

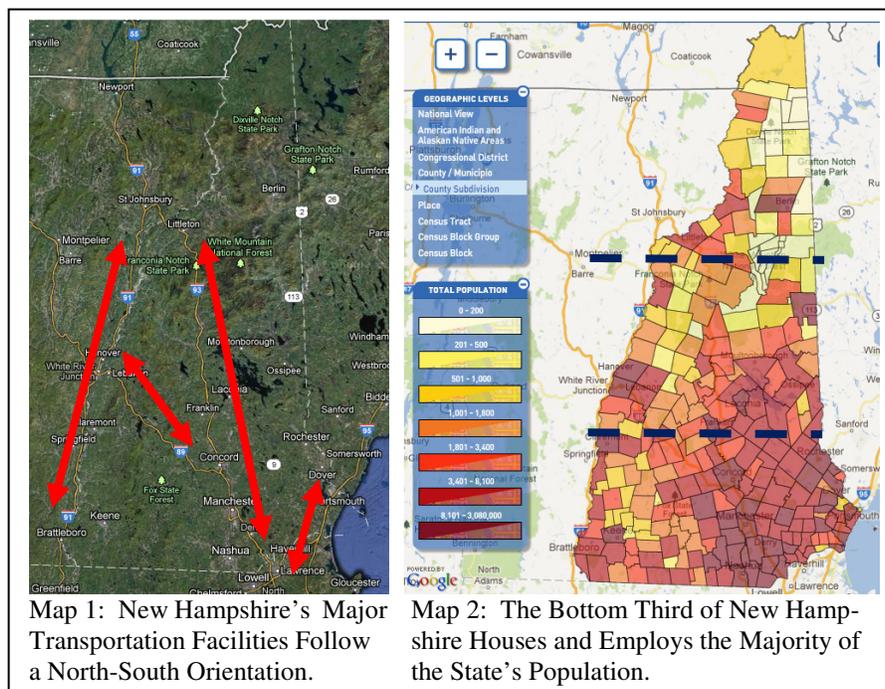
## 1. INTRODUCTION & BACKGROUND

What need is there for improving east-west travel in Southern New Hampshire? This has become an increasingly important question for all of New Hampshire and was the impetus for the New Hampshire Department of Transportation to allocate resources to study, plan for and invest in a Portsmouth to Manchester bus service.<sup>1</sup>

For travelers that want to travel east or west in New Hampshire, both transportation mobility and choice are limited. A map of New Hampshire's limited access highway system shows that limited access highway mobility is mostly concentrated on a north to south orientation. The Spaulding Turnpike, Interstate 95, 295, 395, 93, 89 and 91 (within a few miles from New Hampshire's western boundary) primarily facilitate north-south mobility. Route 101 from Bedford to Interstate 95 is an east-west exception and Interstate 89 provides some east-west connectivity. Likewise, interregional alternative transportation choices are more plentiful on the north-south axis. By example, intercity bus services by Concord Coach Lines, Dartmouth Coach, Greyhound, Megabus and Peter Pan Bus Lines are concentrated on the north south axis of the interstate system noted above. Amtrak services (ie the Downeaster and Vermonter) also follow a north-south axis.

At the same time total population, population density and population growth in New Hampshire is concentrated in the southern half of the State and this is where planners should expect the most inter-regional in-state trips (see Map 2). But how much east-west demand is there in this southern tier, is it expected to grow and if so, should we be planning for it?

FIGURE 1: TRANSPORTATION AND POPULATION IN NEW HAMPSHIRE



<sup>1</sup> Rockingham Planning Commission and Southern New Hampshire Planning Commission. Portsmouth – Manchester Airport Bus Feasibility Study, Final Report, February 2009.

## **1.1. PURPOSE OF STUDY**

The problem of east west travel is an issue that all northern New England states (New Hampshire, Maine and Vermont) have grappled with for a long time and it has been viewed by some as a major economic barrier as well as a tremendous economic development opportunity.<sup>2</sup> Typically it has been characterized as an interstate travel issue, but it has impacts on intra-state travel as well. This study examines a smaller piece of the east-west connectivity quandary—the connection between the Monadnock Region (referred to as the Southwest Region Planning Commission (SWRPC) Region from this point forward) and the Capital Corridor/ Interstate 93 area consisting of Manchester and bookended by Concord and Nashua (referred in this study as the Southern New Hampshire Planning Commission (SNHPC) Region).

With the two regions in mind, the purpose of this study is to:

1. quantify existing and future demand for travel between the Southern New Hampshire Planning Commission (SNHPC) and Southwest Region Planning Commission (SWRPC) regions via this corridor; and
2. identify proposed services, program(s) or projects to more efficiently, safely and effectively serve this travel.

