PETERBOROUGH NH 101/US 202

Corridor Improvement Study

2018-2019

Prepared by Southwest Region Planning Commission

with assistance from the NH 101/US 202 Work Group

New Hampshire DOT
Department of Transportation

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Acknowledgements

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Introduction

Statement of Purpose

The purpose of the Peterborough NH 101/US 202 Corridor Improvement Study is to develop a unified strategy for the use, development and management of NH 101 and US 202 and one which is compatible with local, regional and State goals and needs. The focus of the Study is to assess opportunities to improve access management and multimodal transportation options along the corridors. The Study will address a full range of parameters affecting both highway performance and community development. The project will emphasize the interrelation of development activity with capabilities of the highways, built environment, natural environment, and development constraints, and furthermore the respective roles of private, municipal and State entities in affecting the future of the NH 101 and US 202 area in Peterborough. This is a planning initiative and is not intended to serve as an engineering study.

Description of Study Area

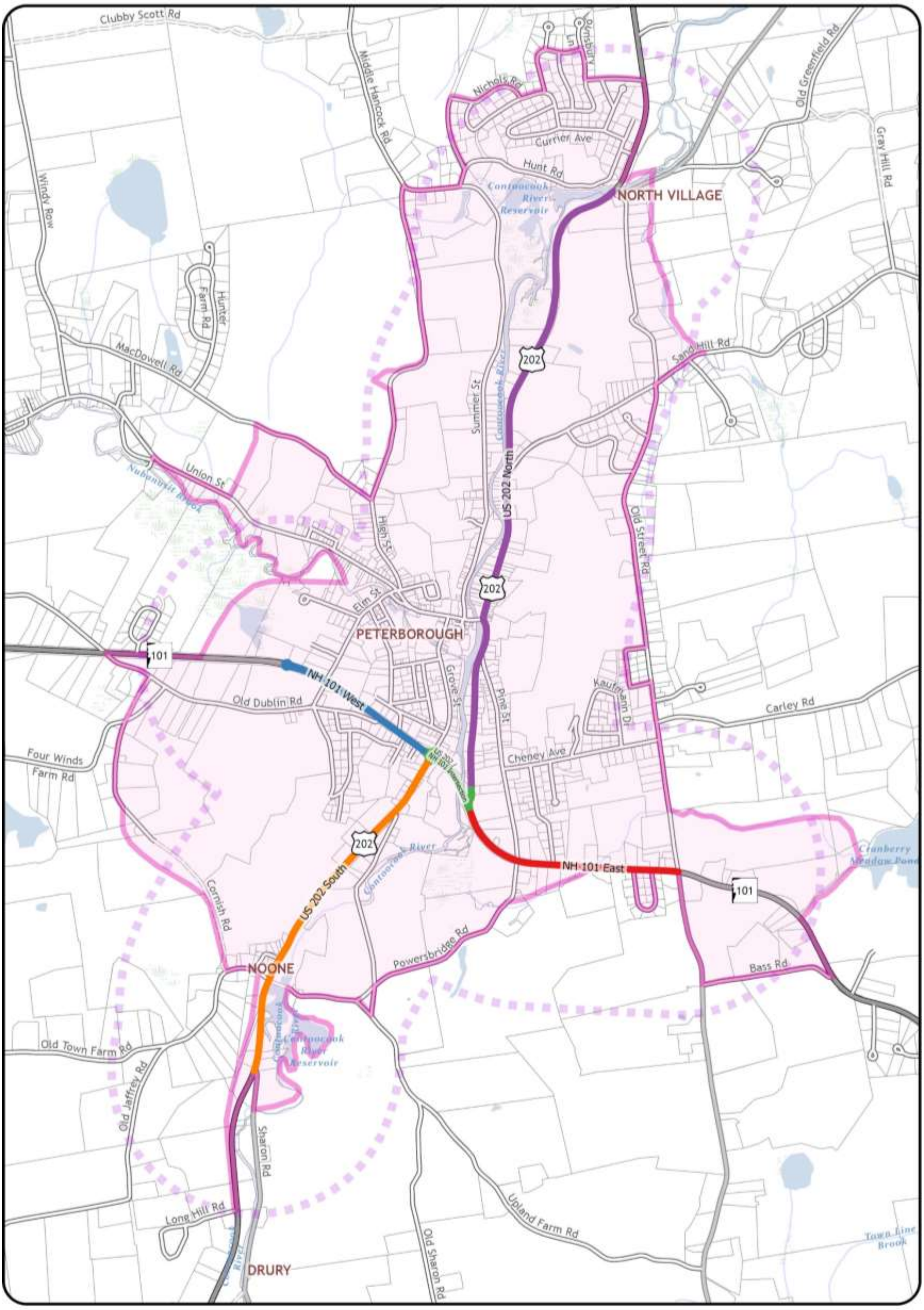
The Study Area includes segments of highway along NH 101 and US 202. On NH 101, the Study Area begins at the NH 101/NH 123/Old Street Road intersection and extends westward to the Shaw's Plaza roundabout, a distance of about 2.3 miles. On US 202, the Study Area begins at the US 202/Sharon Road intersection and extends northward to the US 202/NH 136 intersection, a distance of about 5.3 miles. In order to emphasize that the Study Area focuses on these two highway corridors, this report sometimes references the Study Area as the "Highway Study Area."

To better frame the analysis and discussion in a consistent manner, this report divides the Highway Study Area into five named subsections: US 202 North, US 202 South, NH 101 East, NH 101 West, and the US 202/NH 101 Intersection (Figure 1).

While this report focuses on the highway corridors themselves, it also considers nearby land use, development patterns, natural resources, and other factors that extend beyond the Highway Study Area. The Study establishes a secondary area of focus within a half-mile buffer of the Highway Study Area. Throughout the report, this secondary area is referred to as the "Land Use Study Area" (Figure 1).

Since the geographies that the U.S. Census Bureau uses to collect demographic data do not exactly match the boundaries of the Land Use Study Area, this study develops an approximation of the Land Use Study Area using Census block-level geographies, the most fine-grained level at which U.S. Census Bureau data is available. Throughout this report, this area of demographic data collection is referred to as the "Demographic Study Area" (Figure 1).

Figure 1 - Highway Study Area Subsections, Land Use Study Area, and Demographic Study Area



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Statement of Need

The impetus for this Study came from the Town of Peterborough's concerns about access management and multi-modal transportation in this high-activity, growing area. The project focused on five priority areas that were identified by the Town of Peterborough and the NH Department of Transportation (NHDOT) as important to ensure informed and effective transportation planning and transportation system management. These priority areas include:

- **Management of Existing Infrastructure**-Preserve and maximize existing transportation capacity through local land use, access management, local connections, Travel Demand Management (TDM), Intelligent Transportation Systems (ITS) and innovative land use techniques at the corridor level;
- **Accessibility and Mobility Alternatives**-Set the framework for expansion of services and infrastructure to serve the mobility and accessibility needs for all modes of transportation;
- **Roadway Improvements**-Continue to monitor the highway system in order to categorize and implement necessary improvements;
- **Safety, Security and Hazard Mitigation**-Promote the safety and security of the transportation system, and include components for major emergencies and evacuation; and
- **Public Participation**-Facilitate informed public choices about the development of multimodal transportation infrastructure.

The U.S. Census Bureau American Community Survey (2012-2016 estimates) indicates that the total population in the Peterborough Census Designated Place (CDP), which is roughly equivalent to the study area, is 3,015 and the total housing units are 1,815. For this segment of the Peterborough residents, approximately 30% work in Peterborough, while 70% of CDP residents commute to jobs outside of Peterborough. Monthly transportation costs for those commuters are estimated to be $1,399, which exceeds the average monthly housing costs for homeowners without a mortgage as well as renters.

According to the NHDOT Traffic Report for a count taken in 2014, there was an estimate of 15,000 annual average daily traffic (AADT) at the intersection of NH 101 and US 202, which is an increase of 1,000 AADT from the 2008 traffic count. This is a key intersection for commuters since many use the US 202 highway to commute to Jaffrey, Rindge and New Ipswich as well as jobs in Massachusetts. Likewise, commuters with jobs in Keene, Milford and Nashua use the NH 101 highway to get to and from work.

Approach

The Peterborough Transportation Study was designed to be a combined planning effort with participation and input by State and local officials and Town employees, with research and analysis led by the SWRPC. Information produced by the Study was shared with the key stakeholders and the general public for public input. A stakeholder's Work Group was convened to work closely with SWRPC staff to corroborate findings and serve as a liaison between staff, local and state officials, key stakeholders, and the general public. The Study design was intended to eventually lead to a vision for the future that prepares the area for more local development activity and traffic demand on NH 101 and US 202.

The study collected information and analyzed the following:

- Local highway asset conditions, access management, capacity under current conditions and anticipated future conditions;
- Potential conflicts between community goals and needs and regional/state goals and needs, and;
- Ways to conserve public investment in highway capacity through intergovernmental coordination and corridor management.

The Study's approach was also intended to provide broader, long-term benefits. Principal among benefits is an elevated awareness of the relationship of highway capacity, demand for access and mobility, land use, and quality of life.

Summary of Findings

- The Town of Peterborough's population is projected to grow somewhat faster than that of Hillsborough County or the State of New Hampshire, but still significantly slower than that of the United States as a whole.
- Peterborough has one of the proportionally largest and fastest growing senior populations in the Monadnock Region.
- The number of inbound commuters to the Demographic Study Area increased substantially from 2006-2015. Over the same period, the number of resident workers (i.e. individuals who both lived and worked in the Study Area) decreased significantly.
- Bicycle infrastructure is lacking in the Land Use Study Area with the exception of the Common Path.
- There are notable gaps in sidewalk connectivity in the Land Use Study Area, both on municipally managed streets and state highways.
- Some Town-designated scenic roads intersect with NH 101 or US 202. Improvements on designated scenic roads require Planning Board approval, thereby creating a hurdle for the installation of bicycle and pedestrian infrastructure, such as painted advisory shoulders.
- Longer term trends in traffic volumes on NH 101 and US 202 are mixed. Over a 20-year period, annual volumes on NH 101 are trending downward.
- The area of US 202 south of Sand Hill Road had the highest observed weekday traffic volumes (14,449 vehicles per day). The southern end of the study area, US 202 south of Sharon Road, was observed to have the lowest weekday traffic volumes (8,738 vehicles per day).
- Operating speeds were found to vary from a low of 32.9 mph on US 202 south of the signalized intersection to 54.6 mph on US 202 at the southernmost extent of the study area. US 202 (Granite Street) was observed to have the highest percent of vehicles exceeding the posted speed limit in that area.
- There are more frequent crashes near the NH 101/US 202 intersection than any of the other sections within the study area, however, the severity of crashes is greater near the outer limits of the study area with the increase in speed.
- US 202 South likely has the most development potential, compared to other Highway Study Area subsections.
- Certain large parcels in the Land Use Study may not be prime for short-term development, but lack protections to ensure future long-term conservation.
- Only some parts of the corridor are controlled access highway, a term that describes NHDOT control over the placement of access points due to state ownership of right-of-way access rights. These locations have significantly safer conditions in terms of access management in how they manage double frontage lots, driveway spacing, number of curb cuts, etc.
- There are several areas that do not meet access management standards such as areas lacking in sight line distance, excessive curb cut widths, off-set distances and alignment, minimum corner clearances, etc.
- There are some instances of curb cuts along the corridor which provide precedent for shared driveways and a potential opportunity for reducing the number of access points along roadways.

Public Participation

Work Group Meetings

The Peterborough NH 101/US 202 Intersection Improvement Work Group held three meetings between September 25, 2018 and May 21, 2019. The Work Group included members with various interests and experience including Board of Selectmen, Planning Board, Chamber of Commerce, SWRPC Board of Directors, residents, and town staff. A summary of the committee meetings is below, and summary notes of the meetings are in Appendix A of this report.

September 25, 2018-Meeting 1: Introductions were made and SWRPC staff provided a presentation on the scope of the Peterborough NH 101/US 202 Corridor Improvement Study. A description of the approach that would be used was given, including the analysis of recent trends, current conditions and probable futures. The study area was shown on a map and includes 1000' on both sides of the highway on NH 101 and US 202. The role of the Work Group members was discussed as well as the level of commitment that would be involved to produce a successful study.

Staff explained that a portion of the project will focus on zoning, land use, environmental resources, demographics, economic development, and land development potential. There will also be a significant amount of traffic-related analysis that will be done such as: roadway access, roadway geometry inventory, inventory of highway and bridge conditions, traffic and pedestrian counts, turning movement counts, highway and intersection capacity analysis, crash analysis, and pedestrian infrastructure assessment.

A group exercise was conducted to gather input from members on the status of development projects that have approval, but have not yet been completed.

November 20, 2018-Meeting 2: A presentation was given on the data collection that has been done. This included pedestrian infrastructure data within the project study area. The collected data includes the location, condition and characteristics of sidewalks, curb ramps and cross walks. Data collection included photographing notable pedestrian infrastructure issues within the study area. There were also pedestrian and bicycle counters installed at three locations along the Common Path in Peterborough: south of Hunt Road, north of the pedestrian underpass beneath NH 101/US 202, and south of Grove Street and the Monadnock Plaza driveway. Traffic counts were also discussed and Peterborough staff mentioned that they could install some traffic counters after the ground thaws in the spring. These could be in addition to the ones that have already been collected by SWRPC.

It was noted that some of the work that will be done during the winter months includes the assessment of the development potential of land within the study area which will include mapping and identifying natural and cultural resources and development constraints such as steep slopes.

May 21, 2019-Meeting 3: A final meeting was convened for SWRPC staff to share the draft report with the work group members and collect feedback that should be included in the final report. Staff shared specific portions of the study that could benefit from having the local knowledge of the work group members.

Demographics, Socioeconomics, and Housing

Demographic factors such as population density, age and income can impact transportation patterns and needs. The following section seeks to establish a baseline understanding of demographic trends in Peterborough, with a particular focus on the Demographic Study Area.

Total Population

In 2010, the Demographic Study Area contained 2,781 people, or about 44.3% of the town's total population, according to the U.S. Decennial Census.

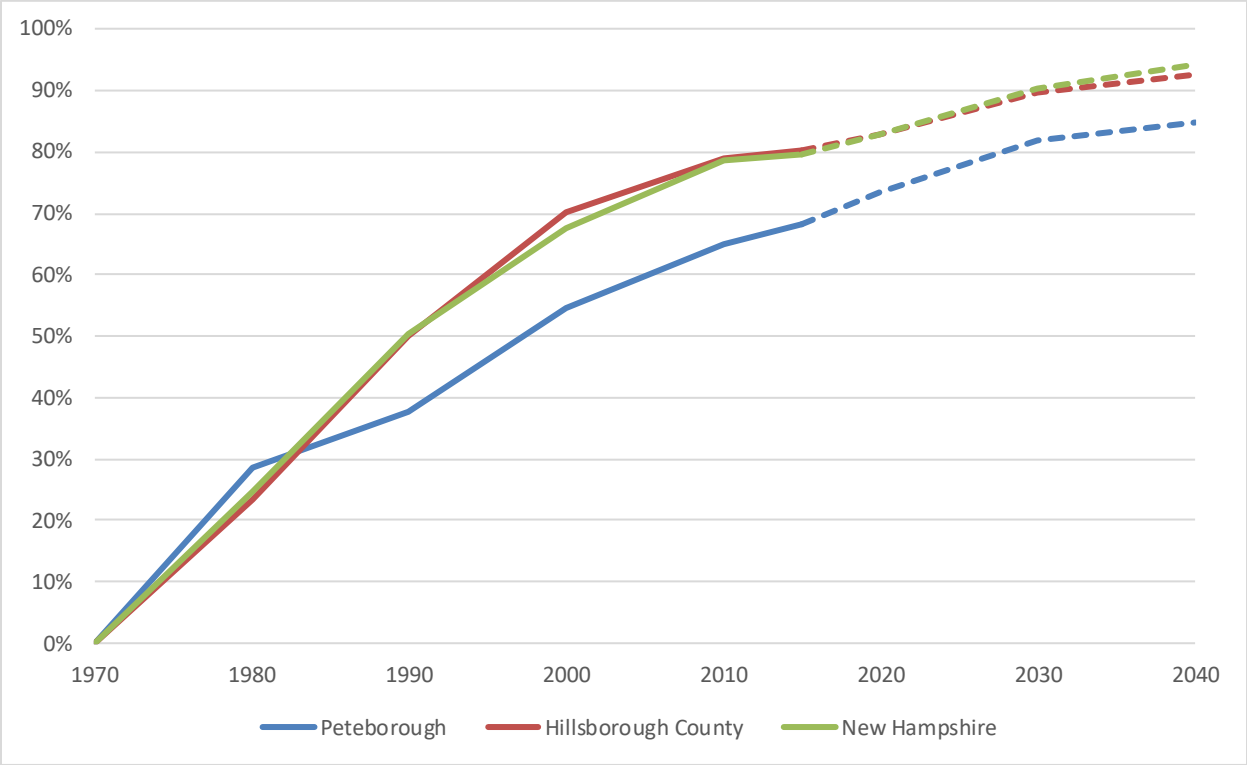
Population trends within the Demographic Study Area are difficult to determine, due to shifting Census block geographies and the absence of population projections at that level of resolution. More general trends, however, may be used from town-level Census data as well as population projections compiled by the NH Office of Strategic Initiatives (OSI).

Peterborough's population grew steadily for the forty-year period between 1970 and 2010, however, at a slower rate than Hillsborough County or the State as a whole. While the Town's population grew 65% between 1970 and 2010, Hillsborough County's population grew 79% while the State's population grew 78%.

In contrast to that trend, Peterborough's population is projected to grow at a slightly *faster* rate than that of the County or the State through the year 2040. According to the OSI, Peterborough's 2015 population estimate was 6,445 people and it is projected to grow steadily to 7,037 in 2040, representing a 9.2% increase. By comparison, the OSI projects that the population of Hillsborough County will grow by 6.7% over the same period while the State population will grow by 7.7%. Although Peterborough represents a regional pocket of population growth, it should be noted that its' growth rate is still quite slow when compared to population growth nationwide, which is projected to grow by about 16.5% between 2015 and 2040 (U.S. Census Bureau).

Population trends - past and future - are more difficult to determine for the Demographic Study Area. Census block boundaries are not stable from census to census. Population projections are unavailable for geographies smaller than the town level. To a certain extent, areas of future population growth may be inferred from municipal land use regulations and anticipated development projects, discussed below under sections *Existing Land Use and Land Use Regulations* and *Future Conditions*.

Figure 2 – Percent Population Growth Relative to 1970 Baseline with Projected Growth through 2040



Source: U.S. Decennial Census, NH OSI

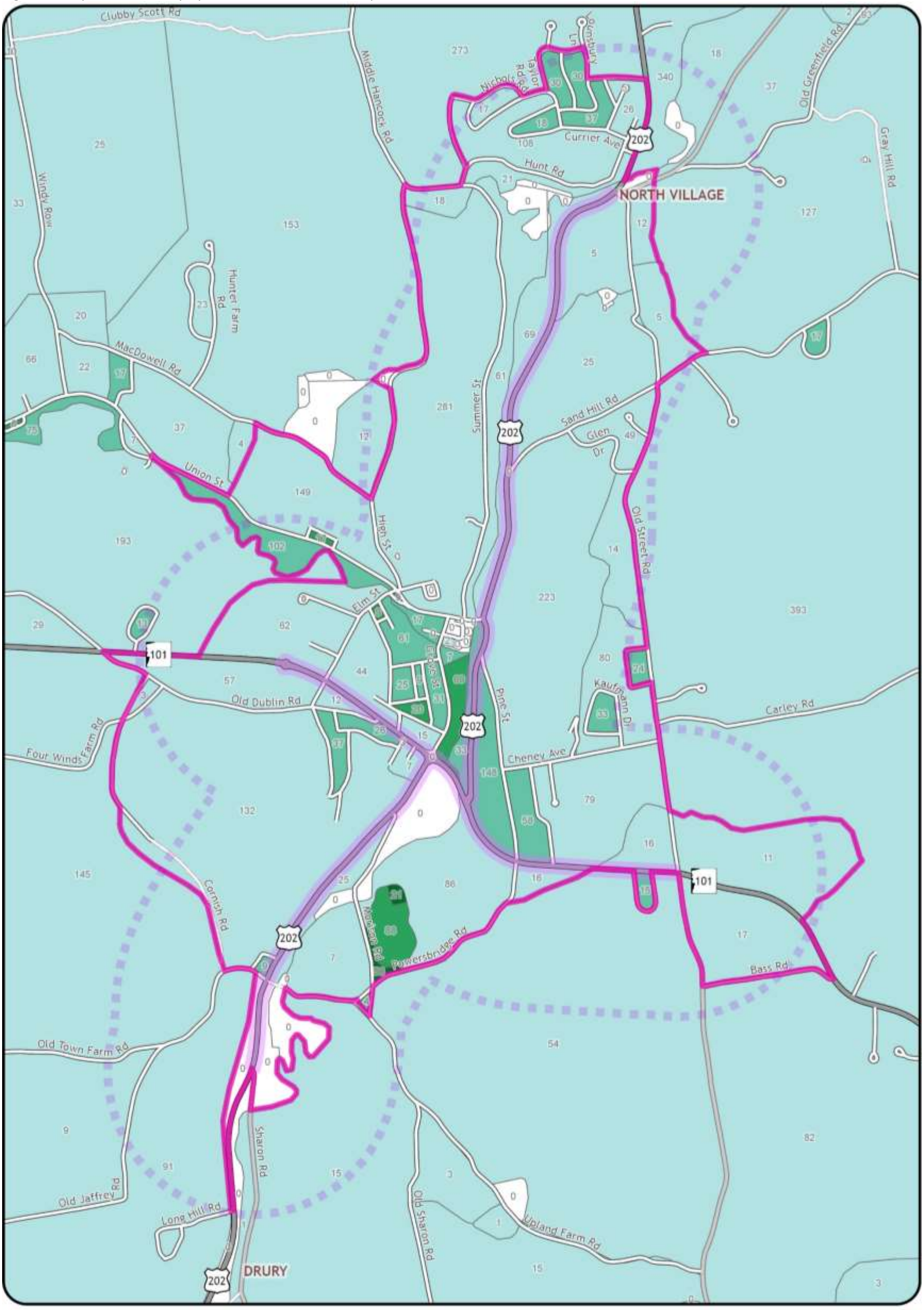
Population Density

Due to irregular Census block boundaries, painting a clear picture regarding population densities across the Demographic Study Area can be difficult. In some cases, Census block boundaries tightly encompass residential development and population densities will appear high. In other instances, Census blocks are larger including both residential development and other land uses, deflating population densities and masking variation within Census blocks.

These challenges notwithstanding, mapping population densities and counts provides some insights into population patterns within the study area (Figure 3). For example, the RiverMead retirement community on Morrison Road and Powersbridge Road stands out as a population cluster likely to drive roadway activity on both US 202 and NH 101. The central village of downtown Peterborough also appears as a population cluster, especially east of Grove Street. On the northern end of the Demographic Study Area, a residential subdivision off of Currier Avenue hosts another notable population cluster.

Although Census block-level population data has its limitations, it will eventually provide a useful gauge for measuring population changes across the Demographic Study Area, once 2020 Census data becomes available. Census block-level population data may also be compared with parcel-level residential land use patterns to enhance understanding of population densities across the Demographic Study Area.

Figure 3 - Population Density by U.S. Census Block with Population Counts Labeled



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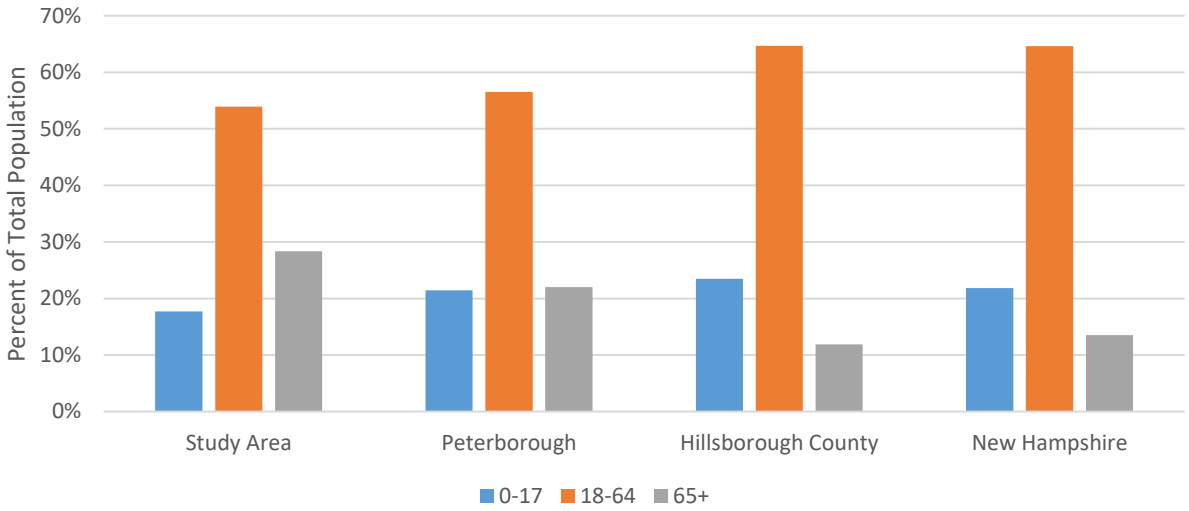
Age

While the age profile of the study area for residents, employees and customers likely differ, the resident population of the demographic study area skews older than the town as a whole or surrounding geographies. The population aged 65 or older was about 29% greater in the demographic study area than in the Town of Peterborough taken as a whole (2010 U.S. Decennial Census). The comparatively large senior population is likely accounted for by the presence of several substantial retirement communities within the demographic study area. Facilities include RiverMead LifeCare Community (Morrison Road/Powersbridge Road), Scott-Farrar at Peterborough (Elm Street, off of NH 101 E), and Pheasant Wood Center (Pheasant Road, off of US 202 N).

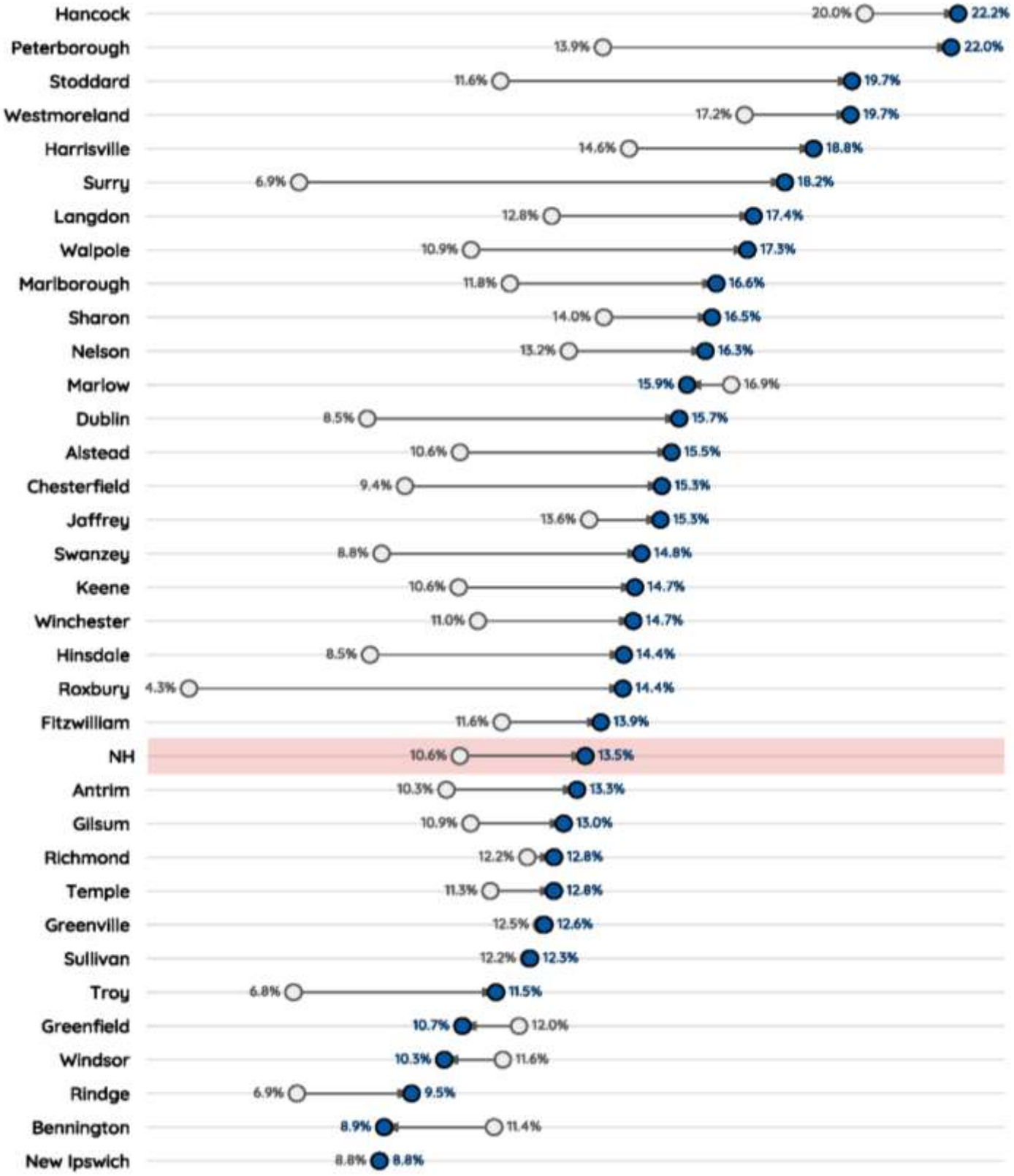
Figure 4 - Age Distribution of Demographic Study Area (2010 resident population)



Source: U.S. Decennial Census, 2010

Due to lack in standardization across decennial censuses, identifying trends in population age is difficult at the Census block level, and thus for the Demographic Study Area. Town-level data, however, may be used as an approximation for how population age is shifting within the Demographic Study Area. Compared to other Monadnock Region municipalities, Peterborough has a relatively large and quickly-growing senior population (Figure 5). In 2010, the Town had the second highest proportion of seniors, with individuals 65 and over making up 22% of the population. Only the Town of Hancock had a higher proportion, with seniors composing 22.2% of the population. Peterborough's senior population, however, grew much faster between 1970 and 2010. While the senior population grew by only 11% in Hancock, it grew by nearly 60% in Peterborough. Statewide, the senior population grew by 27% over the same time period.

Figure 5 – Percent of Population 65 and Over, 1970 (Gray) vs. 2010 (Blue), Municipalities in the Monadnock Region



Source: US Census ACS

The senior population is not distributed uniformly throughout the Demographic Study Area. Figure 6 depicts the senior population density by 2010 U.S. Census block. At the Census-block level, the densest senior population cluster is located at the RiverMead Lifecare Community. Senior population density is especially pronounced at that location due to the fact that the Census block boundaries closely circumscribes the RiverMead property. In other cases, U.S. Census block-level data may obscure significant senior population clusters. Larger census blocks may include both densely populated areas and more sparsely populated areas, lowering the overall density. Senior housing facilities like Summer Hill Assisted Living and Scott-Farrar at Peterborough are located within Census blocks that also include sparsely developed land, diffusing overall density at the Census block level.

Since Census block-level population density data poses limitations, Figure 6 also depicts the location of senior housing facilities, as well as Census block senior population counts, indicated by the numerical labels. Senior population counts reveal substantial senior populations within larger Census blocks. For example, the Census block adjoining US 202 North, Pine Street and Cheney Avenue contains 86 senior residents.

When examining the spatial distribution of minors (17 years old and under) throughout the Demographic Study Area, different patterns emerge. While substantial numbers of seniors live south of NH 101, minors tend to live north of NH 101, most notably in West Peterborough, on Summer Street and in residential neighborhoods near South Meadow School (Figure 7).

