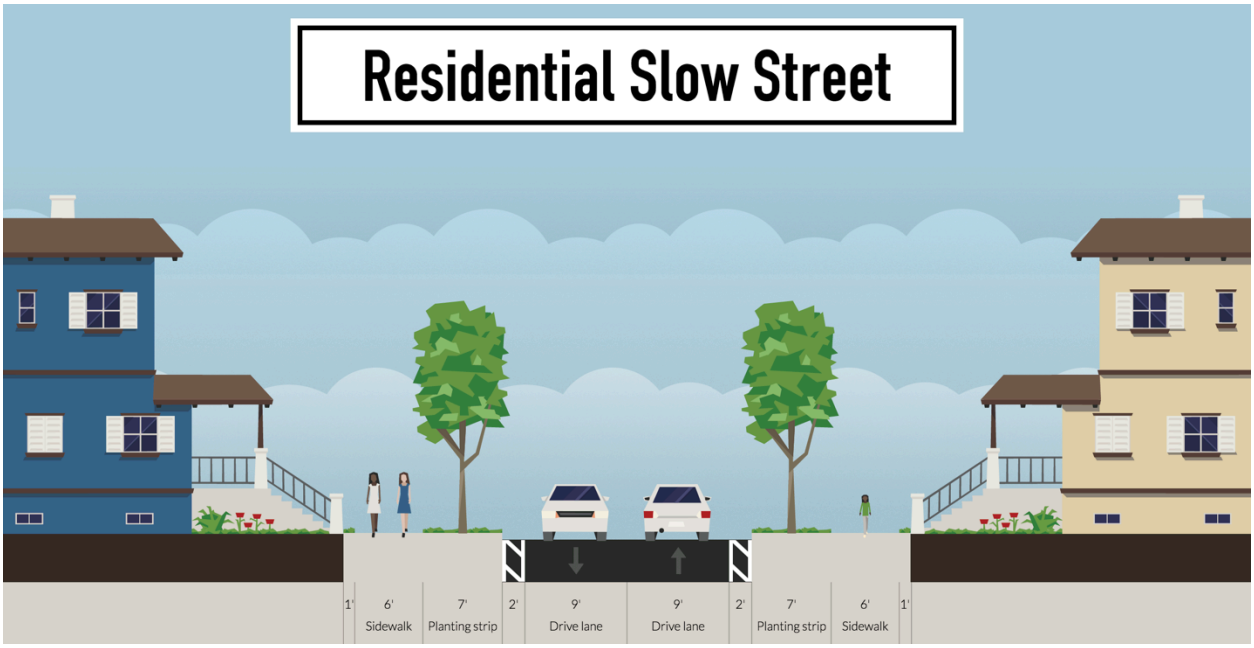

Figure 27: cross-section for a residential slow street

The cross-section above balances narrow travel lanes with the need for emergency access. Striped shoulders serve to guide traffic while providing room for emergency access when needed. 7′ planting strips on both sides of the street provide buffering from traffic and space for snow storage. 6′ sidewalks on both sides provide space for pedestrians to walk side-by-side, including those traveling with wheelchairs or strollers. The total surface width of the street is 22′. Required right of way width is 48′. This could be reduced further if sidewalks and planting strip widths are reduced.

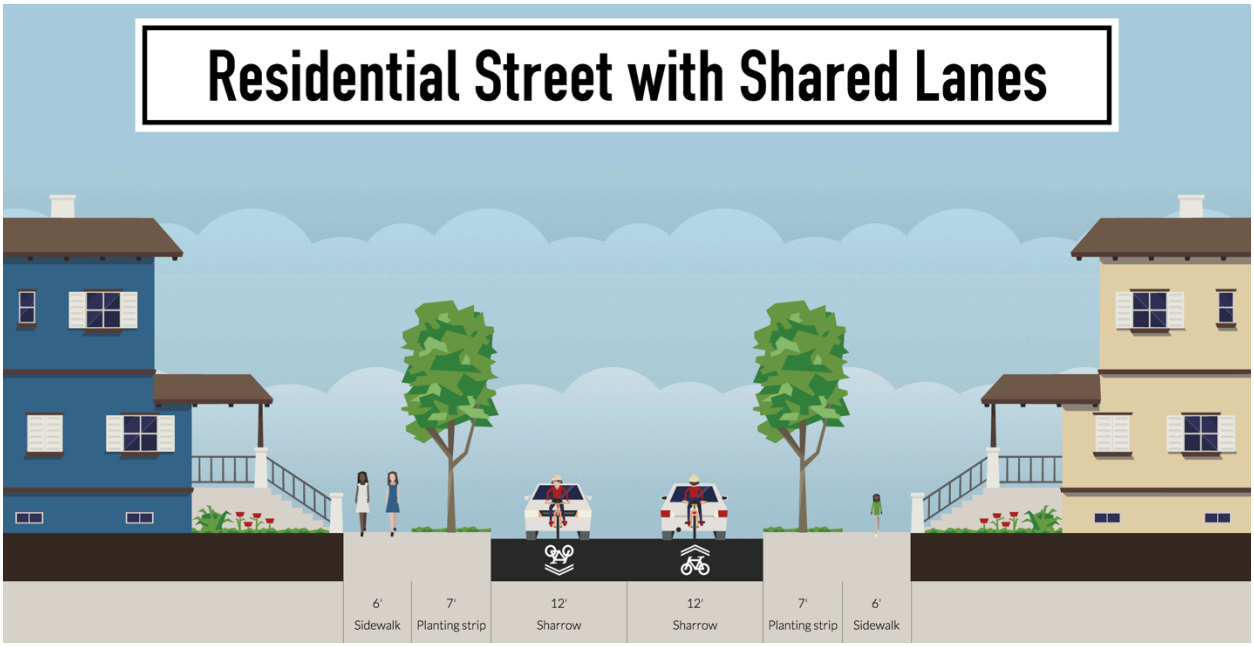

Figure 28: cross-section for a residential street with shared lanes

The cross-section above is similar to the "Residential Slow Street" except that two 12' travel lanes are designated as shared lanes for bicycles and motor vehicles and striped this way. Evidence for the effectiveness of shared lanes is limited and bicyclists generally exhibit a preference for slow streets with low volumes, or separated lanes over shared lanes. Shared lanes, because they are wide, may induce fast motor vehicle speeds. Required right of way width is 50'. This could be reduced if sidewalks and planting strip widths are reduced.

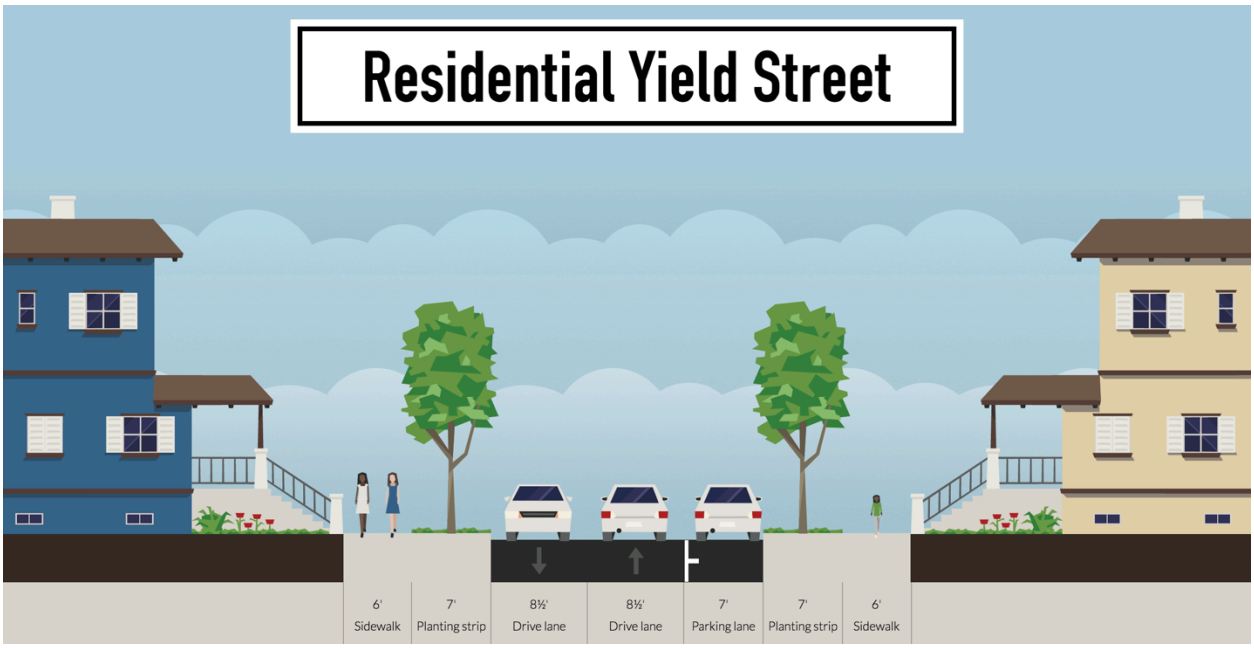

Figure 29: cross-section for a residential yield street

Yield Streets are common in older cities with street layouts that predate cars. On-street parking is offset on alternating sides of the street. A car with parking on their side of the street yields to oncoming traffic. Typically driveways provide enough space for yielding cars to pull over. This type of street works best when on-street parking is regularly used. Otherwise, the result will be a large amount of undifferentiated pavement. The image above shows two 8.5' drive lanes. This is a limitation of the application used to create the image. In reality, there would be 7' parking lanes (offset on alternating sides of the street) with a shared 17' lane that weaves back and forth across the street. The total surface width is 24'. Yield streets with 24' of surface width are one of the four types of streets allowed in Northampton's subdivision regulations. The schematic drawing below was taken from Northampton's subdivision regulations. It shows how cars navigate a yield street. Required right of way width is 50'. This could be reduced further if sidewalks and planting strip widths are reduced.

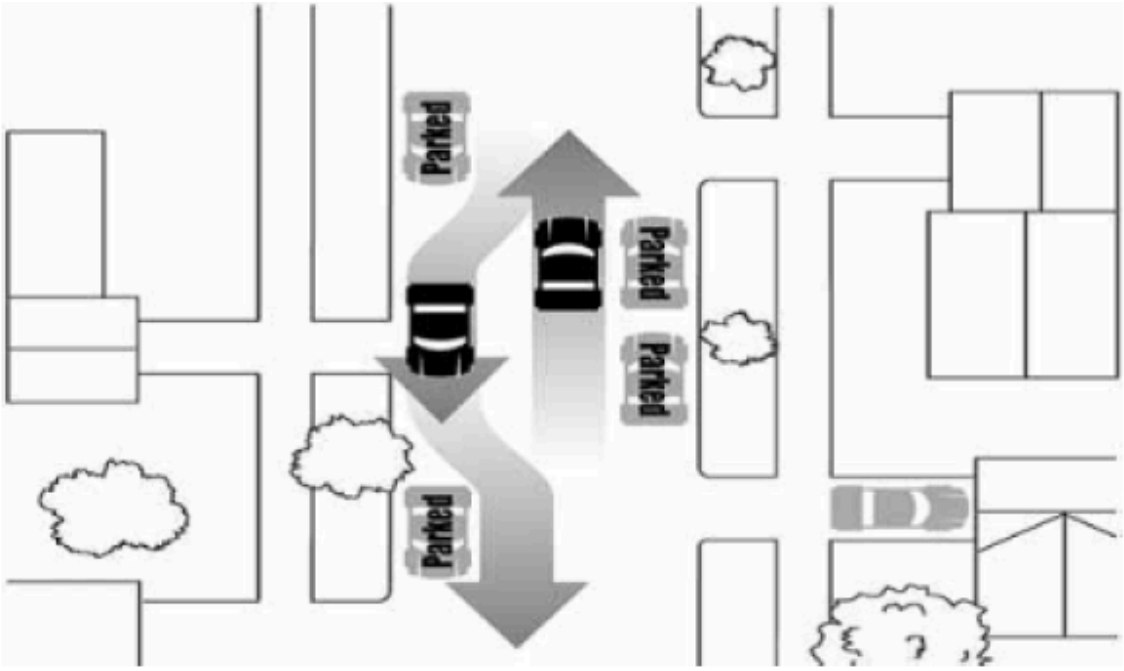

Figure 30: diagram of a yield street from Northampton's subdivision regulations

Figure 31: cross-section for street with advisory bike lanes

Advisory bike lanes are typically only employed where limited right-of-way precludes full bike lanes. Bike lanes are provided on both sides of the street. Dashed lanes separate bike lanes from a single center lane that is shared by bi-directional motor vehicle traffic. Motor may encroach in the bicycle lane to avoid oncoming traffic, but they should yield to bicycles. The image below is from a FHWA

webpage which explains the MUTCD guidance on advisory bike lanes ("Dashed Bicycle Lanes - MUTCD - Guidance - Bicycle and Pedestrian Program - Environment - FHWA" 2016). This treatment is currently experimental. While this treatment is experimental it provides the advantage of providing dedicated (though not exclusive) space for bicycles while limiting lane space for motor vehicles, which may cause them to drive more slowly. This treatment is limited to low volume situations. The MUTCD sets a limit of 6,000 vehicles per day, which far exceeds the volume most new residential subdivision streets in South Hadley will experience. Required right of way width is 50′. This could be reduced further if sidewalks and planting strip widths are reduced.