When combined with initiatives looking at travel between Manchester and points east, the study serves the purpose of providing a better understanding of east-west travel along the entire southern tier of the State from the Seacoast to the Connecticut River Valley. Moreover, the results of the study inform future interregional planning activities including the SWRPC and SNHPC Long Range Transportation Plans and Coordinated Community Transportation Plans.

## **1.3 STUDY AREA**

The area chosen for the study connects the SWRPC Region with the SNHPC Region. Two key routes connecting the two areas were identified for this study:

- NH 101 from Keene, NH to Manchester, NH (NH 101 Route); and
- NH 9 to Interstate 89 to Interstate 93 from Keene, NH to Manchester, NH (NH 9/I-89/I-93 Route)

Certain communities in the study are recognized as capturing more destination end trips due to their high number of jobs, shopping opportunities and services. Those communities include Keene, Greenfield and Peterborough in the SWRPC Region and Bedford and Manchester, and Londonderry in the SNHPC area. While these communities are identified as major trip destination points, the study also examines trip origin information. The study also is cognizant of specific major destinations and they are considered in this study. These areas include: Manchester-Boston Regional Airport, Keene Bus Depot, Keene State College, Antioch University and Franklin Pierce University. Finally, the study considers situations in which a planning region commission is a pass through area en route to other eastern or western destinations.

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<sup>2</sup> Woodard, Colin. “East-West Highway: Savior or Albatross?” The Portland Press Herald. May 27, 2012.

## **1.4 PREVIOUS PLANS AND STUDIES**

There were three types of transportation-related plans that were reviewed and consulted in preparation for the study: regional planning commission/metropolitan planning organization long range transportation plans, corridor studies, transit feasibility studies and coordinated community transportation plans. These plans were reviewed to identify any existing trends, as well as any policy, service or infrastructure recommendations relating to east-west travel in the study area. A very brief summary of each is discussed below.

### **1.4.1 LONG RANGE TRANSPORTATION PLANS**

Both SWRPC and SNHPC maintain Long Range Transportation Plans. SWRPC's Long Range Transportation Plan was last updated in 2007 with an update planned for 2013. The SWRPC Long Range Plan recognizes Manchester-Boston Regional Airport as an important airport serving the Southwest Region. It recognizes that maintaining regional connectivity is absolutely critical for the region as "...there are no interstates, rail, air, or major bus routes connecting our region to the larger Boston Metropolitan area (including Manchester, Nashua, Worcester, etc.)."<sup>3</sup> A key recommendation for the region is to maintain regional connectivity by preserving and enhancing capacity of the arterials leading to Keene, as well as those that provide regional access and mobility. Another key recommendation in the Plan is to set the framework for expansion of services and infrastructure to serve the mobility and accessibility needs of those without personal transportation. Several road segments and intersections along the Route 101 corridor in Keene, Marlborough and Peterborough are identified as having insufficient capacity and requiring improvements.

The long range Regional Transportation Plan for the SNHPC (Plan) is updated semi-annually to coincide with the Ten-Year Highway Plan process and regional air quality conformity. The intermodal Plan is required by Federal law to establish funding priorities for regional transportation projects. In order to maintain eligibility for transportation funds allocated by the NHDOT, the SNHPC members have authorized the completion of this Plan for the thirteen-member communities.

The Plan addresses the following existing and planned transportation modes in the thirteen municipalities: 1) Highways (passenger and freight); 2) Transit (bus and rail); 3) Multi-Use Trails (pedestrians and bicycles); 4) Air (passenger and freight); 5) Rail (passenger and freight). For these transportation modes, existing conditions, future demand analysis, possible initiatives to address needs and final prioritized recommendations are presented. The plan is intended to establish a master guide for funding transportation projects.

Prioritization of the plan recommendations results from a screening process that uses eight planning factors, initially identified and mandated in earlier versions of Federal transportation legislation and carried forward in MAP-21, to ensure that impacts associated with health, safety, welfare and the environment are properly weighed in the public interest. In addition to the MAP-21 planning factors, FHWA and FTA have also identified ten additional Planning Emphasis Areas (PEAs) such as addressing climate change mitigation and adaptation early in the

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<sup>3</sup> Southwest Region Transportation Plan, 2007 Update, p. 63.

planning process. The PEAs are designed to more fully meet Federal requirements and reflect newer initiatives not yet addressed as Federal requirements.

### **1.4.2 CORRIDOR STUDIES**

Both NH 101 and NH 9 have had corridor studies in the Southwest Region. Both programs focused on highway infrastructure and land use planning. Neither travel demand management nor alternative transportation analyses were considered in either study. The NH 101 Corridor Study, conducted in 1999, included the NH 101 highway extending from Keene to Milford. Traffic projections in the study going to 2018 did not indicate drastic reductions in intersection or roadway efficiency, but did predict increased traffic pressure on the open road, at intersections and in settled areas. The report recommended several highway improvement projects at segments of highway and intersections many of which have been advocated by the SWRPC Transportation Advisory Committee as Ten Year Plan projects since the report was published. The NH 9 Corridor Study, which was completed in 2006, was a study of NH 9 that traverses through the towns of Stoddard, Antrim and Hillsborough, one of two areas between Vermont and I-89 that does not have controlled or limited access. This study also recommended a number of highway improvements, including purchasing access for the study area in order to preserve east-west mobility.