Figure 6 – Senior Population Density (Color) and Population Counts (Numerical Label) by 2010 U.S. Census Block

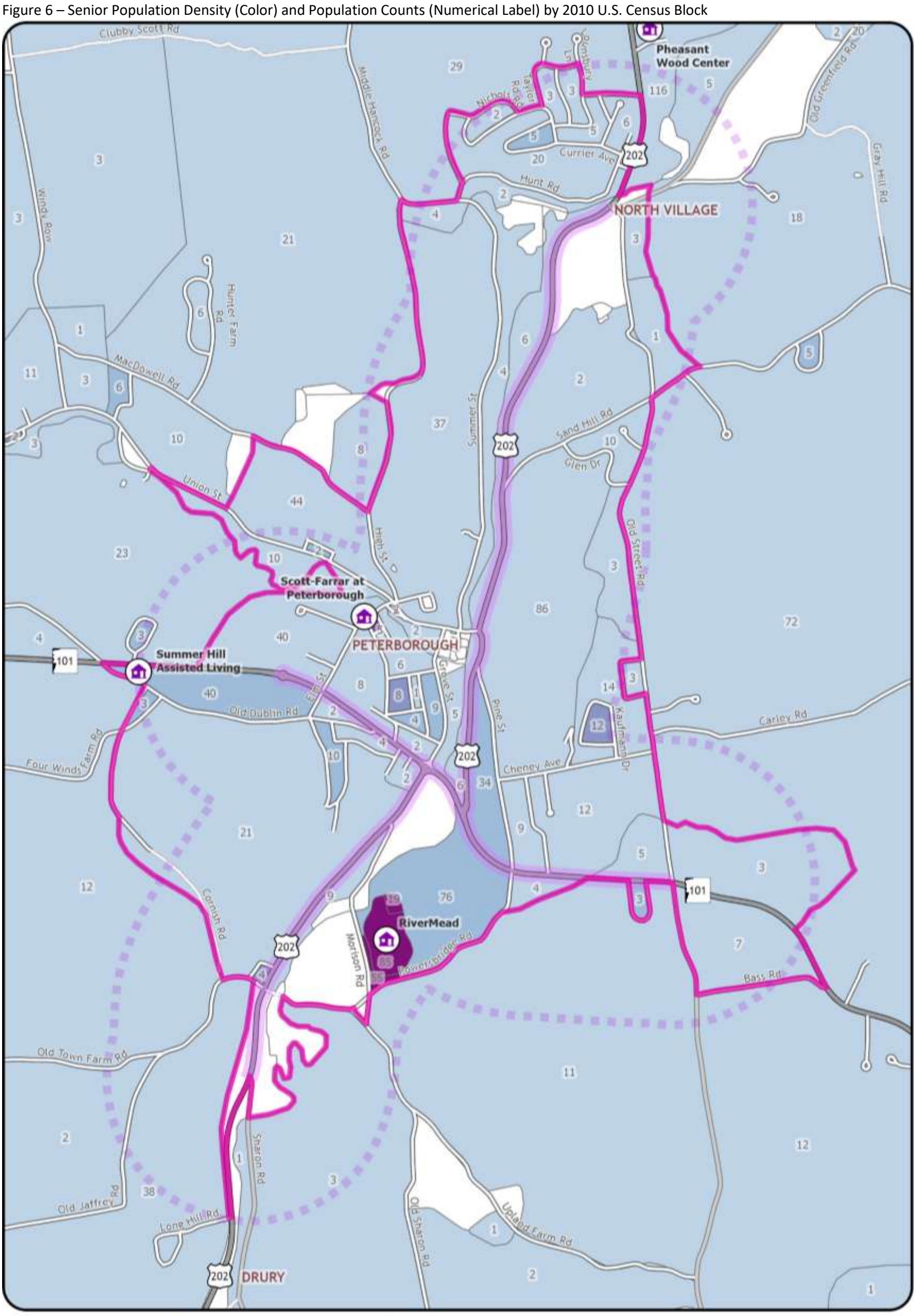


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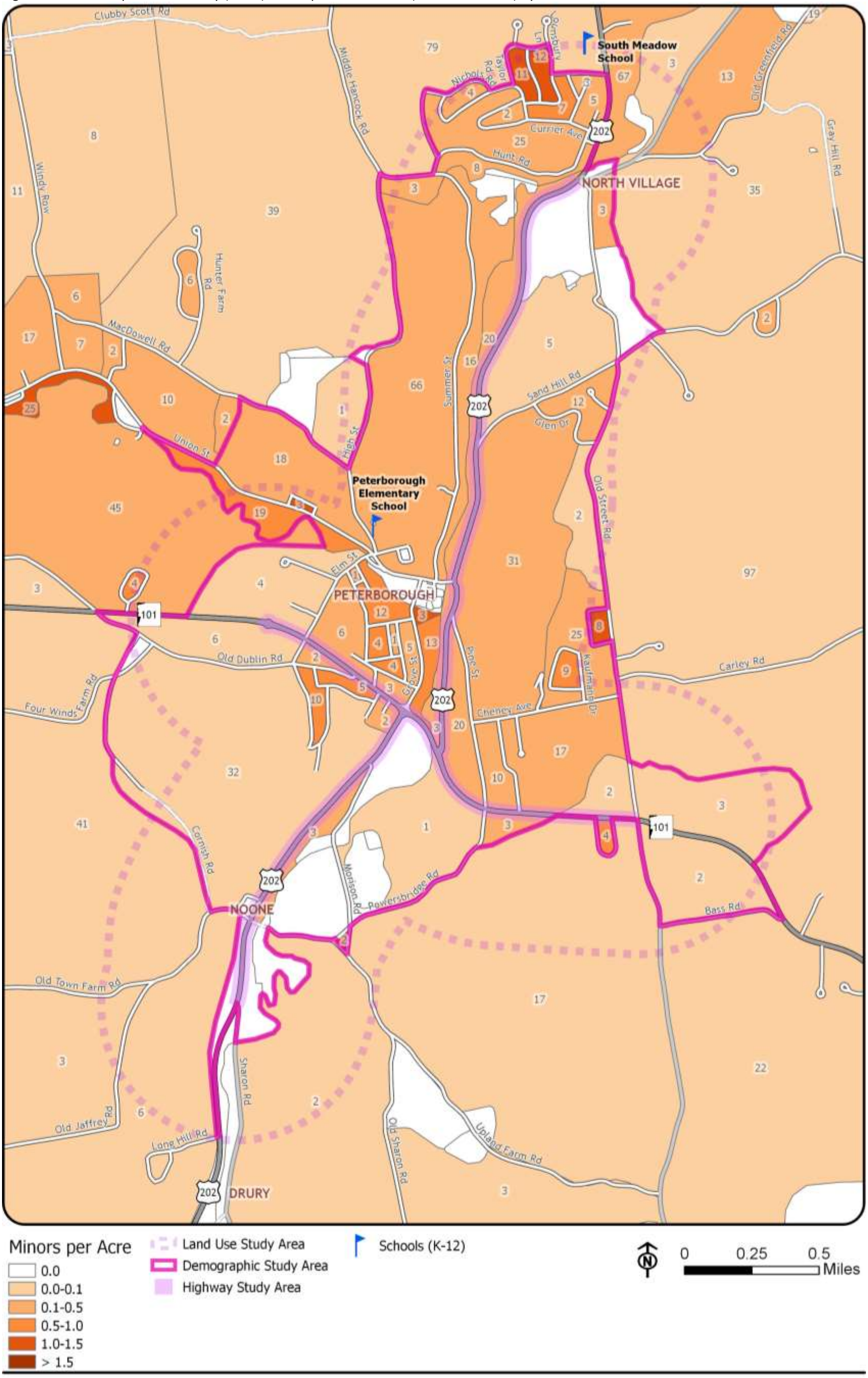
Figure 7 – Minor Population Density (Color) and Population Counts (Numerical Label) by 2010 U.S. Census Block



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Housing

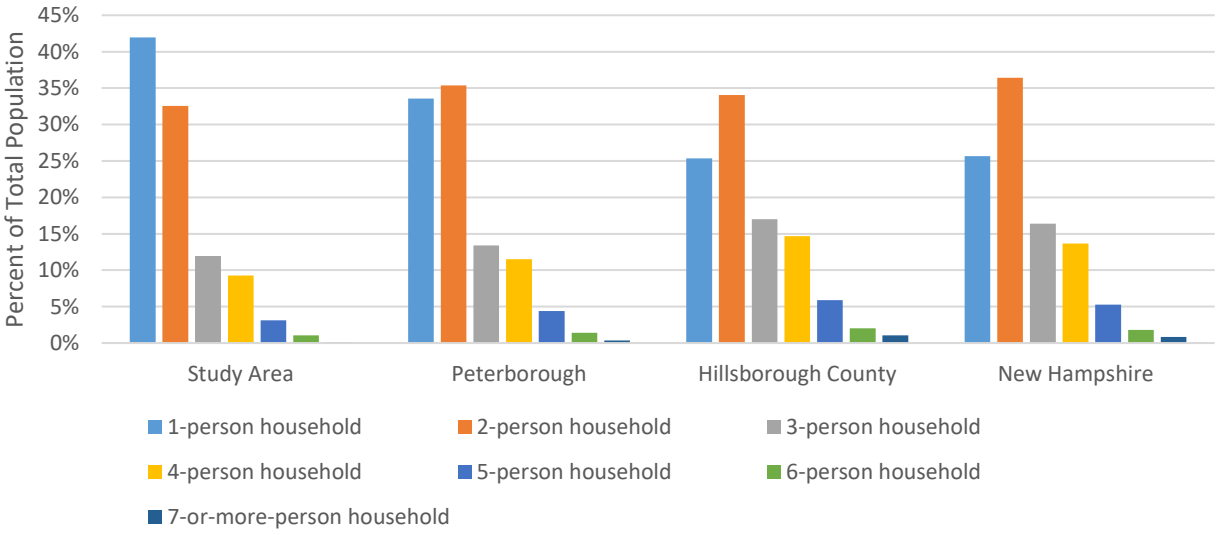
Total Existing Units

The Demographic Study Area contained 1,426 housing units in 2010, at an average of 1.11 housing units per acre. Housing units within the Demographic Study Area accounted for about 48.2% of the Town's total housing units.

Household Size

The Demographic Study Area is characterized by a higher share of one-person households, compared to the town as a whole and the surrounding geographies. However, population and housing trends within the Demographic Study Area are difficult to establish, since the Census block boundaries on which it depends have boundaries that can shift from one Decennial Census to the next. The absence of population projections at the Census block level also impedes the assessment of future housing needs within the Demographic Study Area. Population and housing trends for the entire Town, however, can serve as a useful approximation for the Demographic Study Area and for evaluating future housing needs. In the Demographic Study Area, 42% of households were one-person households, a rate 25% higher than the town as a whole and 65% higher than Hillsborough County. The greater proportion of single-family households within the Demographic Study Area suggests that housing needs may differ elsewhere in town. For example, condominiums and apartments may be in higher demand than single-family homes.

Figure 8 - Household Size (# of Occupants)



Source: U.S. Decennial Census, 2010

Future Housing Needs

The Town of Peterborough Master Plan assumes a minimum 1% annual population growth in order to estimate housing needs through 2030. Given that the Town's population in 2010 totaled 6,284, an annual growth rate of 1% would result in a 2030 population of 7,541. If housing occupancy levels were to remain the same as they were in 2010 (at 2.05 persons per housing unit), an additional 31 housing units would need to be constructed each year.

State population projections published by NH OSI in 2016, however, estimate a population growth rate significantly lower than 1% per year. According to NH OSI, the Town's population is projected to reach 6,926 people by 2030, growing by about a half of a percent per year. At that rate, only about 15 housing units would need to be constructed each year - or 150 per decade - to maintain an occupancy rate of 2.05 persons per housing unit. Previous decades have seen much higher rates of housing construction. For example, from 2000 to 2010, 560 housing units were constructed within Town boundaries, according to the Town's master plan.

Commuter Patterns

Worker Inflow-Outflow

While employment in the study area grew significantly from 2006 to 2015, the population of workers living in the study area declined (Table 1). In 2015, a total of 3,259 people worked in the demographic study area, representing a 20.5% increase over the previous ten years. Also in 2015, 1,284 people lived in the demographic study area, a 9% decrease over the previous decade.

The segment of the study area workforce that lives and works in the study area has always included only a small portion of the total study area workforce. The live-work population, however, grew even smaller from 2006 to 2015. In 2006, the live-work population accounted for about 16% of the study area workforce, while in 2015 it accounted for less than 9%.

Table 1 - Work Inflow/Outflow Analysis

Segment of Workforce	2006	2015	% Change
Worked in Study Area, Lived Outside	2332	2993	28.3%
Lived in Study Area, Worked Outside	1038	1018	-1.9%
Lived and Worked in Study Area	373	266	-28.7%
TOTAL	**3743**	**4277**	**14.3%**

Source: U.S. Census Bureau Longitudinal Employment-Household Dynamics

Distance of Travel

From 2006 to 2015, more individuals who worked in the demographic study area traveled further to work. While nearly half of workers continue to travel less than ten miles, a growing number of workers travel 10-24 miles, 25-50 miles, and more than 50 miles. By percentage change, workers traveling more than 50 miles saw a significantly larger increase during the 2006-2015 period.

Table 2- Distance traveled to work - individuals who work in the demographic study area

	2006		2015		2006-2015 Count Change
	Count	Share	Count	Share	
Total All Jobs	2,705	100.0%	3,259	100.0%	20.5%
Less than 10 miles	1,484	54.9%	1,532	47.0%	3.2%
10 to 24 miles	877	32.4%	1,079	33.1%	23.0%
25 to 50 miles	245	9.1%	414	12.7%	69.0%
Greater than 50 miles	99	3.7%	234	7.2%	136.4%

Source: U.S. Census Bureau Longitudinal Employment-Household Dynamics

Like individuals who work in the study area, individuals who *live* in the study area also traveled further to work over the 2006-2015 period. In 2006, 60% of people who lived in the study area traveled less than ten miles to work, compared to only 43.7% in 2015, representing a 28% decline.

Table 3-Distance traveled to work - individuals who live in the demographic study area

	2006		2015		2006-2015 Count Change
	Count	Share	Count	Share	
Total All Jobs	1,411	100.0%	1,284	100.0%	-9.0%
Less than 10 miles	846	60.0%	561	43.7%	-33.7%
10 to 24 miles	276	19.6%	271	21.1%	-1.8%
25 to 50 miles	183	13.0%	282	22.0%	54.1%
Greater than 50 miles	106	7.5%	170	13.2%	60.4%

Source: U.S. Census Bureau Longitudinal Employment-Household Dynamics

Work/Home Destinations

In 2015, fewer people from the Town of Peterborough worked in the Demographic Study Area, compared to ten years earlier. Similarly, fewer people who *lived* in the demographic study area worked in the Town of Peterborough.

Table 4-Home Locations of Individuals who Work in the Demographic Study Area

	2006		2015		2006-2015 Count Change
	Count	Share	Count	Share	
Peterborough	785	29.0%	598	18.3%	**-23.8%**
Jaffrey	177	6.5%	323	9.9%	82.5%
Rindge	66	2.4%	140	4.3%	112.1%
New Ipswich	129	4.8%	139	4.3%	7.8%
Hancock	152	5.6%	133	4.1%	**-12.5%**
Antrim	168	6.2%	115	3.5%	**-31.5%**
Keene	83	3.1%	114	3.5%	37.3%
Greenfield	68	2.5%	109	3.3%	60.3%
Milford	63	2.3%	79	2.4%	25.4%
Hillsborough	50	1.8%	63	1.9%	26.0%
All Other Locations	964	35.6%	1,446	44.4%	50.0%

Source: U.S. Census Bureau Longitudinal Employment-Household Dynamics

Table 5-Workplace Locations of Individual who Live in the Demographic Study Area

	2006		2015		2006-2015 Count Change
	Count	Share	Count	Share	
Peterborough	613	43.4%	403	31.4%	**-34.3%**
Keene	102	7.2%	94	7.3%	**-7.8%**
Manchester	46	3.3%	67	5.2%	45.7%
Jaffrey	105	7.4%	66	5.1%	**-37.1%**
Nashua	40	2.8%	51	4.0%	27.5%
Greenfield	43	3.0%	35	2.7%	**-18.6%**
Concord	38	2.7%	34	2.6%	**-10.5%**
Milford	26	1.8%	25	1.9%	**-3.8%**
Boston	-	-	22	1.7%	-
Bedford	17	1.2%	21	1.6%	23.5%
All Other Locations	381	27.0%	466	36.3%	22.3%

Source: U.S. Census Bureau Longitudinal Employment-Household Dynamics

Key Findings

- **The Town of Peterborough's population is projected to grow somewhat faster than that of Hillsborough County or the State of New Hampshire, but still significantly slower than that of the United States as a whole.** According to the OSI, Peterborough's population totaled 6,445 people in 2015 and is expected to grow steadily to 7,037 in 2040, representing a 9.2% increase. By comparison, the OSI projects that the population of Hillsborough County will increase 6.7% over the same period while the state population will increase 7.7%. Population growth nationwide is projected to grow at a faster rate from 2015 through 2040, by approximately 16.5% (U.S. Census Bureau).
- **Peterborough has one of the proportionally largest and fastest growing senior populations in the Monadnock Region.** In 1970, 13.9 % of the Peterborough population was 65 and over, a figure which grew to 22% in 2010, representing a 58% increase. By comparison, seniors constituted 10.6% of the population statewide in 1970 and 13.5% in 2010.
- **Seniors are not distributed uniformly throughout the Demographic Study Area.** Dense clusters of seniors likely represent areas where improved transportation infrastructure has the highest positive impact.
- **The number of inbound commuters to the Demographic Study Area increased substantially from 2006-2015.** Individuals who worked inside the Study Area, but who commuted from places of residence outside the Study Area, increased from 2,332 to 2,993, representing a 28.3% increase. The increased number of non-resident workers in the Study Area could potentially impact congestion at morning and evening peak hours.
- **Over the same period, the number of resident workers (i.e. individuals who both lived and worked in the Study Area) decreased significantly.** In 2006, the Study Area included 373 resident workers, while in 2015 it had 266, representing a nearly 29% decrease over the ten-year period.

Existing Land Use and Land Use Regulations

Land use shapes transportation patterns. Low-density residential development, for example, generates much less traffic than a shopping plaza. Land use regulations, meanwhile, play a role in shaping future land use and, consequently, future transportation patterns. This section provides a summary analysis of both existing land use as well as some of the land use regulations that have the potential to shape future land use patterns.

Land Use

The Land Use Study Area contains 1,366 recorded parcels, some which (e.g. condominiums) are duplicates of one another. Removing duplicate parcels yields a total of 1,212 parcels, the majority of which are either primarily used for single-family dwelling units or have no land use data associated with them. Figure 9 depicts parcel-level land use information, as recorded in Town of Peterborough GIS records. To simplify visualization of land use information, some similar land use codes are grouped together. For example, agriculture, hay field and farm are all shown in bright green.

Land use along NH 101 is characterized predominately by low-density residential development or open space. US 202, meanwhile, is lined by a wider variety of land uses, including commercial, industrial, and higher density residential development. As can be seen in Figure 9, many parcels within the Land Use Study Area are currently unassociated with a land use code. Assigning standardized land use codes to all parcels within the Land Use Study Area could allow for a more comprehensive land use analysis.

Table 6 lists land uses that appear within the Land Use Study Area. The table groups land use codes into major categories. The number of parcels and acres associated with each land use code are included. Single-family residential is the most prevalent land use by number of parcels (770 parcels), while “unknown/unlabeled” is the most prevalent land use by acres (2000.7 acres).

Figure 9 – Land Use Map

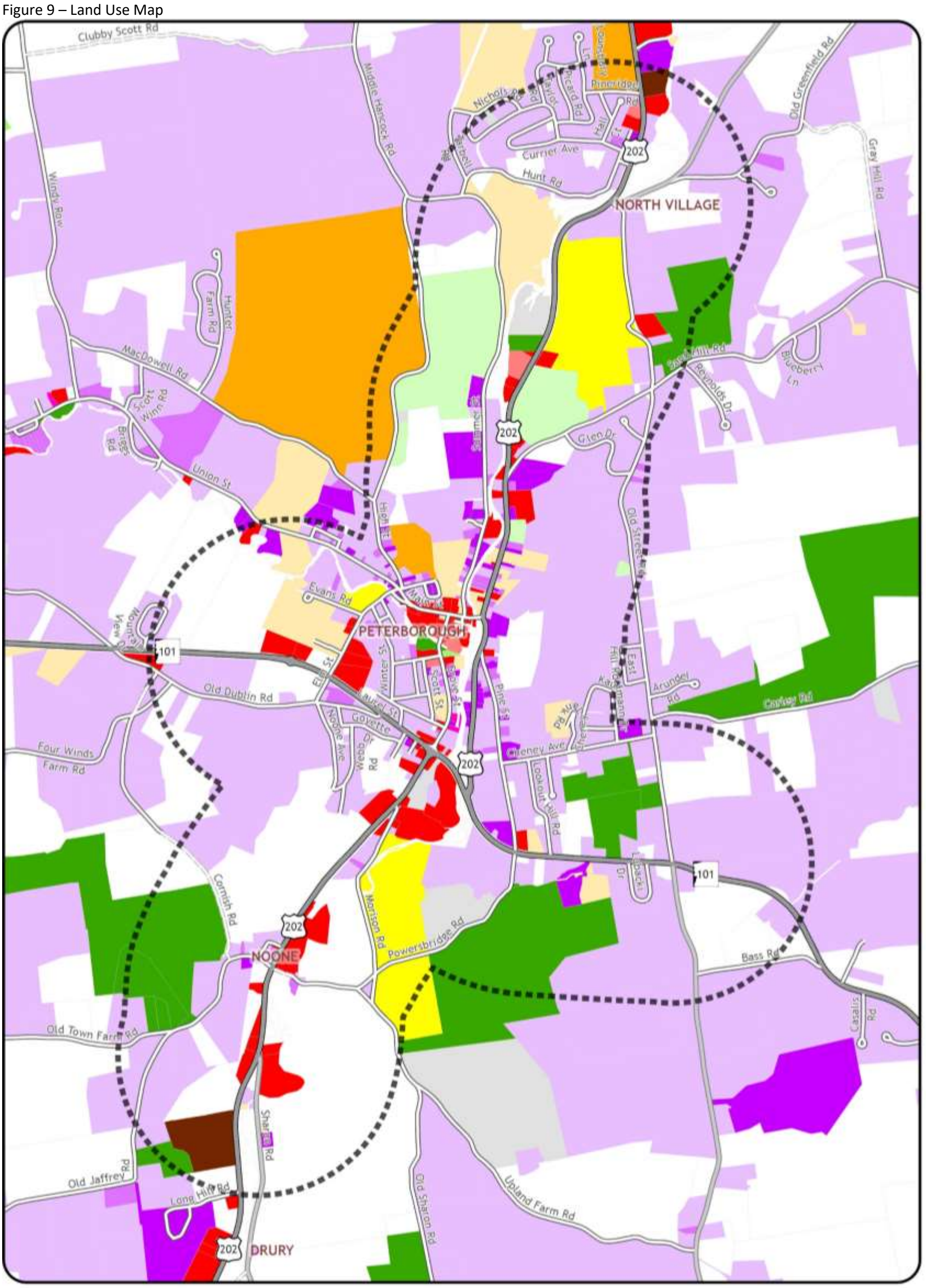


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Table 6- Primary use of land use study area parcels

Study Area Parcels, by Land Use*		
Primary Land Use	**Parcels**	**Acres**
Residential		
Single Family	770	1920.2
Duplex	63	31.5
Multifamily - Apartments	49	57.2
Multifamily - Condo	18	106.5
Unspecified residential	1	0.7
Total residential	**901**	**2116.0**
Business/Commercial		
Commercial	81	118.3
Retail	7	9.4
Bank/Financial Institution	1	0.2
Office	7	21.1
Church/place of worship	10	22.9
Total business/commercial	**106**	**171.8**
Mixed use		
Mixed-use - Primarily Commercial	3	1.1
Mixed-use - Primarily Residential	1	0.5
Total mixed use	**4**	**1.6**
Open space/recreational		
Open space - Protected Land	5	206.4
Recreational	3	53.6
Park	5	180.9
Cemetery	7	132.0
Total open space/recreational	**20**	**572.9**
Institutional/Public Facility		
Educational	3	370.2
Healthcare/Assisted Living	6	185.1
Town Utility/Facility	21	181.0
Public/Semi-Public	1	0.7
Total institutional/public facility	**31**	**737.0**
Industrial	**2**	**30.3**
Undeveloped	**11**	**93.3**
Unknown/No Label	**137**	**2000.7**

*Source: SWRPC analysis of GIS data supplied by the Town *Includes partially contained parcels. Split-zoned parcels are counted more than once.*

Zoning

Zoning in Peterborough is governed both by base zoning districts and overlay districts. Base zoning districts specify permitted uses for parcels contained within those districts, as well as other requirements,

such as maximum building height and lot coverage. As the name implies, overlay districts may sit on top of base zoning districts, superseding or modifying the requirements specified by base zoning districts. The Land Use Study Area contains ten base zoning districts and eight overlay districts. Combined with other land use regulations, such as subdivision regulations and parking requirements, both base and overlay zoning districts influence how land is developed and used along NH 101 and US 202.

Base Zoning Districts

In the study area, the Rural District covers nearly 48% (or 1,722 acres) of the land and the Family District covers 28% (or 1,006 acres). The complete distribution of zoning districts in the study area is shown in the table below.

Table 7- Zoning Districts: Study Area Distribution

Zoning District	Acres	Percent of Study Area	Parcels
Rural District	1722	47.8%	461
Family District	1006	27.9%	832
General Residence District	401	11.1%	525
Commercial District	154	4.3%	133
Monadnock Community Healthcare District	106	3.0%	49
Retirement Community District	75	2.1%	15
Village Commercial District	60	1.7%	35
Business/Industrial District	41	1.1%	53
Downtown Commercial District	30	0.8%	72
Office District	7	0.2%	11
TOTAL	3602	100.0%	2186

*Source: SWRPC analysis of GIS data supplied by the Town *Includes partially contained parcels. Split-zoned parcels are counted more than once.*

Of the 1,316 Parcels within the study area, 570 are split-zoned while 746 are contained in a single zone.

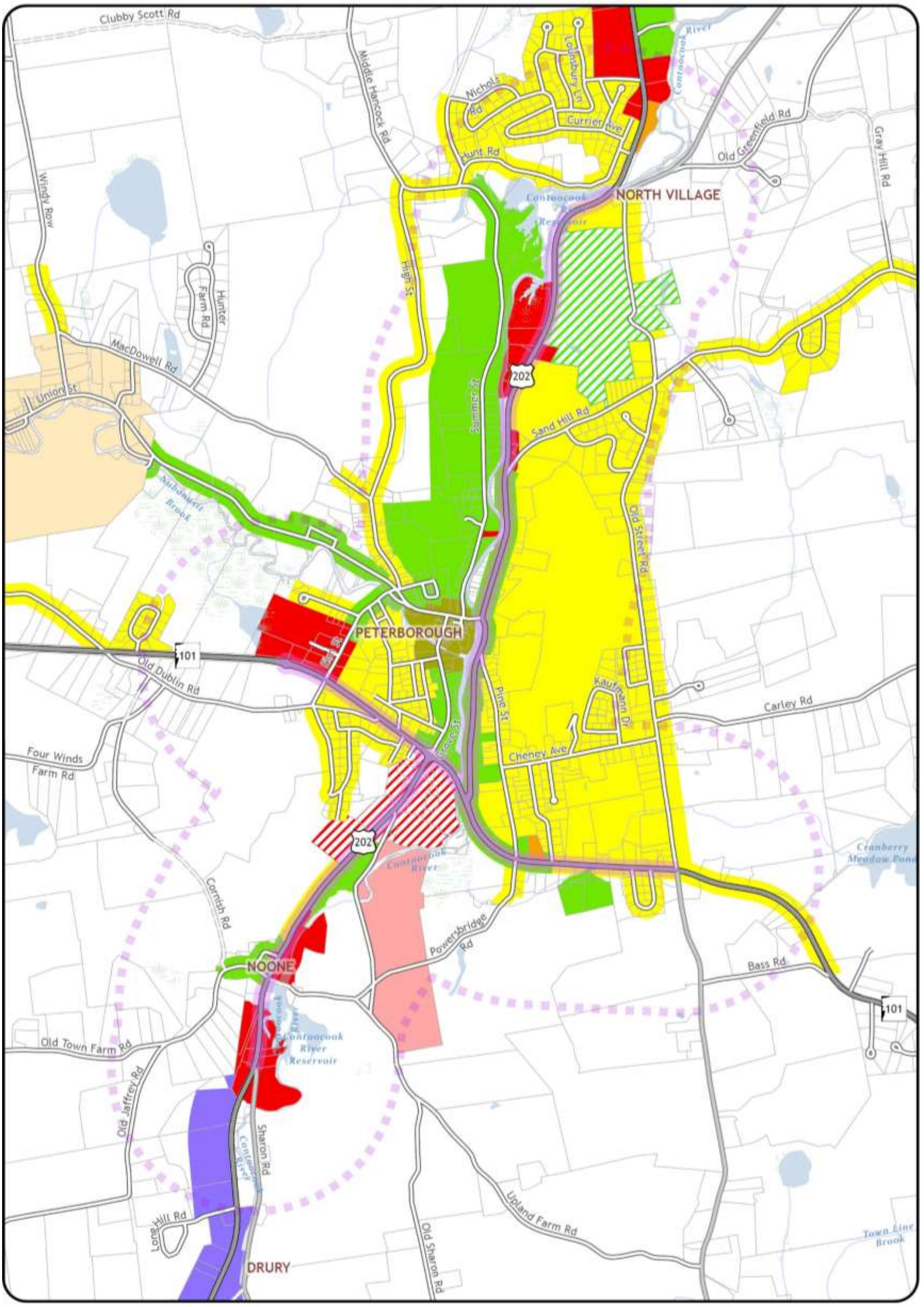
The next table shows the dimensional requirements for the Zoning Districts identified within the study area. Minimum lot frontage varies from 50’ in the Business and Commercial Districts, to 200’ in the Rural District. Setbacks vary considerably, largely based on the type of use.

Table 8- Dimensional Requirements

District	Min Lot Size	Min Frontage (feet)	Front Setback (feet)	Side Setbacks (feet)	Rear Setback (feet)
Rural District	3 acres	200	50	30	30
Family District	40,000 SF (Single family dwelling) 50,000 SF (two family dwelling)	150	30	25	25
General Residence	20,000 SF (single/two family) 10,000 SF/unit (multifamily	100	30	25	25
Village Commercial	Large enough to accommodate emergency vehicles	-	-	-	-
Downtown Commercial	-	-	5*	15*	15*
Business/Industrial	-	50	50***	25†	25†
Commercial	-	50	30**	15	15
Office	1 acre (office building) 5 acres (office park)	100‡	100‡	100‡	100‡
Retirement Community	50 acres	100	100††	100††	100††
Monadnock Community Healthcare	25 acres	-	75‡‡	75‡‡	75‡‡
Retirement Community District	50 acres	100	100‡‡	100‡‡	100‡‡

*Source: Peterborough Zoning Ordinance * Planning Board can elect to reduce;** 50 feet on a state highway, 25 on a town street;*** 50 feet when abutting residential uses; † 30 feet on state highway, 15 on a town street; ‡ For lots less than 10 acres in area, the front setback is 50 feet, side and rear are 30 feet ;†† If the property abuts a state highways, setbacks increase to 150 feet ; ‡‡ Setbacks from perimeter of district are 75 feet. Internal districts are 10 feet or greater, as determined by the Planning Board.*

Figure 10 –Base Zoning Districts



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Overlay Districts

In addition to the base zoning districts identified in the Base Zoning Districts Map, the Peterborough Zoning Ordinance includes eight overlay districts. The purpose and intent of these overlay districts range from natural resource conservation to the promotion of infill development. This section summarizes notable overlay districts and how their provisions may impact transportation patterns.

Traditional Neighborhood Overlay Zone I

The Town adopted the Traditional Neighborhood Overlay Zone I (TNOD Zone I) in 2014 in order to "allow for the infilling of lots and additional residential housing in close proximity to the Downtown Area in section of town where there are established subdivided neighborhood."[1] TNOD Zone I allows for mixed land use and significantly denser residential development than underlying base zoning districts. For example, a significant portion of TNOD Zone I lies over parcels within the General Residence District. A single-family home within that district requires a minimum lot size of 20,000 SF. If a parcel within the General Residence District, however, is also contained within TNOD Zone I, then a single-family home may be developed on a parcel with a minimum area of 5,000 SF. Frontage requirements are also reduced from 100 feet to 75 feet. Table 9 shows additional dimensional requirements in TNOD Zone I. Comparing minimum lot sizes and minimum frontages in TNOD Zone I with those of underlying base zoning districts reveals that TNOD Zone I does in fact allow for significantly denser development than underlying residential base zoning districts (the Rural District, Family District, and General Residence District). The geographic extent of TNOD Zone I, which encompasses the central village of downtown Peterborough and adjacent residential areas, can be seen in Figure 11. TNOD Zone I functions as an important modification to the base zoning scheme, encouraging the mixed, densely clustered development that characterizes traditional New England villages and supports active transportation like walking and bicycling.