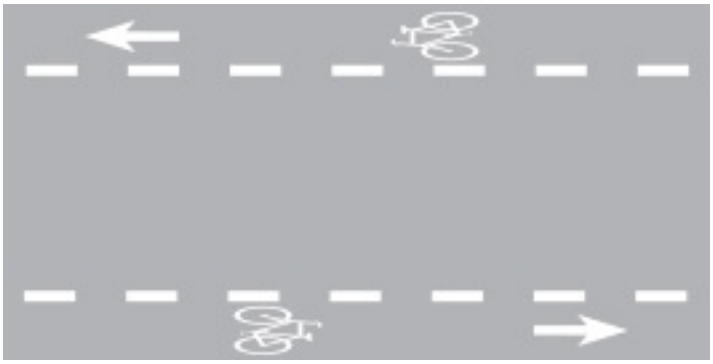

Figure 32: Plan view of advisory bike lanes

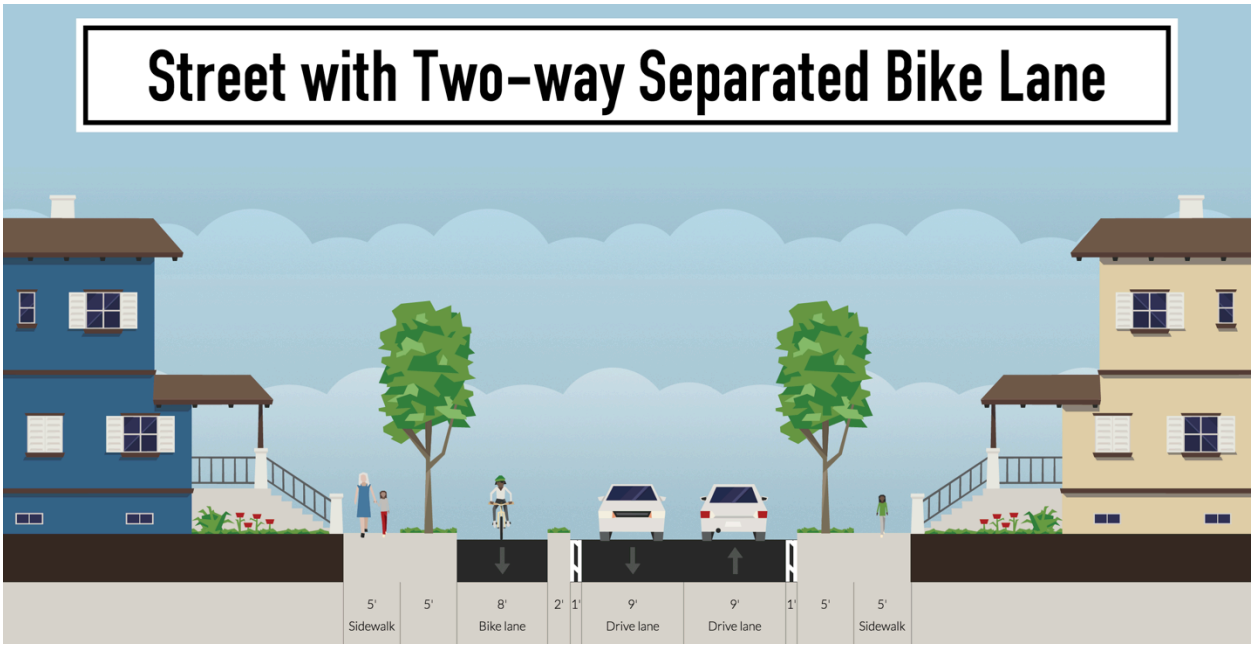

Figure 33: cross-section of street with two-way seperated bike lanes

The image above shows a cross-section for a street with a single two-way separated bike lane. The bike lane is located on only one side of the street. This is appropriate for a low-volume streets with limited driveway crossings where a high volume of bicycle traffic is expected. The bike lane can be at grade with the street level or the sidewalk (provided it is buffered adequately from pedestrian traffic).

In the image above, a planting strip provides buffering between the sidewalk and bike lane. Required right of way width is 50'. This could be reduced further if sidewalks and planting strip widths are reduced.

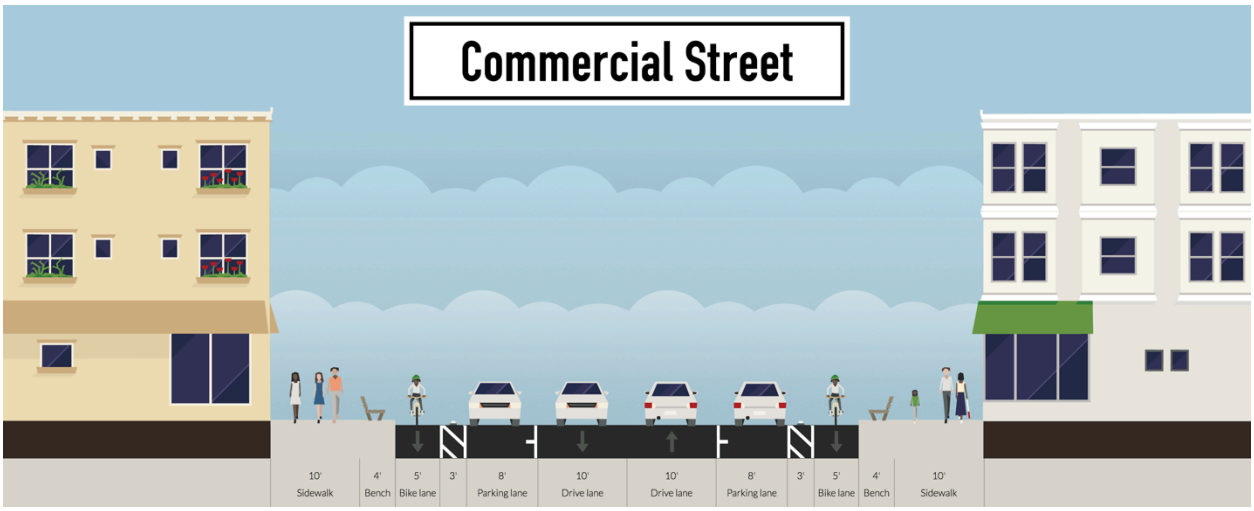

Figure 34: cross-section of a street suitable for mixed-use commercial activity.

The image above shows a cross-section for a mixed-use commercial street. This street type is appropriate for new mixed-use development. It has on-street parallel parking, buffered bike lanes, and wide sidewalks with a "furnishing zone" with space for benches, trees, streetlights, etc. Required right of way width is 80'.

Sidewalks

1. Adopt changes to the subdivision regulations to require sidewalks on both sides of the street and establish in-lieu mechanisms.
2. Establish policy guidance for where in-lieu payment, or in-lieu construction of a pedestrian/bikeway path (aka a multi-use path) are appropriate. We recommend prioritizing use of in-lieu mechanisms in low density locations far from mixed-land use. Essentially these are the same locations where dead-end streets are more appropriate. See above. We recommend limiting use of in-lieu mechanisms either where:
    - the expected population for the new neighborhood is expected to from a vulnerable group (older adult, low-income, minority, or with a high-proportion of young children).
    - Or where the neighborhood is close to mixed land-uses, relatively high residential densities or access to public open space including trails and parks.
3. Employ aggressive traffic calming for streets where sidewalks will not be constructed. Consider shared street, or *woonerf* type designs. See standards in Northampton's subdivision regulations for shared streets.
4. Establish a policy for prioritizing which sidewalk construction projects will be funded through in-lieu mechanisms. Include consideration of the population impacted in establishing this

policy—in particular filling sidewalk gaps that will serve concentrations of older adults, very young children and people with low income and/or limited access to cars.

5. Reconsider what appears to be a current Town policy of only repairing or replacing sidewalks on one side of the street in places expected to have low pedestrian volumes—even if a sidewalk was originally built on two sides of the street. This practice is inconsistent with the proposed subdivision requirement to build sidewalks on both sides of the street. The inconsistency may introduce doubt as to the legality of the proposed sidewalk requirement.

Streetscale Design and Urban Form

1. Consider adopting similar design guidelines for other locations in South Hadley, where mixed-use pedestrian centers are desired. Similar design guidelines may be particularly useful for commercial nodes like near the intersection of Route 116 and Route 33 or near Big Y on Willimansett St.
2. If South Hadley creates additional Smart Growth Districts in the future, consider mapping the desired street network and specifying desired street types as part of the design guidelines. Desired street networks with ideal street cross-sections are routinely included in form-based codes across the country.

Density and Mixed-use

1. Consider setting subdivision standards that are placed-based. In other words, specify different standards for different parts of town based on context and desired character and function. Existing and desired density and mix of uses, would be key factors in determining these standards.
2. Celebrate the South Hadley Falls Smart Growth District's support for increased density and mixed-use. Consider adopting similar provisions elsewhere in town.

Greenness/Trees

1. Require regularly spaced street trees in planting strips between sidewalks and streets.
2. Increase tree preservation requirements. As is done in the South Hadley Falls Design Guidelines, specify the number of trees to be preserved based on a number of trees per acre, not just a number per lot.
3. Balance development of trails with creating a connected and functional sidewalk network. Both provide opportunities for physical activity but the character of that physical activity (leisure walking versus utilitarian walking) and the populations they serve are distinct.

Affordable Housing

1. Prioritize current and future affordable housing for sidewalk construction and maintenance
2. For future affordable housing projects, require street designs that ensures slow speeds and accommodations for all modes of travel.

3. Where possible, site future affordable housing developments within walking distance of civic, open space, and commercial destinations.

Appendix & References

Appendix 1: Changes to Subdivision Regulations Under Consideration

Changes under consideration are highlighted below. Only those sections of the Subdivision Regulations with changes under consideration are included.

SECTION 2.00 DEFINITIONS

2.01 DEFINITIONS

TYPE "A" SUBDIVISIONS: A subdivision for single family residential purpose only, with roadways longer than 800 feet, not ending in a dead-end or turn-around.

TYPE "B" SUBDIVISIONS: A subdivision for apartments, business or industrial purposes.

TYPE "C" SUBDIVISIONS: A subdivision for single-family residential purpose only with roadways ending in a dead-end or turn-around but with adjoining lots having a lot width of no less than 125 feet.

TYPE "O" DEVELOPMENTS: Developments which do not meet the definition of a subdivision but are subject to these regulations because they involve development of more than one building for dwelling purposes on a single lot or parcel.

SECTION 7.00

DESIGN STANDARDS

7.01 STREETS AND WAYS

Streets and ways shown on the subdivision plan or plan for more than one building for dwelling purposes per lot must comply with the following requirements:

1. Location and alignment

2. Width

The minimum widths of street rights-of-way, and paved roadways (traveled way) shall be:

a. Type "A" Subdivisions *

Right-of-way width	50 feet
Paved roadway width	24-32 feet

b. Type "B" Subdivisions *

Right-of-way width	60 feet
Paved roadway width	28-36 feet

c. Type "C" Subdivisions*

Right-of-way width	50 feet
Paved roadway width	18-20 feet

d. Type "O" Developments

Paved roadway width	18-20 feet

e. The paved roadway width shall be measured from front to front of berms. All berms shall be set on the roadway pavement.

f. The center line of the roadway shall coincide with the center line of the right-of-way, unless otherwise approved by the Board.

g. Greater widths may be required by the Planning Board when deemed necessary for present and future vehicular traffic.

*NOTE: See Section 2.00 for definition of Subdivision Types.

3. Grades

The minimum grades of all streets and ways shall be:

a. Type "A" and "C" Subdivisions and Type "O" Developments

1) No grade shall be greater than nine (9) percent.

2) No grade shall be less than one-half of one (0.5) percent.

b. Type "B" Subdivisions

1) No grade shall be greater than six (6) percent.

2) No grade shall be less than one-half of one (0.5) percent.

4. Horizontal Alignment

The minimum center line radii of horizontal street curves shall be:

a. Type "A" and "C" Subdivisions and Type "O" – One Hundred (100) feet.

b. Type "B" Subdivisions – Three Hundred (300) feet.

5. Intersections

6. Cul-de-Sac or Dead-End Street

a. A permanent cul-de-sac or dead-end street shall be no longer than eight hundred (800) feet in length, unless, in the opinion of the Planning Board, a greater length is necessitated by topography or other local conditions.

i. *Large Lot Exception.* In the case of subdivisions wherein all of the lots have a street frontage width of no less than 125 feet, the permanent cul-de-sac or dead-end street shall be no longer than one-thousand, five hundred (1,500) feet in length.

ii. *Emergency or pedestrian connections.* The Planning Board may require pedestrian and/or emergency vehicle connections to permanent cul-de-sac or dead-end streets in excess of eight hundred (800) feet.

iii. *Fire Department Concurrence.* The Planning Board may require that an applicant obtain the appropriate Fire Department Fire Chief and Water Superintendent concurrence with the length of the permanent cul-de-sac or dead-end street where it is beyond 800 feet in length.

iv. *Type "O" Developments.* The Fire Department Fire Chief concurrence referenced in 7.01.6iii is mandatory.