Parallel Route 101 corridor studies of Bedford and the three Nashua Regional Planning Commission (NRPC) towns of Wilton, Milford and Amherst were completed in 2002. The corridor studies included strategies to reduce problems and realize benefits. Several key strategies for the corridor addressed issues such as highway access reduction of hazardous left turns, specific guidelines for commercial development and identification of specific hazardous left turns. The studies represented first steps toward action to be followed by detailed engineering of specific projects proposed for the corridor. The corridor studies summarized what proposed improvements were expected to look like, their size, and their level of impact.

The Bedford portion of the corridor study was approved by the Town Council in 2002 and the Amherst, Milford, and Wilton portions were reviewed by town officials and a four-town Steering Committee which resulted in coordination with the Bedford portion of the Plan. Recommended improvements for the corridor are currently being implemented by NHDOT and others projects have been incorporated into the long-range plans of NRPC and SNHPC. A more detailed discussion of improvement projects proposed for the corridor is included in subsequent sections of this report.

### **1.4.3 TRANSIT FEASIBILITY STUDIES**

SNHPC and Rockingham Planning Commission (RPC) completed the Portsmouth-Manchester Airport Bus Feasibility Study in February 2009. The stated purpose of the study was to: 1) Identify and document the need for a transit bus service between the City of Portsmouth and MBRA, and 2) Develop a plan for a proposed service that will most effectively and efficiently meet the transportation needs of the residents in the regions served by the RPC and the SNHPC. The overall goal of the study was to determine the need for a bus service between the City of Portsmouth and MBRA based on the results of demand estimation and to make

recommendations for the proposed service based on the information gathered. A service based on the results of this study is scheduled to begin in 2013. SNHPC and Central New Hampshire Regional Planning Commission are currently conducting the Concord-Manchester Transit Service Feasibility Study. The study is designed to: 1) identify and document the feasibility of transit services between the City of Concord and City of Manchester, and 2) develop a plan for proposed services that will most effectively and efficiently meet the transportation needs of residents in the regions served by CNHRPC and the SNHPC.

#### **1.4.4 COORDINATED COMMUNITY TRANSPORTATION PLANS**

Both the SWRPC Region and the SNHPC Region have Regional Coordinating Councils (RCC) for Community Transportation that plan for and implement community transportation coordination improvements. Each Region has a Coordinated Community Transportation Plan which provides guidance on identified needs and priorities for each Region.

The Coordinated Community Transportation Plan for Southwest New Hampshire (Southwest Coordinated Plan) was developed in 2006 with subsequent updates in 2010 and 2011. Of the many needs discussed in the Southwest Coordinated Plan, an important identified priority that stands out in that document is the need for additional volunteer drivers to transport people east of the SWRPC Region including to Manchester. Another recommendation in the plan encourages the Monadnock Regional Coordinating Council to engage in dialogue with other RCCs, NHDOT and other relevant stakeholders regarding opportunities for NH 101 corridor shared ride transportation improvements and connections.