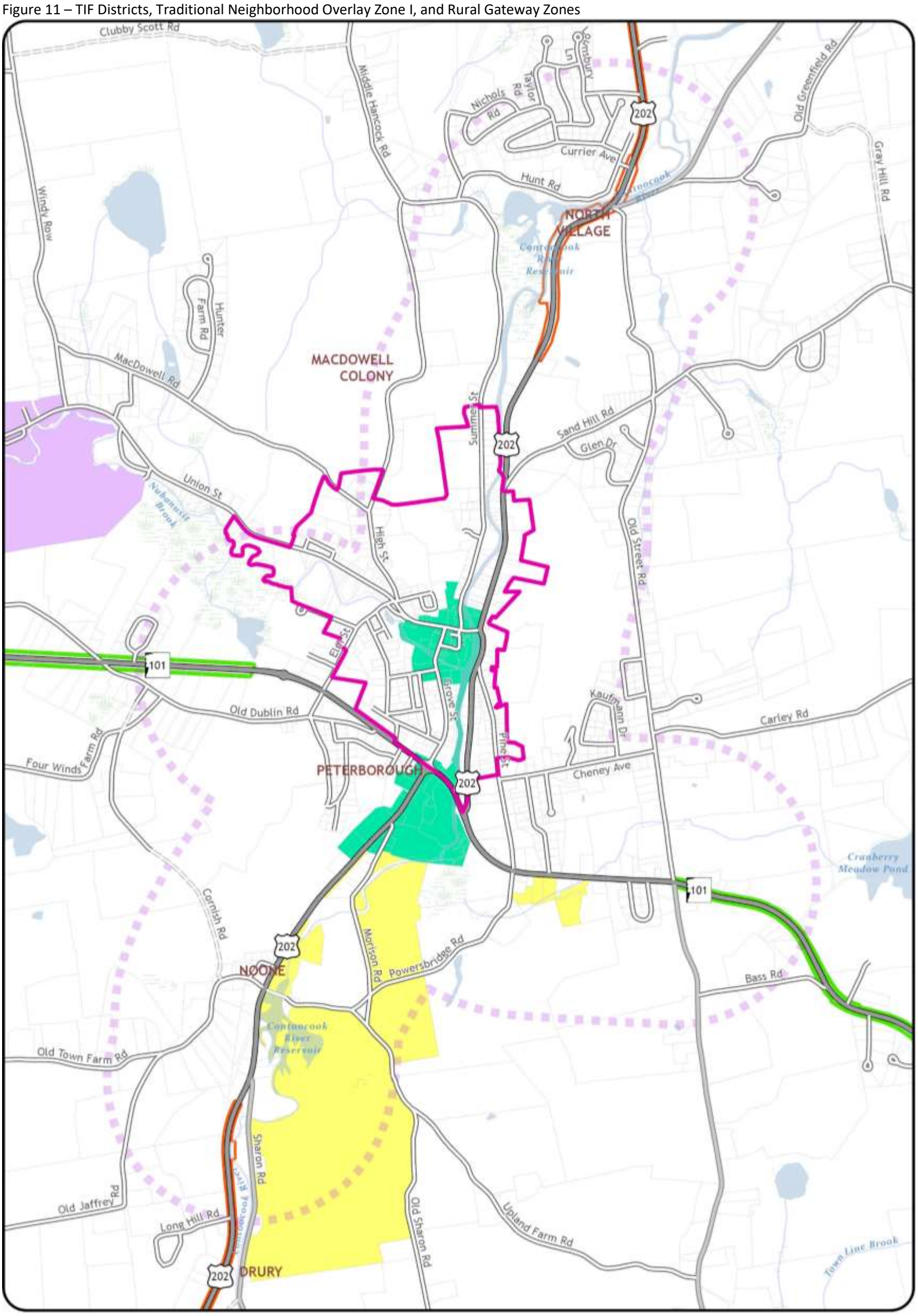
Table 9-Traditional Neighborhood Overlay Zone 1 Dimensional Requirements*

Base District	Type of Development	Min Lot Size	Min Frontage (feet)
Family District	Single-family	10,000 SF	75
	Two-family	10,000 SF	75
	Multi-family	NA	75
General Residence District	Single-family	5,000 SF	50
	Two-family	7,500 SF	50
	Multi-family	5,000 SF + 2,500 SF/Unit	50

*Source: Town of Peterborough Zoning Ordinance*Setbacks determined by taking the average of existing developed residential lots located on either side of the project parcel, on the same side of the street.*

[1] Town of Peterborough Zoning Ordinance. § 245-15.3 A.

Figure 11 – TIF Districts, Traditional Neighborhood Overlay Zone I, and Rural Gateway Zones



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Traditional Neighborhood Overlay Zone II

In 2017, the Town of Peterborough adopted Traditional Neighborhood Overlay Zone II (TNOD Zone II). Similar to TNOD Zone I, TNOD Zone II was intended to promote infill development at densities higher than underlying base zoning districts. Multifamily structures with up to 10 units are permitted within the district. There is no maximum limit to the total number of dwelling units on a parcel, but lot coverage is restricted to 40% of the parcel's total area. Professional and retail activities are allowed as accessory uses, subject to a conditional use permit.

Unlike TNOD Zone I, however, TNOD Zone II is not bound to a specific geographic area. Parcels developed under TNOD Zone II must have access to municipal water and sewer service. Extensions of the municipal water and sewer service must be paid for by the applicant property owner and approved by the DPW director. Parcels with or near existing water and sewer service are most well-positioned to be developed under TNOD Zone II provisions (the geographic extent of water and sewer services can be seen in Figure 53 later in the report). Any parcel in the Town, however, could hypothetically be developed under the Zone, with sufficient investment by a property owner and DPW approval. With TNOD Zone II, the dense residential development allowed under its provisions may have ramifications for vehicle travel on NH 101 or US 202 and/or potential for increased walking and cycling activity, depending on the specific location(s) of properties developed under its requirements.

Rural Gateway Overlay Zone

Outside the central area of the Town, parcels fronting on NH 101 and US 202 are subject to a Rural Gateway Overlay Zone, which requires an eighty-foot vegetated buffer on applicable parcels along NH 101 and a fifty-foot vegetated buffer on applicable parcels along US 202. Within the Highway Study Area, only the northern portion of US 202 North is subject to the Zone. The extent of the Zone can be seen in Figure 11 above. The required vegetated buffer, along with helping to preserve the natural aesthetic of the Town's outlying highway segments, works to create a defined edge between the Town's developed core and rural surroundings. The conspicuous transition from rural highway to village center contributes to a sense of arrival as motorists enter the Highway Study Area, which, along with other measures, could encourage slower speeds and a safer roadway environment.

Tax Increment Finance Districts

Under RSA 162-K, New Hampshire municipalities are authorized to create Tax Increment Finance (TIF) Districts, which are a method for raising funds to finance public improvements and encourage private investment in a targeted geographic area. Once a town creates a TIF District, the tax revenue generated by any increase in assessed property values within the district is used to implement the TIF improvement plan, which lays out certain projects that TIF funds are intended to support.

The Town of Peterborough has three active TIF districts: The Downtown TIF District, the West Peterborough TIF District, and the South Peterborough TIF District. See Figure 11 above, for the geographic extent of TIF district boundaries.

For purposes of transportation planning, Peterborough's TIF districts are important to consider for a number of reasons. First, the TIF improvement plans include transportation projects.

Peterborough TIF districts also represent areas that the town is targeting for future growth. All three of the TIF districts encompass preserved or emerging "villages" identified in Peterborough's Master Plan.[2]

Key Findings

- **The majority of parcels fronting on the Highway Study Area lie within residential zoning districts,** including the General Residence District, the Family District and the Rural District. Commercially-zoned parcels are limited to select clusters adjoining the Highway Study Area, lowering the potential for sprawling commercial development that could harm the carrying capacity of NH 101 and US 202. Limiting low-density strip development also helps preserve the Town's historic and rural character.
- **The Rural Gateway Overlay Zone mandates a front vegetated buffer for parcels abutting outlying segments of NH 101 and US 202**.
- **Drive-through windows for food or beverage service are not permitted in any zoning district** (Town of Peterborough Ordinance § 245-5 H)**.** Although the restriction's impact on access management has not been measured, it presumably decreases turning movements onto and off of the Highway Study Area, since drive-through establishments are designed to serve as many car-borne customers as possible. Drive-throughs cater to customers driving vehicles rather than bicyclists or pedestrians, thereby incentivizing traveling by car as opposed to other transportation modes. It should be noted that no similar restriction exists for banks with drive-through windows. At least one bank along the highway study area operates a drive-through window.
- **With the exception of a single spot-zoned parcel in the Office District, NH 101 East is fronted by all residentially-zoned parcels.** Residential land uses are usually associated with lower levels of turning movements in and out of driveways. Many parcels fronting on the NH 101 East, however, while included within residential zoning districts, are characterized by non-residential land uses, some conforming and some non-conforming with permitted uses.
- **Parcels fronting on US 202 North are characterized predominately by residential zoning districts with notable clusters of commercially-zoned parcels.**
- **Town driveway regulations permit shared driveways, opening opportunity for reducing the number of access points along roadways. However, the driveway regulations only apply to town roads—not to NH 101 or US 202.**

[2] See Chapter 8 of the Peterborough Master Plan, pg. 8-16. Adopted Nov. 10, 2003.

Natural and Cultural Resources

In the context of transportation planning, consideration of natural resources is important for a number of reasons. For example, under the National Environmental Policy Act of 1969 (NEPA), all federal or federally-funded projects must undergo an environmental review process that assesses potential environmental impacts and proposes alternatives that mitigate those impacts. Since most major transportation projects in New Hampshire are at least partially funded by the federal government, the mandated environmental review process will usually be included as a component of the project planning process. Natural resources and associated regulations may also constrain private development. In addition to imposing certain constraints on development, natural resources may also represent opportunities to enhance the transportation network. Bicycle and pedestrian pathways, for example, that pass through or along natural areas may provide scenic active transportation corridors.

Conserved and Protected Land

Conserved and protected land serves as an important control on development, deflecting pressure away from certain parcels within the study area. Approximately 529 acres of protected land lie within the Land Use Study Area (Table 11). Land is distributed among 24 properties, protected either through conservation easement or fee ownership by a protecting entity.

Most conserved properties within the Land Use Study Area front on local streets. Only two conserved parcels front on the Highway Study Area itself. The Niemela Parcel and the Pearson Property, both front on the northern edge of NH 101 East, between Lookout Hill Road and Old Street Road. The Pearson Property, owned in fee by the Town of Peterborough, hosts a hiking trail that can be accessed via a small trailhead on NH 101. A sign marks the trailhead but is not visible when approaching from the east (Figure 1). Improved trailhead signage could better alert westbound drivers to the presence of a trailhead and parking area. The Pearson Property, nearly 9 acres with just over 330 feet of frontage on NH 101 East, hosts a single-family home and is protected through a conservation easement held by the Town.

A large contiguous block of conserved land south of NH 101 East, roughly circumscribed by Powersbridge Road, Upland Farm Road, and Wilton Road (NH 123), significantly limits the possibility of future development in this area.

Table 10- Conserved Properties within Land Use Study Area

Row Labels	Sum of Property Acres	Sum of Acres in Study Area
Harris Center	**50.4**	**50.4**
Eastman	46.5	46.5
HCCE	3.8	3.8
NH Dept. of Resources & Economic Development	**51.4**	**33.4**
Shieling State Forest	51.4	33.4
Society for the Protection of NH Forests	**350.7**	**249.6**
Bass #1A	65.5	64.0
Bass #1D	12.9	12.9
Bass #1E	46.3	40.8
Bass #1F	52.8	6.4
Carter (1)	138.3	95.6
Carter (2)	24.1	24.1
Carter (3)	0.2	0.2
Moore (A)	10.6	5.5
The Monadnock Conservancy	**6.1**	**2.2**
Wheeler CE	6.1	2.2
Town of Peterborough	**316.2**	**193.6**
Cutter Construction Co., Inc.	153.7	59.9
Fernald Lot	21.7	21.7
Moore Parcel	4.8	4.8
Niemela Parcel	18.7	18.7
Pearson	8.8	8.8
Peterborough Water Works Land (1)	42.2	42.2
Peterborough Water Works Land (2)	1.7	1.7
Town of Peterborough Land (1)	26.1	26.1
Town of Peterborough Land (2)	4.4	4.4
Water Department Land (1)	29.0	0.2
Water Department Land (2)	5.1	5.1
Grand Total	**774.8**	**529.1**

Source: NH Granit

Figure 12 –Protected Land

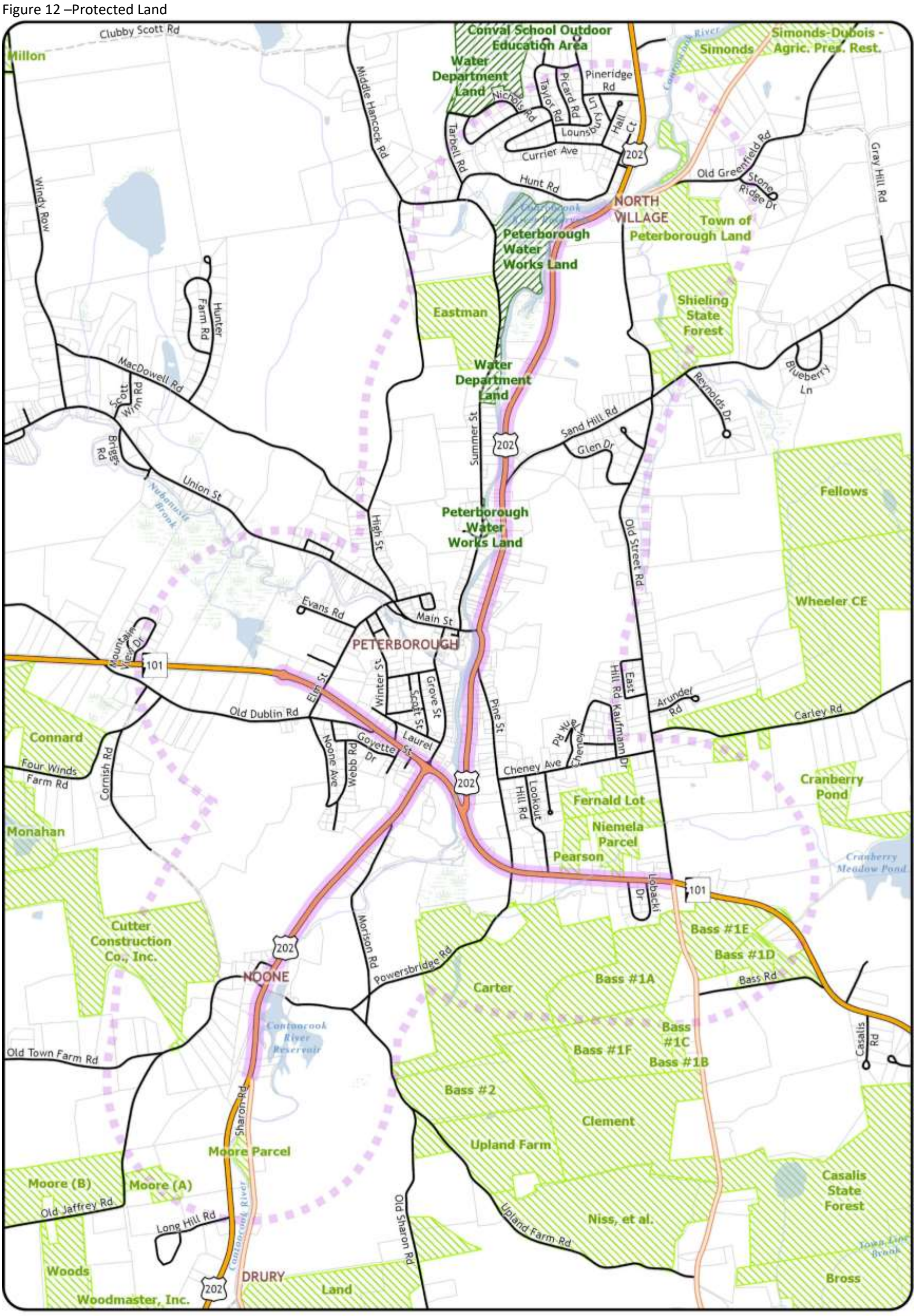

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Figure 13 – NH 101, West of Old Street Road, looking west. The trailhead to Wheeler Trail is pictured on the right, at what appears to be an unmarked dirt driveway. A trail sign is posted on a tree, but is not visible from an eastern approach.

Source: Google Earth

Problematic and Sensitive Soils

Shallow Depth to Bedrock

Bedrock near the soil surface can pose construction difficulties. Pouring foundations, excavating basements, or installing utilities can be complicated or rendered prohibitively expensive. Within the land use study area, only a very small area is impacted by shallow bedrock depths, none of which is located adjacent to NH 101 or US 202 (Figure 14). It should be noted that the highest resolution data available for bedrock depth, sourced from the USDA Soil Survey Geographic Database (SSURGO), may fail to capture localized ledges or outcroppings with exposed or shallow bedrock.

Poorly Drained Soils

Poorly drained soils can constrain development because they can raise site work costs and/or risk of flooding during extreme precipitation events. They also frequently coincide with designated wetlands, presenting regulatory hurdles.

Poorly drained soils impact a number of parcels within the study area, including some fronting on NH 101 and US 202 (Figure 14). Notable parcels include: 7 Powersbridge Road (Parcel U019-011-000), 210 Concord Street (Parcel U013-005-000), and an unaddressed parcel on Old Dublin Rd (Parcel U028-012-000).

The parcel at 7 Powersbridge Road encompasses 27 acres with 1,010 feet of frontage on NH 101 East. Approximately half of the parcel is impacted by poorly drained soils in the Contoocook River floodplain. A single-family home is accessed by a driveway on Powersbridge Road, approximately 250 feet south of NH 101. The majority of the parcel's undeveloped area lies in the Rural District, which requires a minimum lot area of three acres. The relatively large lot minimums combined with poorly drained soils would make subdivision of the parcel difficult, but still possible.

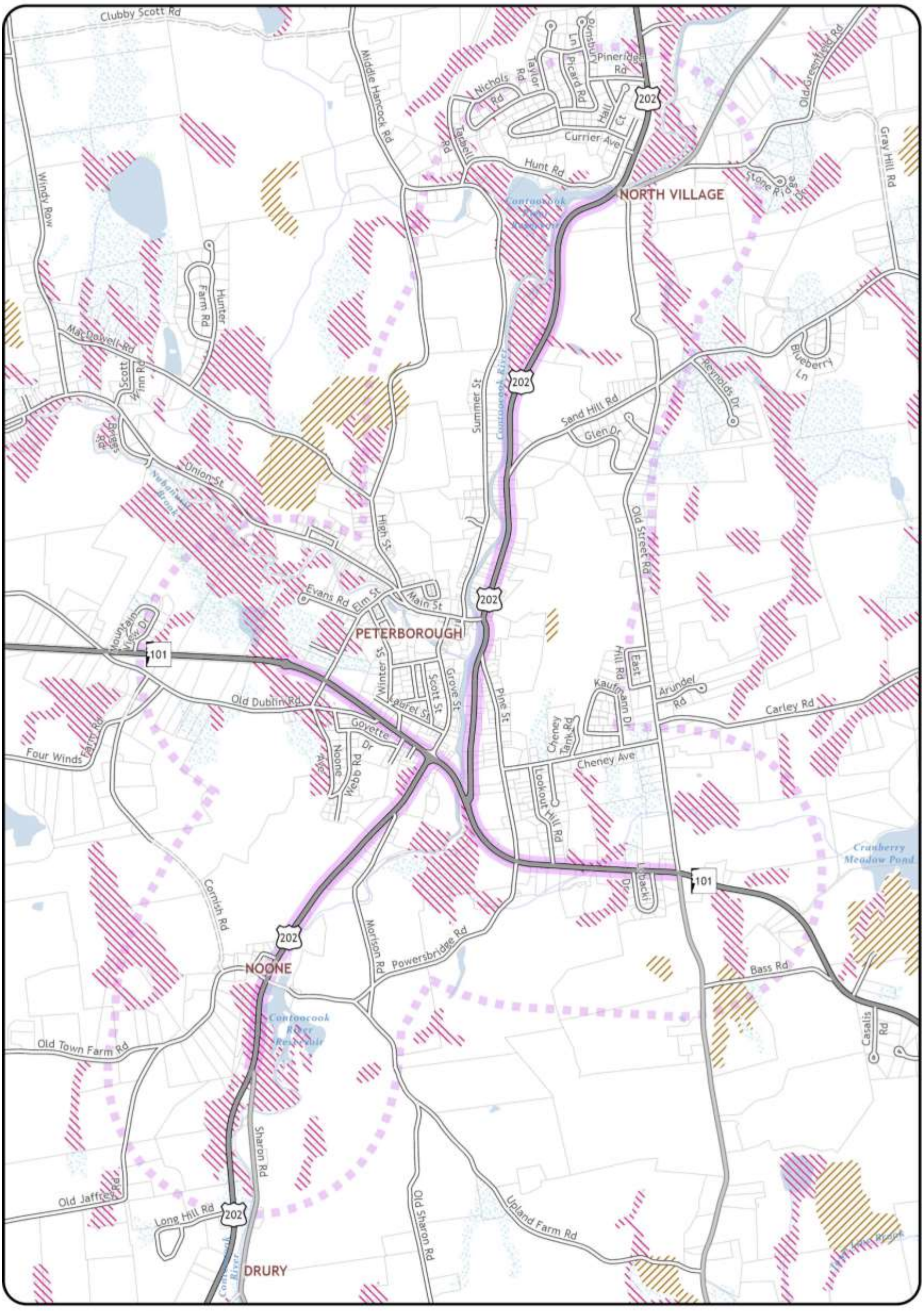
The parcel located at 210 Concord Street, fronting on the western edge of US 202 North, is almost completely underlain by poorly drained soils and wetland habitat. The vacant parcel is owned by Monadnock Tennis Club, whose current facility is located on the parcel abutting on the south. It should be noted that the Club's existing facility sits on poorly drained soils, indicating that expansion onto the vacant parcel would not be precluded by poor drainage. In fact, much of the commercial development sandwiched in between US 202 North and the Contoocook River sits on poorly drained soils.

Parcel U028-012-00, is located across NH 101 west from the Shaw's shopping plaza, and has frontage on both NH 101 and Old Dublin Road. Poorly drained soils underlie much of the undeveloped 20.5 acre property. A 100 foot strip of land that is more suitable for development (well-drained soil) fronts on NH 101, perhaps opening opportunity for the development of a small number of single-family homes. Since the parcel is located in the rural district, the Town does not envision commercial development occurring at the present.

Shallow Water Tables

Shallow water tables often coincide with poorly drained soils and pose similar development challenges. Such is the case in the Highway Study Area, where parcels that exhibit shallow water tables almost always also contain poorly drained soils, according to SSURGO data (Figure 14). A notable exception is a 2 acre lot located on Elm Street, approximately 120 feet north of NH 101 West. The lot, along with a 1.4 acre parcel located at the corner of Elm Street and NH 101, are protected under a conservation easement held by the Harris Center, further lowering the possibility of development on this commercially-zoned property. Traffic flow at the Elm St/NH 101/Old Dublin Road intersection will benefit from the absence of new development on these parcels.

Figure 14 – Problem Soils



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FEMA-Designated Flood Zones

The Federal Emergency Management Agency (FEMA) maps areas susceptible to flooding, including regulatory floodways, 100-year floodplains and 500-year floodplains (Figure 15). Regulatory floodways are streams, channels and adjacent land areas that must be reserved in order to discharge floodwaters without flood water elevations exceeding a certain height.[3] Development in regulatory floodways is subject to a review process meant to determine whether new development would obstruct floodwaters. Regulatory floodways are included in the 100-year floodplain, the area of land where there is a one percent annual chance of a flood event occurring. Property owners in the 100-year floodplain are required to buy flood insurance if they acquired a mortgage through a program that is federally assisted or insured. The 500-year floodplain is the area of land where there is a 0.25 percent annual chance of a flood event occurring. Properties in the 500-year floodplain are not subject to flood insurance requirements, but given the rising probability of intense rainfall events, properties in the 500-year floodplain may be subject to increased risk of experiencing flood events.

Much of US 202 North runs adjacent to the Contoocook River, tightly constraining the potential for new development on properties fronting on the west side of the highway segment. All of these properties lie within either the regulatory floodway or 100-year floodplain. Many properties on both sides of US 202 South are also located within either the regulatory floodway or 100-year floodplain of the Contoocook River. Properties located between Old Sharon Road and Long Hill Road are especially impacted.

Except for a few parcels at the intersection of US 202 North and NH 101 East, properties fronting on NH 101 do not all fall within FEMA-designated floodways or floodplains.

Stratified Drift Aquifers

According to the United State Geological Survey (USGS), a stratified drift aquifer is "a coarse grained sand or sand and gravel deposit that contains a usable supply of water."[4] Stratified drift aquifers are an important source of drinking water in the Town of Peterborough. All the Town's public well sites sit on top of stratified drift aquifers (Figure 16). Stratified drift aquifers are an important natural resource and development constraint to consider because certain types of development might jeopardize water purity.

Within the Land Use Study Area, there are three stratified drift aquifers of notable *transmissivity,* a measure of how easily water moves through the aquifer and an indication of the aquifer's water producing capacity. One aquifer lies at the northern tip of the Land Use Study Area, beneath and north of a residential neighborhood. Two active public wells are located on top of this aquifer. The second aquifer lies in between Summer Street and US 202 North, site of one active public well. The third stratified drift aquifer begins south of the Peterborough Plaza, and curves southwards to where it intersects Sharon Road and US 202, at the southern tip of the Land Use Study Area. The southern tip of the aquifer lies beneath several parcels zoned business/industrial, perhaps posing concerns regarding aquifer water quality.

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[3] 44 CFR 59.1

[4] "Groundwater Resources in New Hampshire: Stratified Drift Aquifers," United States Geological Survey. Water-Resources Investigations Report 95-4100. 1995. Pg. 12.

Figure 15 – Floodplain Map

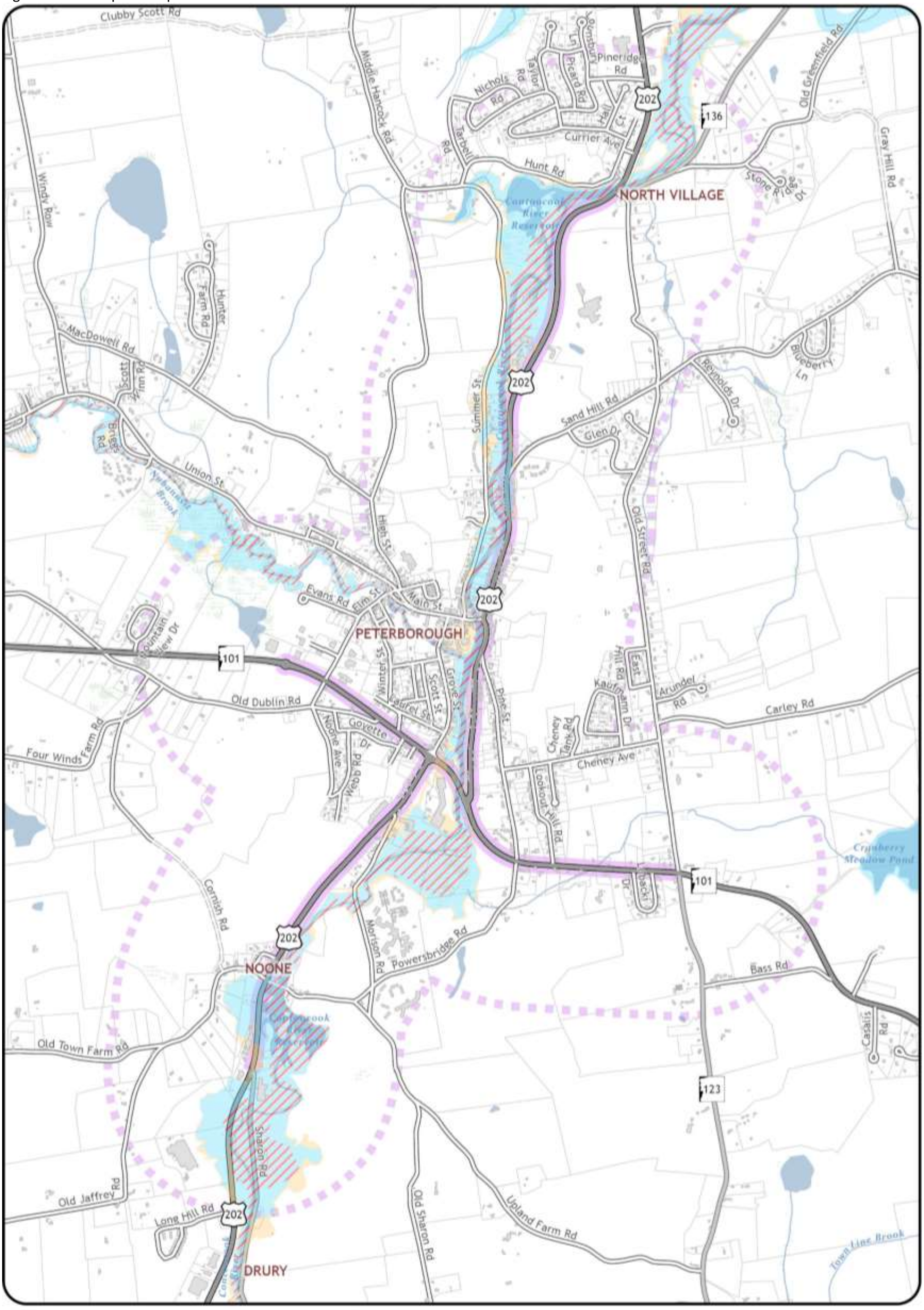

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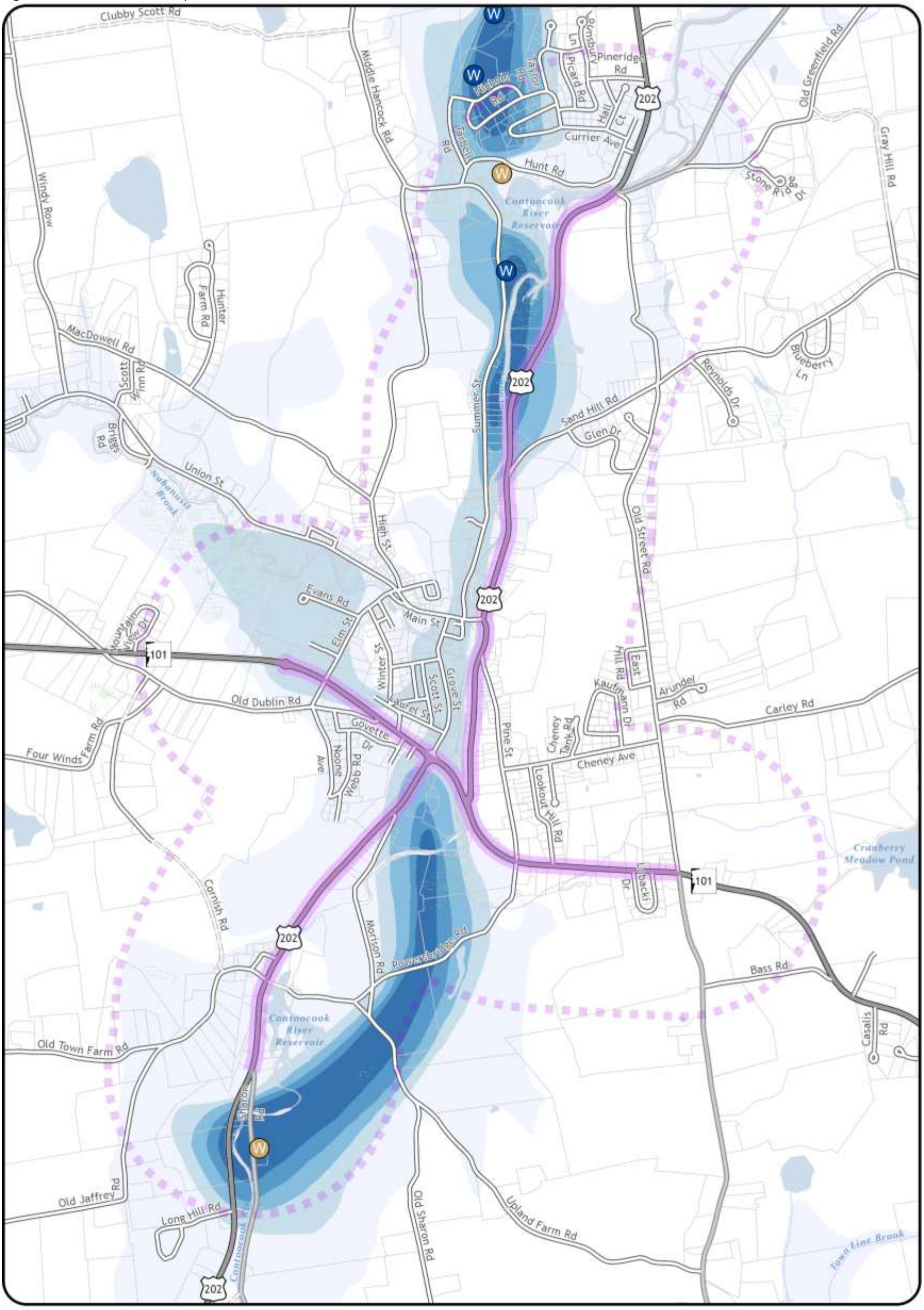
Figure 16 – Stratified Drift Aquifer



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Historic Resources

The Study Area hosts a rich variety of historic resources, including historic mill buildings, churches, farmhouses, cemeteries, and stone walls. Together, these historic resources help establish a strong local identity and sense of place. Carefully considered design and management of state highways and local roads can enhance how historic resources are experienced, by both residents and visitors. For example, if historic resources are connected by high quality pedestrian and bicycle infrastructure, then historical walking and biking tours become more feasible. The presence of historic resources in, or along, the public right-of-way should, therefore, be given due consideration when planning changes to the transportation network. The Town of Peterborough has not established any local historic districts, and consequently cannot compel landowners to protect historic properties through the enforcement of a preservation ordinance. The Town, however, in coordination with appropriate state agencies, can ensure that transportation projects in the public right-of-way have minimal adverse impact on historically significant properties.