7.02 EASEMENTS

7.03 OPEN SPACES AND PROTECTION OF NATURAL FEATURES

7.04 COMPLIANCE WITH ZONING BY-LAW

7.05 LOTS OF ABNORMAL SIZE AND SHAPE

SECTION 8.00

REQUIRED IMPROVEMENTS FOR SUBDIVISIONS

AND DEVELOPMENTS FOR MORE THAN ONE BUILDING FOR

DWELLING PURPOSES PER LOT

8.01 STREET AND ROADWAY CONSTRUCTION

1. Clearing and Grubbing

2. Gravel Foundations

8.02 ROADWAY SURFACING

8.03 CURBS AND BERMS

8.04 DRIVEWAY APRONS

1. In Type "A" Subdivisions, the minimum driveway width within the right-of-way shall be twelve (12) feet, with at least a two (2) foot curb radius.

2. In Type "B" Subdivisions, the minimum driveway width within the right-of-way shall be thirty (30) feet, with at least a seven (7) foot curb radius.

3. In Type "C" Subdivisions, the minimum driveway width within the right-of-way shall be twelve (12) feet, with at least a two (2) foot curb radius.

4. In Type "O", the minimum driveway width within the right-of-way shall be twelve (12) feet, with at least a two (2) foot curb radius.

8.05 SIDEWALKS

1. Sidewalks of not less than four feet in width shall be constructed on ~~one or~~ both sides of the street starting at the property line, ~~when in the opinion of the Planning Board such sidewalks are necessary.~~ except as waived by the Planning Board

    a. As an alternative to construct all or a portion of the otherwise required sidewalk and/or contributing to the "Sidewalk/Bikeway Construction Fund", with the Planning Board's approval, the developer is to construct a pedestrian/bikeway path out of appropriate materials consistent with the Town's "Complete Streets" policy and the Comprehensive Bike/Pedestrian Plan. This pedestrian/bikeway path is to connect to other publicly accessible and usable pedestrian/bikeway paths. Plans for this alternative must be submitted with the Subdivision Application as part of the applicant's request for a waiver from the Sidewalk Requirement. If the alternative approach is suggested by the Planning Board members during the public hearing, the applicant must submit the appropriate plans with a request for a waiver and the Board shall include notice of the waiver request in its continuation of the public hearing.

2. Sidewalk construction shall consist of at least eight (8) inches of select gravel placed over a suitable subgrade, graded to a ¼ inch per foot slope and rolled with a minimum five (5) ton roller. The sidewalk surface shall be composed of the standard one and one-quarter (1 ¼) inches of compacted binder course and a three-quarter (3/4) inch of compacted surface course Type I-1, Class I bituminous concrete.

3. The property side of the sidewalk shall be set at least six (6) inches to the street from the property line. (See 8.08: Monuments and Markers).

4. Wheelchair ramps will be constructed to ADA (Americans with Disabilities Act) standards.

5. *Sidewalk/Bikeway Construction Fund.* Where the Planning Board waives the construction of a sidewalk within a development pursuant to Section **1.**05 of these Subdivision Regulations, the Applicant will pay, in lieu of performance, an amount approximately equivalent to the cost of constructing the waived sidewalk to the Town of South Hadley to be used for sidewalk/bikeway construction. The amount of the payment will be calculated by the Town Engineer and provided to the Planning Board and the Applicant before the waiver request is considered.

8.06 GRASS STRIPS AND SIDE SLOPES

1. Where sidewalks are required, there shall be provided between the curb or edge of the roadway a planted grass strip (see Typical Street Cross-Section).

2. The finished grade of such grass strips shall have a slope of ¼ inch per foot toward the roadway, unless unusual topographic characteristics exist wherein greater slopes may be approved by the Board.

3. Only those trees approved by the Tree Warden or signs or poles approved by the Town Engineer shall be permitted in the grass strip.

4. Where no sidewalk is constructed, the grass strip between the lot property line and the street line shall have a slope of ¼ inch per foot toward the roadway, unless unusual topographic characteristics exist wherein greater slopes may be approved by the Board.

5. All grass strips, side slopes, and unpaved areas within the right-of-way shall contain a top of at least six (6) inches of good quality loam spread over a suitable subgrade, screened, raked and rolled with a 100 pound roller. The loam shall be fertilized at a rate of twenty (20) pounds per one hundred (100) square yards and then seeded with lawn seed at the rate of three and six tenths (3.6) pounds per hundred (100) yards and rolled. Any area which fails to show a uniform growth of grass shall be reseeded until the entire area is covered with a uniform growth of grass.

8.07 BRIDGES

1. Bridges shall be designed in accordance with the design standards of the Massachusetts Department of Public Works.

8.08 MONUMENTS AND MARKERS

1. Monuments shall be installed and centered at all street intersections at all angle points and curvature of streets at other points as shown on the Definitive Plan. Such monuments shall also be installed at intervals of two hundred and fifty (250) feet on any straight portion of a street if such portion is five hundred (500) feet in length or longer.

2. Granite or reinforced concrete monuments shall be used, being not less than four (4) feet in length, dressed to six (6) inches at the top with a three eights (3/8) inch hole drilled in the center and flared at the bottom. The hole shall be filled with lead securely rammed in place.

3. Iron rods, "rifle barrels" or other markers suitable to the Planning Board shall be installed at every corner of each lot within the subdivision. Such markers shall be at lease three (3) feet in length and their locations shall be noted on the Definitive Plan.

4. Monuments and markers shall be set vertically and suitable material thoroughly compacted around each bound, with the tops of the monuments and markers set flush with the finished grade.

5. No permanent monument or marker shall be installed until all construction which would disturb or destroy the monument or marker is completed.

6. All monuments and markers shall be installed before bond or covenant is released.

8.09 INSTALLATION OF UTILITIES

1. General Standards

The installation of utilities and underground structures shall conform to the following general standards:

a. All public and private sewers, surface water drains, water and gas pipes, electric, telephone and cable T.V. lines, together with their appropriate underground structures, within the street right-of-way, shall be placed underground.

b. Underground utilities shall be installed after the street has been excavated to subgrade.

c. The location of the utilities shall conform to the Definitive Plan and the Typical Street Cross-Section, with the minimum cover as shown on the Typical Street Cross-Section.

d. Material used surrounding and supporting pipes and conduits in the utility trenches shall be screened gravel compacted at least six (6) inches in diameter around pipes, unless the trenches are in ledge, peat or heavy clay which requires twelve (12) inches of the compacted, screened gravel.

e. Material used in back-filling utility trenches around underground structures shall be placed in six (6) inch layers and thoroughly compacted by pneumatic or vibratory tamps.

f. Gravity sewer lines shall be true to line and grade with no horizontal or vertical curvature permitted.

g. No footing drains, roof drains or storm water drains shall be connected to the sanitary sewer system.

h. All lot connections shall be installed from the main structures in the street to the exterior right-of-way line for each lot regardless of whether there is a building thereon. In the case of a lot to be used for a park or playground or any other purpose for which the Planning Board deems lot connections are not necessary, installation of such connections may be waived by the Board.

i. Private, on-site water supply wells shall be located a minimum of one hundred (100) feet from a leaching field, seepage pit or cesspool; ten (10) feet from a sewer line; and fifty (50) feet from a septic tank.

j. All underground utilities shall be properly inspected, tested and approval given before the back-filling of trenches and placement of gravel base courses and pavement (see Section 9.00 for inspection procedures).

2. <u>Drainage System</u>

a. The storm drainage system shall be so designed to intercept storm water runoff from the entire portion of the drainage basin that drains to or across the proposed subdivision, and provisions shall be made for proper and adequate storm lines, structures, and channels to accommodate up stream properties as

well as affording protection from flooding and erosion to adjacent and down stream properties.

b. In determining quantities of storm water for system design, the rational method should be used, unless another method is shown to be more appropriate in specific cases, but in any event, the system should be designed for a minimum of twenty-five (25) year storm frequency.

c. Discharge of storm water shall be either into an existing, adequate storm system or the nearest natural water course. Where necessary, the developer shall obtain and convey to the Town drainage easements on adjacent properties, and be responsible for installation of pipe and structures or channels at his expense.

d. Storm water shall not be permitted to cross over the roadway on the surface, and must be piped underneath the roadway.

e. The minimum diameter of storm drains in Type "A" Subdivisions shall be twelve (12) inches and Type "B" fifteen (15) inches, excluding footing drains and subsurface connection pipes.

f. Catchbasins shall be located on both sides of the roadway at intervals of not more than three hundred (300) feet on continuous grades, and at low points and sags in the roadway and near the corners of the roadway at intersecting streets.

g. Maximum distance for surface runoff to flow upon the road surfaces shall be three-hundred (300) feet.

h. The methods of construction, and type of materials used shall conform to the Massachusetts Department of Public Works Standards and Specifications, or the DPW Superintendent where applicable.

i. Where storm water discharges into an open stream or channel, provisions shall be made for proper stabilization of the stream channel.

j. As construction progresses, unforeseen groundwater conditions may be encountered which require additional subdrains, curtain drains and/or footing drains. These conditions include potential problems if construction is in progress at a time of low water table or other dry conditions. The Board, acting on the advice of the Department of Public Works, reserves the right to require appropriate systems, including stubs, to accommodate the problems.

k. The owner will be responsible for the maintenance and upkeep of any detention ponds.

l. Through every phase of construction no surface run-off will drain onto the abutting public way or abutting private property.

3. Sanitary Sewer System

a. Wherever, in the opinion of the Planning Board, the public sewerage system is reasonably accessible and where connection to it is feasible, the applicant shall properly connect all lots in the subdivision to the public sewerage system.

b. The minimum diameter of public sewer pipes shall be eight (8) inches, unless a smaller size is recommended by the DPW Superintendent.

c. The methods of construction and type of materials used shall conform to the Massachusetts Department of Public Works Standards and Specifications, or the DPW Superintendent where applicable.

d. A sewer extension permit application shall be filed by the applicant (see Section 5.04-2 for further details).

e. Where a public sewerage system connection is infeasible or inaccessible, a private on-site sewerage system shall be designed and constructed in conformity with Article XI of the Sanitary Code of the Massachusetts Department of Public Health, and subject to approval and in conformity with the rules and regulations of the South Hadley Board of Health.

f. If a subdivision is to be located in an area where a public sewerage system connection is infeasible, but within five (5) years from date of submission of the Definitive Plan a public sewerage system is planned to be installed by the Town, as confirmed by the Selectmen, the applicant may be required, at the request of the Planning Board, to install at his expense street sewers, structures and laterals (i.e., dry sewers).

g. Sewer connection fees, in accordance with the Sewer Department's fee schedule, shall be paid prior to issuance of a building permit(s) for individual lot(s).

4. Water Systems

a. Where available and feasible, all lots in a subdivision shall connect to the appropriate water service system: Water Department, Fire Districts Nos. 1 and 2.

b. All water mains, fittings, gates and hydrants shall be installed in conformity with the specifications of the respective Water Departments, and in accordance with the Definitive Plan as approved by the Planning Board.

c. Where connection to a water district system is infeasible, the applicant shall make provisions to serve every lot with an adequate supply of potable water approved by the Board of Health.

d. A laboratory test of the water quality shall be required and submitted to the Board of Health for all private, on-site systems.

5. Electrical, Telephone and Other Wires

a. All electrical, telephone, fire alarm, cable T.V. and other wires and cables shall be installed underground, unless in the opinion of the Planning Board and the appropriate utility company, such installation is impractical or not in the best interest of the Town. Installation of the underground electrical distribution system shall be in accordance with the specifications and regulations of the South Hadley Electric Light Department.

8.10 STREET TREES AND PLANTING

Planting operations and requirements for trees and plantings contained herein shall be in accordance with the standards and specifications of the American Nurseryman Association and the Associated Landscape Contractors of Massachusetts.

1. Street Trees

a. There shall be two trees, which may be existing or newly planted, for each lot in the subdivision and each dwelling in "Other Developments"

b. If they are existing trees, they must be approved as to health and suitability by the Tree Warden, and if newly planted they must be approved by the Tree Warden as to their species, size and location.

c. No dead, damaged or diseased tree existing as such at the time of approval of the plan, and no tree injured in the course of work shall be permitted to stand on any lot within a subdivision, and upon orders from the Tree Warden, the subdivider shall remove the same at his own expense, together with the stump and roots thereof.

d. A partial list of acceptable types of street trees is included in the Appendix, and categorized according to growth size.

e. Large-growing trees should be spaced at intervals of fifty (50) to sixty (60) feet, medium-growing trees at intervals of thirty (30) to forty (40) feet, and small-growing, at intervals of twenty (20) to thirty (30) feet. On the side of the street where overhead wires are present, large and medium growing trees should be planted within the front yard of the individual property owner, away from such wires.

f. Where possible, and with the approval of the Tree Warden, the street trees should be of different varieties. Said location of trees shall be at least ten (10) feet from any underground utilities.