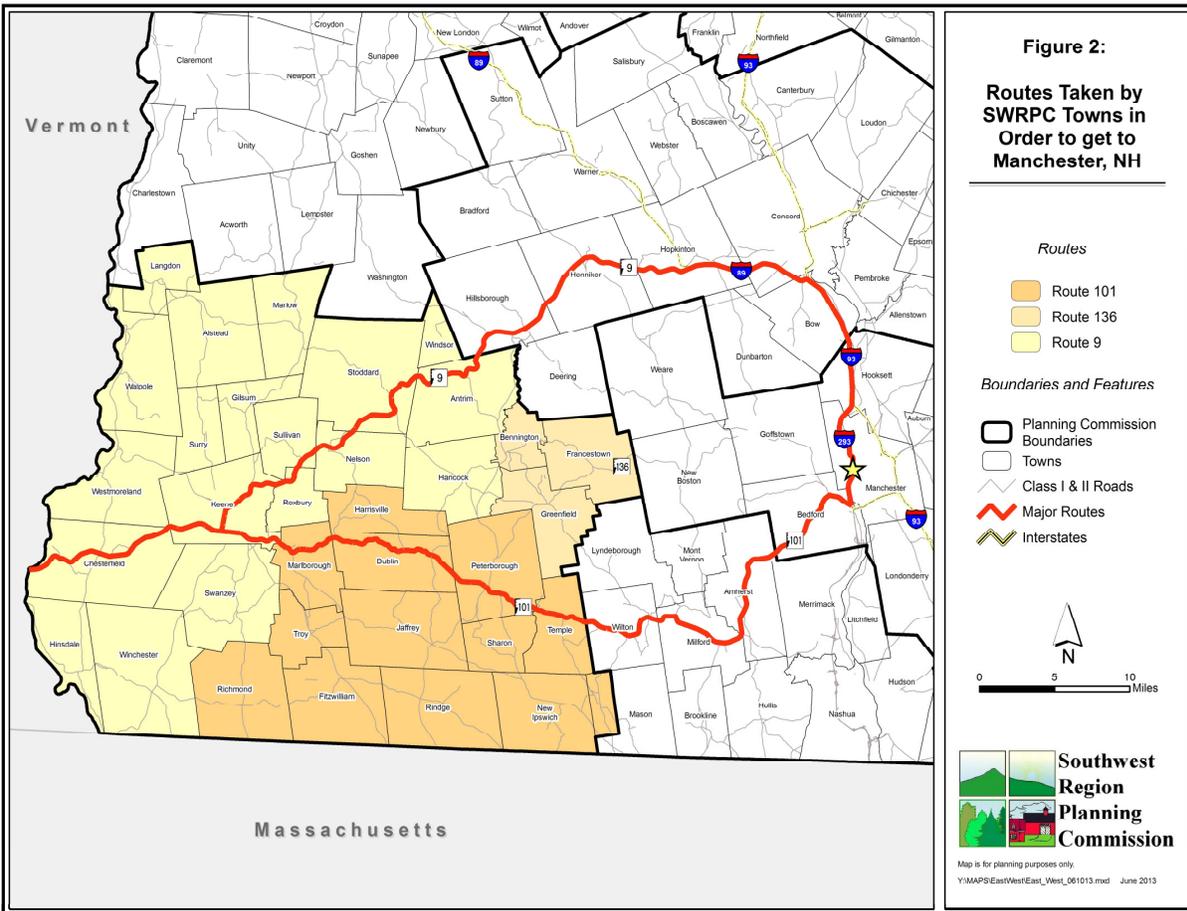
The Coordinated Public Transit Human Services Transportation Plan for the SNHPC Region was originally developed in 2008 and subsequently updated in 2011. Input to the original Plan and the 2011 update was received from stakeholders participating in the Region 8 RCC. The Plan was adopted by the Region 8 RCC on September 20, 2011 and was subsequently adopted by the SNHPC Metropolitan Planning Organization (MPO) on November 22, 2011. The Plan identifies prioritized strategies to address gaps in the provision of Community Transportation services in Region 8. These strategies address the needs of transportation disadvantaged groups in the Region and realistically could address deficiencies relating to travel on any one of a number of corridors in the region, including NH 101. Strategies in the Plan include; 1) continuing support for improvements to demand-responsive and other regional transit and transportation services including ridesharing and TDM strategies; 2) development of taxi and volunteer driver programs; 3) development of transportation options for travel to medical facilities and senior center and 4) maintaining a dialogue with member communities to stress the importance of expanding Community Transportation and transit on a regional basis.

## 2. EXISTING CONDITIONS

### 2.1. DESCRIPTION OF TWO EAST WEST ROUTES (NH 101 AND NH 9/I89/I93)

#### NH 101

NH 101 is a state-maintained principal east-west highway that extends from the seacoast to Keene. NH 101 is a significant commuter route connecting several large employment areas in the study area including Keene (18,057 jobs), Bedford (13,820 jobs) and Manchester (63,873 jobs).<sup>4</sup>



Although NH 101 is one continuous route, its character changes significantly between Keene and Manchester. The mileage between Keene and Manchester is roughly 60 miles.

In the Southwest Region, NH 101 is a rural highway that passes through five towns (Keene, Marlborough, Dublin, Peterborough and Temple) and doubles as a “Main Street” for Marlborough and Dublin. Most of this 26 mile segment is hilly undeveloped forest punctuated by village settings and dispersed rural development. Small stretches of highway are limited or

<sup>4</sup> Employment Data Source: NH Department of Employment Security, 2010 Average Annual Employment.

controlled access including the segment of NH 101 from Main Street to Optical Avenue in Keene as well as from Gerry Road in Dublin to the intersection with Grove Street and US 202 South (Jaffrey Road) in Peterborough. Posted speed limits in this area range from 30 mph and 55 mph, with most of the corridor's posted speed at 40 and 50. Most highway on this section consists of 12 foot lanes with 5 to 6 foot shoulders. About 7.5 miles of the 26 mile section of NH 101 are 3 or more lanes on at least one side of the road to accommodate passing traffic. Major intersecting roads include NH 12 and Optical Avenue in Keene, NH 124 in Marlborough and US 202 and NH 123 in Peterborough. About 4.7 miles of the 26 segment is controlled access highway in eastern Dublin and western Peterborough. Signalized intersections on this first stretch of highway exist in Keene at the intersection of NH 12, in Keene at the intersection of Optical Avenue and the intersection of US 202 in Peterborough.