The study area includes officially recognized historic resources as well as historic resources that lack any official designation. Five properties have been placed on the National Register of Historic Places: the MacDowell Colony, the Peterborough Town House, the Peterborough Post Office, the Peterborough Unitarian Church, and All Saint's Church. Of these properties, only one (All Saint's Church), fronts on a state-owned highway (US 202 North). It should be noted that placement on the National Register is honorific and does not restrict how these properties are altered or redeveloped. The same applies to properties listed on the State Register of Historic Properties, two of which are located in the Land Use Study Area: the Peterborough Town Library (which fronts on Main Street and US 202 North) and the Peterborough Historical Society (on Grove Street).

In addition to properties listed on the National and State registers, the Land Use Study Area includes many historic properties highlighted in the Historic Resources chapter of the Town's Master Plan. Many of these properties have been determined to be eligible for the National Historic Register, including the Baptist Church/Mariposa Museum (Main Street), GAR Hall (Grove Street) and Noone's Mill (US 202 South).

Along with historic structures, stone walls make a significant contribution to the historic character within the Study area. Stone walls have an extensive presence throughout within the Study area and throughout the Town of Peterborough (Figure 17). Notable stone walls within or near the Highway Study Area include NH 101 East (Figure 18), near Lookout Hill Road, and the cemetery wall along the eastern edge of US 202 North (Figure 19). Any modification to transportation infrastructure that might impact nearby stone walls would trigger a Section 106 Review under the National Historic Preservation Act (NHPA). The NHPA requires that federal projects or projects supported by federal funds must consider alternatives that minimize impact to historic resources.

Figure 17 – Select Historical and Cultural Resources

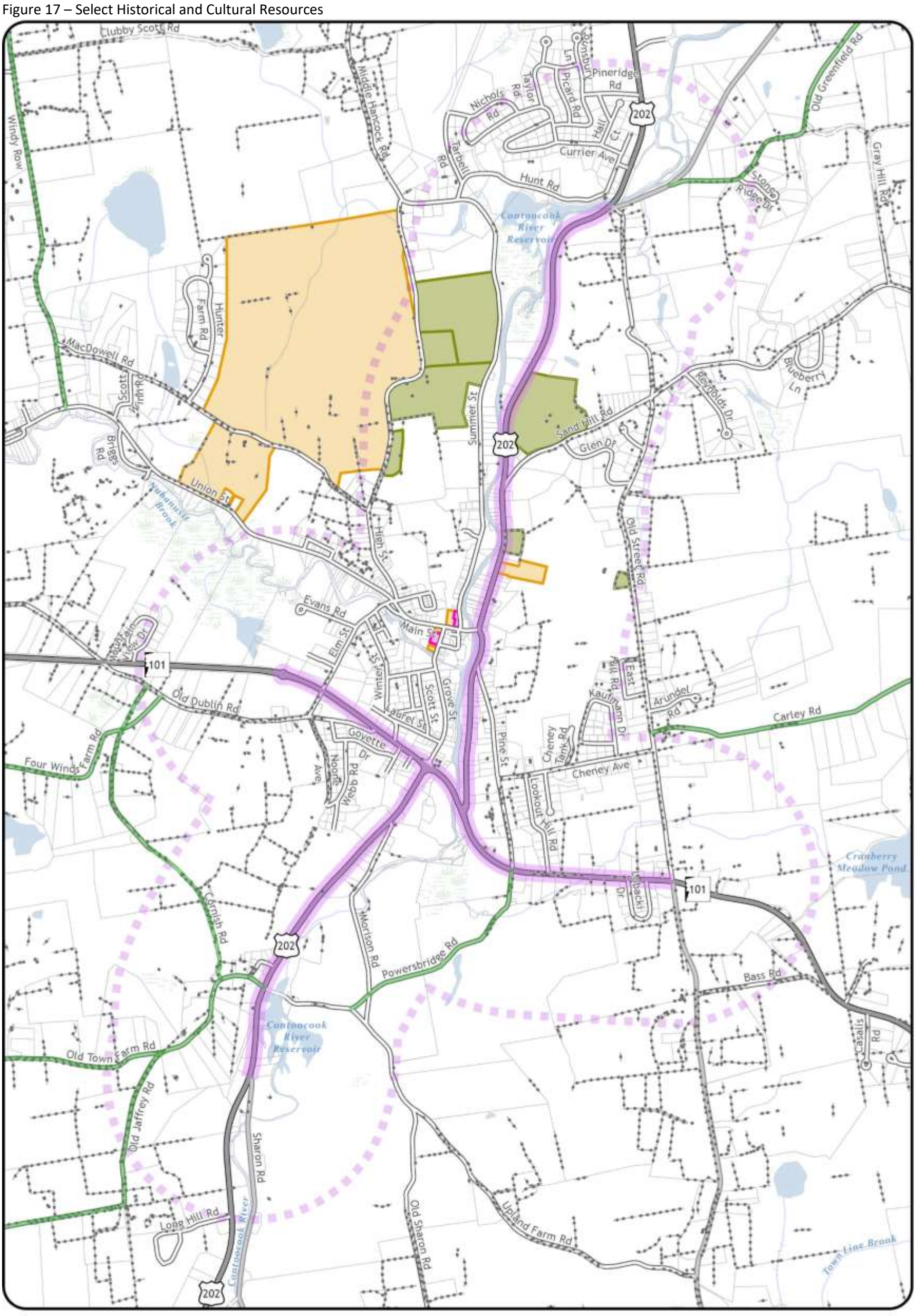

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Figure 18 - Stone wall along the northern edge of NH 101 East

Figure 19 - Cemetery wall along the eastern edge of US 202 North

Source: Google Earth (Fig. 18 & 19)

Findings

- **Protected parcels in the vicinity of NH 101 East limit development potential along that subsection of the Highway Study Area, contributing towards the preservation of the highway segment's traffic-carrying capacity.**
- **Many historic properties that front on the Highway Study Area are either listed on the National or State Registers of Historic Places, or are eligible for listing.** Most properties along US 202 North (from its intersection with NH 101 East to the cemetery property north of All Saint's Episcopal Church) are either listed or eligible for listing on the National Register of Historic Places.
- **The Town of Peterborough has not created any Local Historic Districts, and thus property owners face few legal constraints when considering razing, altering, or redeveloping historic properties.** A property's presence on the National or State Register of Historic Places does not preclude private redevelopment. A Historic District Area Form was at one point prepared for a proposed Peterborough Downtown Historic District. Proposed District boundaries encompass the central village of downtown Peterborough, including US 202 North, from its intersection with NH 101 East running north to a cemetery property that fronts on US 202.
- **Some Town-designated scenic roads intersect with NH 101 or US 202.** Improvements on designated scenic roads require Planning Board approval, thereby creating an additional administrative step for the installation of bicycle and pedestrian infrastructure, such as painted advisory shoulders. Town staff and officials communicated that the extra step is not anticipated to create a significant regulatory hurdle.
- **Historic stone walls front on sections of the Highway Study Area, especially along NH 101 East.**

Infrastructure Characteristics and Conditions

Roadway Access Study

Introduction

Access management is a key planning tool for preserving roadways where mobility is essential. In addition, by managing a roadway's access, one can increase highway safety, extend the life of the roadway, reduce traffic congestion, and improve the appearance and quality of the built environment. The costs associated with not managing access on New Hampshire's highways are great. By leaving the transportation impacts of development unchecked on these highways, the function and character of the roadway can deteriorate rapidly. This can lead to adverse social, economic and environmental impacts including but not limited to:

- An increase in crashes;
- Accelerated reduction in roadway efficiency and mobility;
- Reduced walking, bicycling and transit trips;
- Unsightly commercial strip development;
- Degradation of scenic landscapes;
- More cut-through traffic in residential areas due to overburdened arterials;
- Increased costs associated with building new infrastructure to catch up with highway degradation;

- Increased commute times, fuel consumption and vehicular emissions as increases in driveways and traffic signals intensify congestion and delays on major roads; and
- Opportunity costs to businesses by poor access management of closely spaced, poorly designed driveways, unsafe roadway environment, choking of the extent of the market area because of congestion, and driver inattention to businesses because of unsafe roadway condition.[5]

If access to development on highways is left unmanaged, the problems created are difficult and very expensive to resolve. Access management is a way to avoid administrative and financial headaches down the road. In fact, most access management tools are relatively easy to administer and inexpensive.

Good Access Management Means Local & State Coordination

NHDOT has made some significant strides in protecting the state's arterial highways 1) through its driveway permitting process for state-maintained highways and, 2) by purchasing rights-of-way (including access rights) as part of road reconstruction projects. While the first strategy is helpful for designing good accesses parcel by parcel it has limited utility for ensuring systematic corridor wide implementation. The second option, which has proven effective for several highways around the State, is expensive and, therefore, impractical for widespread implementation.

Planners and engineers recognize that local and state coordination is the key to effective, practical access management. Effective access management requires the management of the *transportation system* **as well as** highway abutting *land uses,* and *land use management* is not under the purview of NHDOT. The result is that in many instances the NHDOT's "hands are tied" in administering an effective program, the NHDOT does not have access to important local land use information, or its access management goals are in direct conflict with local land use planning practices.

In order to maximize the efficiency and effectiveness of an access management program, ideally the party with expertise and management authority over the transportation system *and* the party with expertise and management authority over land use planning would be partners. The key land use management partner for an access management program is local government. It has regulatory and enforcement authority over access management related issues, it is well informed about local growth plans and issues and it has the responsibility for protecting and implementing its community vision.

Driveway Permitting System

By order of statute[6], a landowner must apply for a permit from the NHDOT for the construction or alteration (including change of use) of a driveway, entrance, exit or approach that will access any state-maintained highway. NHDOT owns and maintains NH 101 and US 202 as well as NH 123, NH 136 and Sharon Road which are all part of the study area. All other roads in the study area are under the purview of the Town of Peterborough's driveway permitting system.

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[5] Transportation Research Board, *Access Management Manual*, 2003.
[6] DOT's Driveway permitting authority is derived from RSA 236:13.

A state highway driveway permit in Peterborough is reviewed through the NHDOT District Office in Swanzey. The District Office will make a determination as to whether a driveway permit is subject to a regular driveway permitting process or a driveway permitting process for major entrances.[7] The NHDOT permit requires that the landowner fill out an application that describes the proposed driveway including a sketch of the driveway and the layout of the connecting road and neighboring properties. The driveway is subject to a number of design standards, which are summarized below in Table 11:

Table 11-NHDOT Driveway Permit Design Standards*

	NHDOT Jurisdiction Design Standards	Citation	Exceptions granted
1	No more than one access point if less than 400 feet all season sight distance both directions	Policy 8 (a)	No
2	If frontage on highway is 500 feet or less, no more than 2 access points	Policy 8 (b)	No
3	No more than 3 access points for frontage exceeding 500 feet	Policy 8 (c)	Yes, Policy 8 (d)
4	No parking, loading, vending or servicing vehicles on highway or ROW	Policy 9 (a)	No
5	Miscellaneous items not permitted on, over or under state highway or ROW	Policy 9 (b)	No
6	Access to highway from parcel other than permitted driveway is prohibited	Policy (c)	No
7	Except Major entrance exceptions, maximum width of driveway 50 feet wide	Policy 10 (a)	Yes, Policy 10 (b)
8	In rural areas, 200 feet corner clearance. In urban areas, 100 feet corner clearance.	Policy 10 (c)	Yes, Policy 10 (c)
9	Intersection of driveway to highway no less than 60 degrees unless "right turn only"	Policy 10 (d)	No
10	Radius may not extend beyond applicant's frontage without permission of abutter	Policy 10 (e)	No
11	5% slope for car length and vehicle storage incline or decline (20'-25' in length)	Policy 10 (f)	No
12	Maximum grade for major driveway is 8%, Maximum for driveway 15%, algaebraic difference between any 2 grades shall not exceed 10%	Policy 10 (g)	Yes, Policy 10 (g)
13	Gradual slopes on side of driveway	Policy 10 (h)	No

*Source: NHDOT. *The Table is meant to summarize design standard components of the NHDOT Driveway permit. Please consult NHDOT's "Policy Relating to Driveways and Access to the State Highway System" for more detail or for clarification.*

Access Management Considerations

There are a number of considerations that can be used to assess the health of access management on a corridor. This access management analysis focuses on the following considerations: curb cut width, corner clearance, curb cut offset distances, and double frontage lots.

Curb Cut Width

Proper curb cut width will help achieve desired operations. Consistent designs make it more easily apparent to daily users and unfamiliar travelers alike. Although there are many aspects to the geometric

[7] Major entrances, aka major traffic generators, customarily require a more intensive review process.

design of a driveway, a fundamental consideration is curb cut width. Wider driveways result in less predictable vehicle movements and narrower driveways can result in vehicle conflicts. Typically, a landowner is more likely to advocate for a wider driveway, however, which can lead to safety issues. NHDOT's driveway permitting system indicates that driveways should be no wider than 50 feet from curb to curb not counting curb radii. Typically, a driveway can be a smaller width, but if curb radii are short, the design vehicle for the curb cut includes trucks, and/or if the driveway design needs to accommodate separate left-hand or right-hand turns, then 50 feet may be required. This report flags non-residential driveways greater than 50 feet in width as deserving closer review.

Corner Clearance

Corner clearance refers to the distance from an intersection of a public or private road to the nearest curb cut, measured from the closest edge of the intersection and curb cut. NHDOT's driveway permitting process tries to restrict corner clearance distances of less than 100 feet in urban areas and 200 feet in rural areas. This report brings attention to non-residential driveways with a corner clearance less than 100 feet.

Offset Distance

Closely spaced curb cuts located on opposite sides of undivided highways can lead to motorists crossing from one side of the road to another in a "jog maneuver," or conflicting left hand turns between drivers turning on and off the highway. SWRPC identified curb cuts in the study area that were within 300 feet of each other on NH 101, a major arterial and within 220 feet of each other on US 202, a minor arterial. Like corner clearance, the measurement is from the nearest curb of one curb cut to the nearest curb of the adjacent curb cut. These minimum offset distances are referenced in the Transportation Research Board's Access Management Manual. The findings sections focus on non-residential driveways within those distances as priority concerns.

Double Frontage Lots

When lots have frontage on more than one public way, and one side of the lot fronts an arterial, best practice is usually to avoid placing the access point on the arterial road. Arterials are designed for mobility, whereas local streets are designed for accessing land. In cases where existing double frontage lots are shown as having access on the arterials, and the lot's configuration is such that access could be obtained by the local road, the findings section notes this issue.

Key Findings

In the following analysis, SWRPC evaluated all curb cuts in the study area including curb cuts up to 200 feet off the corridor located on intersecting roads. The analysis examines access management characteristics of five sections of the study area:

- NH 101/US 202 between Grove Street and Granite Street;
- NH 101 between Grove Street and the Shaw's Plaza;

- NH 101 between Granite Street and Old Street Road/NH 123;
- US 202 between NH 101 and NH 136; and
- US 202 between NH 101 and Sharon Road.

NH 101/US 202 between Grove Street and Granite Street

NH 101/US 202 between Grove Street and Granite Street is the shortest and also the busiest segment of the corridors in the study. There are currently 10 driveways in this section including the on-corridor driveways to the Peterborough Plaza (U018-062-100), Shell Gas Station (U018-135-000), the Greater Peterborough Chamber of Commerce (U018-134-000), and the Better Homes and Gardens real estate office (U018-079-000).

Table 12: Driveway characteristics on NH 101/US 202 between Grove Street and Granite Street

Corridor Orientation	Access Type	Land Use	Curb Cut(s)
On Corridor	1 Way Egress	Commercial	1
On Corridor	2 Way Open	Commercial	5
On Corridor	2 Way Splitter	Commercial	2
On Corridor	2 Way Open	Residential	0
Off Corridor	2 Way Open	Commercial	0
Off Corridor	2 Way Open	Residential	2
Total			**10**

Source: SWRPC Traffic Research

In addition, this part of the study area includes the four-way intersection of NH 101/US 202 and Grove Street, the intersection with Bridge Street and the 3-way intersection of US 202 (Granite Street) with NH 101/US 202.

Table 13: Intersection characteristics on NH 101/US 202 between Grove Street and Granite Street

Corridor Orientation	Access Type	Number
On Corridor	4 Way Open with Slip Lanes	1
On Corridor	3 Way Open	1
On Corridor	3 Way Splitter with Slip Lane	1
Total		**3**

Source: SWRPC Traffic Research

Access points on this section of the highway are regulated by NHDOT through the driveway permitting process. Every parcel on this stretch of corridor has an existing driveway. Of the four parcels abutting the intersection of NH 101/US 202 and Grove Street, three of them have an access point on this section. However, one of them is a one-way right turn only egress driveway (Dunkin' Donuts parcel U018-063-000).

On-Road Access Management Features

On-road access management features in this location include slip lanes for right hand turns at the intersection of NH 101/US 202 and Grove Street as well as medians on the eastbound and westbound approaches to the intersection. A two-way left-hand turn lane is present in front of the Peterborough

Plaza and provides access to three different commercial parcels. A left-hand turn lane is available for westbound NH 101/US 202 traffic making a left on US 202 (Granite Street). The Granite Street approach to NH 101/US 202 has a splitter island and a dedicated left turn lane.

Driveway Widths, Corner Clearance and Offset Distances

When accounting for the splitter islands, no driveway exceeded a width of 50 feet in this section. There were no off-corridor driveway curb cuts within 100 feet of the corridor, the recommended corner clearance distance for an urban area. Bridge Street and some of the commercial driveways to the east of the NH 101/US 202 and Grove Street intersection (U018-134-000, U018-135-000 and U018-062-100) are under the minimum curb cut offset distance recommended in the Transportation Research Board's Access Management Manual for simultaneous opposing left-hand turns.

Double Frontage Lots

The Better Homes and Gardens Real Estate double frontage lot (U018-079-000) on the northwesterly quadrant of the NH 101/202 and Grove Street 4-way intersection appears to have a driveway connection with the Studio 105 Hair Design parcel to the north (U018-080-000) that provides local customers access to both NH 101 and Grove Street. The commercial parcel on the northeast quadrant (U018-133-000) has access only on NH 101/US 202, although site conditions appear to provide opportunities for reconfiguring site access if considerable investment was put into an access reconfiguration. On the southeast quadrant, Dunkin Donuts (U018-063-000) has a one-way egress driveway in this section as well as a point of access from US 202. The GFA Federal Credit Union (U018-069-100) has one point of access on US 202 (described earlier in the section concerning US 202 between NH 101 and Sharon Road).

The intersection of Bridge Street and NH 101/US 202 includes two double frontage lots (U018-062-000 and U018-062-100), and the Peterborough Plaza (U018-062-100) has access points on both roads, however, the Bridge Street access point does not appear to be used very much.

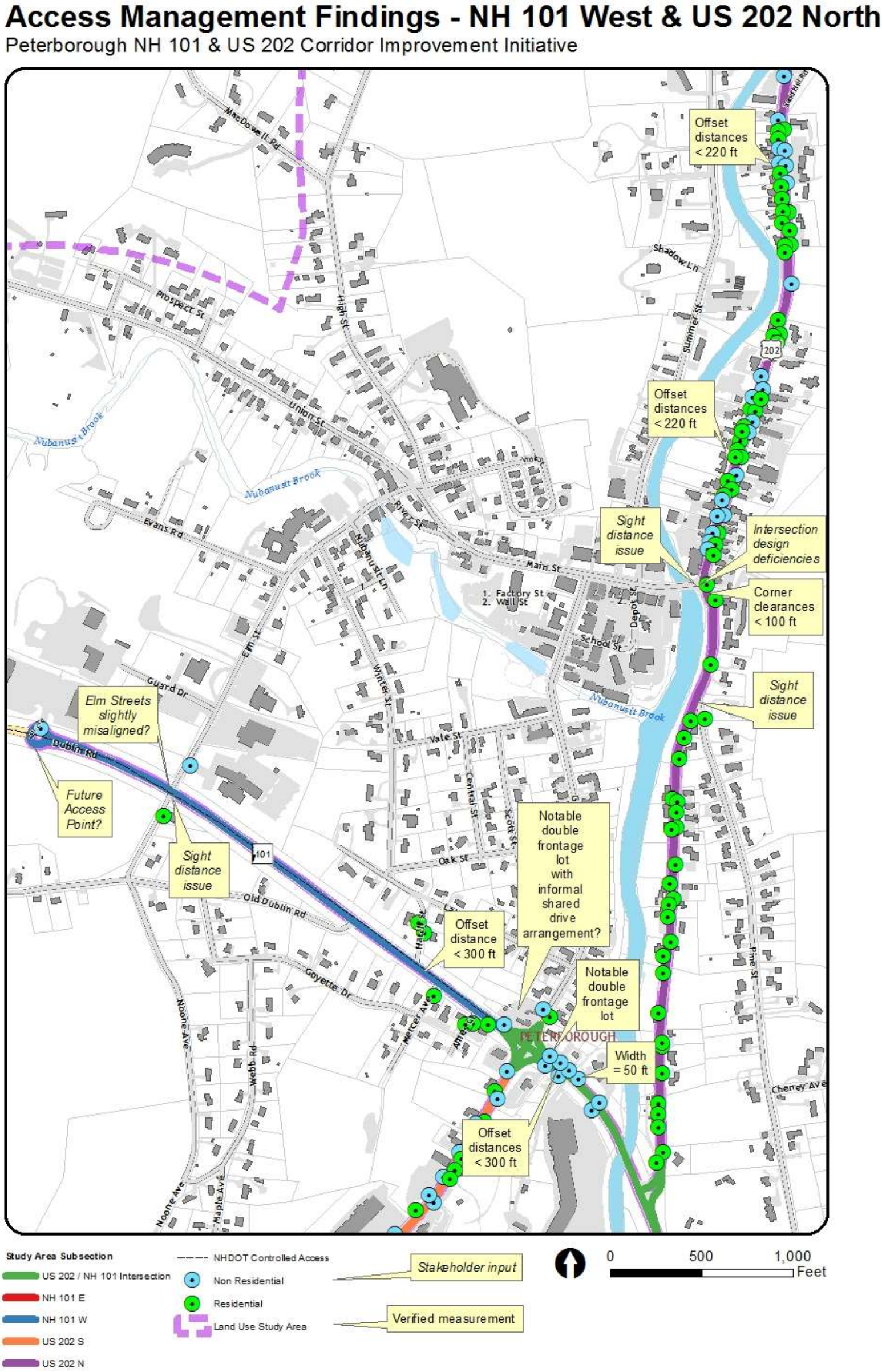
There are also two double frontage lots at the US 202 (Granite Street) intersection with NH 101/US 202, one of which is a residential lot with an access point on Granite Street only (U018-062-100). The other parcel (U019-017-000) appears to have an access point on Pine Street and NH 101, though the driveway appears to be currently used as a service road for the residential property's back yard.

Key Findings:

- The minimum offset distance between the Bridge Street curb cut and the Peterborough Chamber of Commerce (U018-134-000) curb cut is closer than recommended. The offset distance between the Peterborough Plaza (U018-062-100) curb cut and the Shell Station's (U018-135-000) western curb cut is also below the recommended offset distance.
- The Shell Station's (U018-135-000) western curb cut is very large at 50 feet, is located in a congested part of the corridor and is fairly close to a large intersection and a number of other curb cuts.

- The commercial parcel (U018-133-000) on the northeast quadrant of the 4-way intersection of NH 101/US 202 and Grove Street has access only on NH 101/US 202, although site conditions appear to provide opportunities for reconfiguring site access if considerable investment was put into an access reconfiguration.
- The Better Homes and Gardens Real Estate office (U018-079-000) and Studio 105 Hair Design (U018-080-000) appear to have a connected driveway between the two parcels.

Figure 20: Access Management Findings – NH 101 West and US 202 North



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NH 101 between Grove Street and Shaw's Plaza

NH 101 between Grove Street and Shaw's Plaza includes 9 driveway curb cuts in the study area, but only two of those are directly on NH 101.

Table 14: Driveway characteristics on NH 101 between Grove Street and Shaw's Plaza

Corridor Orientation	Access Type	Land Use	Curb Cut(s)
On Corridor	1 Way Egress	Commercial	0
On Corridor	2 Way Open	Commercial	0
On Corridor	2 Way Splitter	Commercial	1
On Corridor	2 Way Open	Residential	1
Off Corridor	2 Way Open	Commercial	1
Off Corridor	2 Way Open	Residential	6
Total			**9**

Source: SWRPC Traffic Research

There are road intersections at Elm Street, Old Dublin Street, Hatch Street, Mercer Street, Goyette Drive, and Ames Court. It appears as though the two Elm Street curb cuts are not perfectly aligned with each other as a 4-way intersection.

Table 15: Intersection characteristics on NH 101 between Grove Street and Shaw's Plaza

Corridor Orientation	Access Type	Number
On Corridor	4 Way Open	1
On Corridor	3 Way Open	2
On Corridor	3 Way Splitter	0
Off Corridor	3 Way Open	3
Total		**6**

Source: SWRPC Traffic Research

The entire stretch of highway is considered NHDOT controlled access highway. Parcel configurations in the area are such that there doesn't appear to be any need for curb cut openings on this portion of the corridor in the future, although NHDOT may determine that there is cause to add a fourth street opening to the roundabout currently serving the Shaw's Plaza to the large open space parcel on the southern side of the street (U028-012-000). However, as indicated earlier in the report, this parcel has problematic and sensitive soils.

On Road Access Management Features

Current on-road access management design features include a roundabout serving NH 101 and the Shaw's Plaza as well as opposing left-hand turn lanes along the entire portion of corridor between Elm Street and the approach to Grove Street/US 202 South.

Driveway Widths, Corner Clearance and Offset Distances

An analysis of driveway widths found three parcels with driveway widths exceeding 50 feet, but all were off the corridor serving residential properties. There were three driveway curb cuts within 100 feet of an intersection, but all of these were from residential properties off the corridor. One pair of intersecting streets (Hatch Street and Mercer Avenue) were closer than the recommended minimum offset distance cited in the Transportation Research Manual.

Double Frontage Lots

Since NHDOT controls the right-of-way for the entire subsection, there are no double frontage lot concerns that exist on this stretch of the corridor. All double frontage lots are configured so that access is from a local street instead of the NH 101 arterial.

Key Findings:

- The northbound and southbound approaches of Elm Street appear to be misaligned at their intersection with NH 101, potentially causing turning movement conflicts for left hand turns.
- The entire corridor's right-of-way is controlled by NHDOT, but it would be helpful to know if NHDOT plans for additional curb cuts in the area. An obvious location for a curb cut is to the parcel directly across from the Shaw's Plaza entrance, however, that lot could have access from Elm Street as well.
- The minimum offset distance between Hatch Street and Mercer Avenue is less than the recommendation for a major arterial.
- A member of the Peterborough Steering Group stated that there was a sight distance issue at the intersection of Elm Street and NH 101. Based on a review of intersection conditions, it appears there may be a site distance issue to the east from the Elm Street's southern approach to the intersection.

NH 101 between Granite Street and Old Street Road/NH 123

NH 101 between Granite Street and Old Street Road/NH 123 includes 35 driveway curb cuts in the study area, of which 23 are directly on NH 101.

Table 16: Driveway characteristics on NH 101 between Granite Street and Old Street Road/NH 123

Corridor Orientation	Access Type	Land Use	Curb Cut(s)
On Corridor	1 Way Egress	Commercial	0
On Corridor	2 Way Open	Commercial	8
On Corridor	2 Way Splitter	Commercial	1
On Corridor	2 Way Open	Residential	15
Off Corridor	2 Way Open	Commercial	2
Off Corridor	2 Way Open	Residential	9
Total			**35**

Source: SWRPC Traffic Research

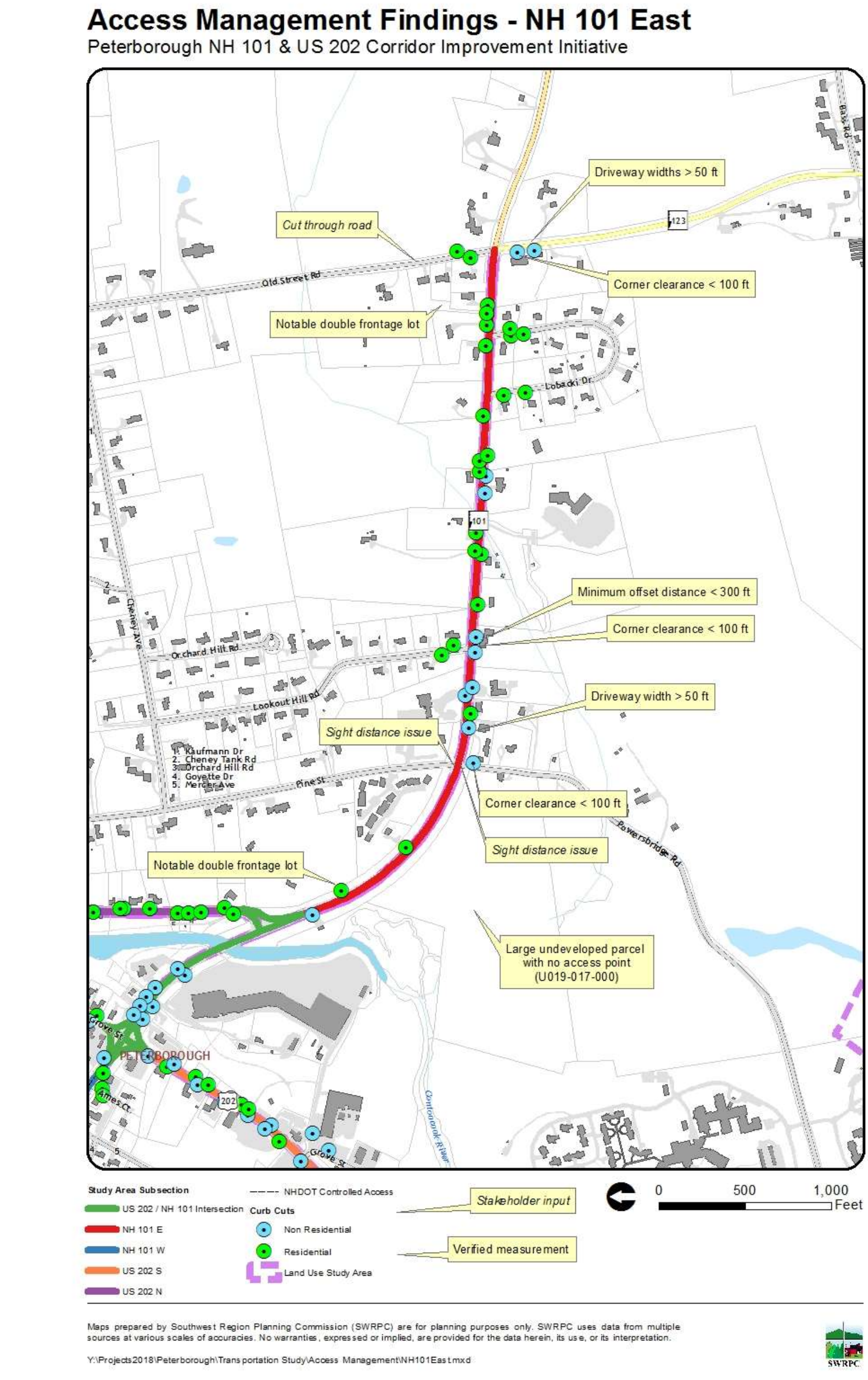
There are road intersections at Pine Street, Powersbridge Road, Lookout Hill Road, Church Street, Lobaki Drive (2 curb cuts), Old Street Road and NH 123. The Old Street Road and NH 123 approaches to NH 101 are at a slightly skewed angle. The Town of Peterborough and NHDOT has identified the skewed angle and vertical barriers as issues associated with the intersection that impede sight distance. A NHDOT project (#15698) is scheduled to mitigate some of the safety concerns with this intersection in 2019.