2. Cul-de-sac Plantings

With the approval of the Planning Board, the central radius of a cul-de-sac may be planted with perennial grass (sod or seed), ornamental shrubs, or retention of existing vegetation. Suitable mulch shall be used between plants for weed control.

3. Bank Plantings

a. All cut and filled bankings, or portions thereof, that are susceptible to eroding or any building lots where fill or excavation has changed the contours such that drainage to adjoining parcels will be affected, shall be planted with low or very low growing plantings, herbaceous plants or sod grass (see list in Appendix).

b. Suitable mulch shall be spread liberally for weed and erosion control.

4. Intersection Plantings

No small trees, shrubs or herbaceous plants that tend to obstruct visibility at street intersections shall be permitted within one hundred (100) feet of the point of intersection of the curb or exterior roadway lines along both sides of the corner lot at the intersection.

8.11 STREET LIGHTING

Street lighting shall be installed along all streets in accordance with the Electric Light Department's specifications.

8.12 STREET SIGNS

Street name signs shall be the standard street name signs made by the South Hadley Highway Department at the applicant's expense. Such signs shall be erected by the applicant at each street intersection near the inside edge of the curb, subject to approval by the DPW Superintendent. The posts of these signs shall be buried in concrete blocks ten (10) inches in diameter and twenty-four (24) in length.

8.13 AS-BUILT PLANS

After final approval of all the improvements in the subdivision and before final release of the performance guarantee, the applicant shall furnish the Board with two copies (one copy for the Board and the other for the DPW Superintendent) of "As-Built Plan" showing location and grades of road as built, as well as all utilities as installed including inverts of drainage and sewerage systems, and swing ties at 60 degrees and 120 degrees apart for all ends and intersections of pipes that are buried. Such plans may be mylar or linen copies of the complete set of Definitive Plans revised into "As-Built Plans".

8.14 CLEANING UP

After completion of construction and before release of the performance guarantee, the subdivider shall remove all temporary structures, debris, surplus materials and rubbish, and shall otherwise leave the area in a neat and orderly appearance.

Appendix 2: Design Guidelines, South Hadley Falls Smart Growth District

TOWN OF SOUTH HADLEY
SOUTH HADLEY FALLS SMART GROWTH DISTRICT
DESIGN STANDARDS

January 2015

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1. INTRODUCTION

These Design Standards complement the South Hadley Falls Smart Growth District By-Law (SHFSGD) and establish the design requirements for development within the District.

2. PURPOSE

The Design Standards include both binding design standards for compliance and non-binding guiding principles. The Design Standards shall be used by the Planning Board in their review and consideration of development proposals pursuant to the SHFSGD By-Law.

3. APPLICABILITY

These Design Standards apply to all proposed development within the Downtown Smart Growth District that is subject to Plan Approval under the provisions of Section 7(V)(11.) of the Zoning By-Laws.

The Planning Board, at its discretion, can approve minor deviations from the Design Standards if, in its opinion, such deviations contribute to the goals articulated in Section 5 below more effectively than literal compliance with specific requirements.

Applicants should clarify how proposed deviations further the goals of the Town as defined by the Guiding Principles.

These Design Standards do not exempt applicants from obtaining all required permits and complying with all applicable building codes, laws, and regulations in force.

4. DEFINITIONS

Definitions in Section 7(V)(2.) of the Town of South Hadley Zoning By-Laws apply to these Design Standards. Where referenced, the Primary Commercial Streets in the SHFSGD shall be those portions of Main Street, Canal Street and Bridge Street.

5. GUIDING PRINCIPLES

5.1 Support Mixed Use Development

Downtown South Hadley Falls has historically contained a mix of uses: residential, office, retail, mass-transit, and governmental--that all contribute to the community center character. New mixed-use development should contribute to the overall mix of uses within the district to and support architectural design that marks South Hadley Falls' identity. New residences, restaurants, and commercial development will bring people to downtown to shop, live, work, and engage in civic and cultural activities. Mix use development will add to the employment, residential, commercial and cultural opportunities and enrich the varied societal life of Downtown South Hadley Falls. Together they create the livable and vibrant communities that the "Smart Growth" district is intended to promote.

5.2 Reinforce Broader Town Goals to Enliven the Downtown

New development and adaptive reuse should enhance the character of downtown South Hadley Falls and its community amenities, including sidewalks, crosswalks, street trees, lighting, and

pedestrian oriented spaces, and it should use these improvements to make connections to open spaces, public buildings and public transportation.

5.3 Balance Unity and Variety and Create Legibility
These design standards are intended to ensure that new buildings are compatible with the existing town center. It is in the Town's interest to promote variety as well. The creative use of forms, materials and unique uses that give vitality to South Hadley Falls' center is encouraged. Legibility of spaces is especially encouraged – a clear definition of public, semi-public, semi private, and private zones; residential, retail, commercial and public uses; usable open spaces and enclosed building volumes; and vehicular and pedestrian areas.

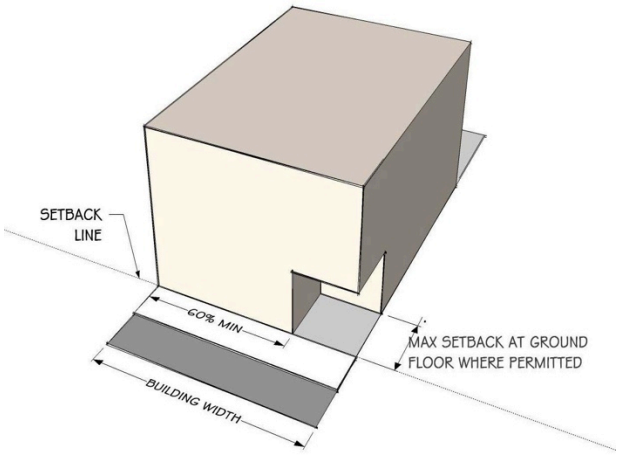
5.4 Protect and Preserve Historic and Cultural Resources
New development should be compatible with nearby buildings and streetscape patterns. The adaptive reuse of historic buildings is encouraged. New construction should respect the patterns of New England Village construction that have and continue to define the downtown area, including reinforcing the street line by moving the buildings next to the sidewalk in commercial areas, creating an intimately scaled rhythm of façade features.

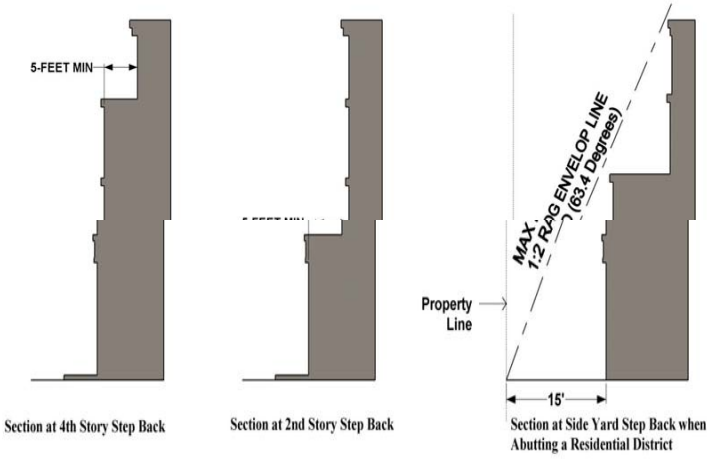
5.5 Promote Sustainable Development
Sustainable construction techniques and materials should be incorporated in new construction in the District. Renovation of existing buildings should seek to improve energy efficiency within the building. Water conservation and energy efficiency should be a central goal in the selection of building components and building systems.

6. BUILDING DESIGN STANDARDS

6.1 Massing

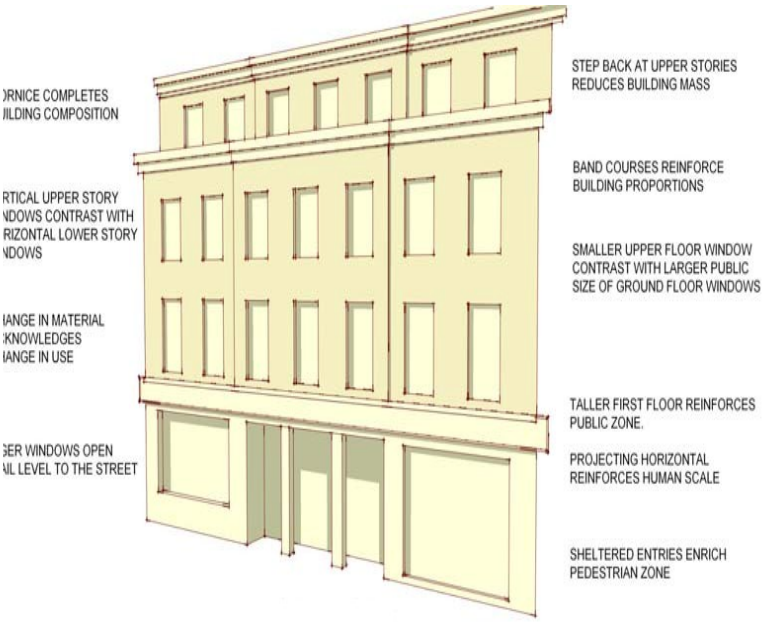
6.1.1 Front Façade Setback - A minimum of 60% of front facades at ground level shall be located at the minimum setback line to reinforce the street line. When the space between the façade and setback line is specifically designed for pedestrian uses, such as outdoor dining, the maximum setback shall be permitted. Stepped back portions of the front façade at ground level are encouraged to articulate entries and provide variety.





6.1.2 Building Step-Back Requirements
The front and rear facades of four story buildings shall step back a minimum of five (5) feet from the primary building face at either the second or fourth floor levels over 50% of their length, or offer alternative strategies for scaling the building height to the pedestrian must be offered. Where

buildings abut a residential district, the side yard step-back shall be such that the maximum building envelope is bounded by a line projected from the property line at a 1 to 2 ratio (63.4°)



6.1.3 Mixed use buildings shall use proportions – a dominant horizontality for commercial, and a dominant verticality for residential – to give legibility to building uses.

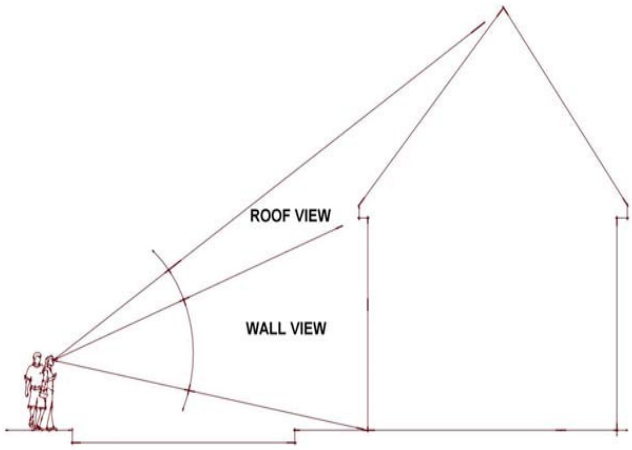
6.1.4 Special functions with public significance such as theaters, educational uses, and exhibitions spaces, shall be differentiated in form to articulate their role in the downtown environment.

6.2 Appearance

6.2.1 Projecting bays, recesses, and cornices are encouraged at all floor levels to define proportions noted above. Building façades over 40′ in length are required to have a change in plane articulated by projecting or recessed bays, balconies, or setbacks.

6.2.2 Horizontal elements such as belt courses, projecting cornices, canopies, and step backs should be combined with vertical elements such as recesses, projecting bays, parapets and vertically aligned windows, to create facades that may evoke but do not imitate the historic buildings of South Hadley Falls. Projected elements 2 feet and less may be located within the setback areas. Projections into the public right-of-way shall comply with the requirements of the Massachusetts State Building Code 780 CMR.

6.2.3 Façade elements shall continue around to all sides of buildings visible from the street. Elements can be simplified at the rear of buildings to clarify a front/back hierarchy.



AVOID ROOF VISUAL EMPHASIS EQUAL TO OR GREATER THAN THAT OF THE WALL

6.2.4 Rooftop mechanical equipment shall be set back from building facades so that it is not visible from street views, screened from view behind parapets or enclosed within architectural elements that integrate it into the building design. Screening elements shall incorporate sound control devices or construction that mitigates equipment noise. Roofs shall not be visible from street views, except that mansard roofs may be used at the top floor of three or four story buildings. For any buildings, visible roofs shall not exceed walls in their respective visible proportions from street views.

6.2.5 Existing building facades with architectural significance are to be incorporated into new construction wherever feasible. Protected buildings can be changed only with the approval of the South Hadley Historical Commission.