The function of the NH 101 corridor varies as it passes through the study corridor communities of Amherst, Milford, and Wilton in the NRPC region. The posted speed limit varies on the NH 101 corridor in the NRPC region from 35 mph near signalized intersections to 55 mph on the "Bypass" portion of the corridor in Milford.

In Wilton, study area intersections such as Greenville Road (NH 31 South) and Abbott Hill Road serve as residential collector roadways connecting local residential streets to the corridor. For much of the corridor in the eastern portion of Wilton, NH 101 runs concurrently with NH 31. In the western portion of Milford, an approximately 1.5 mile section of the corridor west of the NH 101A/NH 101 intersection is a full access arterial roadway traveling through a commercial area. In this area, access to NH 101 is provided at three traffic signal controlled intersections where collector roads Wilton Road, Elm Street (Route 101A), and Old Wilton Road connect Route 101 to the Wilton town center and to residential communities north and east of Route 101. On this segment of the corridor, NH 101 is a full access two-lane bidirectional and undivided roadway characterized with business frontage, numerous curb cuts and intersecting side streets.

In the towns of Milford and Amherst, an approximately seven mile section of the corridor known as the "Bypass" functions as a limited access highway between Old Wilton Road in Milford and Baboosic Lake Road in Amherst. In this area, the corridor consists of a two lane bidirectional undivided highway with twelve foot travel lanes and ten foot paved shoulders. Full interchanges are provided at NH 13 and NH 101A in Milford and at Baboosic Lake Road (NH 122) in Amherst. In Amherst, a half diamond interchange provides westbound access/egress to NH 122.

The western portion of the corridor in the SNHPC region near the Amherst town line in Bedford is principally a two-lane bidirectional roadway in the vicinity of Gage Girls Road and near the intersection of Hardy Road and Jenkins Roads. In this area, the corridor has a 50 mph speed limit that slows to 35 mph near the signalized NH 101/Hardy Road/Jenkins Road intersection that includes exclusive turning lanes.

East of the Hardy Road/Jenkins Road intersection, the roadway returns to a single travel lane in each direction until it approaches the signalized Wallace Road intersection. Speed limits on this portion of the corridor are 40 mph and 35 mph in the vicinity of principal intersections approaching the signalized intersection of Wallace Road.

The eastern portion of the Bedford NH 101 corridor east of the Wallace Road intersection, which is considered to be the commercial center of the town of Bedford, is characterized by dense commercial development. East of the Wallace Road intersection, the corridor narrows down to a single travel lane in each direction and signalized intersections on this portion of the corridor are found at Nashua Road, Meetinghouse Road, Constitution Boulevard and at the eastern end of the study area corridor at NH 114. Roadway improvements recently completed on this portion of the corridor include signalization and turning restrictions at the Nashua Road intersection. Traffic congestion on this portion of the corridor is regularly experienced during weekday AM and PM peak periods.

### NH 9/I-89/I-93

The other route that connects Keene with Manchester is via NH 9, Interstate 89 and Interstate 93. Over time, this route has become the preferred route for traveling between the two cities even though the mileage is a greater distance (roughly 66 miles as opposed to 60 miles). All three routes are principal arterials. Major job destinations on the route are in Keene (18,057 jobs), Concord (40,179 jobs) and Manchester (63,873 jobs).

The route examined by this study starts with NH 9 in Keene which is part of the Keene bypass starting as NH 9/10/12 at what is known as the “trumpet” intersection near Monadnock Marketplace. From this intersection NH 9 begins heading east towards I-89 through Roxbury, Sullivan, Nelson, Stoddard, Antrim, Hillsborough, Henniker and Hopkinton for a total of 43 miles. Most of the road from Keene to I-89 in Hopkinton is limited or controlled access highway. The two exceptions are a windy and narrow section of Route 9 in Roxbury and Sullivan near Otter Brook and a section of Route 9 encompassing the highway from east of NH 123N in Stoddard to the beginning of the Hillsborough bypass in western Hillsborough.

The NH 9 highway stretch traverses through several hilly areas that cause trucks to slow down their speeds. To facilitate safe passing opportunities there are several three and four lane sections of road available in Keene, Sullivan, Nelson, and a small 770 foot section in western Stoddard. Additionally, there are several parts of the road that provide dashed yellow lines for safe passing. The posted speed limit on the stretch of NH 9 from Keene to I-89 in Hopkinton ranges from 40 mph to 55 mph, with most of the corridor posted at 55 mph. There are no traffic signals on this stretch of NH 9 except for the intersection signal at the trumpet intersection in Keene. There is one 106 space park and ride facility at the Henniker Street exit in Hillsborough.