Table 17: Intersection characteristics on NH 101 between Granite Street and Old Street Road/NH 123

Corridor Orientation	Access Type	Number
On Corridor	4 Way Open	2
On Corridor	3 Way Open	4
On Corridor	3 Way Splitter	0
Off Corridor	3 Way Open	0
Total		**6**

Source: SWRPC Traffic Research

Figure 21: Access Management Findings - NH 101 East



This entire stretch of highway is not a controlled access highway, so the standard driveway permitting process applies to this area.

On Road Access Management Features

There are no on-road access management design features on this section.

Driveway Widths, Corner Clearance and Offset Distances

An analysis of driveway widths found 3 parcels with driveway widths exceeding 50 feet, including the on-corridor driveway for the Black Swan (U019-007-000) and the 2 driveways associated with Murray's Home Again (U001-014-000). There were 11 driveways that were within 100 feet of intersecting public roads along this corridor, 6 of which were off-corridor. Commercial driveways with limited corner clearance included one of the driveways for Murray's Home Again, the driveways for Twin Elm Farm (U019-004-000) and an off-corridor driveway that the Black Swan appears to use on a limited basis off of Powersbridge Road. The easterly driveway for Twin Elm Farm and Lookout Hill Road do not meet the minimum offset distance cited in the Transportation Research Manual.

Double Frontage Lots

There are several lots with double frontage on this section of corridor, a few of which have access on NH 101. Some of the lots that are worthy of future inspection include a residential lot with access both on Pine Street and NH 101 (U019-017-000) and a residential lot (U001-008-000) with access on NH 101 and Old Street Road.

Key Findings:

- The intersection of NH 123 and Old Street Road is skewed and is known for having sight distance issues. However, NHDOT has scheduled a project (#15698) to address these issues. The project will be advertised for construction bids in October 2019.
- This section of corridor is not affected by NHDOT's controlled access program.
- There are a few non-residential properties that have curb cuts wider than 50 feet (U019-007-000, U001-014-000), which is the maximum width recommended by NHDOT.
- There are several properties (U001-014-000, U019-004-000 and U019-007-000) that do not meet the minimum corner clearance recommended by NHDOT.
- The easterly driveway for Twin Elm Farm (U019-004-000) and Lookout Hill Road do not meet the minimum offset distance cited in the Transportation Research Manual.
- Two residential double frontage lots were identified that have curb cuts on NH 101 and local roads (U019-017-000 and U001-008-000).
- Town of Peterborough staff noted that there was a sight distance issue at the intersection of NH 101 and Powersbridge Road and the intersection of NH 101 and Pine Street.

US 202 between NH 101 and NH 136

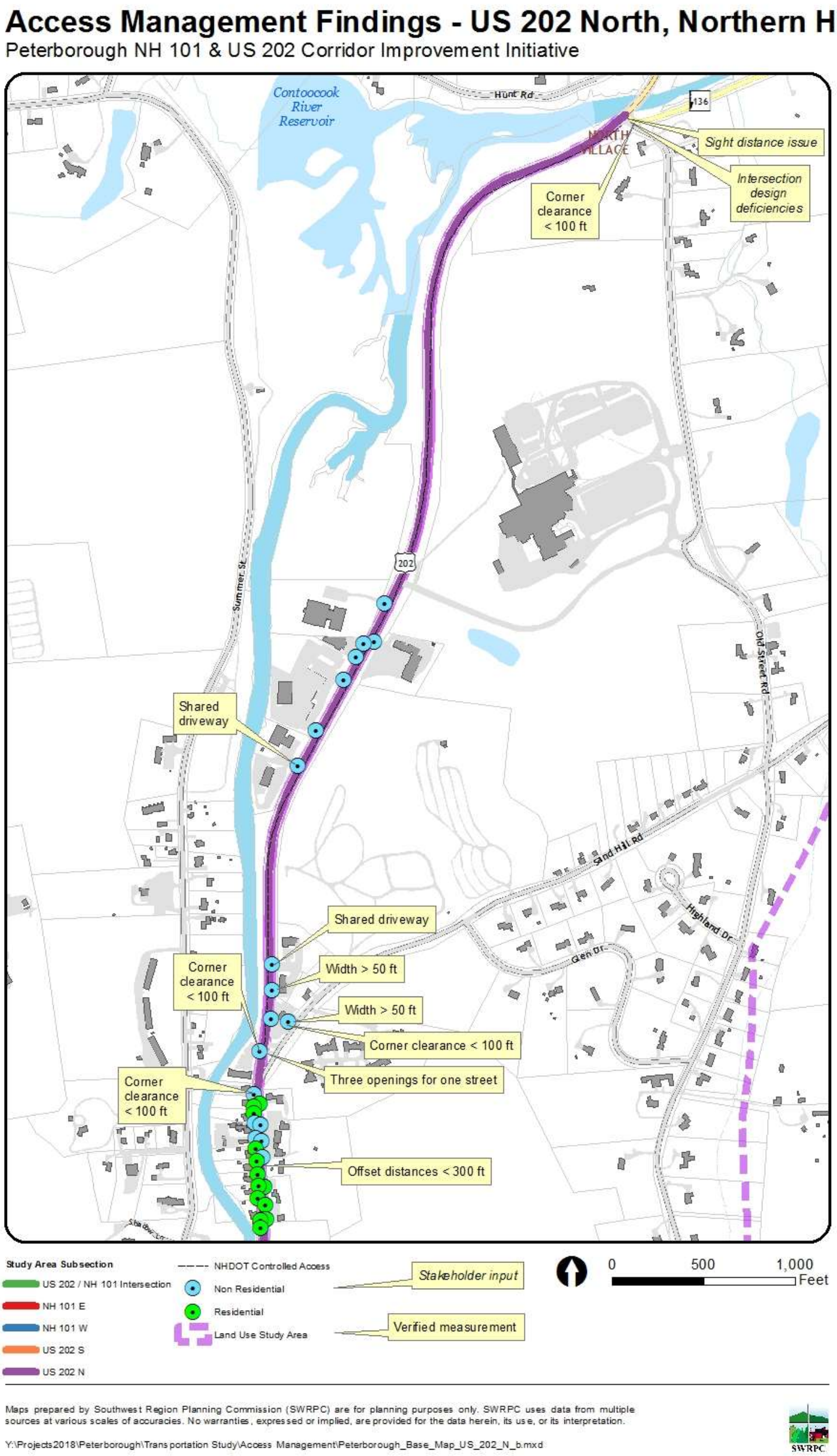
US 202 between NH 101 and NH 136 includes 92 driveway curb cuts in the study area, with 2 of the driveways within 200 feet of but not directly on US 202. There are 2 shared driveways in the controlled access portion of the section of corridor, each of which is shared between 2 different parcels. BC Auto (U015-002-000) shares a driveway with Monadnock Animal Care Clinic (U015-002-100) and Dara's Paw Spa (U015-001-000) shares a driveway with Hidden Treasures of NH (U015-001-100).

Table 18: Driveway characteristics on US 202 between NH 101 and NH 136

Corridor Orientation	Access Type	Land Use	Curb Cut(s)
On Corridor	1 Way Egress	Commercial	2
On Corridor	1 Way Ingress	Commercial	2
On Corridor	2 Way Open	Commercial	25
On Corridor	2 Way Open Shared	Commercial	2
On Corridor	2 Way Splitter	Commercial	0
On Corridor	2 Way Open	Residential	59
Off Corridor	2 Way Open	Commercial	1
Off Corridor	2 Way Open	Residential	1
Total			**92**

Source: SWRPC Traffic Research

Figure 22: Access Management Findings – US 202 North, Northern Section



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Going north to south there are on-corridor road intersections at NH 136, Parmalee Drive, Sand Hill Road, Main Street and Pine Street. In addition, there are two local roads that are not directly on the corridor but within 200 feet of US 202, including Old Street Road (off of NH 136) and Veteran's Way (off of Main Street).

Table 19: Intersection characteristics on US 202 between NH 101 and NH 136

Corridor Orientation	Access Type	Number
On Corridor	3 Way Open	3
On Corridor	3 Way Splitter	2
Off Corridor	3 Way Open	2
Total		**7**

Source: SWRPC Traffic Research

On Road Access Management Features

Heading south from the northernmost part of the study area, there is a left turn lane on US 202 on the approach to Parmalee Drive. Parmalee Drive has a dedicated left turn lane on its approach to US 202. Sand Hill Road's approach to US 202 separates ingress and egress traffic, but in between there is a third curb cut. Main Street has a dedicated left turn lane at its approach with US 202.

Driveway Widths, Corner Clearance and Offset Distances

Only two driveways on the section had widths larger than 50 feet. One of those was the driveway for BC Auto (U015-002-000). The other wide curb cut was off-corridor providing access to Mickey's Repair Services (U015-003-000) on Sand Hill Road. There were six driveways closer than 100 feet to an intersecting street including the commercial driveway described above for Mickey's Repair Services. Others include Jack Daniels Motor Inn (U016-039-000), Concord Street Health Insurance (U016-038-000), several residences across from the US 202/Main Street intersection and residential property near Pine Street. There are several driveways that don't meet the minimum threshold for offset distances along this section of US 202, particularly as the driveways get denser south of Sand Hill Road. Parcels are also very small making it difficult to reconfigure driveways.

Double Frontage Lots

No issues with double frontage lots were found on this stretch of corridor by SWRPC.

Key Findings:

- There were two shared driveways evident on this section of corridor.
- Old Street Road's northern opening is closer than 100 feet of the intersection of US 202 and NH 136, the recommended corner clearance.
- Sand Hill Road's approach to US 202 separates ingress and egress traffic, but in between there is a curb cut that looks as though it is for accessing the Jack Daniels Motor Inn (U016-039-000).
- There are a few commercial properties (U015-002-000 and U015-003-000) that have curb cuts wider than 50 feet, which is the maximum width recommended by NHDOT.

- There are several properties (U015-003-000, U016-039-000 and U016-038-000) that do not meet the minimum corner clearance recommended by NHDOT.
- There are several commercial driveways that don't meet the minimum threshold for offset distances along US 202 between the intersection of Main Street and the intersection of Sand Hill Road.
- Town of Peterborough staff note that there are sight distance issues at the intersection of Pine Street and US 202 and Main Street and US 202.

US 202 between NH 101 and Sharon Road

US 202 between NH 101 and Sharon Road includes 38 driveway curb cuts in the study area, with six of the driveways within 200 feet of but not directly on US 202. There are no explicitly shared driveways, however, there are several abutting parcels that share driveways because their parking areas are connected including: Achille Agway (R003-016-000), Manhattan East Hair Design Studio, Peterborough Pizza Barn (R003-018-100), and the Peterborough Collision Center (R003-018-000).

Table 20: Driveway characteristics on US 202 between NH 101 and Sharon Road

Corridor Orientation	Access Type	Land Use	Curb Cut(s)
On Corridor	1 Way Egress	Commercial	1
On Corridor	1 Way Ingress	Commercial	0
On Corridor	2 Way Open	Commercial	23
On Corridor	2 Way Open Shared	Commercial	0
On Corridor	2 Way Splitter	Commercial	0
On Corridor	2 Way Open	Residential	8
Off Corridor	2 Way Open	Commercial	6
Off Corridor	2 Way Open	Residential	0
Total			**38**

Source: SWRPC Traffic Research

There are five street openings along this section of the corridor. From north to south, these include: Grove Street Extension, Cabana Drive, Old Jaffrey Road, Old Sharon Road and Sharon Road. Though not currently a street opening, there appears to be street right of way set aside for the lot behind Achille Agway which would eventually provide access to two effectively landlocked parcels (R003-014-000 and R003-005-100).

Table 21: Intersection characteristics on US 202 between NH 101 and Sharon Road

Corridor Orientation	Access Type	Number
On Corridor	3 Way Open	5
On Corridor	3 Way Splitter	0
Off Corridor	3 Way Open	0
Total		**5**

Source: SWRPC Traffic Research

Access points on this section of the highway are regulated by NHDOT through the driveway permitting process from Old Sharon Road south.

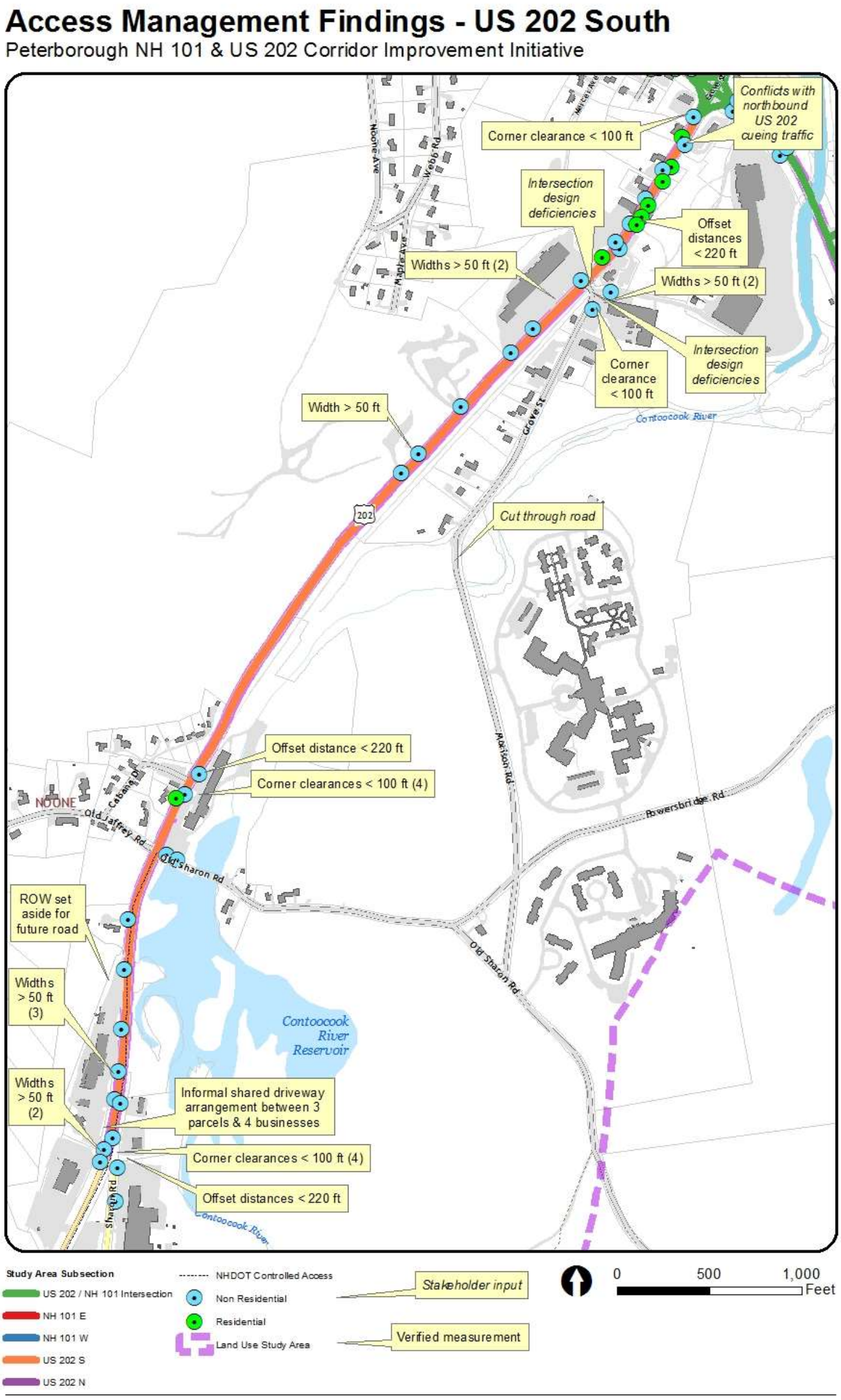
On Road Access Management Features

Heading north to south, there is a dedicated left turn lane to Dunkin Donuts (U018-063-000), followed by a left turn lane to Grove Street Extension. There are two consecutive left turn lanes for northbound motorists wanting to access the Monadnock Community Plaza (U021-020-000) as well. No other on-road access management features are on this section of the corridor.

Driveway Widths, Corner Clearance and Offset Distances

SWRPC's analysis found 11 driveway curb cuts that exceeded 50 feet including two at the Monadnock Community Plaza (U021-020-000), one at the gravel pit (U022-035-000), three at the Achilles Agway (R003-016-000), and two serving the Manhattan East Hair Design Studio and Peterborough Pizza Barn (R003-018-100) all on US 202. In addition there were two at the Peterborough Basket Company property (U021-008-000), which is off the corridor on the Grove Street Extension. There were 11 driveways that were less than 100 feet from an intersection including one of the driveways for the Peterborough Basket Company. Another included the GFA Federal Credit Union property (U018-069-100), but the driveway there is at an optimal location because it is such a small parcel. Other driveways with poor corner clearance include all four of the driveways (on and off-corridor) at the Noone Falls Mill Building (U020-024-000) and four driveways are within 100 feet of the intersection of US 202 and Sharon Road (R003-019-000, R003-018-100, R003-018-000 and R003-037-000). Driveway offset distances are also problematic around the US 202 and Sharon Road intersection, the Noone Falls Mill Building and Cabana Drive area and there may be offset distance issues in the future for the string of former residential and undeveloped properties on the northern part of this section of corridor (U021-007-000, U018-065-000, U021-004-000, U021-005-000 and U021-006-000).

Figure 23: Access Management Findings - US 202 South



Double Frontage Lots

Although there are a number of double frontage lots on this section of the corridor, none of them appear as though there is merit to restrict access on US 202 in favor of a local road at this time.

Key Findings:

- There are several driveways on the corridor that are informally shared by abutting parcels by virtue of connected parking areas, however, no parcels rely on sharing driveways.
- The intersection of Grove Street Extension with US 202 and an access road to the back side of the Peterborough Plaza (and several wide driveways at Peterborough Basket Company) may make for less than desirable circulation.
- There is a right-of-way for two effectively land locked parcels running behind Achilles Agway.
- NHDOT has controlled access for the section of the Corridor from Old Sharon Road south.
- Several driveway curb cuts exceed 50 feet on and off the corridor (U021-020-000, U022-035-000, R003-016-000, R003-018-100 and U021-008,000).
- Several driveway curb cuts also are within 100 feet of the US 202 intersections with Grove Street Extension (U021-008-000), US 202 and Cabana Drive (U020-024-000) and US 202 and Sharon Road (R003-019-000, R003-018-100, R003-018-000 and R003-037-000).
- Likewise several driveways are within the maximum offset distance of Cabana Drive and Sharon Road (U020-024-000).
- There are at least two areas of undeveloped or underdeveloped land along the corridor including the east side of the northern part of this section of corridor (U021-007-000, U018-065-000, U021-005-000 and U021-006-000) and an active gravel pit area (U022-035-000).

The following access management analysis includes findings and recommendations for the study area generally and then more specifically for each of the five subsections of the corridor.

General Findings:

- Peterborough does not have an access management agreement with the New Hampshire Department of Transportation.
- Peterborough does not have an access management plan for the subject study area.

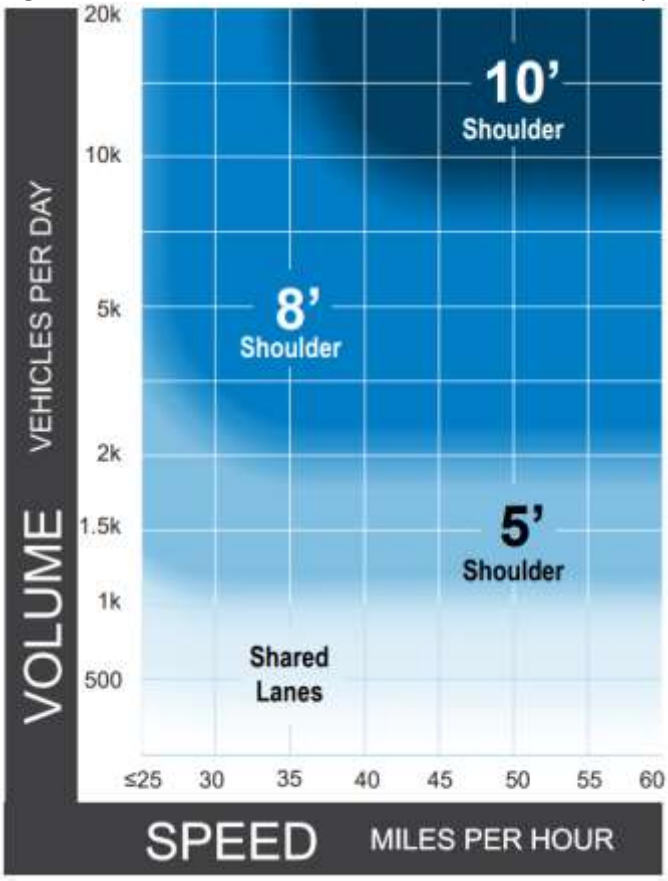
Highway

Shoulder Widths

The width of local street and highway shoulders can be an important consideration for both pedestrians and cyclists using the road network. Where dedicated pedestrian and cyclist infrastructure are absent, individuals on foot or bike often resort to traveling on the road shoulder. Wider shoulders provide pedestrians and cyclists with a greater buffer between them and vehicles passing in the travel lane. Goal 2.4 of the NHDOT Statewide Pedestrian and Bicycle Plan calls for allocating a minimum of 2.5 feet for each

shoulder on all highways in the state, and allocating four feet where possible.[8] Guidelines published by the American Association of State Highway Transportation Officials (AASHTO) recommend a minimum usable width of four feet.[9] Preferred widths on rural roadways can be as a high as 10 feet depending on the number and speed of the vehicles using the roadway (Figure 24).

Figure 24 – Preferred shoulder width on rural roadways

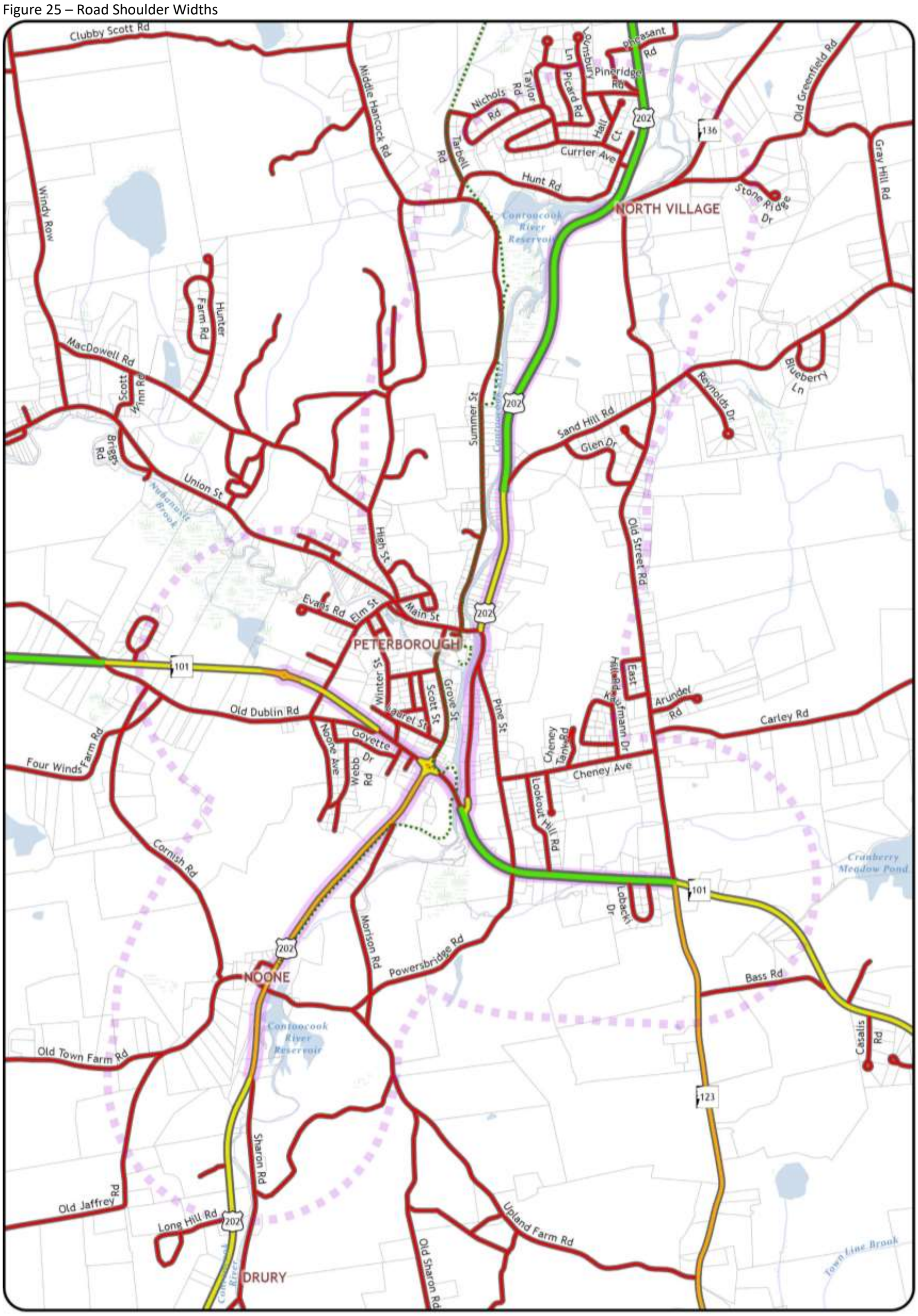


Source: FHWA Bikeway Selection Guide, February 2019, p. 25

According to NHDOT GIS Data, US 202 N (from Sand Hill Road running north) and NH 101 E (from US 202 N to Old Street Road) are the only road segments in the Highway Study Area that have shoulders on both sides that meet the four-foot minimum shoulder width suggested by AASHTO (Figure 25).

[8] New Hampshire DOT Statewide Pedestrian & Bicycle Transportation Plan and Economic Impact Study, Technical Memorandum #1, Existing Conditions Assessment, p. 59. February 19, 2019. http://nhpedbikeplan.com/wp-content/uploads/2019/02/190219_Statewide-Ped-Bike-Plan-Tech-Memo-1-Compiled.pdf
[9] Ibid. p. 29.

Figure 25 – Road Shoulder Widths



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Other road segments in the Highway Study Area have significantly narrower shoulders, most notably, perhaps NH 101 W, from its intersection with US 202 S and Grove Street to Old Dublin Road (Figure 26) and US 202 N, from NH 101 E to Main Street (Figure 27). Both of these segments have shoulders on at least one side that are narrower than 2.5 feet. The narrow shoulders on US 202 N are particularly significant, given the lack of sidewalk infrastructure along the road segment, forcing both pedestrians and cyclists to travel along narrow shoulders.

Figure 26 – NH 101 E looking west towards Hatch Street

Source: Google Earth

Figure 27 – US 202 N looking north from its intersection with NH 101 E

Source: Google Earth

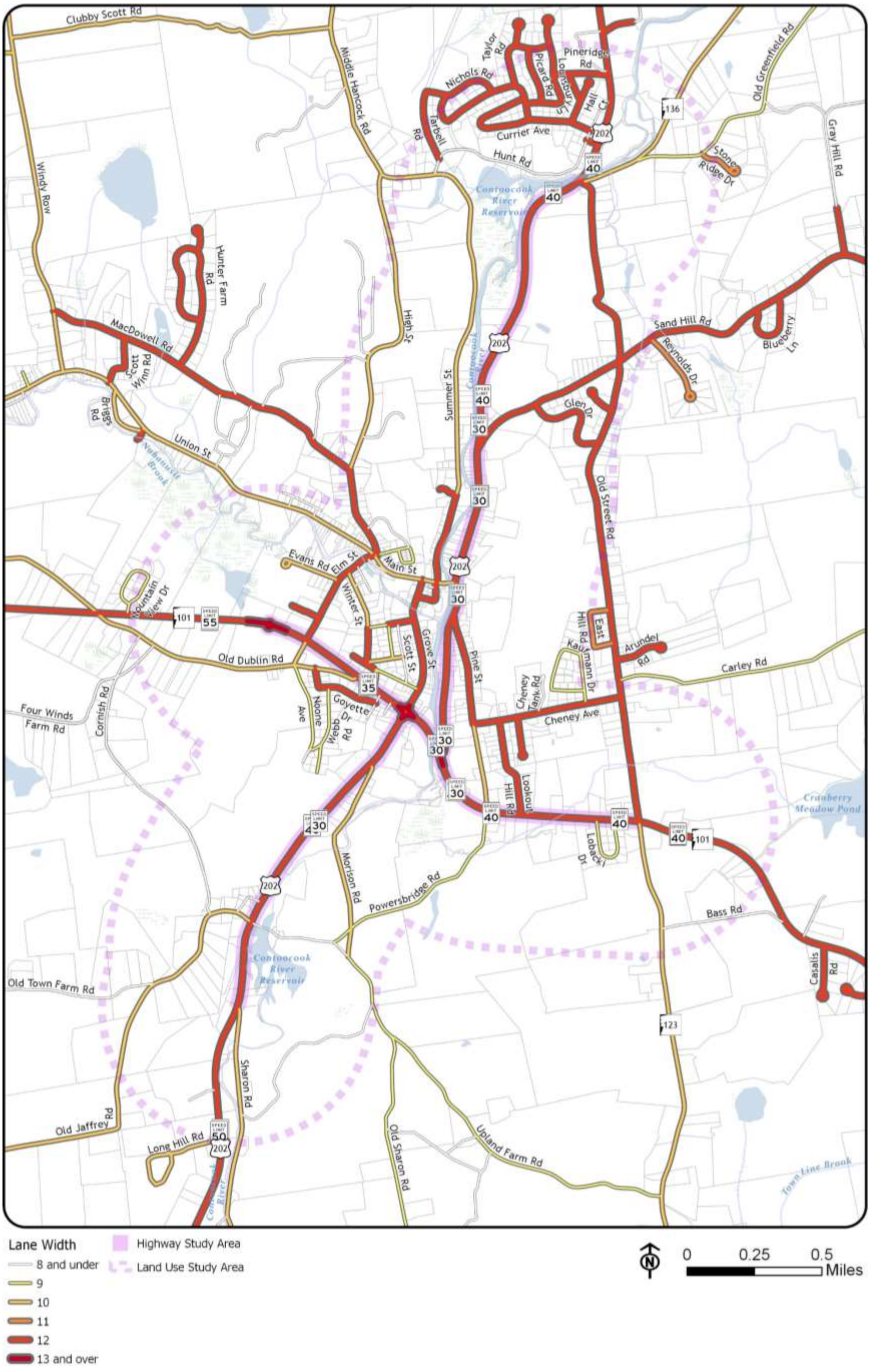
Lane Width

Consideration of travel lane widths is important for several reasons. Travel lanes must be wide enough to accommodate a range of vehicles, e.g. cars, buses, heavy trucks. Travel lanes that are too wide, however, can encourage vehicle travel speeds that exceed posted limits and pose a danger to cyclists and pedestrians. Unnecessarily wide travel lanes also present an opportunity to claim additional space for widened shoulders or other pedestrian and cycling infrastructure within the existing right-of-way.