6.2.6 Franchise Architecture, distinctive building design that is trademarked or identified with a particular chain or corporation and is generic in nature, shall not be allowed in the SHFSGD: To maintain the unique character of Downtown South Hadley Falls, buildings shall not be branded using an architectural style of a company.

Franchises or national chains may adapt their architectural style to follow these Design Standards, to create a building that is compatible with Downtown South Hadley Falls.

ENTRANCES CLEARLY ARTICULATED AND DIFFERENTIATED

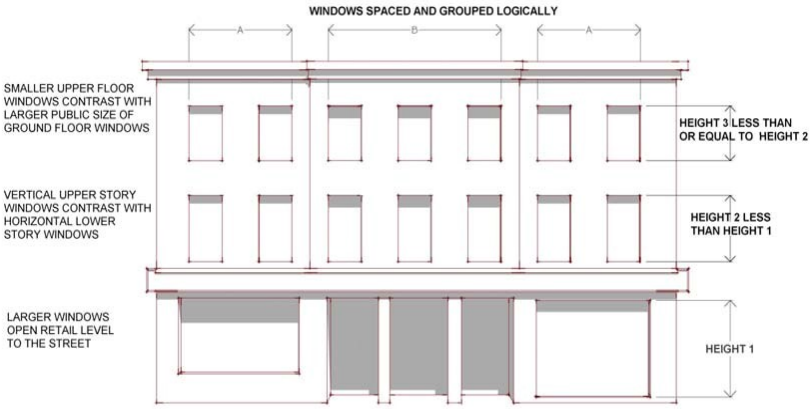
6.3 Entries

6.3.1 Entries are to be clearly articulated with projecting canopies or recesses for convenience, way-finding, and to activate the street front and pedestrian spaces. Residential and commercial entries shall be separated as required in the District By-Law.

6. 32 Retail and commercial entries will face a public sidewalk and are to be primarily transparent to reinforce the public nature of the ground floor uses, and they are to be flanked by primarily transparent façade elements to reinforce this perception.

6.3.3 Lighting and signage shall be integrated into the entry design to reinforce the public nature of the entry.

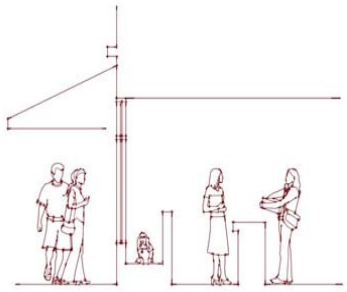
6.3.4 Entries to upper floor residential and commercial uses are encouraged on commercial streets, but shall not interrupt the perceived continuity of the commercial streetscape.



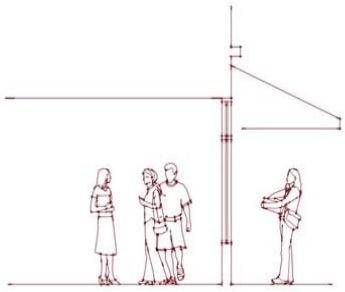
6.4 Fenestration

6.4.1 Fenestration shall reinforce the dominant horizontality for commercial uses and a dominant verticality for residential uses to give legibility to different uses.

6.4.2 Ground floor commercial and retail uses shall be a minimum of 60% glass. The view into the first floor commercial or retail windows shall be maintained with a view into the sales floor or seating area. View windows shall not be blocked. Merchandise displays shall not include full-height backdrops that block the view.



PRODUCT DISPLAY - BEST FOR RETAIL,
~GENERATES HIGH PEDESTRIAN INTEREST
~MAX UTILIZATION OF STOREFRONT
~DOES NOT BLOCK VISIBILITY TO INTERIOR



ACTIVITY DISPLAY - FULL VIEW TO ACTIVITY
~GOOD FOR RESTAURANT AND NON-RETAIL USES
~MAX CONNECTION TO STREET LEVEL

Transom windows above view windows and doors are encouraged. Upper floor residential and commercial uses shall have relatively less glass area to emphasize the public nature of the street-front uses. Glass shall be clear, or reflective only to the extent that such reflectivity reduces interior heat. Mirror glass is not permitted.

No appliqués or other such deliberate screening shall be permitted. Signage on glass shall be as permitted in Section 8.

6.4.3 Protecting ground floor fenestration and defining commercial street fronts with overhanging awnings or canopies is encouraged. Operable windows and doors onto balconies and terraces at upper floor uses are encouraged.

6.5 Materials

6.5.1 Allowed exterior finishes include, but are not limited to brick, stone, cast stone or other finished masonry, cementitious panels, glass, metal, wood, and cellular PVC trim.

6.5.2 Prohibited materials include vinyl siding and EIFS, although these materials may be used on facades not visible from the primary commercial streets provided such materials are detailed and installed in such a manner as to be consistent with the intent of these Design Standards.

6.5.3 Changes in materials are encouraged to reinforce the massing requirements noted above. When change in material or colors occur, they shall articulate the difference between public and private uses, upper floors and lower floors.

6.5.4 Materials shall continue around to all sides of buildings, which are visible from the street or public parking areas. Elements can be simplified at the rear of buildings to clarify a front/back hierarchy

6.5.5 Blank facades are not permitted. Changes in material, which are accompanied by a change in plane, vertical and / or horizontal elements shall be used to provide a pedestrian scale in areas where windows and doors are not functionally required.

7. SITE DESIGN STANDARDS

7.1 Sidewalks

7.1.1 New sidewalks shall not interrupt the continuity of existing sidewalk materials and dimensions. However, recessed entries and widened sidewalks devoted to outdoor uses, such as dining, can receive special materials and articulation that give spatial definition to these functions.

7.1.2 Amenities that increase the comfort of pedestrian movement along sidewalks such as lighting, projecting canopies, and street trees are required.

7.1.3 Usable open spaces adjoining sidewalks that create activated pedestrian areas for dining, farmers markets, etc. , are encouraged, especially those in the vicinity of public uses such as the commuter rail station.

7.1.4 Improvements to adjacent crosswalks, curbing and sidewalks to accommodate increased pedestrian activity associated with new developments are encouraged.

7.2 Driveways and Parking

7.2.1 Driveways shall not interrupt the continuity of sidewalks and pedestrian spaces. Curb cuts shall be located away from the primary commercial streets whenever possible, preferably on side streets and alleys.

7.2.2 Parking lots shall not face primary commercial streets or be located in front of buildings. Whenever possible, parking areas should be located behind buildings.

7.2.3 Parking lots behind buildings shall be aggregated across property lines wherever possible to maximize the efficiency of the paved space and minimize the number of curb cuts and driveways.

7.2.4 Below grade parking is encouraged, especially where existing changes in grade make on-grade access possible while allowing economical structuring of buildings above. Ramping must be incorporated within the building envelope or below grade.

7.2.5 Parking areas that abut lots in residential districts shall be screened from view by fencing, planting or both and conform to landscaping requirements in paragraph 7.3, following.

7.2.6 Shared parking plans for proposed developments shall be developed in cooperation with the Town of South Hadley and shall be compatible with the Town's parking policy.

7.2.7 All parking areas and driveways must be designed to maximize pedestrian and vehicular safety. No driveways are to be located within 50' of an intersection.

7.3 Landscaping

7.3.1 Providing street trees that continue the planting plan established by the Town of South Hadley is encouraged.

7.3.2 Landscaping at retail frontages should be minimal and not interfere with the connection between the sidewalk and interior uses. Landscaping to define commercial entries or outdoor

dining areas shall not interfere with the continuity of the sidewalks. Landscaping to define residential entries shall not compete with or overwhelm the continuity of the retail frontages.

7.3.3 Landscaping in parking areas is required – one tree in a minimum 50 square foot planting area for every 5 cars. Landscaping to buffer parking lots from adjoining residential areas is required.

7.3.4 Landscaping that creates usable public open space, or continues existing public open space, is encouraged, providing it does not interrupt the continuity of retail frontages or disengage buildings from the sidewalk in commercial areas.

7.3.5 Wherever possible plantings shall be native species that require minimal irrigation and fertilizer. Planting of invasive species is prohibited.

7.3.6 Healthy existing trees with a minimum 6" caliper and large canopy shall be identified and shall be identified on the Concept Plan if such plan is submitted as specified in 7(V)(11.) of the SHFSGD Bylaw. Proposed development shall preserve four of the identified healthy existing trees per acre or one per lot, whichever is greater.

7.4 Lighting

7.4.1 Façade lighting and architectural lighting shall articulate building uses and entries and reinforce the public nature of the sidewalk and building frontage.

7.4.2 Lighting along street fronts shall reinforce rather than compete with the continuity of the Town's street lighting. If the sidewalk includes street trees, streetlights shall be located between the trees so that the tree canopy does not interfere with illumination coverage.

7.4.3 Lighting in parking areas and at the side and rear of buildings abutting adjoining properties should be designed to cut off light at the property line.

7.4.4 Lighting should contribute to public safety by lighting entries, exits, and adjacent open spaces.

7.4.5 Lighting incorporated into signage, or illuminating signage, must conform with sign requirements of the Zoning Bylaws of the Town of South Hadley in effect as of (date of adoption of the SHFSGD Bylaw).

7.4.6 All lighting shall be oriented downward and otherwise conform to "dark skies" standards. Uplighting is permitted to light a primary entrance when the light fixture is mounted under an architectural element (e.g. roof, cornice, walkway, entryway or overhanging non-translucent eaves) so that the uplight is captured.

7.4.7 Prohibited lighting includes neon or other edge-glowing sources, mercury vapor, low pressure sodium, high pressure sodium, searchlights, and flashing or changing light sources.

7.5 Utility Areas and Utilities

7.5.1 Loading docks, dumpsters, mechanical equipment and utility meters shall be located at the rear or side of buildings where they are not visible from primary commercial streets and do not interrupt the continuity of the sidewalk and building facades.

7.5.2 When loading docks, dumpsters, and mechanical equipment cannot be located within buildings they shall be screened by elements compatible with the architecture of the building.

7.5.3 Where possible and feasible, shared loading areas, dumpsters, and mechanical equipment shall be incorporated into the design.

7.5.4 No above ground electrical lines or utility cables will be permitted.

7.5.5 Burial of overhead utility lines, adjacent to new development will be required.

7.6 Drainage and Storm Water Management

7.6.1 Storm water management systems shall incorporate "Best Management Practices" (BMP) as prescribed by the Massachusetts Department of Environmental Protection, in addition to employing Low Impact Development (LID) strategies. BMP/LID means and methods should be carefully integrated within the site design approach with a goal of decentralizing storm water management systems to the greatest extent practical and minimizing environmental impact of new development. The specific goals of the BMP/LID measures should be mitigation of post-development downstream impacts and achieving the highest level of water quality for all storm water runoff.

7.6.2 Systems and the designed approach for storm water management should include elements such as infiltration chambers, landscaped swales, vegetated rain gardens, infiltration trenches, dry-wells, permeable pavements and other runoff controlling features that in combination serve to achieve BMP/LID goals.

7.6.3 A Storm water Operations and Maintenance Plan shall be submitted *at the time of application* for all Development Projects to ensure compliance with the District By-Law. The plan shall include a map of the proposed system, specify the parties responsible for the system, a map of the system, easements required, and a schedule for maintenance tasks.

7.6.4 All water from roofs and paved areas shall be retained on site, where possible, and recharged into the ground, or incorporated into a recovery system for use as on-site irrigation, gray water flushing, etc.

7.6.5 Pervious paving is recommended, along with landscaping and pervious landscaped areas.

7.6.6 Sites shall be graded as necessary to prevent ponding of water.

8. SIGNAGE DESIGN STANDARDS

8.1 Exterior Signs

8.1.1 Signage shall be provided to identify residential and non-residential. Signs shall be made of natural materials or have a natural appearance.

8.1.2 A residential-only development or the residential component of a mixed use development project shall be permitted one sign at each principal entrance to the site. The sign shall identify the name and address of the development and shall not exceed 16 square feet.

8.1.3 Each mixed-use development project in the District may include a primary storefront sign, a storefront cantilevered sign, a display window sign and an awning, or some combination thereof.

8.1.4 Signs on buildings should not obstruct elements such as cornices, arches, lintels, pediments, windows, pilasters, etc.