From the I-89 exit to the I-93 interchange motorists will travel approximately 8 miles on the limited access highway from Hopkinton, Concord and Bow. There is one exit for each community on this section of highway which has a posted speed limit of 65 mph. On this facility there is a 100 space park and ride facility at Exit 2 on I-89.

From the I-89 and I-93 interchange in Bow, I-93 travels an additional 15 miles through Bow and Hookset into Manchester along the limited access highway. There is a 45 space park and ride facility in Hookset on I-93 off Exit 11 immediately after the toll facility.

## 2.2 POPULATION, DEMOGRAPHIC AND LAND USE INFORMATION

With the exception of Keene, Milford and Peterborough, the town populations and population densities on the western end of the NH 101 and NH 9 Corridors are small starting in western portion of Hillsborough County. On NH 101, population drops off sharply between Wilton and Marlborough, with populations ranging from 3,677 to 1,597 and population densities ranging from 142.8 to 56.9 people per square mile. Likewise, populations are relatively small from Antrim to Roxbury with populations ranging from 2,637 to 229 and population densities ranging from 72.2 to 18.8 people per square mile. Between 2000 and 2010, Bedford, Milford, Nelson, Stoddard and Hillsborough each had growth rates higher than 10%. Only Wilton reduced its population during that period. Communities with small employment bases and centered between Keene and Manchester (Wilton, Temple, Stoddard and Antrim) had commutes longer than 30 minutes.

FIGURE 3: POPULATION AND DEMOGRAPHIC INFORMATION FOR NH 101 AND NH 9 COMMUNITIES

	Town	Square miles	2010 Population	Population density (persons per square mile)	% Population change from 2000	% Population 65 or over	% Population that drives commute alone	Mean commute travel time (minutes)
NH 101	Bedford	32.8	21,203	645.9	14.7	12.7	86.0	25.0
	Amherst	32.4	11,201	327.6	3.4	11.7	79.4	27.0
	Wilton	25.8	3,677	142.8	-1.0	16.0	81.5	35.0
	Milford	25.3	15,115	597.0	11.0	10.0	80.4	27.0
	Temple	22.2	1,366	61.4	4.4	14.2	64.0	31.5
	Peterborough	37.7	6,284	166.6	6.6	20.8	80.7	21.0
	Dublin	28.1	1,597	56.9	7.8	12.0	77.4	21.2
	Marlborough	20.4	2,063	101.1	2.5	16.6	83.1	19.7
	Keene	37.3	23,409	628.5	3.5	13.5	72.3	15.4
NH 9	Roxbury	12.2	229	18.8	3.4	13.8	87.9	20.9
	Sullivan	18.7	677	36.2	9.2	9.6	89.0	25.1
	Nelson	23.2	729	31.4	15.0	14.4	83.0	27.4
	Stoddard	53.0	1,232	23.2	24.7	15.8	75.6	41.8
	Antrim	36.5	2,637	72.2	7.1	15.6	83.5	30.1
	Hillsborough	44.6	6,011	134.8	18.0	13.8	73.8	27.7
	Henniker	44.8	4,836	107.9	8.3	5.6	76.9	26.8
	Hopkinton	45.1	5,589	123.9	3.4	21.1	84.3	24.7

Land uses change from town to town on each corridor. A brief description of land use patterns along each route follow.

### NH 101

The section of NH 101 in Keene within the study area begins at the intersection of NH Routes 9, 12 and 101. This section traverses the Southeastern portion of Keene and has heavy volumes of traffic. The land uses include a roundabout with access to a large and active retail area, Keene

State College, and an active industrial park. The Cheshire County Prison also has frontage on the highway. There are some densely populated neighborhoods in this section, although most do not have direct frontage onto NH 101. There remain a few parcels of undeveloped land, however, they are located in a Limited Access control area. The zoning districts include: Commercial, Industrial, High Density Residential, and Rural Residential.

### *Marlborough*

NH 101 travels through the Village Center of Marlborough, from the western to eastern town lines. Existing land development includes a mix of retail and housing in the village area, with industrial and residential uses outside of the village. The Town Offices, Police Dept, Fire Dept/Ambulance, and Community Center all have highway frontage on NH 101. The elementary school does not have frontage, however, it is within the general vicinity. Traffic calming in this area is very important since there are many pedestrians. There are several larger industrial businesses along the western section of Marlborough. The current zoning districts include: commercial, high density residential, and rural residential. The Future Land Use map indicates a potential zone change along NH 101 for additional commercial development. This change would commence at the Village Center and extend approximately 1.5 miles in an easterly direction toward Dublin.