Nearly the entire Highway Study Area has travel lanes of twelve feet, according to NHDOT data (Figure 28). At the same time, the maximum posted speed limit in the Highway Study Area is 40 MPH, with areas closest to the central village of downtown Peterborough dropping to 35 or 30 MPH. While the ideal travel lane width depends on a number of factors, some research suggests that travel lanes as narrow at 10 feet do not increase vehicle crash rates or reduce roadway carrying capacity on roads with speeds of 45 MPH or less.[10] There may be opportunity to narrow travel lane widths on segments of both NH 101 and US 202, especially in areas with posted speed limits of 35 MPH or less. US 202 N, from its intersection with NH 101 E running north to Main Street appears to be an especially notable candidate for travel lane narrowing. Relatively dense residential development abuts either side of the right-of-way. The roadway also provides a critical link between homes on Pine Street and downtown Peterborough. Narrower travel lanes may help reduce vehicle speeds, improving pedestrian comfort and safety. Narrower travel lanes would also make room for expanded shoulders, giving cyclists using the roadway more room to maneuver.

[10] Potts, I. B., D.W., Harwood, and K.R., Richard. Relationship of Lane Width to Safety on Urban and Suburban Arterials. Presented at the 86th Annual Meeting of the Transportation Research Board, Washington, DC, 2007.

Figure 28 – Lane Widths and Posted Speed Limits



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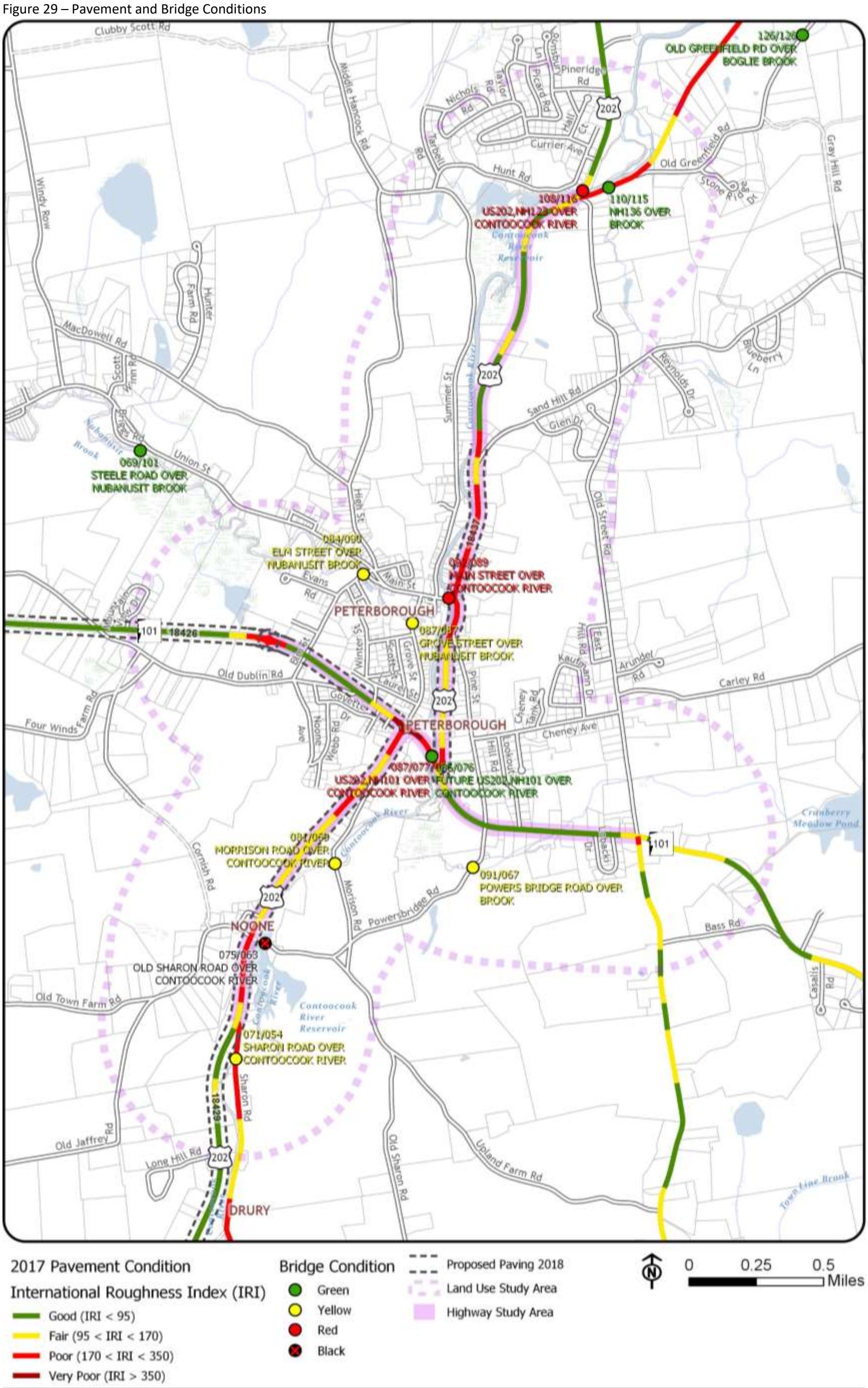
Pavement Conditions

Poor pavement conditions can detract from the safety of all roadway users, including motorists, cyclists, and pedestrians. An inventory of pavement conditions and planned paving projects can also indicate upcoming opportunities to modify road striping or other painted infrastructure, like crosswalks and bike lanes.

While 2017 NHDOT Pavement Condition data indicated that some roadway segments within the Highway Study Area had pavement in "poor" or "very poor" condition, most of these segments were scheduled for repaving in 2018 (Figure 29). One roadway segment proves an exception: US 202/NH 101 between the US 202 S/NH 101 W/Grove Street intersection and the US 202 N/NH 101 E intersection. Much, if not all of this segment will likely be repaved as part of the reconstruction of the bridge spanning the Contoocook River.

Segments of the Highway Study Area that were not planned for repaving in 2018 are scheduled for repaving in either 2019 or 2020, according to NHDOT data. All of NH 101 within the Highway Study Area is planned for repaving in 2019. US 202 N, from Sand Hill Road running north is planned for repaving in 2020.

Figure 29 – Pavement and Bridge Conditions



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Bridges

There are ten bridges in the Land Use Study Area - four owned by the State and six owned by the Town of Peterborough (Table 22). Only two of these bridges - one located on Main Street over the Contoocook River (ID: 092/089) and one located on NH 101/US 202 over the Contoocook River (ID: 087/077) lie within the Highway Study Area. Both bridges are on the state red list and are scheduled for replacement, the former in 2019-2020 (NHDOT Project No. 14933) and the latter in 2020-2021 (NHDOT Project No. 15879).

A third bridge on the red list, located just north of the Highway Study Area on US 202 N, is scheduled for replacement in 2025 (NHDOT Project No. 27712). With preliminary engineering scheduled to begin in 2019, now would be an opportune time to study how the bridge might serve all users, including pedestrians and cyclists.

Four municipally-owned bridges in the Land Use Study Area have elements - either decking, superstructure, or substructure with a condition rating of "satisfactory or fair," suggesting that additional bridges will require maintenance, reconstruction, or replacement in the years to come.[11] One state-owned bridge, located on Sharon Road over the Contoocook River, has a deck rating of "satisfactory," and a superstructure and substructure rating of "fair," indicating a likely need of serious renovation in the near future. The bridge is the oldest in the Land Use Study Area, constructed in 1925, and has never undergone reconstruction.

One bridge in the Land Use Study area, located on Old Sharon Road, is closed to vehicle traffic (Figure 30). According to the South Peterborough Tax Increment Finance (TIF) Plan, the Town intends to renovate the bridge in order to better accommodate pedestrians. There are no plans, however, to rehabilitate the bridge in order reopen it to vehicle traffic. The TIF Plan budgets $1.5 million to improve the bridge.

[11] According to NHDOT data, bridge deck, superstructure, and substructure condition ratings are ranked as follow, from best to worst: excellent, very good, good, satisfactory, poor, and serious.

Table 22– Bridges within ½ Mile of Highway Study Area

ID	Location	Owner	Year Built	Year Recon.	Red list Status	Deck Condition	Super-structure Condition	Sub-structure Condition
110/115	NH136 over Brook	NHDOT	1950	2014	No	N/A	N/A	N/A
084/090	Elm Street over Nubanusit Brook	Town	2003	N/A	No	Very Good	Good	Satisfactory
087/077	US 202, NH 101 over Contoocook River	NHDOT	1958	N/A	State Red list	Poor	Fair	Satisfactory
108/116	US 202, NH 123 over Contoocook River	NHDOT	1942	1974	State Red list	Poor	Fair	Poor
071/054	Sharon Road over Contoocook River	NHDOT	1925	N/A	No	Satisfactory	Fair	Fair
091/067	Powersbridge Road over Brook	Town	1920	N/A	No	Fair	Fair	Satisfactory
087/087	Grove Street over Nubanusit Brook	Town	1936	N/A	No	Satisfactory	Satisfactory	Satisfactory
081/069	Morrison Street over Contoocook River	Town	1958	N/A	No	Satisfactory	Satisfactory	Satisfactory
092/089	Main Street over Contoocook River	Town	1940	N/A	Town Red list	Serious	Serious	Fair
075/063	Old Sharon Road over Contoocook River	Town	1940	1972	Closed Bridge	Closed	Closed	Closed

Source: NHDOT. Note: Deck, superstructure, and substructure condition ratings are ranked as follow, from best to worst: excellent, very good, good, satisfactory, poor, and serious.

Figure 30 - Closed bridge on Old Sharon Road off of US 202 S.

Source: Bing Maps. Photo dated July 7, 2015.

Pedestrian Infrastructure

Pedestrian infrastructure like sidewalks, crosswalks and separated pathways serve many critical transportation functions. Some of society's most vulnerable members, including children, seniors and those living in poverty, travel on foot. Good pedestrian infrastructure encourages active lifestyles, improving health and reducing the risk of obesity. Walkable streets foster opportunities for increased interaction with fellow community members, creating an environment suited to building social capital. Pedestrian-friendly areas are also known to attract tourists and economic activity.

In the summer and early fall of 2018, SWRPC staff and interns conducted a pedestrian infrastructure assessment, inventorying the location of pedestrian infrastructure within the Land Use Study Area and recording attributes related to facility condition and characteristics. The assessment was conducted in the field over the course of approximately three days, using standards set forth by NHDOT under the New Hampshire Statewide Data Exchange System (SADES). Location and attribute data was collected for sidewalks, crosswalks and curb ramps. Separated multiuse pathways (segments of the Common Path) were also included in the assessment.

The sidewalk inventory confirmed that sidewalks extend throughout the Downtown Commercial District, but that significant gaps exist elsewhere in the Land Use Study Area (Figures 31 and 32). Key identified gaps include:

- US 202/NH 101 from the Shell gas station running east to the US 202 N/NH 101 E intersection, then running north on US 202 N (Granite Street) about 1,200 feet, to the terminus of an existing sidewalk on the east side of the road. Although the Common Path runs beneath US 202/NH 101, pedestrians living along Granite Street and adjoining side streets (e.g. Pine Street) must walk routes without sidewalks (or other pedestrian Infrastructure) in order to reach Peterborough Plaza. Since 2012, three vehicle collisions have involved pedestrians in this area (Figure 32).
- NH 101 E, from Elm Street to the Shaw's shopping plaza;
- The segment of the Common Path running through the Peterborough Plaza parking lot; and
- Morrison Road, from the RiverMead Lifecare Community to US 202 S.

Figure 31 – Public Sidewalks with Identified Accessibility Deficiencies

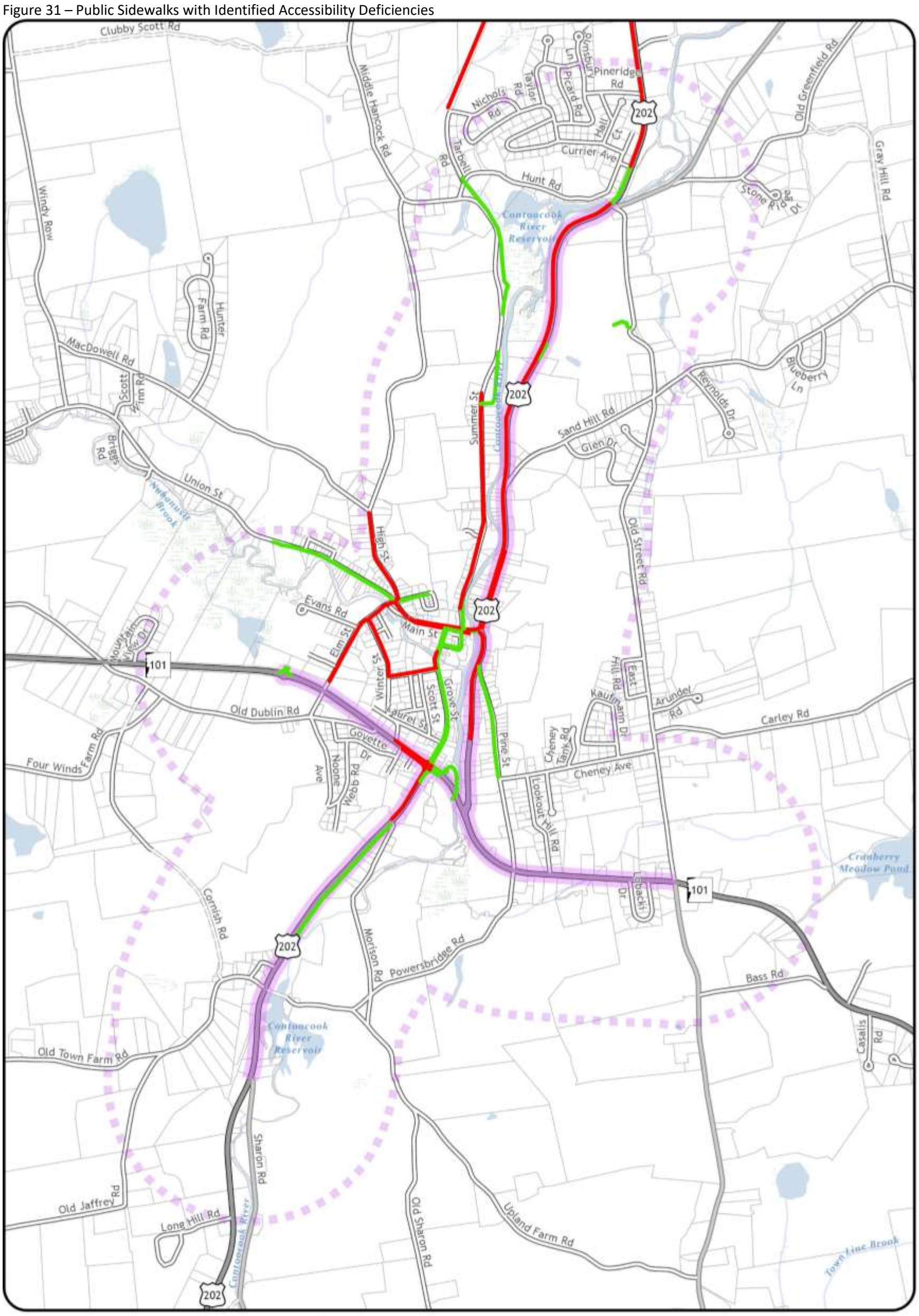

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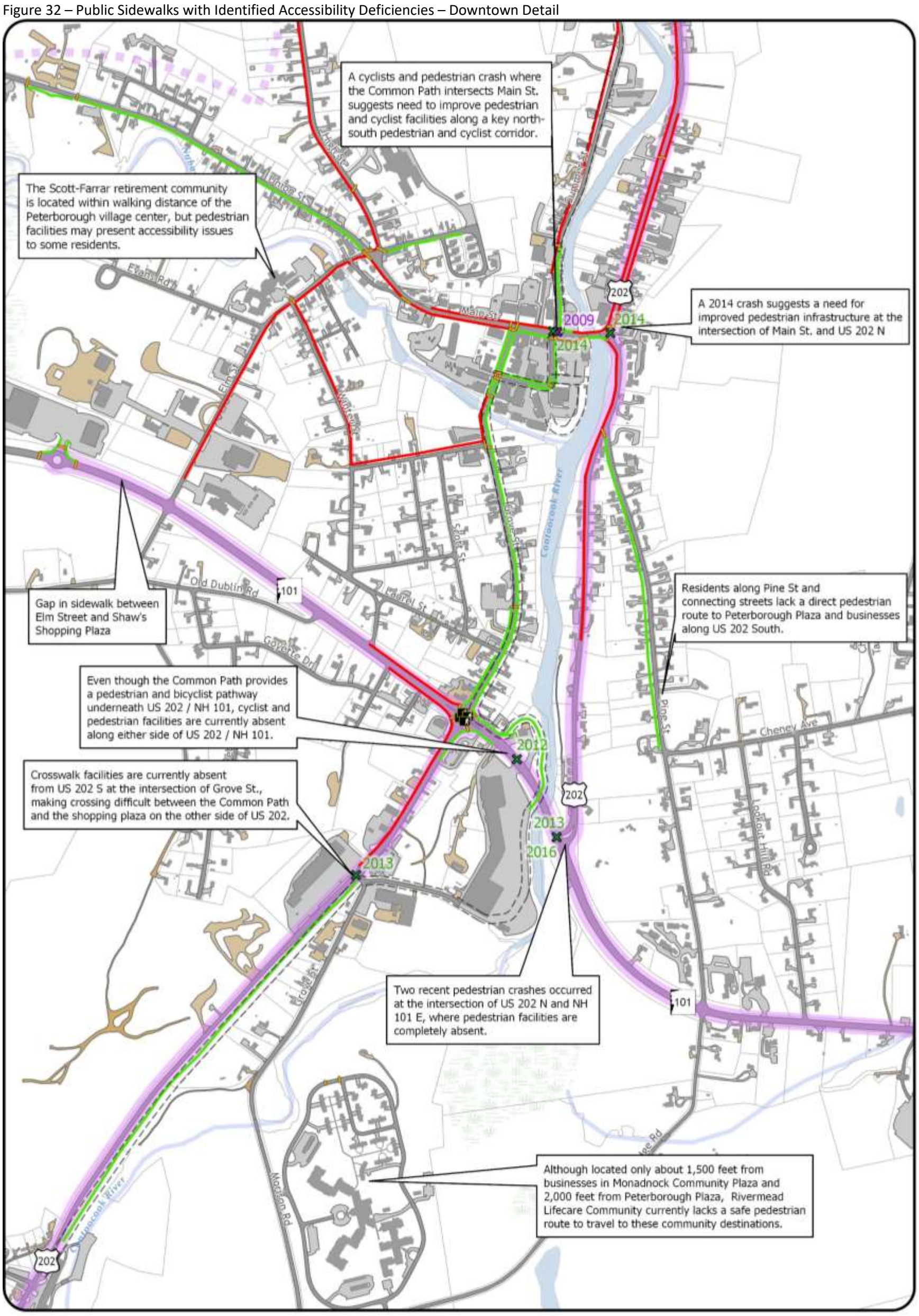
Figure 32 – Public Sidewalks with Identified Accessibility Deficiencies – Downtown Detail



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Although sidewalks line one or both sides of most streets in the Downtown Commercial District, existing sidewalks vary in condition and character. Some segments are accessible to a broad range of users while others may pose challenges and safety concerns to individuals with disabilities. In the Public Right-of-Way Accessibility Guidelines (PROWAG), the United States Access Board has proposed a number of standards for assessing the accessibility of sidewalks in the public right-of-way.[12] They include (but are not limited to) the following:

1. A continuous width of at least four feet.

A maximum cross slope of two percent.

2. Figure 33).
3. A running grade not greater than the adjacent roadway.

Figure 33 - Vertical surface discontinuities. On the left, a discontinuity of ¼ in without a beveled edge. On the right, a discontinuity between ¼ and ½ in., shown with the required 1:2 beveled edge.

Source: United States Access Board

Together, these standards are intended to promote sidewalks that accommodate individuals with disabilities, including wheelchair users. In the Land Use Study Area, many sidewalks segments do not meet one or more of these standards (Figures 31 and 32). Some sidewalks are shown to be substandard because they have cracks or heaves with a vertical surface discontinuity of ¼ in or greater. Others are because obstacles such as telephone poles or fire hydrants create choke points that are narrower than four feet. Steep cross slopes also impact some sidewalks in the study area, especially those of asphalt construction, which are more prone to slumping or heaving than sidewalks constructed with concrete.

The Central Business District of downtown Peterborough benefits from sidewalks that largely meet the basic accessibility standards listed above. Sidewalks in this area appear generally newer than sidewalks elsewhere in the Land Use Study Area and are predominately constructed of concrete, as opposed to less durable asphalt. Where present along the Highway Study Area, sidewalks typically fail to meet accessibility standards. For example, sidewalks lining the western edge of US 202 North suffer from cracks with vertical surface discontinuities greater than 0.25 in. Overgrown vegetation or other obstacles may also constrict the travel path to less than 48 inches (Figure 34). Obstacles and other accessibility deficiencies also exist along sidewalks on local streets within the Study Area.

[12] Section 302 of the *Proposed Accessibility Guidelines for Pedestrian infrastructure in the Public Right-of-Way*. United States Access BoaRoad July 26, 2011. https://www.access-boaRoadgov/attachments/article/743/nprm.pdf.

Figure 34 – Telephone pole obstructs sidewalk along US 202 S

Figure 35 – Telephone pole obstructs sidewalk on Elm Street at Winter Street

Source: SWRPC

Like sidewalks, crosswalks are important pedestrian infrastructure that contribute to the safety, function and connectivity of the pedestrian network. Although crosswalks exist at some points along the Highway Study Area, they are absent in others. Most notably is the lack of crosswalks or other pedestrian infrastructure at the intersection of US 202 N and NH 101 E (Figure 36). The intersection design is tailored to vehicle travel, and poses serious risks to pedestrians. Despite the lack of crosswalks or other safety infrastructure, pedestrians do travel along and/or across the intersections, as indicated by two recent crashes (2013 and 2016) at the intersection involving pedestrians. Although the exact route taken by pedestrians at the intersection is unknown, pedestrian trips likely originate from homes along or off of Granite Street, with the Peterborough Plaza or other nearby businesses as the intended destination. In order to reach the Peterborough Plaza, Monandock Plaza or other nearby businesses with pedestrian infrastructure, pedestrians living along or off of Granite Street would need to take a circuitous route along Main Street and the Common Path, adding substantial travel time.

Figure 36 – The intersection of NH 101 and US 202 N (Granit Street), looking west

Source: Google Earth

Another pedestrian crash site serves as an example of a location where crosswalk facilities are absent. In 2013, a pedestrian was involved in an accident at the intersection of US 202 S. and Grove Street. A multiuse pathway, part of the Common Path, also terminates at the intersection. Crosswalks are not available across US 202 or Grove Street (Figure 37 and Figure 38). A crosswalk, along with other improvements such as a pedestrian refuge island, will likely improve safety for pedestrians crossing US 202 from the Common Path to businesses and restaurants in the Monadnock Plaza. Pedestrian improvements should be considered in conjunction with any future alterations planned for this intersection.

Figure 37 – US 202 at Grove Street and the Monadnock Plaza, looking south. A multi-use pathway—a segment of the Common Pathway—visible on the left.

Figure 38 – Multi-use pathway—a segment of the Common Pathway—terminating at Grove Street

Source: Google Earth

Where crosswalks do exist along the Highway Study Area, their conditions and characteristics often raise safety and accessibility concerns. For example, a crosswalk on Elm Street at Winter Street and the Scott-

Farrar retirement community terminates in the middle of a driveway, prompting crosswalk users to walk in the driveway travel lane and increasing the likelihood of vehicle-pedestrian conflicts (Figure 39). The example highlights safety issues that may arise if access management and crosswalks (as well as other pedestrian infrastructure) are not planned in a coordinated fashion. In the case pictured below, safety concerns are especially notable given that some of the retirement home residents (both motorists and pedestrians) may have disabilities that could increase the risk of vehicle-pedestrian collisions.

Figure 39 - Crosswalk on Elm Street at Winter Street and Scott-Farrar Retirement Community

Source: SWRPC

Multiple crosswalks in the study area are excessively long, posing safety concerns to pedestrians. Most notably is the crosswalk that crosses Main Street at the intersection of US 202 N.

(Figure 40). The crosswalk extends approximately 90 ft. and lacks pedestrian crossing warning signs. An accident involving a pedestrian was recorded at the intersection in 2014. Given that the library is located at the corner of Main Street and US 202 N. and frequented by a variety of users, including children, intersection improvements should be incorporated, including safer crosswalk facilities. Fortunately, this intersection is anticipated to be reconfigured into a more pedestrian-friendly pattern with upcoming work on the Main Street Bridge and US 202 N. Ideally, intersection reconfiguration would include shortening curb-to-curb distances and other safety methods such as the inclusion of a pedestrian refuge island.

Figure 40 – US 202 N at Main Street

Source: Google Earth

Curb ramps are critical for creating accessible transitions between sidewalks and roadway crossings. Few street crossings within the Study Area lack some type of curb ramp or blended transition from sidewalk to roadway surface. A notable example is located at the intersection of US 202 N and Sand Hill Road, where a crosswalk terminates into an asphalt curb (Figure 41). Where ramps do exist, conditions and accessibility vary. Like with sidewalks, PROWAG establishes accessibility standards for curb ramps in the public right-of-way. Standards include, but are not limited to, maximum running slope, maximum cross slope, minimum width, and maximum grade break between the ramp and roadway surface. Detectable panels, which function as an important warning to individuals with visual impairments, are also required by PROWAG standards.

The most common accessibility deficiency among curb ramps in the Study Area is the absence of detectable panels. The lack of detectable panels can make it difficult for individuals with visual impairments to distinguish between sidewalks and roadways, especially at complicated intersections such as the US 202/NH 101/Main Street intersection (Figure 42). Detectable panels are most commonly absent from older curb ramps and sidewalk segments, but they are also absent from some newer curb ramps. The Americans with Disabilities Act (ADA) applies to all curb ramps constructed or altered after January 26, 1992. The standards apply to all curb ramps at pedestrian crossings, which generally include all sidewalks that cross a curb. Pedestrian crossing at commercial driveways along the highway study area offer some notable examples of absent or deficient curb ramps. See, for example, narrow curb ramps

lacking detectable panels at a commercial drive along US 202 S (Figure 43). Judging from their appearance, the ramps were constructed well after the ADA took effect.[13]

Figure 41 - US 202 N at Sand Hill Road, looking north

Source: Google Earth

Figure 42 – US 202/NH 101/Main Street intersection, looking northeast

Source: SWRPC

[13] Public Pedestrian infrastructure constructed or altered after January 26, 1992 are bound to comply with ADA standards.

Figure 43 – Curb ramp at commercial driveway along US 202 S

Source: SWRPC

The analysis above constitutes only a cursory overview of the location and accessibility of existing pedestrian infrastructure. Future pedestrian planning in the study area would benefit from a systematic self-evaluation of accessibility challenges in the public right-of-way.

Bicycle Infrastructure

On-street bicycle infrastructure such as bike lanes are completely absent from the study area. As noted above, some roadways within the study area have wide shoulders, and accommodate experienced cyclists relatively comfortably. Other roadway shoulders, however, are much narrower, with insufficient room to accommodate cyclists safely. The Common Path provides segments of separated shared-use path to the north and south of the Central Business District, but gaps exist along the trail. As noted above, the Common Path passes through the Peterborough Plaza parking lot and along the rear driveway, but only a small portion of the segment is indicated by any sort of marking (Figure 44).

Figure 44- Segment of Common Path in Peterborough Plaza parking lot, partially indicated by painted stripe

Source: SWRPC

Key Findings

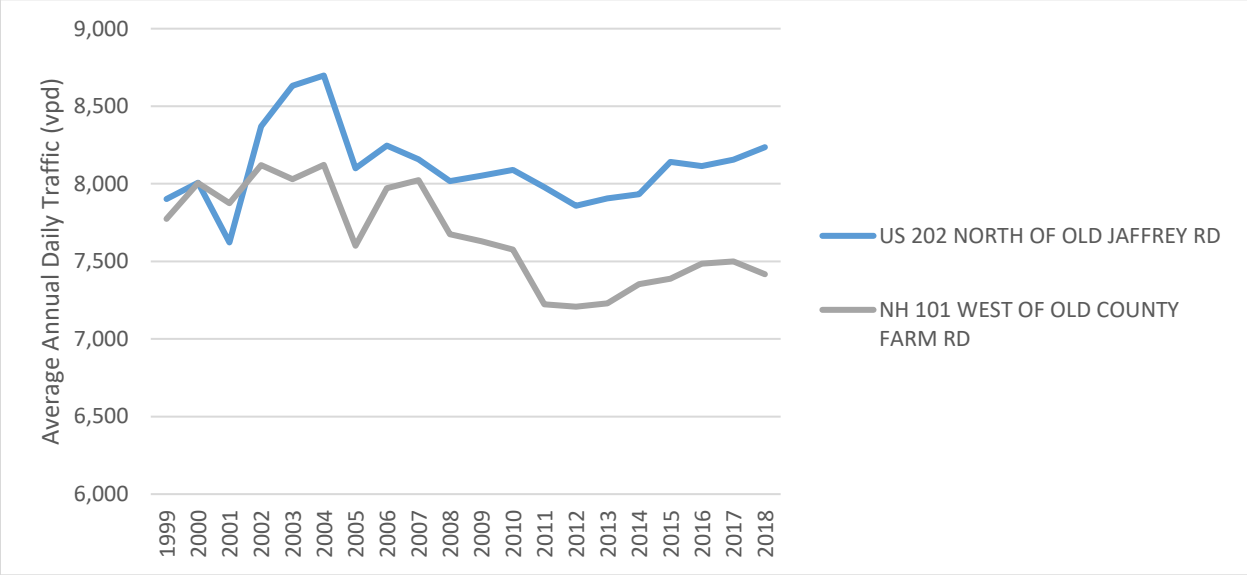
1. While sidewalks extend throughout most of Peterborough's central business districts, notable gaps in sidewalk connectivity exist elsewhere in the Land Use Study Area, both on municipally managed streets and state highways.
2. Within the Land Use Study Area, pedestrian crashes have tended to occur on state highways. Pedestrian crash sites have lacked sidewalks or other pedestrian infrastructure that may improve safety.
3. Aside from the Common Path, bicycle infrastructure is absent from the Land Use Study Area.

Traffic Counts, Pedestrian Counts and Turning Movement Counts

Traffic Counts

Regional context of NH 101 and US 202 can be studied via both short-term studies conducted within the study area as well as nearby permanent counters in Wilton (on NH 101) and Rindge (on US 202) to consider longer term trends in traffic volumes. At NH 101 West of Old County Farm Road in Wilton (average annual daily traffic of 7,418 vehicles per day, or vpd, in 2018 according to NHDOT), a.m. peak traffic trends toward higher eastbound flow towards larger job centers in Hillsborough County and beyond. Over a 20-year period, annual volumes on NH 101 are trending downward. On US 202 North of Old Jaffrey Road in Rindge (8,237 vpd in 2018), traffic volumes have experienced recent increases, but fall short of historical highs.