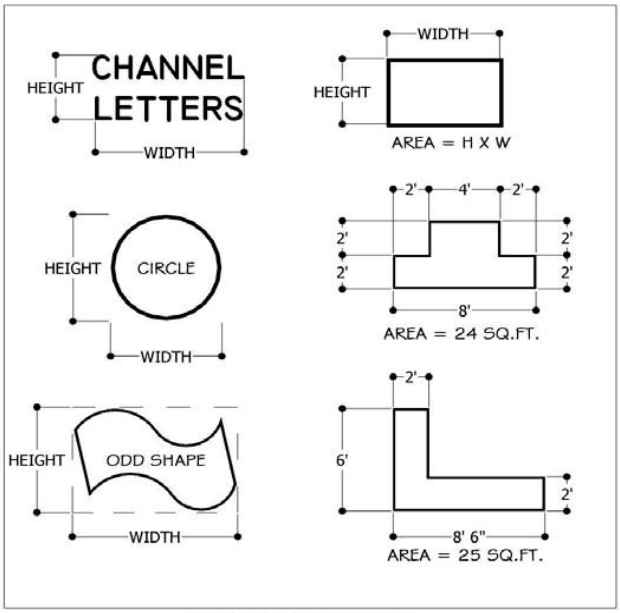
8.1.5 Signs in the District should be designed primarily to be visible to pedestrians or slow moving vehicular traffic. Wording should be kept to a minimum and the use of logos is encouraged.

8.1.6 No signmaker labels or other identification (including UL label), are permitted on the exposed surfaces of signs, except as may be required by the building code. If required, such labels or other identification shall be in an inconspicuous location.

8.1.7 Awnings that are used to provide signage should be standardized by height above grade, type, size, materials, colors, illumination and method of installation, across the building façade and within the block to the largest extent practical.

8.2 Primary Storefront Sign

8.2.1 A primary storefront sign shall be located within a sign band beginning approximately 8 to 15 feet above the finish floor level. When a tenant has elevations fronting on different sides of a building, the tenant may have a primary storefront sign on each façade. Wall signs in multi-tenanted buildings shall be placed within the same sign band. The placement of wall signs on individual buildings shall respect the sign band on adjacent buildings.



SIGNAGE AREA GUIDE

8.2.2 The total sign area for the primary storefront sign shall not contain more than two square feet of sign area for each linear foot of storefront. Sign area shall be calculated by creating a box around the main body of the primary sign. The storefront lease line width multiplied by two equals the maximum sign area in square feet, and may not exceed 75 square feet.

8.2.3 Signage above the sills of the second story windows shall be confined to painted or applied letters on the window glass, provided that such signs advertise the organizations

therein. Signage is not permitted on continuous, horizontal “curtainwall” type windows in upper stories.

8.3 Storefront Cantilevered Sign

8.3.1 Each tenant will be allowed to construct and install a cantilevered (“blade sign”), installed perpendicular to the building façade, not in excess of eight (8) square feet as measured on one face of the sign. Any such storefront cantilevered sign shall not count toward the total allowable area of signage on a single façade.

8.3.2 One storefront cantilevered sign will be allowed per tenant on each elevation of a building with a customer entrance. The sign shall be attached to the tenant storefront at a minimum 8’ 6” above finish floor level.

8.3.3 Each storefront cantilevered sign may be externally illuminated with two integrated lights (one light on each sign face or panel). The sign may be square, round, elliptical or other shape. Complex shapes and three-dimensional letters or figures are encouraged. Formed plastic, injection molded plastic, and internally illuminated panels are prohibited.

8.3.4 Signs on the inside or outside surface of display windows may be permitted provided, however, that such signage shall not cover more than ten percent (10%) of the display window area and shall be lighted only by building illumination (white, non-flashing).

8.4 Awnings

8.4.1 Awnings shall be made of fire resistant, water repellent marine fabric (e.g. canvas) or may be constructed of metal or glass. Vinyl or vinyl-coated awning fabric will not be permitted.

8.4.2 Patterns, graphics and stripes are encouraged.

8.4.3 Continuous, uninterrupted awning spans are not permitted. Fixed awnings shall not span numerous bays, windows or store fronts. The awnings should delineate storefronts on a multi-tenant building.

8.4.4 Internally illuminated awnings are not permitted, except that down lighting that is intended to illuminate the sidewalk may be provided under the awning. All lighting under a canopy shall be cutoff or recessed, with no lens dropping below the horizontal plane of the canopy. The light source shall not illuminate or cause the awning to “glow”.

8.5 Prohibited Sign Types

The following sign types are prohibited in the SHFSGD:

8.5.1 Signs employing luminous plastic letters are prohibited.

8.5.2 Signs or lights that move, change, flash, or make noise are prohibited. Such prohibition shall include commercial balloon devices, high powered search lights and signage expressed or portrayed by emitted light, digital display or liquid crystal display. Where permitted, indicators of time or temperature may move.

8.5.3 Box style cabinet signs or “can” signs are prohibited, whether internally illuminated or not.

8.5.4 Signs utilizing paper, cardboard, Styrofoam, stickers or decals hung around, on or behind storefronts, or applied to or located behind the storefront glazing are prohibited.

ACKNOWLEDGEMENTS

We would like to thank the following for the use of the Town of Reading's Downtown Smart Growth District Design Standards & Guidelines. Photographs and text were provided with permission from the:

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Appendix 3: Additional Pathways that Warrant Further Investigation

This HIA prioritized assessment of pathways that appeared to be most directly related to the decisions at hand. However, the HIA was built on a comprehensive HIA framework developed by MAPC for the Healthy Neighborhood Equity Fund HIA[12]. Based on this framework, as well as concerns raised during the HIA process, the following pathways appear to warrant further investigation. We've listed them in order from the highest priority to lower priority.

1. Economic Opportunity
2. Social Cohesion
3. Environment
4. Municipal Services and Fiscal Sustainability (not part of HNEF framework)

[12] The HNEF HIA report is at: http://www.mapc.org/sites/default/files/HNEF%20HIA%20Report%20v5_0.pdf. Additional related information (including updated literature reviews) and tools for assessment are at: http://www.mapc.org/transportation-health

Appendix 4: Urban Form-Putting the Pieces Together

Putting together the various elements of community design described in this HIA—density, street network, street type, and building type results in the overall sense of a place. We call this urban form. Below are examples of several kinds of urban form in South Hadley. These examples are not an exhaustive catalog of the diversity of urban form in South Hadley. They are introduced here because they represent different features that are linked to health determinants and that are discussed in the HIA. They provide the basis for a transect of existing conditions in South Hadley that could be used in future design guidelines or regulations that integrate land use and transportation infrastructure.

Figure 35 : Vertical mixed-use development on traditional downtown-type streets. Buildings align along the front lot line with no visible front setback. Streets typically have on-street parking. Sidewalks are wide and occupy the full space between the curb and the building frontage. This street type often has a furnishing zone near the curb with regularly spaced street trees (usually in tree pits—not a continuous tree belt), benches, bike racks and other street furniture.

Figure 36: Large multi-family building on street with on street-parking and sidewalk

Figure 37: Garden apartment complexes. The site plan is designed to create a private "complex." Often buildings are arranged around parking lots. Whether the streets are public or not, the configuration of buildings and parking make this type appear "private" and the driving lanes appear to be parking circulation rather than streets.

Figure 38: Townhouses. Often Townhouses align along a street front (sometimes called a row house). In this example the townhouses are set perpendicular to street with garage-fronted entries on one side, a pedestrian path on other side, and blank wall facing the street.

Figure 39: Mixed single family and two or three family on small lots (less than ¼ acre). The street on the left (High St) is approximately 32' wide with on street parking, a sidewalk on one side, no tree belt or street trees. The street on the right (Carew St.) is similar except it has sidewalks on both sides, with a tree belt on one side (not shown).

Figure 40: Single-family houses on small to medium lots (1/8 to 1/3 acre). All three images show relatively narrow streets with tree belts, regularly-spaced street trees and sidewalks. The street on the left (Dayton St.) is approximately 22' with a sidewalk on one side. The street in the middle (Fairview Street) is approximately 23' with sidewalks on both sides. The street on the right (Wright Place) is approximately 20' with sidewalks on both sides and on-street parking that is utilized.

Figure 41: Large-lot single family houses (about 3/4 acre or larger). The street (Valley View Drive) is approximately 24' wide with sidewalks and a narrow tree belt on one side (not shown).

Appendix 5: Relevant Selections from Subdivision Regulations for Comparison Communities

Agawam

http://ecode360.com/6566995

- **Maximum road length of a dead-end street:**
  - "Dead-end streets shall not be longer than 500 feet measured from the nearest intersecting through street unless, in the opinion of the Board, a greater length is necessitated by topography or other local conditions."
- **Sidewalk requirements:**
  - There shall be cement concrete sidewalks constructed on both sides of each street in the subdivision. The width of the sidewalks shall be as specified under the Design Standards for the various classes of streets.
- **Street Network Requirements**
  - All streets in the subdivision shall be designed so that, in the opinion of the Board, they will provide safe vehicular travel and discourage nonterminal traffic and excessive speed. Due consideration shall also be given by the subdivider to the attractiveness of the street layout in order to obtain the maximum livability and amenity of the subdivision.
- **Requirements for connecting to existing paths or trails**
  - Provisions for pedestrian and bicycle access shall be made in all subdivisions connecting public open space or commercial areas. When roads do not connect with the adjacent subdivisions or open land, such non-vehicular access shall be provided. The pedestrian/bike path shall be eight feet in paved width with a minimum easement or deeded width of 16 feet. All ways shall be clearly marked and landscaped to protect adjoining lot owners. Such ways shall be secured by easement or deeded to the Town
- **Requirements to set aside easement for future connections to future streets:**
  -
- **Number and location of trees and/or landscaping**
  - There shall be tree belts constructed on both sides of each street in the subdivision.
  - Before release of the covenant, the developer shall deposit with the Town of Agawam an amount of money sufficient to cover the replacement of two shade trees per lot according to the specifications of the Planning Board.
  - The developer shall be responsible for providing, planting and maintaining through one full year two living healthy trees or their substitutes per lot. Such trees shall be 2.5 inches minimum in diameter, balled and burlapped and planted in season and subject to direction of the Tree Warden. Types of trees shall be selected from a list available

from the Planning Board which shall include native and hardy species readily available locally.

- On each lot two shade trees shall be planted within 20 feet of the street line and located so as not to conflict with underground utilities and sight distances. On places at the discretion of the Tree Warden, shade trees may be planted on the tree belt within the street right-of-way.

- **Street Design Requirements**

159 Attachment 1

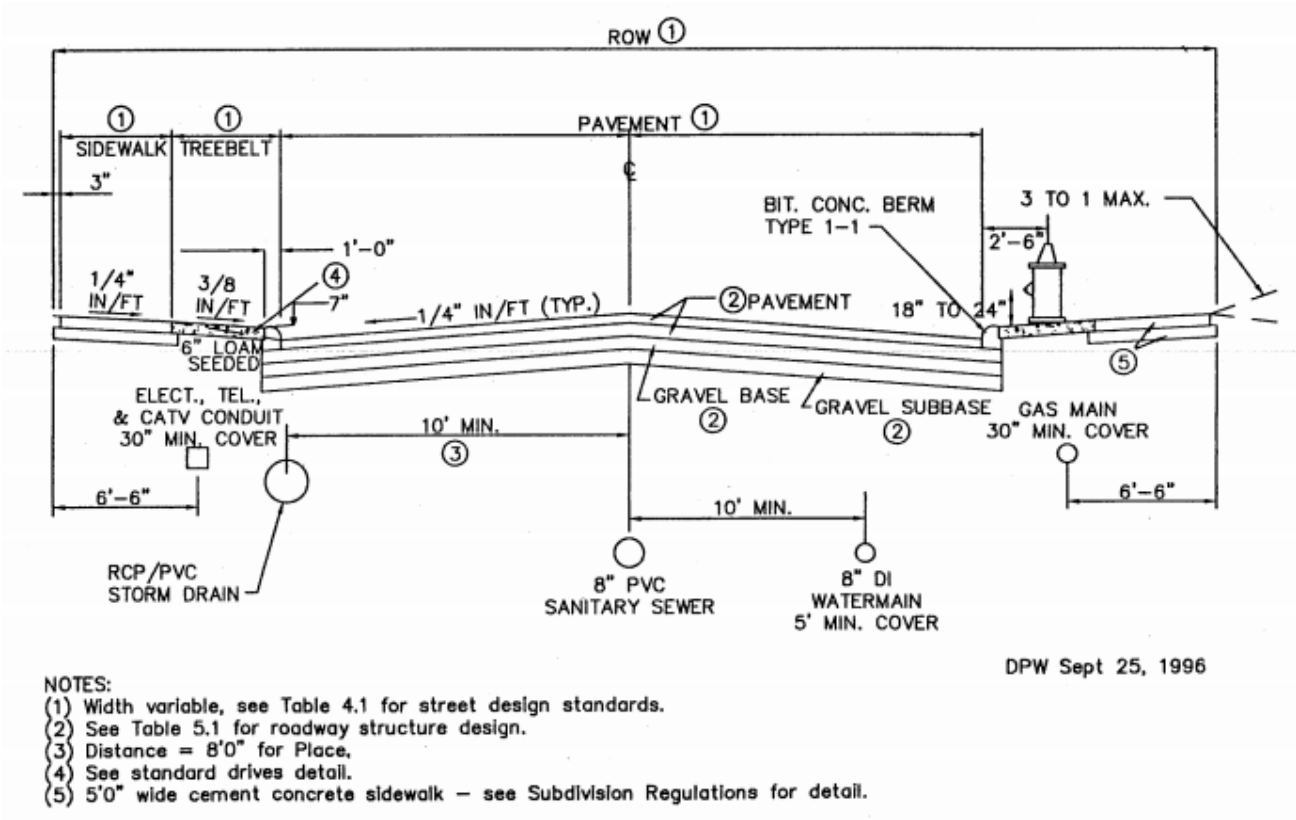
Table 4.1
Town of Agawam
Street Design Standards
[Amended 12-5-1996]

Average Daily Traffic (number of vehicles)	Type of Street	Right-of-Way Width (feet)	Pavement Width (feet)	Minimum Radius of Curvature (feet)	Maximum Grade[1] (percent)	Sidewalk Width (feet)	Tree Belt Width (feet)	Minimum Length Vertical Curve	Design Speed (mph)	Stopping Distance (feet)
0-100	Place	46	26	150	10	5	5	Based on safe stopping, sight distances and satisfactory curb drainage	20	110
101-400	Lane	50	30	225	8	5	5		25	150
401-1000	Subcollector	60	36	300	6	5	7		30	200
1001-3000	Collector	66	40	400	5	5	8		35	250
3001+	Arterial	To be determined by Planning Board on an individual basis.								