### *Dublin*

This section of the NH 101 corridor runs from the western town line to the eastern town line and bisects the village center. The village center is an active area of Dublin with many of the municipal facilities located there including the Town Offices, library, and the elementary school. There are also several businesses and a private school with access onto the highway. Zoning is predominantly Rural Residential, with a portion near the town center for the Village District. Although there are many undeveloped areas along the NH 101 corridor, there are constraints, such as steep slopes and wetlands, which will limit the potential for new development. There are very curvy portions of the highway which present sight-line challenges for locating new driveways. Some high valued natural resources exist along the highway adding additional development challenges. A portion of NH 101 is designated as Controlled Access from the intersection of Route 137 to the Peterborough Town line. The Dublin Master Plan encourages the development of businesses in the Village District and states that the district may need to be expanded.

### *Peterborough*

NH 101 runs through the southwestern quadrant of Peterborough and bypasses Peterborough's downtown. The predominant land use along this corridor is residential but also includes an active retail center, industrial businesses, hiking areas, and some conservation land. The zoning districts include rural, medium, and high density residential, and some small pockets of commercial. The Peterborough Master Plan encourages commercial growth in the Plaza area which is located near the intersection of NH 101 and 202. Sections of NH 101 are designated part of a Rural Gateway Overlay District which requires an 80 ft. buffer from the right-of-way.

There is a roundabout at the base of a hill on the western side of Peterborough which was installed to reduce speeds coming down a large hill and to provide access to the shopping center.

### *Temple*

The highway bisects the upper portion of Temple from the western Town line to the eastern Town line. The current zoning is residential, however, commercial uses may be permitted after obtaining a special exception approval by the Zoning Board of Adjustment. Development along this section of NH 101 is sparse, but there is potential for commercial and residential growth. The Future Land Use Chapter of the Temple Master Plan includes this as a likely location for commercial and industrial development.

### *Wilton*

Large industrial districts are located between NH 101 and downtown Wilton on the north side of Route 101 west of its crossing of the Souhegan River and on both sides of the corridor near the divergence of Route 31 south. There is more industrially zoned land along NH 101 west of Route 31, along Route 31 south, and along Route 31 in the northern part of the town.

### *Milford*

In Milford, the section of the corridor from Wilton Road to the NH 101/101A intersection abuts a major industrial land use area of Milford. In this area, land is concentrated between an active railroad line to the south and NH 101 and the Souhegan River to the north. There is a strip of businesses which are generally automobile-oriented, including service stations, convenience stores, and auto repair businesses.

South of the NH 101A/NH 101 intersection in the limited limited-access “Bypass” section of NH 101, land use near the highway is primarily vacant with some low density residential development set well back from the highway, limiting its exposure to the highway. Commercial and Office zoning districts existing along the corridor with additional parcels designated as Highway Commercial. There is a mix of commercial, retail, service and office uses scattered along the corridor.

### *Amherst*

Approximately four miles of the NH 101 corridor exists in Amherst. Most of the corridor in this area is a two-lane controlled access highway. Along the section of NH 101 north and east of 122/Baboosic Lake Road interchange which provides access to Amherst’s town center, land is predominately agricultural, very low density residential, or vacant. Access demands are focused at a small number of commercial driveways and at the intersections of side streets service residential land use. The visual character of this area of the corridor in Amherst is rural and open.

### *Bedford*

Much of the commercial, industrial and retail land uses in the town are concentrated along the NH 101 corridor. Developments range from office parks to retail strip development. A significant portion of the non-residential building space is office use and the non-office commercial uses consist of a mixture of local goods and services. The western portion of the corridor in the town near the Amherst town line is principally a two-lane bidirectional roadway characterized by less dense development and isolated pockets of commercial development in the vicinity of Gage Girls Road and Hardy Road/Jenkins Road. Denser pockets of development are found in the vicinity of Kahliko Lane and in the vicinity of the Wallace Road signalized intersection where a number of commercial businesses including a shopping plaza and drug store are located. There has more recently also been commercial development in the vicinity of the Hardy Road/Jenkins Road intersection. East of the Wallace Road intersection, there is a noticeable increase in the density of development along the corridor.

### NH 9/I-89/I-93

Since I-89 and I93 are limited access highways, adjacent land uses do not pose a significant potential challenge for mobility. NH 9, on the other hand, is a subject to a mix of access regulations between Hopkinton and Keene.

### *Hopkinton*

NH 9 bisects the southern portion of Hopkinton and runs from the western to eastern town line and crosses the Hopkinton – Everett Reservoir. Existing land uses include residential, public utility easements, and some minor commercial uses. The zoning along this corridor is predominantly Rural Residential /Agricultural, with a portion running through the Village Area and a section of Low Density Residential District. There are several large areas of undeveloped land that are not protected under conservation easements and are currently forested. With the volume of traffic along this corridor, undeveloped parcels in this area have the potential for additional development. A portion of the highway is classified as Controlled Access which may affect the development potential for some of the undeveloped parcels.