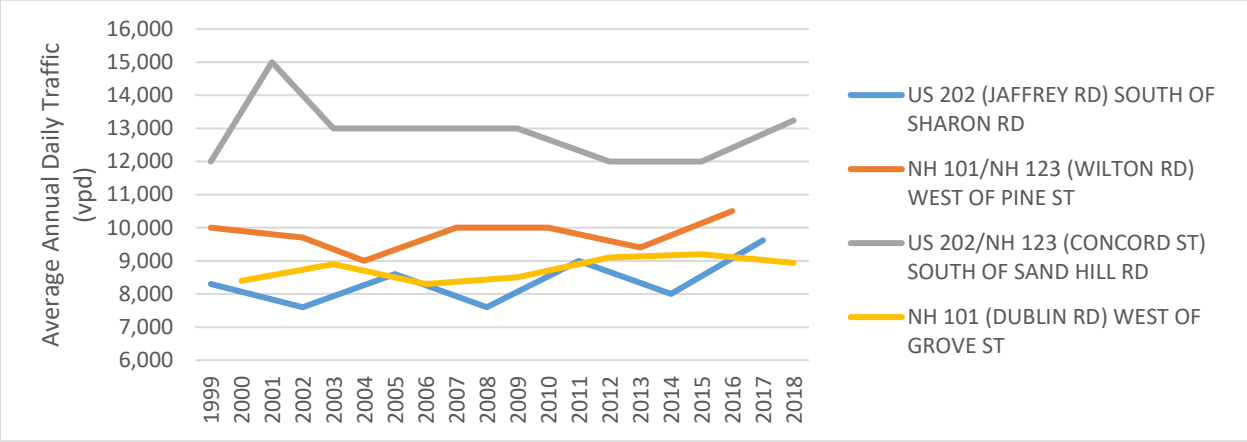
Figure 45 - US 202 and NH 101 Traffic Volume Trends (1999-2018) Outside of the Study Area



Source: NHDOT

Although the study area lacks permanent traffic monitoring stations, there exist a number of sites that are the focus of short-term counts, generally every three years. Unlike the permanent counters, the results are based on a few days of actual data collection and are manipulated based on other information to provide an estimate figure. The data indicates that US 202 north of NH 101 is consistently the busiest section of either US 202 or NH 101 within the study area, with the exception of the US 202/NH 101 bridge over the Contoocook River. This is likely a result of major trip generators being located on the northern section of US 202 (including public schools, hospital and residential development).

Figure 46 - US 202 and NH 101 Traffic Volume Trends (1999-2018) Within the Study Area



Source: NHDOT

In 2018, SWRPC conducted five short-term automatic traffic recorder (ATR) counts on NH 101 and US 202 in the study area during the summer and fall of 2018[14] (see Appendix D - Traffic Map). The purpose of the counts was to provide more detailed information about traffic volumes, vehicles types (also referred to as classification), and operating speeds within the Highway Study Area. A previous count from 2016 was also included in the analysis (Location 5). Of the six locations, the area south of Sand Hill Road had the highest observed weekday traffic volumes (14,449 vehicles per day). The southern end of the study area, south of Sharon Road, was observed to have the lowest weekday traffic volumes (8,738 vehicles per day).

Table 23: List of Automatic Traffic Recorder Counts and Daily Traffic

Description (Location #)	Weekday Average Daily Traffic (vpd)	Saturday (vehicles)	Sunday (vehicles)	Analysis Period
US 202 south of NH 101 (1)	12,687	10,791	8,203	Saturday, September 8, 2018 through Thursday, September 13, 2018
US 202 south of Sand Hill Road (2)	14,443	*	*	Tuesday, September 4, 2018 through Thursday, September 6, 2018
NH 101 west of Grove Street (3)	9,778	*	*	Tuesday, September 4, 2018 through Thursday, September 6, 2018
US 202 north of NH 101 (4)	9,232	7,971	6,123	Saturday, September 8, 2018 through Thursday, September 13, 2018
NH 101 west of Pine Street (5)	11,273	11,668	9,610	Tuesday, July 26, 2016 through Sunday, July 31, 2016
US 202 south of Sharon Road (6)	8,731	7,274	5,638	Saturday, September 8, 2018 through Thursday, September 13, 2018

**Labor Day weekend*
Source: SWRPC

[14] Traffic volumes vary throughout the year. According to NHDOT, New Hampshire roads are generally travelled more frequently in the months June through September.

During peak hours, the general trend favors northbound and eastbound travel during the morning peak period. In the afternoon peak periods, this trend continued to a lesser extent on the northern sections of US 202. The study site with a strong directional variation during commuting periods was US 202 south of Sharon Road, at the southern extent of the study area (south of the New Hampshire Ball Bearing Driveway). Morning periods were dominated by northbound traffic, whereas evening peak travel was dominated by southbound traffic (Table 24). For more information about daily traffic volumes, including counts by hour of the day, and counts by direction of travel, see Appendix B – ATR Reports (Weekly Vehicle Counts).

Table 24 - Peak Hour Traffic and Directional Distribution

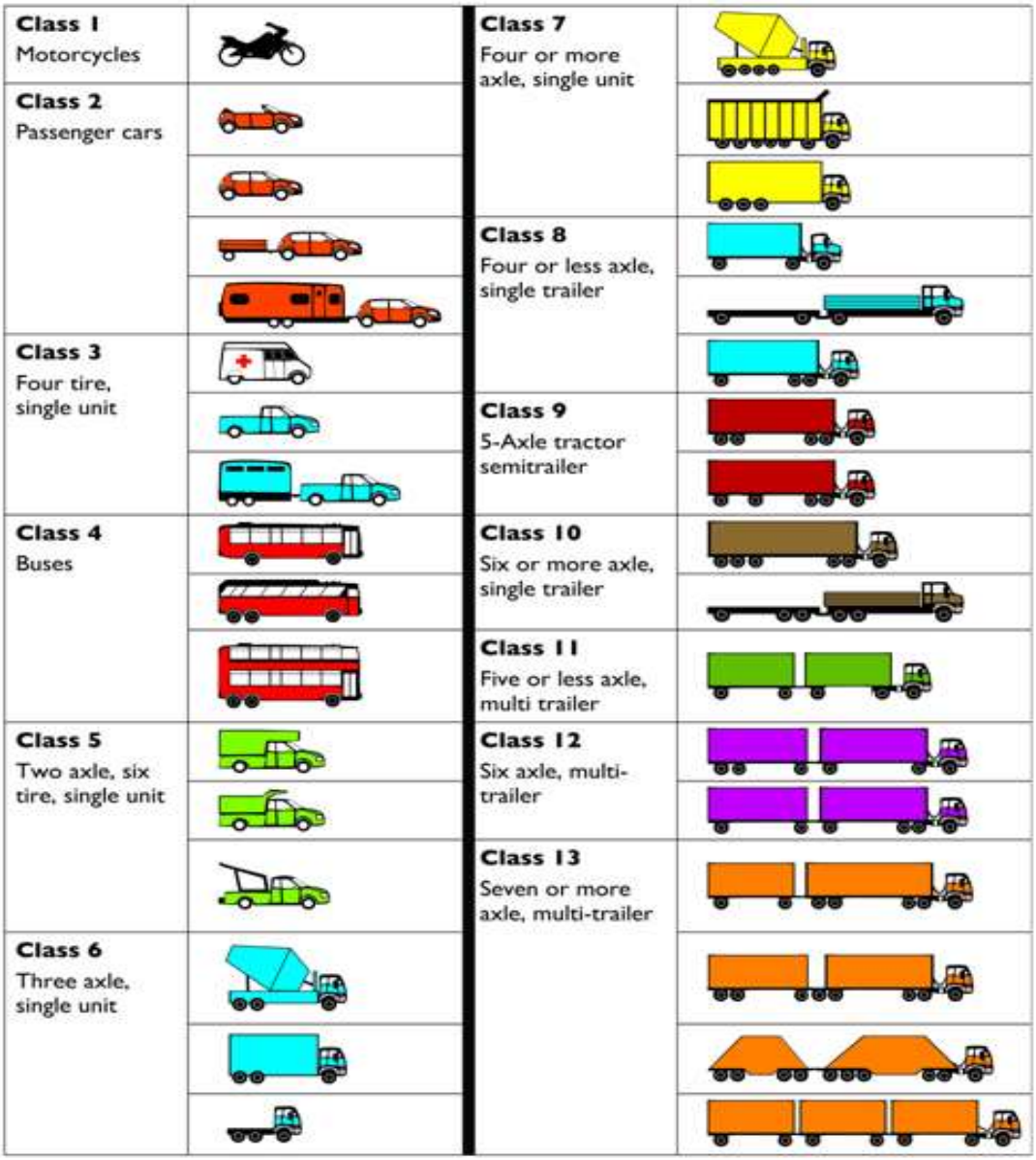
Description (Location #)	Time Period	Average Traffic (vehicles)	NB/WB (vehicles)	% NB/WB
US 202 south of NH 101 (1)	Weekday	12,687		
	Peak AM (7-8)	900	492	54.7%
	Peak PM (3-4)	1,111	600	54.0%
US 202 south of Sand Hill Road (2)	Weekday	14,443		
	Peak AM (7-8)	1,095	577	52.7%
	Peak PM (4-5)	1,241	610	49.2%
NH 101 west of Grove Street (3)	Weekday	9,778		
	Peak AM (11-12)	637	298	46.7%
	Peak PM (3-4)	871	430	49.4%
US 202 north of NH 101 (4)	Weekday	9,232		
	Peak AM (7-8)	694	448	64.6%
	Peak PM (3-4)	827	498	60.2%
NH 101 west of Pine Street (5)	Weekday	11,273		
	Peak AM (10-11)	693	345	49.7%
	Peak PM (4-5)	925	468	50.5%
US 202 south of Sharon Road (6)	Weekday	8,731		
	Peak AM (7-8)	685	394	57.5%
	Peak PM (3-4)	816	361	44.3%

Source: SWRPC

Classification

As part of each traffic volume count, each vehicle was classified according to a 13-category Federal Highway Administration scheme (called Scheme F). To generalize this information, vehicles were aggregated into three categories: “light-duty” vehicles contain motorcycles, passenger cars, and other single-unit vehicles like pick-ups and vans (Class 1-3); “medium-duty” vehicles include buses and single-unit trucks (i.e. without trailers) (Class 4-7); and “heavy-duty” vehicles include trucks with one or more trailers (Class 8-13). For more information about vehicle counts by type, see Appendix B – ATR Reports (Daily Classes).

Figure 47 - Federal Highway Administration 13 Vehicle Category Classification (Scheme F)

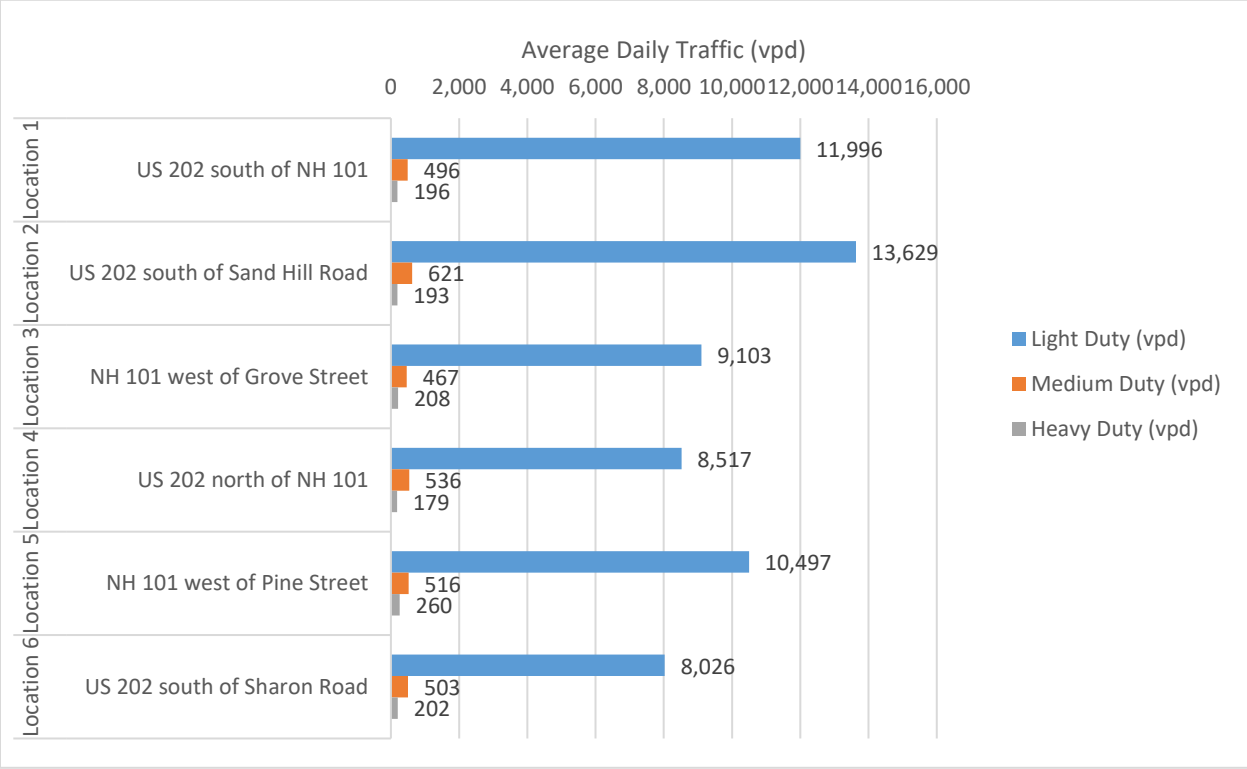


Source: Federal Highway Administration[15]

The observed breakdown of each category ranged from 95.2% light duty vehicles at the southern end of the corridor, to a high of 97.0% light duty vehicles at the northernmost study location (US 202 south of Sand Hill Road). Each location carried an average of at least 400 medium and heavy duty vehicles per day during weekdays, with a high of 457 vehicles per day at the southern end of the corridor (Figure 48).

[15] https://www.fhwa.dot.gov/policyinformation/tmguide/tmg_2013/vehicle-types.cfm

Figure 48 - Weekday Average Vehicle Classification



Source: SWRPC

Table 25 - Average Daily Vehicle Classification

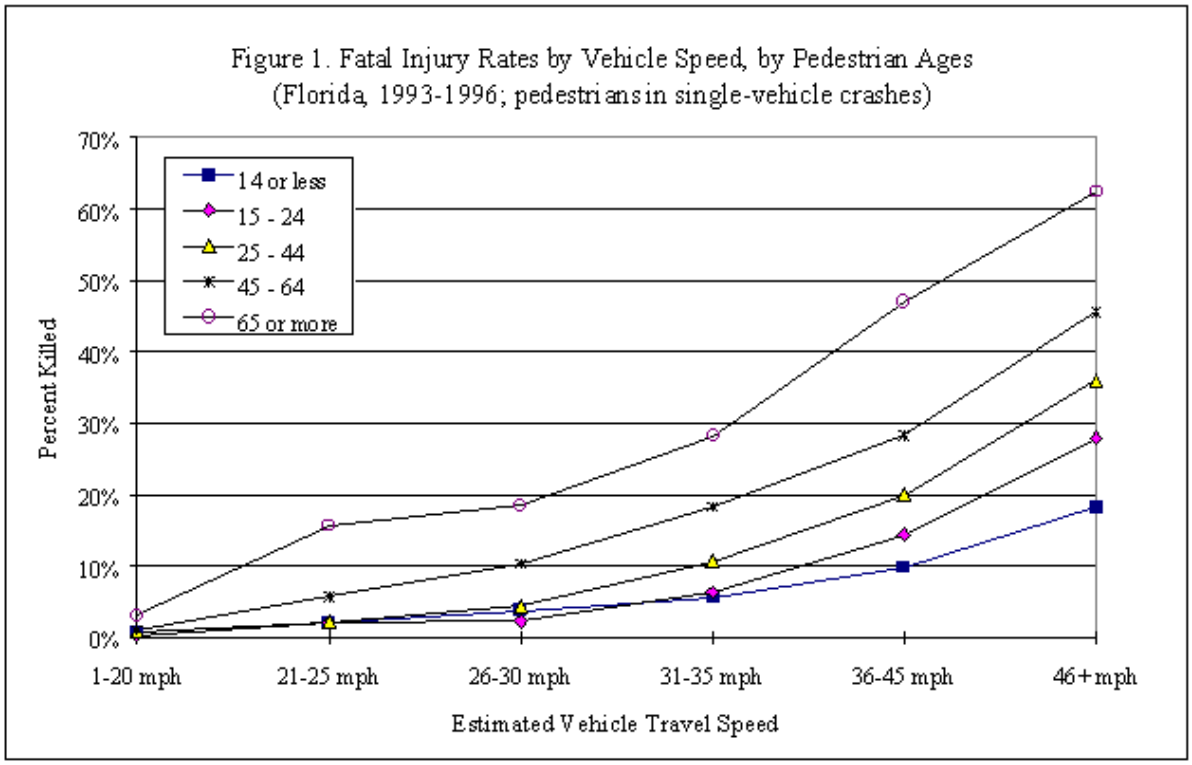
Description (Location #)	Weekday Average (vpd)	Light Duty (vpd)	%	Medium Duty (vpd)	%	Heavy Duty (vpd)	%
US 202 south of NH 101 (1)	12,687	11,996	94.6%	496	3.9%	196	1.5%
US 202 south of Sand Hill Road (2)	14,443	13,629	94.4%	621	4.3%	193	1.3%
NH 101 west of Grove Street (3)	9,778	9,103	93.1%	467	4.8%	208	2.1%
US 202 north of NH 101 (4)	9,232	8,517	92.3%	536	5.8%	179	1.9%
NH 101 west of Pine Street (5)	11,273	10,497	93.1%	516	4.6%	260	2.3%
US 202 south of Sharon Road (6)	8,731	8,026	91.9%	503	5.8%	202	2.3%

Source: SWRPC

Operating Speeds

Posted speed limits on US 202 and NH 101 range from a low of 30 mph, the minimum posting allowed, to 50 mph. Observed or operating speeds (defined as the 85th percentile of observed speeds[16]) were analyzed at the location of each traffic study. They were found to vary from a low of 32.9 mph on US 202 south of the signalized intersection to 54.6 mph on US 202 at the southernmost extent of the study area. US 202 (Granite Street) was observed to have the highest percent of vehicles exceeding the posted speed limit in that area. These patterns are not only related to the enforceability of speed limits and the comfort of drivers in the study area, but play a prominent role in the severity of injuries and frequency of fatalities, especially for vulnerable road users like people walking and biking. Surviving a crash is also closely tied to the age of the person walking, with individuals 65 and older observed to experience more than four times as great a risk of being killed compared to people ages 14 and younger. For more statistics about operating speeds in the study area, see Appendix B – ATR Reports (Speed Statistics).

Figure 49 – Percent of people walking killed in motor vehicle crashes by estimated vehicle travel speed and age[17]



[16] SWRPC excluded vehicles with a following distance of fewer than six seconds to provide a better picture of how drivers choose their speed at each location.

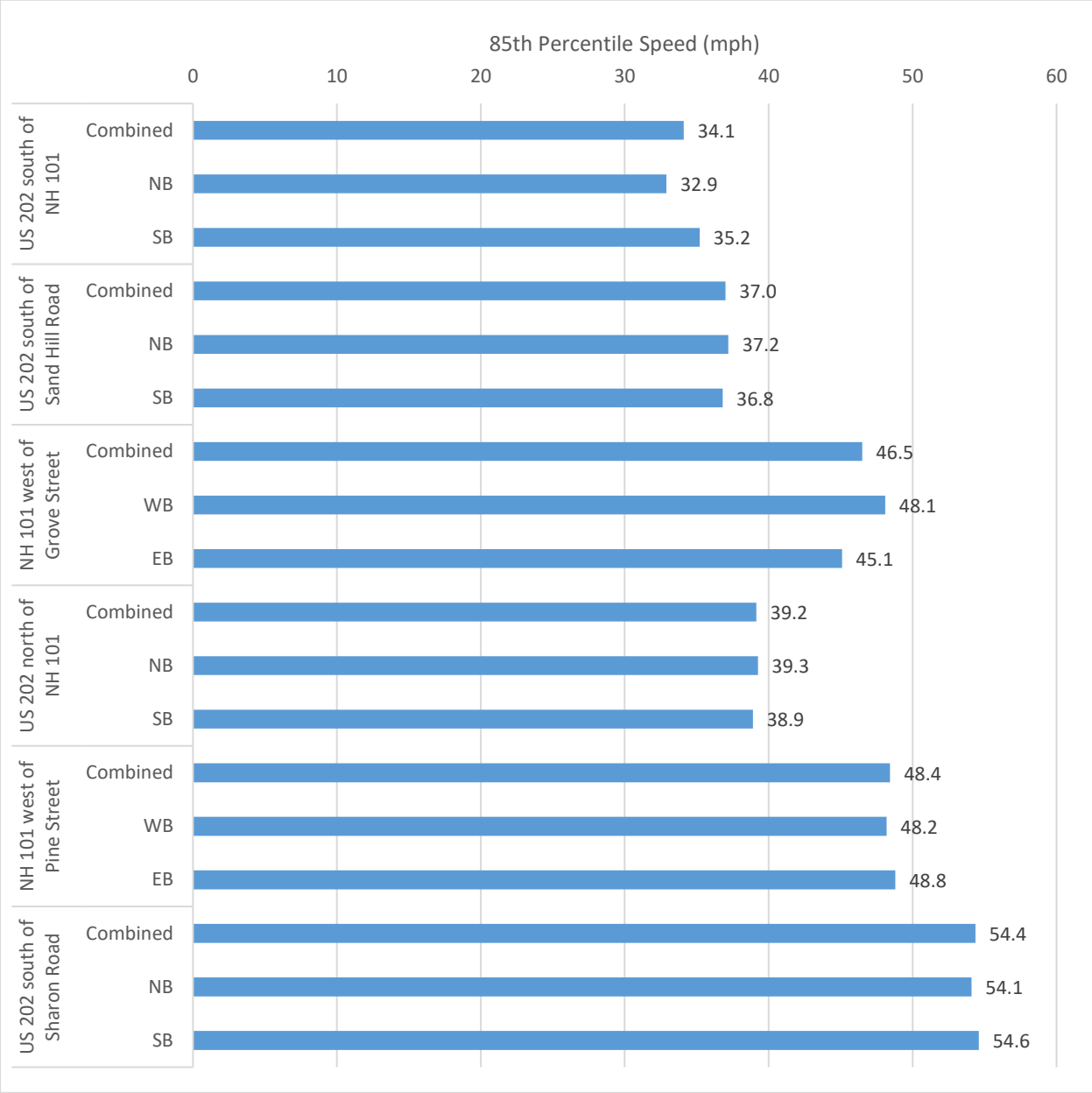
[17] https://one.nhtsa.gov/people/injury/research/pub/hs809012.html

Table 26 - Observed Operating Speeds (85%), Posted Speed Limits, and Percent Exceeding

Description (Location #)	Direction	Operating Speed (85%)	Posted Speed Limit (mph)	Operating minus Posted (mph)	Vehicles Exceeding (%)	Comment
US 202 south of NH 101 (1)	Combined	34.1	30	4.1	49.5	
	NB	32.9	30	2.9	39.6	
	SB	35.2	30	5.2	61.3	
US 202 south of Sand Hill Road (2)	Combined	37.0	30	7.0	87.6	
	NB	37.2	30	7.2	88.9	
	SB	36.8	30	6.8	86.2	
NH 101 west of Grove Street (3)	Combined	46.5	30/35	16.5/11.5	96.2/86.2	Recorded at 30/35 posting
	WB	48.1	30/35	18.1/13.1	96.4/89.9	30 going up to 35
	EB	45.1	30/35	15.1/10.1	96.1/83.1	35 going down to 30
US 202 north of NH 101 (4)	Combined	39.2	30	9.2	90.0	
	NB	39.3	30	9.3	88.7	
	SB	38.9	30	8.9	91.5	
NH 101 west of Pine Street (5)	Combined	48.4	40	8.4	78.8	
	WB	48.2	40	8.2	79.1	
	EB	48.8	40	8.8	78.7	
US 202 south of Sharon Road (6)	Combined	54.4	40/50	14.4/4.4	90.2/43.2	Recorded at 40/50 posting
	NB	54.1	40/50	14.1/4.1	89.6/41.2	50 going down to 40
	SB	54.6	40/50	14.6/4.6	90.7/44.9	40 going up to 50

Source: SWRPC

Figure 50 – Comparison of 85th Percentile Speeds



Source: SWRPC

Non-Motorized Counts

Compared to motorized traffic, counting people walking and biking is relatively new and challenged highly variable patterns in traffic type based on the land use type, time of year, weather, and transportation infrastructure. Relative to the study area and project, SWRPC conducted counts of people walking and biking on the Common Path at three locations during 2018. Each location utilized automated equipment to provide continuous data throughout the study period (October 9, 2018 through November 14, 2018). The Common Pathway itself serves as an important connection for non-motorized travel and extends north from the Noone Falls area, where no dedicated pathways for people walking and biking exist, under the US 202/NH 101 bridge over the Contoocook River, through downtown, and parallel to and alongside Summer Street within the study area. Counts were recorded prior to the installation of a new bridge and crossing over Nubanusit Brook, which opened in the spring of 2019. The Common Path south of Hunt Road was observed to have the highest number of users of the three locations, about 60 per day on average. The lowest volume of the three sites was the Common Path south of Grove Street, about 28 users per day on average. The site north of the bridge over the Contoocook River averaged about 49 users per day (Table 27). The 2018 results build on previous studies conducted in May of 2016, which demonstrated higher average daily use near the bridge (Table 28). More information about each count is available in Appendix C – Non-Motorized Count Reports.

Table 27 - 2018 Non-Motorized Count Locations

Description (Location #)	Total Walking & Biking	Daily Average Walking & Biking	Total Walking	Daily Average Walking	Total Biking	Daily Average Biking
Common Path north of bridge over Contoocook River (1)	1,828	49	*	*	*	*
Common Path south of Grove Street (2)	1,247	28	792	21	226	6
Common Path south of Hunt Road (3)	2,238	60	1,927	52	311	8

*Source: SWRPC *Location experienced equipment failure of bike counter*

Table 28- Previous Non-Motorized Count Locations[18]

Description	Total Walking & Biking	Daily Average Walking & Biking	Total Walking	Daily Average Walking	Total Biking	Daily Average Biking
Common Path north of bridge over Contoocook River	1,086	99	671	61	415	38
Common Path north of Tarbell Road	N/A	N/A	Not Counted	N/A	572	52

Source: SWRPC

[18] Conducted by SWRPC 5/15/16 to 5/25/16

Turning Movement Counts

Manual turning movement counts (or TMCs) can serve a variety of purposes. SWRPC approached this analysis with the goal of maximizing the number of areas studied, rather than studying any one area in detail. This enabled SWRPC to conduct TMCs at 7 unsignalized, stop-controlled intersections and 1 signalized intersection to determine the relative demand at each intersection as a whole, as well as for specific turning movements during the peak morning and peak evening commuting periods (Table 29 and Table 30). For more information and graphics related to each intersection, please see Appendix E: Turning Movement Count Reports and the Traffic Map.

Table 29 - Stop Controlled Intersection Turning Movement Count Locations

Location #	Major Route	Minor Route(s)	Type
1	US 202 (Jaffrey Road)	Sharon Road	3-leg
2	US 202 (Jaffrey Road)	Grove Street	3-leg
3	NH 101 (Dublin Road)	Elm Street	4-leg
4	US 202 (Hancock Road)	NH 136 (Greenfield Road)	3-leg
5	NH 101 (Wilton Road)	NH 123 (Elm Hill Road) / Old Street Road	4-leg
6	US 202 (Concord Street / Pine Street)	Main Street	3-leg
7	NH 101 (Wilton Road)	US 202 (Granite Street)	3-leg

Source: SWRPC

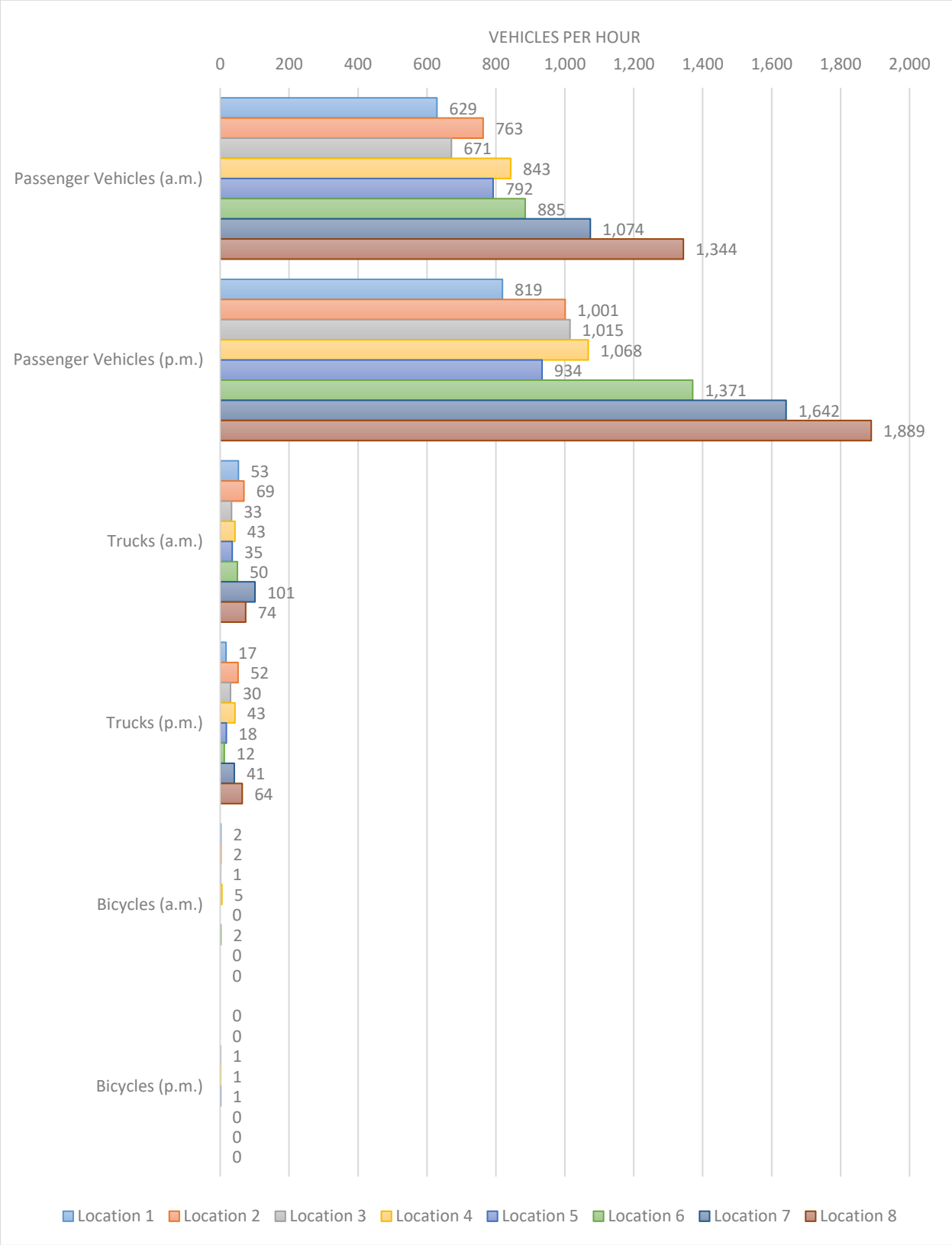
Table 30 - Signalized Intersection Turning Movement Count Location

Location #	From North	From East	From South	From West	Type
8	Grove Street	US 202/NH 101 (Wilton Road)	US 202 (Jaffrey Road)	NH 101 (Wilton Road)	Fully actuated

Source: SWRPC

For each location, volumes of passenger vehicles, trucks (medium and heavy duty) and bicycles were recorded (Figure 51).

Figure 51 - Comparison of Peak Hour Intersection Turning Movement Count Volumes (All Approaches)



Source: SWRPC

Key Findings

- Longer term trends in traffic volumes on NH 101 and US 202 are mixed. Over a 20-year period, annual volumes on NH 101 are trending downward. On US 202 in Rindge, traffic volumes have experienced recent increases, but fall short of historical highs.
- Of the six short term traffic count locations, the area of US 202 south of Sand Hill Road had the highest observed weekday traffic volumes (14,449 vehicles per day). The southern end of the study area, US 202 south of Sharon Road, was observed to have the lowest weekday traffic volumes (8,738 vehicles per day).
- Of the hourly data collected, the peak weekday period at the majority of traffic study locations started at 7:00 a.m. The evening peak commuting periods were observed to begin at either 3:00 p.m. or 4:00 p.m. The only study site with a strong directional variation during commuting periods was US 202 south of Sharon Road, at the southern extent of the study area. Morning periods were dominated by northbound traffic, whereas evening peak travel was dominated by southbound traffic. US 202 (Granite Street) north of NH 101 was observed to have significantly higher northbound traffic in both the morning and evening peak hours of travel.
- Each location carried an average of at least 400 medium and heavy duty vehicles per day during weekdays, with a high of 457 vehicles per day at the southern end of the corridor.
- The US 202 and NH 101 intersection was identified as a low priority truck freight bottleneck location within the New Hampshire Statewide Freight Plan Final Report (2019, p. 132), one of three within Southwest New Hampshire.
- Operating speeds were found to vary from a low of 32.9 mph on US 202 south of the signalized intersection to 54.6 mph on US 202 at the southernmost extent of the study area. US 202 (Granite Street) was observed to have the highest percent of vehicles exceeding the posted speed limit in that area.
- There is a lack of detailed data on use of State and local roads and pathways for biking and walking. The Common Path south of Hunt Road was observed to have the highest number of users, about 60 per day on average. The lowest volume of the three sites was the Common Path south of Grove Street, about 28 users per day on average. The site north of the bridge over the Contoocook River averaged about 49 users per day.