NOTE:
[1] Minimum grades on all streets shall be 1.0% except where such a minimum will adversely affect ride, as determined by the Town Engineer, in which case the minimum grade will be 0.5%.

159 Attachment 2

Figure 4.2
Town of Agawam
Typical Road Section
September 25, 1996



Easthampton

http://www.easthampton.org/back-to-forms-documents/planning/planning-board-applications-info0rmation/600-subdivision-regulations-1990-new-scan-form-a-ocr-2013-0903/file.html

- **Maximum road length of a dead-end street:**
  - A permanent cul-de-sac or dead-end street shall be no longer than five hundred (500) feet in length measured along the centerline of construction from its beginning to the center of the island at the turnaround.
- **Sidewalk requirements:**

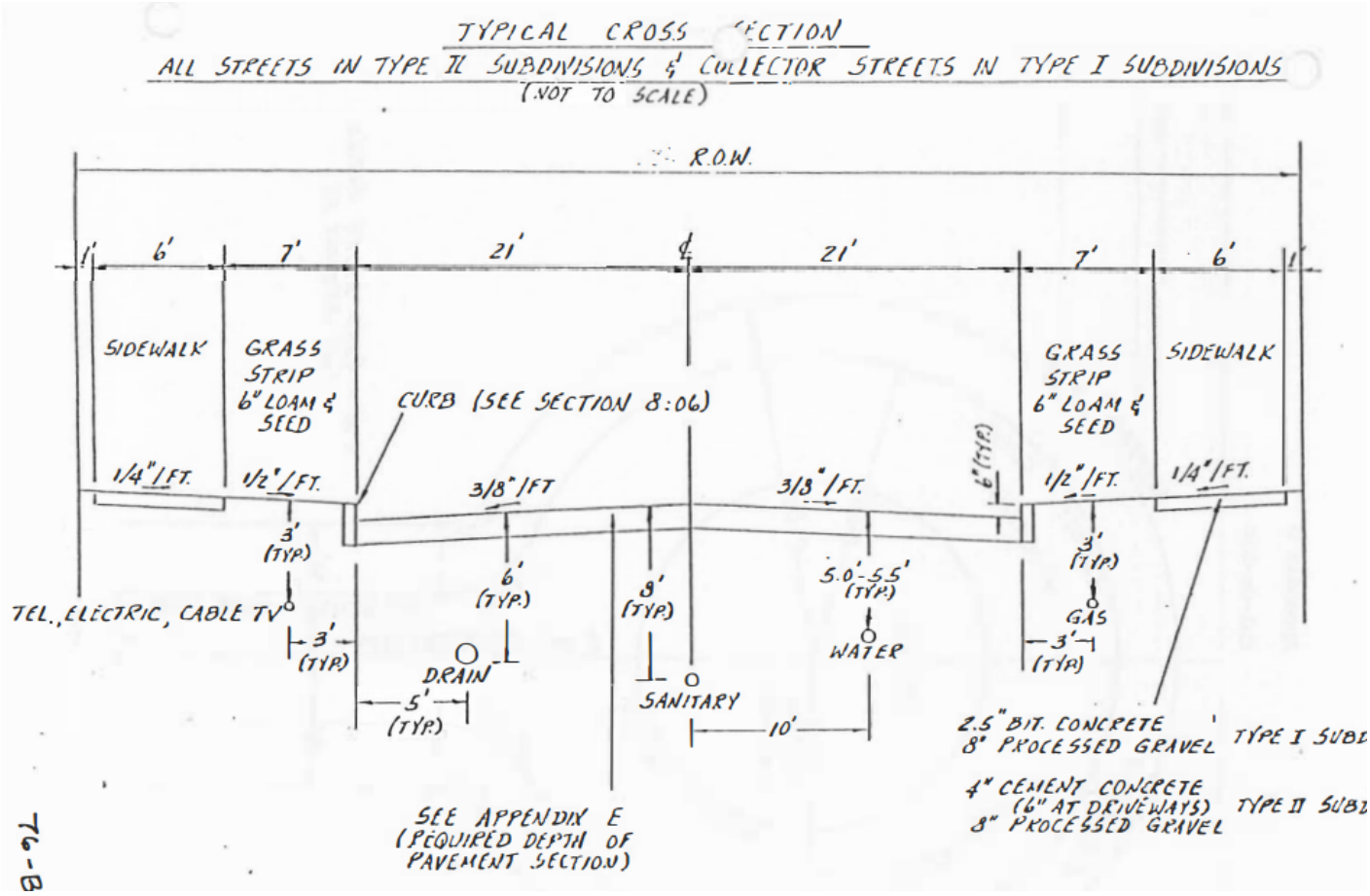
- Sidewalks shall be required on both sides of all streets in Type II subdivision and Type I subdivision collector streets. Sidewalks shall be required on one side of all streets in Type I subdivision local streets.
    - Sidewalks shall be made of cement concrete with a minimum width of five (5) feet in Type II subdivisions. In Type I subdivision collector streets sidewalks shall be of bituminous concrete with a minimum width of five (5) feet for collector streets and four (4) feet for local streets.

- **Street Network Requirements:**
    - All streets in the subdivision shall be designed so that, in the opinion of the Board, they will provide safe vehicular travel. Due consideration shall also be given by the subdivider to the attractiveness and design of the street layout in order to obtain the maximum livability and amenity of the subdivision. As far as practicable, streets should also follow natural contours.
    - Provisions satisfactory to the Board shall be made for the proper projection of streets adjoining to properties and their street connections, if they are already subdivided, or to the Plan Boundary when adjoining properties are not already subdivided or developed. Accesses to adjoining property which is not yet subdivided shall be provided in such a manner that cross connections will be spaced at not more than 1,000-foot intervals. When plans include such connections or projections, the Board may require full construction of the same as part of the street system for the purpose of providing adequate facilities for water, sewerage and drainage in the subdivision and for coordinating the ways in the subdivision with the town and adjacent subdivisions.
    - Streets and ways shall be continuous and in alignment with existing streets, as far as practicable, to insure free and safe movement of vehicular traffic.
    - The developer shall make every effort to avoid the creation of dead-end streets.
- **Requirements for connecting to existing paths or trails:**
    -
- **Requirements to set aside easement for future connections to future streets:**
    - Easements with Temporary Cul-de-sac
        - A temporary cul-de-sac shall be allowed only where, in the opinion of the Planning Board, it is essential to the reasonable development of the subdivision and where it is a part of a street or way that eventually will be extended into adjoining property. The design of a temporary turnaround shall be satisfactory to the Planning Board, and clearly shown on the plan as temporary in nature, and such property lines shall be those which would normally have been required or used without the turnaround. Regardless of the above, no temporary cul-de-sac shall be allowed if the street length exceeds the limit set in these Rules and Regulations. Layout of the turnaround beyond the normal street right-of-way lines shall be in the form of an easement to the Town of Easthampton covering said premise included in the

turnaround. When the street is extended into adjoining property, the easement shall become null and void.

- **Number and location of trees and/or landscaping:**
  - Planting Strips
    - Planting strips shall be provided on each side of the roadway, between the roadway and sidewalk
    - No trees or other obstruction shall be place or retained within the planting strip so as to be closer than two feet from the edge of the roadway
    - The Board may require that shade trees shall be retained or planted within the planting strip of a species and size directed by the board
    - The minimum width of any planting strip shall be seven (7) feet**.**
  - Street Trees and Landscape Plan
    - Where , in the opinion of the Planning Board, the existing trees in the area of the subdivision are not adequate, provisions for at least two street trees per lot may be required in the side slope or in adjacent · portions of each lot. A Landscape Plan including species, size and planting procedure for such trees shall be submitted and must be approved in writing by the Planning Board.

      Planting operations and requirements for trees and plantings contained herein shall be in accordance with the standards and specifications of the American Nurserymen Association and the Associated Landscape Contractors of Massachusetts, and shall have a one year growth warranty.
- **Street Design Requirements**



Type	Pavement Width (Face to face of Berm)
A: Proposed street with MDTVP of not greater than 200 ADT	24′
B: Proposed street with MDTVP of not greater than 500 ADT	26′
C: Proposed street with MDTVP of not greater than 2,000 ADT	28′
D: Proposed street MDTVP exceeding 2,000 ADT	30′

MDTVP- Maximum Development Traffic Volume Potential- The maximum traffic volume generated from the maximum number of dwelling units capable of being developed on a proposed roadway using the minimum lot frontage requirements

Belchertown

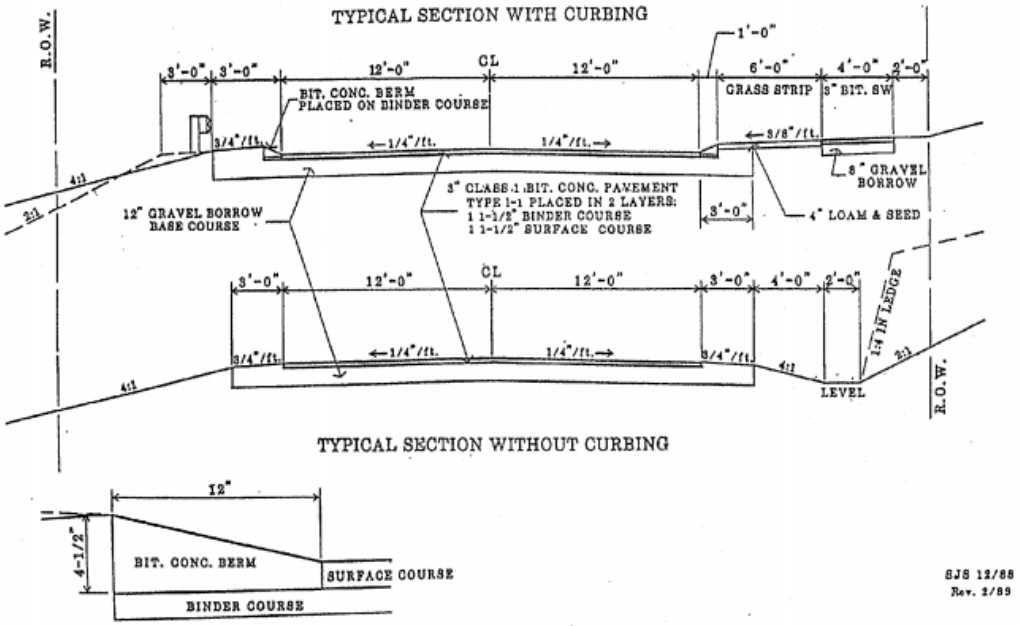
http://ecode360.com/9053050

- **Maximum road length of a dead-end street:**
  - The length of a dead-end street allowed by right is 600 feet. A long dead-end street is allowed up to 1,200 feet if a corresponding amount of open space in the subdivision is dedicated. The formula is that for every two acres of open space dedicated, 100 feet of street length is allowed, up to 1,200. If a second dead-end extending form the first one is desired, an additional two acres of open space per 100 feet of street length is required.
    - No more than one new permanent dead-end street may be connected to another permanent dead-end street. The farthest point of either such dead-end street may not exceed the limits allowed above
- **Sidewalk requirements:**
  - Requirements. Bituminous concrete sidewalks shall be constructed on one side of the roadway when contiguous with other town sidewalks or if required by the Planning Board. The Planning Board may require sidewalks to encourage pedestrian activity and provide more security for pedestrians.
  - Sidewalks must be a minimum of four feet in width
- **Street Network Requirements:**
  - Due consideration shall be given by the Planning Board and the subdivider to the attractiveness and design of the street layout. Except where public safety and compliance with these regulations require otherwise, streets shall follow natural contours.
  - The streets shall conform to any Master Plan adopted under MGL c. 41, § 81D, in whole or in part by the Planning Board.
  - Provision shall be made, to the satisfaction of the Planning Board, for the proper projection of streets or for access to adjoining property which is not yet subdivided or developed. Reserve strips prohibiting access to streets shall not be permitted, except where, in the opinion of the Planning Board, such strips shall be in the public interest.
  - Streets and ways shall be laid out to intersect as nearly as possible at right angles. In no case shall street and way intersections be less than 75°.
  - Street and way lines at all intersections shall be rounded with a curve at each corner which has a property line radius of not less than 30 feet. When the intersection of two streets varies more than 10° from a right angle, radii shall be provided in accordance with the detail in Appendix B
  - When streets and ways do not intersect directly, intersections of streets and ways shall have center-line offsets of not less than 200 feet.
- **Requirements for connecting to existing paths or trails:**
  -
- **Requirements to set aside easement for future connections to future streets:**

- The Planning Board may require that provisions be made for the future extension of a proposed new dead-end street to provide access to adjoining land if the Board believes it desireable to provide potential connections for a through street.