Highway and Intersection Capacity Analysis

Stop-Controlled Intersections

The purpose of performing a highway and intersection capacity analysis is to understand how key intersections in the study area were performing relative to their theoretical capacity in accordance with the Highway Capacity Manual.

The following results are according to level of service (LOS) criteria for unsignalized intersections as found in the Transportation Research Board Highway Capacity Manual. A level of service is a letter designation that describes a range of operating conditions on a particular type of facility. Six levels of service are defined, using the letters A through F. Level of service A represents the best level of service, and generally describes operation of free flow and very low delay. Level of service F represents the worst operating conditions (see Table).

Table 31 - Highway Capacity Manual Level of Service (LOS) Criteria for Stop-Controlled Intersections

Level of Service (LOS)	Control Delay (seconds/vehicle)
LOS A	0 - 10
LOS B	> 10 - 15
LOS C	> 15 - 25
LOS D	> 25 - 35
LOS E	> 35 - 50
LOS F	> 50

Source: Transportation Research Board Highway Capacity Manual

The following table depicts the level of delay for each approach and applicable turning movements. Following the trend of observed traffic volumes being higher during the p.m. peak period, intersection delay was modeled to increase significantly compared to the a.m. peak period for a given location. To view the complete calculations relative to each intersection, please see Appendix F: Two-Way Stop-Control Reports.

Table 32 - Level of Service Analysis for Stop-Controlled Intersections

Description (Location #)	Approach	Movement	LOS (a.m.)		LOS (p.m.)	
			Movement	Approach	Movement	Approach
US 202 & Sharon Road (1)	Westbound	Left / Right	Not Applicable	Not Applicable	B	B
	Southbound	Left / Through	A	Not Applicable	A	Not Applicable
US 202 & Grove Street (2)	Westbound	Left / Right	A	A	B	B
	Southbound	Left / Through	A	Not Applicable	A	Not Applicable
NH 101 & Elm Street (3)	Eastbound	Left	A	Not Applicable	A	Not Applicable
	Westbound	Left	A	Not Applicable	A	Not Applicable
	Northbound	Left / Right / Through	C	C	C	C
	Southbound	Left / Through	C	B	D	C
		Right	B		B	
US 202 & NH 136 (4)	Westbound	Left / Right	C	C	D	D
	Southbound	Left / Through	A	Not Applicable	A	Not Applicable
NH 101 & NH 123 / Old Street Road (5)	Eastbound	Left	A	Not Applicable	A	Not Applicable
	Westbound	Left	A	Not Applicable	A	Not Applicable
	Northbound	Left / Right / Through	C	C	C	D
	Southbound	Left / Right / Through	B	B	D	C
US 202 & Main Street (6)	Eastbound	Left	C	C	F	F
		Right	B		B	
	Northbound	Left / Through	A	Not Applicable	A	Not Applicable
US 202 & NH 101 (7)	Eastbound	Left	A	Not Applicable	B	Not Applicable
	Southbound	Left	E	C	F	F
		Right	B		B	

Source: SWRPC

Key Findings

- A December 2015 “Traffic Impact and Site Access Study” performed by Stephen G. Pernaw & Company, Inc. related to the Dunkin Donuts at the signalized intersection of NH 101 and US 202 identified the following:
    - The signalized intersection was modeled to be operated “at capacity” during the peak p.m. hour in 2016 and by 2016 the intersection is expected to operate over capacity during the p.m. peak hour.
- A July 2015 “Traffic Assessment” performed by Global Montello Group Corp. related to a then proposed Gasoline Station/Convenience Store project identified the following:
    - Historical traffic count data obtained from NHDOT indicate that traffic volumes in the areas have been decreasing at a rate of 2.04 percent, on average, since 2008.
    - Under 2016 and 2026 future traffic-volume conditions, the Grove Street (NH Route 202) major street movements at Grove Street/Monadnock Plaza are expected to operate at LOS A during the weekday a.m. and p.m. peak hours. However, the Monadnock Plaza left turn/through movement was anticipated to operate at LOS F. The Grove Street approach was modeled to operate at LOS C during the weekday a.m. peak hour and LOS D (2016) and LOS E (2026) during the weekday p.m. peak hour.

Safety Infrastructure and Crash Inventory

From 2007 through 2016, the Highway Study Area saw a total of 373 vehicle crashes. Of those, 49 crashes resulted in non-capacitating injuries, 3 in incapacitating injuries, and one in a fatality. From 2007 through 2010, the number of crashes remained relatively flat, hovering between 43 and 49 crashes per year. Beginning in 2011, the number of recorded crashes began to decline significantly, dropping to only four recorded crashes in 2012. The drop, however, is likely attributable to deficiencies in available data, not a true drop in crashes. Only crashes associated with geographic coordinates of a certain level of accuracy can be located within the Highway Study Area. A higher proportion of crash data from 2011 through 2013 lacked a sufficiently accurate accident location. For example, in 2012, about 70 percent of reported crash incidents in Peterborough lacked accurate geographic coordinates, versus a median of 20 percent during the ten-year period of 2007-2016.[19] Changes in data accuracy make trends difficult to discern. The ten-year median of 45.5 crashes per year, however, provides a useful baseline figure against which to compare future years of crash data.

Table 33 - Annual Crashes, by Severity, Highway Study Area, 2007-2016

Year	No Apparent Injury	Non-incapacitating	Incapacitating	Killed	Possible	Unknown	Annual Total
2007	40	3	0	0	4	0	**47**
2008	39	7	0	0	3	0	**49**
2009	32	9	0	0	2	0	**43**
2010	37	7	0	0	5	0	**49**
2011	19	1	1	0	1	0	**22**
2012	3	1	0	0	0	0	**4**
2013	5	2	0	1	1	0	**9**
2014	33	6	1	0	6	1	**47**
2015	33	5	0	0	3	3	**44**
2016	43	8	1	0	2	5	**59**
Total	**284**	**49**	**3**	**1**	**27**	**9**	**373**

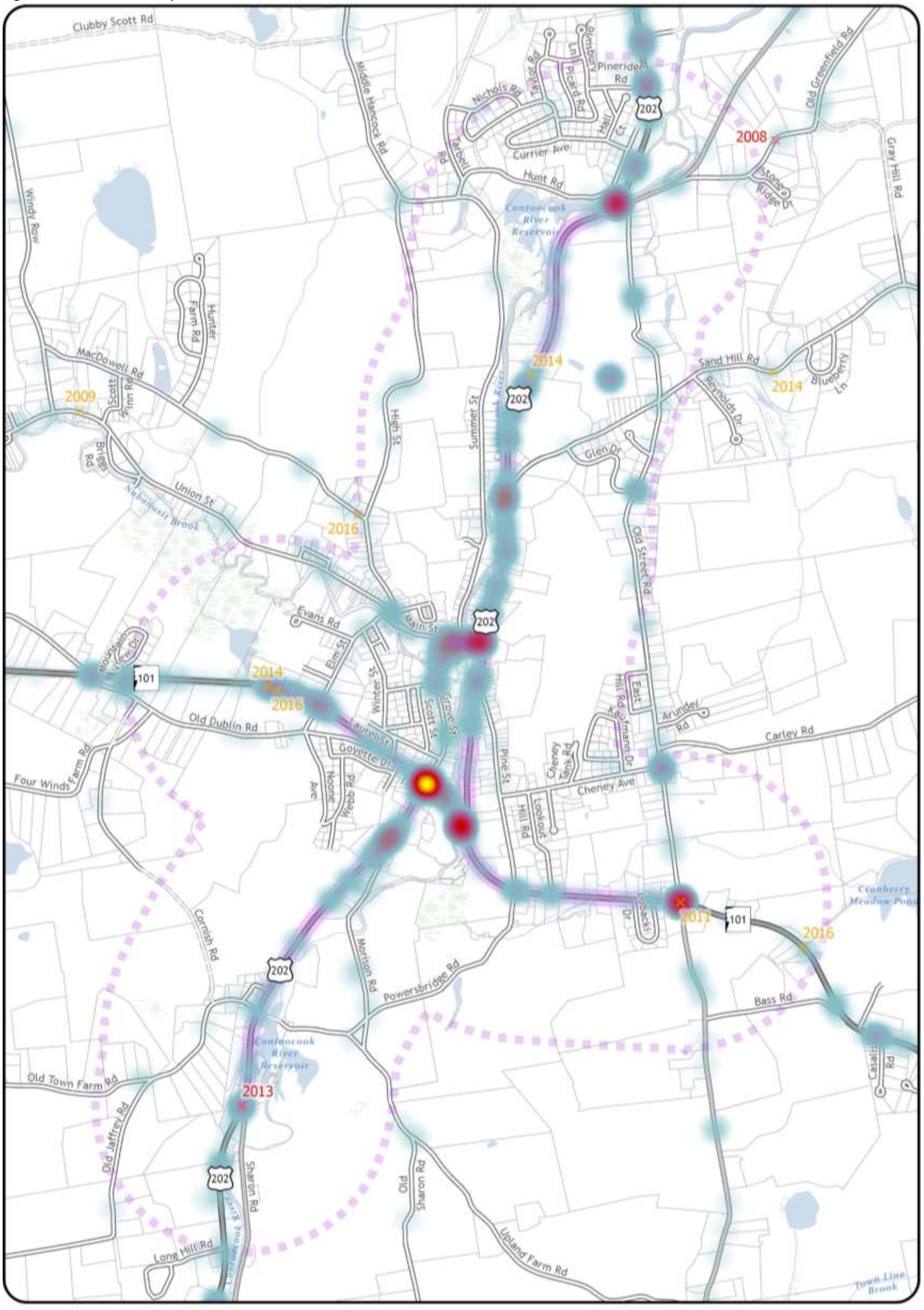
Source: NHDOT Locatable Crash Data. Only located and estimated crashes are included in tally.

Crashes within a five foot search distance of highway study area are included.

The spatial distribution of crashes reveals some notable patterns. Within the Highway Study Area, crashes cluster most densely at the NH 101 West/US 202 South/Grove Street intersection (Figure 52).

[19] Each recorded crash in NHDOT data is associated with a code that described the geographic accuracy of the georeferenced point. For purposes of this analysis, crashes with a location code of "located" or "estimated" are considered sufficiently accurate.

Figure 52 – Crash Heat Map



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SWRPC

However, neither this intersection, nor the intersection of NH 101 East and US 202 North have seen an accident resulting in a serious injury or fatality. All crashes resulting in either a serious injury or fatality have occurred towards the extremities of the Highway Study Area. Two crashes at the Shaw's plaza roundabout resulted in serious injuries: a motorcycle crash into a guard rail in 2016 and a two-vehicle incident in 2014. A two-vehicle crash at the intersection of NH 101 East/NH 123 South/Old Street Road resulted in one serious injury in 2011. A crash on US 202 North, north of Sand Hill Road resulted in a one serious injury in 2014. The only recorded fatality in the Highway Study Area occurred at the intersection on NH 202 South and Sharon Road in 2013. It should be noted, however, that the fatal crash is associated with only an estimated location, and may have occurred at a point to the north or south of the estimated coordinates, somewhere along US 202 South.

Pedestrian and Bicyclist Crashes

From 2007 through 2016, there was one recorded crash involving a bicyclist and six involving pedestrians. According to NHDOT data, these crashes resulted in only minor injuries, no serious injuries or fatalities. Four of the six pedestrian crashes occurred on state-owned highways: a 2012 crash on NH 101/US 202 near the Shell gas station; a 2013 crash at the intersection of US 202 South and Grove Street; a 2013 and 2016 crash at the junction of US 202 North and NH 101 East; and a 2014 crash at the intersection of US 202 North and Main Street. The two remaining crashes occurred at the intersection of Summer Street and Main Streets: a crash involving a pedestrian in 2014 and a crash involving a bicyclist in 2009.

Key Findings

- **Per VMT, crashes occur more frequently along the NH 101/US 202 Intersection than any of the other Highway Study Area subsections.** Crashes that result in either serious injuries or fatalities, however, occur at the extremities of the Highway Study Area, where vehicles are traveling at higher speeds.
- **Due to inconsistencies in State crash data, historic trends in crash frequency and severity are difficult to discern.** The 2007-2016 median, however, for total annual crashes within the Highway Study Area (45.5 crashes per year) provides a rough baseline for assessing crash frequency in future years.

Future Conditions

Current and Potential Development

The location, scale, and type of development, ongoing and in the future, have the potential to impact traffic and safety. This section identifies parcels experiencing current development as well as parcels that have the potential to accommodate significant development in the future.

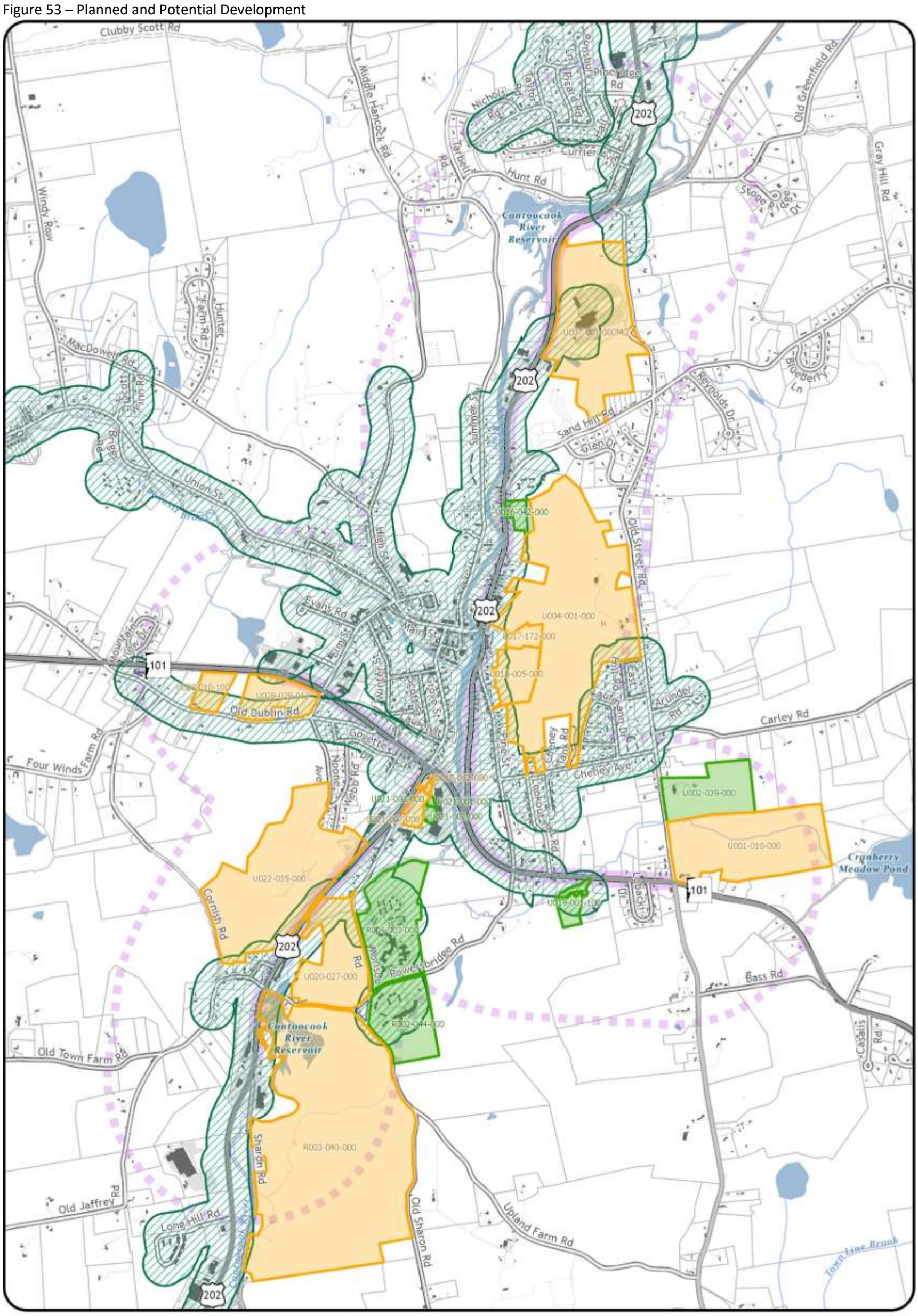
Parcels with current development projects were identified through conversations with the Project Working Group and municipal staff. Parcels that were identified during those discussions are shown in green on Figure 53. The same parcels are listed in Table 34, with details and notes.

Parcels with development potential were identified through a two-step process. First, a GIS exercise layered various development constraints on top of parcel boundaries. Development constraints considered during the analysis included steep slopes, protected land, public land, wetlands listed in the National Wetlands Inventory plus a fifty-foot buffer, rivers and waterbodies plus a 100-foot buffer, footprints of existing buildings, and existing pavement. Once these constrained areas were subtracted from parcels within the Land Use Study Area, parcels with significant amounts of land remaining were flagged as potentially developable.

SWRPC staff then reviewed flagged parcels with municipal planning staff to verify whether those parcels did in fact hold development potential or if unforeseen constraints somehow precluded or limited future development. Municipal planning staff feedback was then used to modify the list of flagged parcels and to enhance the information attached to each parcel. Figure 53 shows parcels still thought to hold development potential after the two-step identification process. Parcel details and notes can be found in Table 35.

Through conversations with municipal staff, it became apparent that several important factors were unaccounted for during the initial GIS analysis used to identify parcels with development potential. First, the presence or proximity of municipal sewer and water can play a significant role in boosting a parcel's development potential. The presence of municipal sewer removes the need to dedicate land to septic facilities. With a municipal water and sewer connection, a parcel becomes eligible to be developed under the provisions of the Traditional Neighborhood Overlay Zone II, which allows for relatively dense residential development (multifamily buildings with up to 10 units) as well as certain commercial uses. As of writing, the Traditional Neighborhood Overlay Zone II is being considered for repeal at the 2019 town meeting. The extent of municipal sewer and water, plus a 400-foot buffer, is shown in Figure 53.

Figure 53 – Planned and Potential Development



Maps prepared by Southwest Region Planning Commission (SWRPC) are for planning purposes only. SWRPC uses data from multiple sources at various scales of accuracies. No warranties, expressed or implied, are provided for the data herein, its use, or its interpretation.

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SWRPC

Table 34 - Planned or in Process Development Projects

Parcel ID	Acres	Comments	Primary Zoning	TIF	Current Water/Sewer Service
R004-003-000	48.5	Two new residential buildings planned at RiverMead Retirement Community @ 24 units/building.	Retirement Community	South	Sewer and Water Services
R002-044-000	34.7			South	
U002-039-000	32.8	Renovation of historic stone barn into a 35-unit condominium and accessory farm operation.	Family/Rural	No	Public Water Service
U016-042-000	5.6	A 20 to 25-unit condominium development east of US 202, south of the intersection of US 202 and Sand Hill Rd. Could be impacted if Traditional Overlay Zone II is repealed during the 2019 Town Meeting	General Residence/Family	No	Sewer and Water Services
U019-001-100	6.9	A planned 20-unit residential development fronting on NH 101 E, East of Lookout Hill Road	General Residence	South	Public Water Service
U021-001-000	0.5	A 65-bed inpatient rehabilitation facility.	Village Commercial	Downtown	Public Water Service
U021-002-000	1.5			Downtown	Public Water Service
U021-003-000	0.1			Downtown	Public Water Service

Sources: SWRPC analysis of Town of Peterborough GIS Data; Communications with Project Working Group and Town of Peterborough staff.

Table 35 - Parcels with Development Potential

Parcel ID	Acres	Comments	Primary Zoning	TIF District	Current Water/Sewer Service	Water and Sewer within 400 Ft.
R003-040-000	282.1	Unprotected land currently being operated as an aggregates business. Will continue to operate as a gravel pit for the next 5-10 years. Frontage on US 202 S	Rural	South		Yes
U001-010-000	79.1	Large parcel with one single-family home. Located at the corner of NH 101 E and Old Street Road. Not currently located near sewer and water, but renovation of adjacent Stone Barn property may bring those utilities within close access.	Family/Rural	No	Public Water Service	No
U004-001-000	174.2	Large group of predominately undeveloped parcels with frontage on Pine Street and Old Street Road. Current owner has expressed no interest in selling, but parcels are unprotected. Site of historic town common may cause Town to oppose subdivision.	Family	No	Public Water Service	Yes
U017-172-000	5.5		Family	No		Yes
U018-005-000	17.1		Family	No		Yes
U007-001-000MC	91.3	Monadnock Community Hospital. No new development planned, but parcel includes substantial portions of developable land.	Monadnock Community Healthcare	No	Sewer and Water Services	Yes
U018-062-000	0.3	Commercially zoned parcels with access at the NH 101 / US 202 Intersection. Includes 2 parcels with duplicate ID numbers.	Village Commercial	Downtown		Yes
U021-007-000	0.6		Village Commercial	Downtown		Yes
U021-007-000	4.7		Village Commercial	Downtown		Yes
U020-027-000	45.9	Large wooded parcel west of RiverMead Retirement Community. Frontage on US 202 South. Development may be complicated by presence of Settler's Rock, location of first permanent residence in the Town.	Rural	No	Public Water Service	Yes
U022-035-000	111.9	Large undeveloped parcel with aggregate yard and large swathe of undeveloped woodlands. Extensive frontage on US 202. Steep slopes separate the SE and NW portions of the parcel.	Rural	No		Yes
U028-010-000	9.4	Frontage on US 202 west of the Shaw's shopping plaza	Rural	No		Yes
U028-028-012	20.5	Frontage on US 202 across from the Shaw's shopping plaza.	Rural	No		Yes

Sources: SWRPC analysis of Town of Peterborough GIS Data; Communications with Project Working Group and Town of Peterborough Staff

Key Findings

- **US 202 South likely has the most development potential, compared to other Highway Study Area Subsections.** Several large vacant or underutilized parcels have front on the highway. Several key parcels south of the Main St./NH 101/US 202 intersection also offer vacant, developable land.
- **High asking prices for key developable parcels may prevent growth along US 202 South.**
- **Repeal of the Traditional Neighborhood Overlay Zone II, up for consideration at the 2019 town meeting, may prevent or diminish development projects along the Highway Study Area.** A planned condominium development, for example, on US 202 North at Sand Hill Road, may be preempted by a repeal.
- **Certain large parcels in the Land Use Study may not be primed for short-term development, but lack protections to ensure future long-term conservation.** Parcels U004-001-000 and U001-010-000, both located on Old Street Road, offer examples (see Figure 53).

Preliminary Recommendations

As a result of the studies conducted within this report, the following recommendations were developed and refined by the SWRPC staff and members of the Work Group.

Land Use and Land Use Regulations

- Consider standardizing parcel land use codes and assigning land use codes to every parcel in the Land Use Study Area. Currently, many parcels are not associated with land use codes. Future land use analysis would benefit from comprehensive land use code coverage.
- In order to facilitate compact growth patterns, direct development to areas with existing water and sewer as well as established tax increment finance districts.

Infrastructure Characteristics and Conditions

- Consider developing and adopting complete streets design guidelines to guide roadway improvements and to help identify key pedestrian and cyclist corridors.
- Consider developing and adopting an Americans with Disability Act (ADA) Transition Plan in order to guide strategic improvements to universal accessibility in the public right-of-way. Under the ADA, state and local governments with fifty employees or more are required to develop and administers a ADA Transition Plan. A Transition Plan developed at the local level should consider the policies and provision laid out in the NHDOT ADA Transition Plan, which was drafted in August, 2016.
- Adopt commercial and residential driveway standards that support the preservation and development of a well-connected sidewalk network. Current NHDOT standards and guidelines focus exclusively on accommodating vehicle travel and turning movements and do not address how driveways and pedestrian infrastructure should interface. The Town of Peterborough's driveway standards reference NHDOT standards. Both the Town and NHDOT should consider investigating how driveway standards may be improved to support the safety of pedestrian infrastructure that interface with driveways.

Access Management

NH 101/US 202 between Grove Street and Granite Street

- Investigate whether the offset distances identified for three parcels (U018-134-000, U018-062-100, U018-135-000) and Bridge Street are problematic for simultaneous opposing left-hand turning traffic. Possible alternatives include restricting left turns by extending the existing median or creating shared access points for abutting parcels on the northern side of the corridor.
- Conduct a field review to determine if there are any safety concerns related to the Shell Station's (U018-135-000) western curb cut. If there are concerns, explore ways to redesign the curb cut, potentially as a one-way right-turn only curb cut or a splitter island curb cut to better delineate the ingress and egress points of the curb cut.
- Conduct a field review examining the driveway for the northeast quadrant parcel (U018-133-000) on the 4-way intersection of NH 101/US 202 and Grove Street. If there are concerns with safety for the curb cut on NH 101/US 202, explore ways to reconfigure the parcel's access to Grove Street.

- Investigate if the Better Homes and Gardens Real Estate office (U018-079-000) and Studio 105 Hair Design (U018-080-000) share the connected driveway between the two parcels. If warranted, a future shared drive arrangement could result in restricting access on NH 101 to a right-hand turn only movement.

NH 101 between Grove Street and Shaw's Plaza

- Request an engineering review of the Elm Street intersection with NH 101 to determine if future realignment is warranted.
- Request information from NHDOT regarding any potential future curb cuts on Subsection 2.
- Investigate whether the offset distance between Hatch Street and Mercer Avenue is problematic when a simultaneous opposing left-hand turn traffic maneuver is occurring.
- Investigate if there is a sight distance deficiency at the intersection of Elm Street and NH 101.

NH 101 between Granite Street and Old Street Road/NH 123

- Monitor safety after the completion of project #15698 at the intersection of NH 101, Old Street Road and NH 123.
- Ensure the Town of Peterborough's site plan and subdivision regulation processes and its coordination with NHDOT on driveway permits improve existing deficiencies with new curb cuts on this section of corridor. Note the 27-acre undeveloped lot on NH 101 (U019-011-000) and look for opportunities to minimize access points on this lot.
- Work with existing or new owners of properties with wide curb cuts to limit their size, while ensuring on-site traffic circulation does not impede safety on NH 101. Notable lots that could be addressed include the Black Swan (U019-007-000) and Murray's Home Again (U001-014-000) driveways.
- Work with existing or new owners of properties with less than adequate corner clearance to adjust driveway locations if feasible. Notable commercial driveways include Murray's Home Again (U001-014-000), Twin Elm Farm (U019-004-000).
- Investigate to determine if it is feasible to work with the existing owners of Twin Elm Farm (U019-004-000) (or future owners) to address the less than adequate offset distance of its easterly driveway with Lookout Hill Road.
- Consider working with present or future land owners to eliminate NH 101 curb cuts for two double frontage parcels (U019-017-000 and U001-008-000) located on this section of the corridor.
- Investigate if there is a sight distance deficiency at the intersection of NH 101 and Powersbridge Road and the intersection of NH 101 and Pine Street.

US 202 between NH 101 and NH 136

- If the Town of Peterborough and NHDOT find the need to encourage shared driveway arrangements in the study area, consider speaking with the four property owners of shared driveways on this stretch of corridor (U015-002-000, U015-002-100, U015-001-000 and U015-001-100) to learn the benefits and drawbacks of the arrangement as a way to correct deficiencies in shared drive arrangements and communicate with other prospective shared driveway land owners about the benefits of shared access arrangements for the corridor.
- Conduct an engineering study at the US 202, NH 136 and Old Street Road area to determine if there is an alternative design that would improve safety and operations at the intersection.

- Consider redesigning the intersection of Sand Hill Road and US 202 in order to eliminate at least one of the three curb cuts that constitute that intersection.
- Work with existing or new owners of properties with wide curb cuts to limit their size, if feasible. Notable driveways that could be addressed include BC Auto (U015-002-000) on US 202 and Mickey's Repair Services (U015-003-000) on Sand Hill Road.
- Investigate opportunities to correct the corner clearance distance for Mickey's Repair Services Sand Hill Road driveway, as well as the US 202 driveways for Jack Daniels Motor Inn (U016-039-000) and Concord Street Health Insurance (U016-038-000).
- Investigate opportunities to better align driveways on US 202 between Main Street and Sand Hill Road.
- Investigate sight distance at the intersections of Pine Street and US 202 and Main Street and US 202.

US 202 between NH 101 and Sharon Road

- Explore opportunities to officially share (and potentially close or decrease the width of) driveways associated with Achilles Agway (R003-016-000), Manhattan East Hair Design Studio and Peterborough Pizza Barn (R003-018-100), and the Peterborough Collision Center (R003-018-000) with current or future owners.
- Conduct an engineering study at the US 202 and Grove Street Extension intersection to determine if there is an alternative design that would improve safety and operations at the intersection.
- Prepare for future development associated with the right-of-way behind Achilles Agway by learning NHDOT's controlled access plans for the area.
- Work with NHDOT to improve access deficiencies in the controlled access portion of the corridor.
- Work with current or future owners to decrease the width of the following driveway curb cuts: 2 at the Monadnock Community Plaza (U021-020-000), 1 gravel pit (U022-035-000), 3 at the Achilles Agway (R003-016-000), 2 serving the Manhattan East Hair Design Studio and Peterborough Pizza Barn (R003-018-100) and 2 at the Peterborough Basket Company property (U021-008-000).
- For driveways on US 202 Investigate opportunities to correct the corner clearance distance for the Noone Falls Mill Building driveways with Cabana Drive, preferably by lining up a curb cut with Cabana Drive, and look to move or consolidate driveways for parcels near Sharon Road (R003-019-000, R003-018-100, R003-018-000. For off-corridor properties consider closing the northern driveway for Staff Development for Educators (R003-037-000) on Sharon Road and adjusting driveway widths for the Peterborough Basket Company property (U021-008-000) on Grove Street Extension.
- In addition to having corner clearance, issues there are several driveways at the Noone Falls Mill property and near the US 202 Sharon Road extension that do not meet guidance for off-set driveway spacing. Investigate ways to correct these deficiencies.
- Proactively prepare future access management scenarios for the gravel pit property (U022-035-000) as well as the string of undeveloped and underdeveloped properties (U021-007-000, U018-065-000, U021-004-000, U021-005-000 and U021-006-000) on the northern portion of this section of corridor.

General Access Management

- Determine if there is Town (staff and elected official) and NHDOT District IV support for entering in an access management agreement with the NHDOT. Several years ago SWRPC presented the Town of Peterborough with an access management memorandum of understanding, but according to Peterborough staff the agreement was never implemented. A copy of the memorandum of understanding is attached in Appendix G.
- Evaluate Town (staff and elected official) and NHDOT District IV support for developing an access management plan for the study area. SWRPC has provided some example excerpts of access management plans to illustrate how they have been used to deal with new lot development as well as retrofit access management situations. See Appendix G for more information.

Traffic Counts, Pedestrian Counts and Turning Movement Counts

- Consider conducting or requesting follow-up automated counts of people walking at key sites in the study area to better understand the demand at various portions of the transportation network, as well as benchmark project areas prior to the construction of relevant improvements.
- Identify a volunteer coordinator to lead an in-person survey effort of people biking and walking to obtain information on trip purposes and user needs using tools from the National Bicycle and Pedestrian Documentation Project. This method requires little to no equipment, can be accomplished with help from community volunteers, can be accomplished where the installation of equipment is impractical, and will assist the town in justifying funding as well as understanding user needs.
- Investigate the Strava Global Heatmap as a means to identify the relative popularity of routes and intersections by people walking and biking.

Safety and Crashes

- Investigate where sites of serious or fatal crashes are eligible for a Road Safety Audit (RSA), a formal safety performance examination that may provide a pathway to infrastructure improvement funding. SWRPC could assist the Town in assessing the viability of an RSA application, and, if viable, assembling an application.
- Where pedestrian and cyclist crashes have occurred, consult crash reports to investigate the nature of those accidents and consider how improved pedestrian or cyclist infrastructure may prevent similar crashes from occurring in the future.
- NHDOT should consider compiling and releasing the most recent crash data available. Currently available crash data runs through the summer of 2017.

Future Conditions

- In cases where subdividable lots are located near the periphery of the Land Use Study Area, consider working with landowners to investigate the feasibility of land protections, like conservation easements.
- If development or subdivision of lots along the Highway Study Area does occur, work with property owner to consolidate and limit driveways accessing NH 101 or US 202.