- **Number and location of trees and/or landscaping:**
  - Provisions. Where, in the opinion of the Planning Board, the existing trees to remain are not adequate, provisions for two street trees per lot may be required for each lot. Species, size and planting procedures shall be approved, in writing, by the Planning Board. Street trees shall be planted at an interval of 50 feet separating individual trees or at an interval required by the Planning Board. The Planning Board may also require shrubs or other vegetation for aesthetic benefits, and to stabilize slopes and absorb excess water.
  - No small trees, shrubs, or herbaceous plants that may obstruct visibility at street intersections shall be permitted within 90 feet of the point of intersection of the curb or exterior roadway lines along both sides of the corner lot at the intersection.
- **Street Design Requirements**
  - Minimum Right-of-way width: 50 feet
  - Minimum Paved Roadway Width: 24 feet
    - Without berms: 24 feet from pavement edge to pavement edge
    - With berms: 24 feet from face of berm to face of berm
  - Greater or lesser width may be required by the Planning Board
  - Street Center islands are not allowed. They obstruct snowplowing and deteriorate unless frequent maintenance is performed

TYPICAL STREET CROSS SECTIONS



TYPICAL SECTION WITHOUT CURBING

SJS 12/88
Rev. 1/89

Appendix 6: Relevant Selections from 40R District Design Guidelines for Comparison Communities

Easthampton 40R District Design Guidelines

SECTION III: DESIGN STANDARDS

A. Building Character & Design

Building design shall be reviewed by the Plan Approval Authority (PAA) with input from City Officials and any review consultant(s) employed by the PAA, and others as appropriate. The following design elements listed in this subsection are to be interpreted as building design standards to be applied by the PAA as appropriate to the situation under review, and other extraordinary site constraints.

1. Building Size, Height and Scale
   New buildings in the Traditional Neighborhood Sub-District shall be constructed to a size, scale and height roughly equal to the average size, scale, and height of existing buildings (of a similar use) within 200 feet from the structure. New buildings in the Downtown Mixed Use and Highway Business Mixed Use Sub-Districts shall follow the standards listed in Section 7.371 of the Smart Growth Zoning Ordinance.

2. Building Massing
   Unbroken building facades longer than 100 feet shall be avoided. Human-scale features such as porches, patios, walkways and gardens, especially at lower levels within mixed use buildings shall be encouraged.

3. Garages and Driveways
   The use of detached garages to the rear of the lot is highly encouraged. Attached front-entry garages shall be a minimum of 10 feet behind the front main building wall. Attached garages, not setback from the main building façade, shall be designed to have access from the side or from the rear of the building not visible from the public way. Minimize the impact of individual garage entrances where they face the street by limiting the curb cut width and visually separating the garage entrance from the street with landscaped areas. Emphasize pedestrian entrances in order to minimize the garage entrances.

4. Rooflines
   The roof design shall provide a variety of building heights and varied roofline articulation within the Highway Business and Traditional Neighborhood Village sub-districts.

5. Energy Efficiency

All buildings shall reflect environmentally responsible design and construction practices as governed by the Energy Star Program.

6. Universal Access

To the greatest extend feasible, all buildings shall conform to the universal access requirements of 521 CMR (The Rules and Regulations of the Massachusetts Architectural Access Board), the Uniform Federal Accessibility Standards (UFAS), as referenced by Section 504 of the Rehabilitation Act, the 24 CFR 100.205 – Federal Fair Housing Act (FHA) requirements for Accessible Design and Construction, and Appendix A to 26 CFR Part 36 – ADA Standards for Accessible Design (ADAAG), as referenced in the Americans with Disabilities Act.

B. Circulation

1. Pedestrian and Bicycle Circulation

Each neighborhood street shall be designed to encourage pedestrian and bicycle travel by providing short routes to connect residential uses with nearby commercial services, schools, parks, and other neighborhood facilities. Sidewalks shall be provided to allow access to adjacent properties and between individual businesses within the development. If the property directly abuts a pedestrian walkway or bikeway right-of-way, a paved access route to the bikeway shall be provided.

2. Access to Public

Transportation The following standards shall apply to projects in the Highway Business Sub- District:

a) Where appropriate, bus stops and shelters shall be made available and incorporated into the project design.

b) The applicant shall consult with the Pioneer Valley Transit Authority for the design standards of bus shelters, turning radius for buses, and vehicle access.

3. Public Streets and Sidewalks

The following standards will apply only in the Highway Business and Traditional Neighborhood Village Sub-Districts:

a) All public and streets and sidewalks shall provide for deed public access, and shall be constructed in conformance with the design and construction standards in the Subdivision Rules and Regulations for the City of Easthampton in effect as of October 17, 1990.

b) All off site construction of roadways shall comply with the most recent edition of the Massachusetts Highway Design Standards, as applicable.

4. Private Streets

All private roadways shall be allowed in any development provided the way shall be constructed in conformance with the design and construction standards in the Subdivision Rules and Regulations for the City of Easthampton in effect as of October 17, 1990. All on-site and off-site improvements, which include the installation of utilities, public lighting, sewers, and other public improvements, shall be constructed in accordance with the standards in the Subdivision Rules and Regulations for the City of Easthampton in effect as of October 17, 1990.

C. Parking

1. Shared Parking
   Notwithstanding anything to the contrary within, the use of shared parking to fulfill parking demands noted in Section 7.380 of this Ordinance that occur at different times of the day is strongly encouraged. Minimum parking requirements may be reduced by the PAA through the Plan Approval process if the applicant can demonstrate that shared spaces with meet parking demands by using accepted methodologies (e.g. Urban Land Institute Shared Parking Report, or other approved studies).

2. Reduction in Parking Requirements
   Notwithstanding anything contrary to herein, any minimum required amount of parking may be reduced by the PAA through the Plan Approval process if the applicant can demonstrate that the lesser amount of parking will not cause excessive congestion, endanger public safety, or that lesser amount of parking will provide positive environmental or other benefits, taking into consideration:

a) The availability of surplus off street parking in the vicinity of the use being served and /or the proximity of a bus stop;

b) The availability of public or commercial parking facilities in the vicinity of the use being served;

c) Shared use of off street parking spaces serving other uses having peak user demands at different times;

d) Age or other occupancy restrictions that are likely to result in a lower level of auto usage;

e) Impact of the parking requirement on the physical environment of the affected lot or adjacent lots including reduction in green space, destruction of significant existing trees and other vegetation, destruction of existing dwelling units, or loss of pedestrian amenities along public ways; Such other factors as may be considered by the PAA.

3. Location of Parking

To the maximum extent feasible, any surface parking shall:

a) Locate no more than 25% of the total parking requirements or 10 car spaces whichever if smaller, along the front yard relative to any principal street, public open space, or pedestrian way;

b) Limit individual parking areas to no more than 30 parking spaces. Surface parking areas larger than 30 parking stalls may be allowed if they are separated from the street by a minimum 30 foot wide landscaped buffer, and the applicant can demonstrate that a consolidated parking area produces a superior site plan;

c) Arrange all parking and loading spaces to prevent the backing of automobiles onto any street;

D. Infrastructure

1. Storm water Management

Proposed developments in the Highway Business and Traditional Neighborhood Village sub-districts are encouraged to use Low Impact Development Standards (LID) drainage systems to closely mimic natural systems that meet the following standards:

a) All of the stormwater from a 1" NRCS design storm drains into the ground and does not leave the site. A 1" NRCS design storm is a storm with 1" of rain within a 24 hour period.

b) Water leaving the road enters grassed swales graded flat enough to avoid erosion and hold and treat water.

c) Measures to reduce runoff, improve groundwater recharge, and improve stormwater quality, such as rain barrels (barrels at the base of roof gutter leaders that store stormwater and provide water for future lawn and garden use), or rain gardens (rain is captured and retained in depressions carefully planted with native vegetation and allowed to drain into the ground.)

d) Curbs are only appropriate in narrow defined areas without opportunity for grassed swales or in the Downtown Mixed Use sub-district. In those areas, curbs shall be designed to be consistent with the standards set forth in the Subdivision Rules and Regulations for the City of Easthampton in effect on October 17, 1990.

2. Utilities

All electric, telephone, cable TV, and other such utilizes shall be underground from existing roadway utilities, to the extent feasible.

3. Lighting

In order to encourage pedestrian-scale lighting, all plans shall comply with the following requirements:

a) Parking lot poles lighting shall not exceed a height of 18feet.

b) Lighting along the driveways, pedestrian walkways and sidewalks shall not exceed 12 feet in height.

E. Natural Features

1. Open Space

To the greatest extent possible, such open space shall be left in its undisturbed natural condition or, at the discretion of the PAA, it shall be developed so as to be appropriate, in size, shape, dimension, location, and character to assure access to and its use as a park, recreational area, and visual amenity for the development and its residents.

2. Abutting Conservation Areas

To the extent possible, open space shall be planned as single contiguous areas and configured contiguously with abutting conservation open areas. The PAA may require a project to provide public access from one or more streets, ways, or public access trails.

3. Permanent Protection

Open space areas left in their natural condition shall be deed restricted in perpetuity through a permanent conservation restriction.

4. Ownership

The open space shall be owned by a non-profit land trust, City of Easthampton, or conservation organization, homeowners' association, and a permanent conservation easement or deed restriction must be conveyed to the City, with City approval, or to a non-profit trust or conservation organization whose principal purpose is to conserve farmland or open space. In the event that ownership of the land will remain with the homeowners, a non- profit, homeowners' association shall be established. The association shall be responsible for the permanent maintenance of all common lands, protected open space not in public ownership, recreational and thoroughfare facilities, except where such responsibility is assumed by another owner of the common land (land trust or conservation organization).

5. Tree Preservation

The following standards apply to the Highway Business Mixed Use and Traditional Neighborhood Village sub-districts

a) Every effort shall be made through the design, layout, and construction of a project to save as many existing, mature trees as possible. Accordingly, the applicant shall institute alternative site design methods to assure the best chance of tree survival.

b) The applicant shall ensure that at least 35% of the parcel will be shaded, through protection of existing, replacement, and street trees. Plans submitted to the PAA shall show the estimated tree canopies after 15 years of growth, the specific names, sizes and locations of trees to be planted, and the total area of square feet of the area shaded by tree canopies. In determining the shaded area, measure the shaded area assuming that the shaded area is only that area directly under the drip line.

c) The PAA will have the discretion to modify tree shading requirements under power lines and other obstructions which prohibit strict compliance with shading requirements, and to give shading credit for off-site trees and sidewalk tree canopies, where appropriate

d) Selection of replacement trees in regard to their number, size and species, shall be determined by the PAA upon recommendation of the Tree Warden in consultation with a certified arborist, on the basis of an analysis of tree canopy conditions, soil conditions, and other relevant factors.

e) When possible, a diversity of trees shall be used, with a preference of species native to North America. Please see "List of Recommended Trees" for preferred tree species.

f) Use of exotic and invasive plants is prohibited. Applicant shall refer to the latest version of the "Massachusetts Prohibited Plant List" released by the Department of Agricultural Resources for a full listing of prohibited plant species.

g) The applicant will be liable for all planted street trees as to their erectness and good health for one calendar year after planting as determined by the Tree Warden in consultation with a certified arborist.

F. Landscaping

1. Landscape Buffers

A landscaped buffer strip at least twenty (20') wide, continuous except for approved driveway, shall be established adjacent to any public road to visually separate parking and other uses from the road. The buffer strip shall be planted with grass, medium height shrubs, and shade trees. At all street or driveway intersections, trees and shrubs shall be set back a sufficient distance from such intersections so that they do not preset an obstruction to sight lines.

2. Storage Areas

Exposed storage areas, machinery, service areas, truck loading areas, utility buildings and structures and other unsightly uses shall be screened from view from neighboring properties

and streets using dense, hardy evergreen plantings, or earthen berms, or wall or tight fence complemented by evergreen plantings.

3. Maintenance

All landscaped areas shall be properly maintained. Shrubs or trees which die shall be replaced within one growing season.

4. Signs

All signs will conform with Section 10.0 of the Easthampton Zoning Ordinance in effect as of January 18, 1995.

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