### *Henniker*

The NH Route 9 corridor bisects the Town of Henniker from the east to west boundaries of the community. The existing development consists of small pockets of commercial and industrial businesses and some residential. This area is zoned as a Rural Residential District, but also includes Heavy and Medium Commercial Districts. This stretch of the corridor is predominantly undeveloped land and therefore has some growth potential. However, the access restrictions include a Limited Access section, and a Controlled Access section which can have an affect on the development of the vacant parcels. Though it is not situated on Route 9, Henniker is home to New England College which has a student population of 1,800 students.

### *Hillsborough*

A ramp from NH 9 provides access to the downtown area which has a mix of uses including: Town Offices, Police & Fire Departments, library, school, and Post Office. It also is an active commercial area with uses including a grocery store, retail shops, restaurants & fast food, banks, automobile dealers, and industrial businesses. The Future Land Use section of the Hillsborough Master Plan calls for an expansion of the commercial District along NH 9. Since there are large parcels of undeveloped land, there is a potential for growth in this area. The access classification is Controlled Access near the highway ramps, however, much of the highway has no access restrictions.

### *Antrim*

The section of NH 9 that travels through the Town of Antrim is along the northern boundary of the town. It runs along the North Branch River and is sparsely developed. Current development is predominantly rural residential with a few small commercial uses. The entire portion of NH 9 in Antrim is zoned for commercial development and has no access restrictions, therefore allowing for the potential of future development. It includes a NH Rest Area that was closed down in 2011.

### *Stoddard*

The Stoddard section of this study includes a mix of residential and commercial uses. The businesses are predominantly industrial, however there is a gas station and convenience store that is moderately busy throughout the day. It is a Controlled Access section of the highway and runs along the southeast corner of the town. The development potential is limited due to large parcels of land under conservation.

### *Nelson*

NH Route 9 runs along the northwest corner of the town. This is the most sparsely developed section of the study area. The zoning in Nelson is Residential, with the exception of a small Commercial District near the Sullivan town line. The potential for future development in this area is limited due to development constraints, predominantly steep slopes. This is a Limited Access area of the highway, which further limits the potential for large development.

### *Sullivan*

This is a very small portion of the study area. The highway runs through the Southeast corner of the town. Most of this section of NH 9 is a Controlled Access area with a flashing light to alert travelers to reduce their speed. The land uses include a few residential properties and a convenience store. The only zoning district in Sullivan is Residential. There are some large parcels in this section that have the potential for future development.

### *Roxbury*

The Roxbury portion along NH 9 is a small section of the highway. This section predominantly follows the river in a meandering way. Granite Gorge Ski area is a popular land use in the winter months but has little activity throughout the rest of the year. There is little other development along this stretch. The potential for development is limited due to development constraints including steep slopes and river frontage.

### *Keene*

The section of NH Route 9 in Keene within the study area begins at the intersection of NH Routes 9, 12 and 101. This section cuts along the southeast quadrant of Keene and has heavy volumes of traffic. Development includes on/off ramps to an active retail area, as well as public schools and colleges. There are some densely populated neighborhoods in this section, although none have direct frontage onto NH 101. The level of access control for NH 9 in the study area is a mix of Controlled Access and Limited Access. There are some conservations areas, including Otter Brook, and the potential for future development nearby.

## **2.3 COMMUTING PATTERNS**

Commuting patterns and estimates of commuting travel between the principal cities and towns of the SNHPC and SWRPC regions were developed using data from the 2010 Census, NH OSP town profile data and Longitudinal Employer-Household Dynamics data.

Many of the residents of study area towns are currently experiencing mean commute times in excess of twenty minutes (see travel time data in Figure 3). On both NH 9 and NH 101, travel times increase the farther the town's distance from Keene or Manchester. While towns in the center of the corridor tend to have longer commute times, mean commute times for Keene residents was slightly over 15 minutes. Due to the rural nature of many of the study area communities as well as a lack of travel alternatives, the overwhelming majority of work trip travel took place in single-occupant vehicles. In many of these communities, the proportion of work trip travel by single-occupant vehicles was in excess of eighty percent of total work trip travel. Public transit made up a very small portion of work trip travel, generally less than one percent of the total for almost all the study area communities.

Commuting patterns from the Longitudinal Employer-Household Dynamics dataset, made available by the US Bureau of the Census, suggests that employers in the SNHPC Region and SWRPC Region employ about the same number of each other's residents. The SNHPC Region employs 1,302 SWRPC residents and the SWRPC Region employs 1,280 SNHPC residents. However, since the SWRPC Region has a smaller population, the proportion of jobs SNHPC provides to SWRPC residents represents 3.1% of all SWRPC workers, while the proportion of jobs that SWRPC provides to SNHPC residents represents just 1.2% of all SNHPC workers.

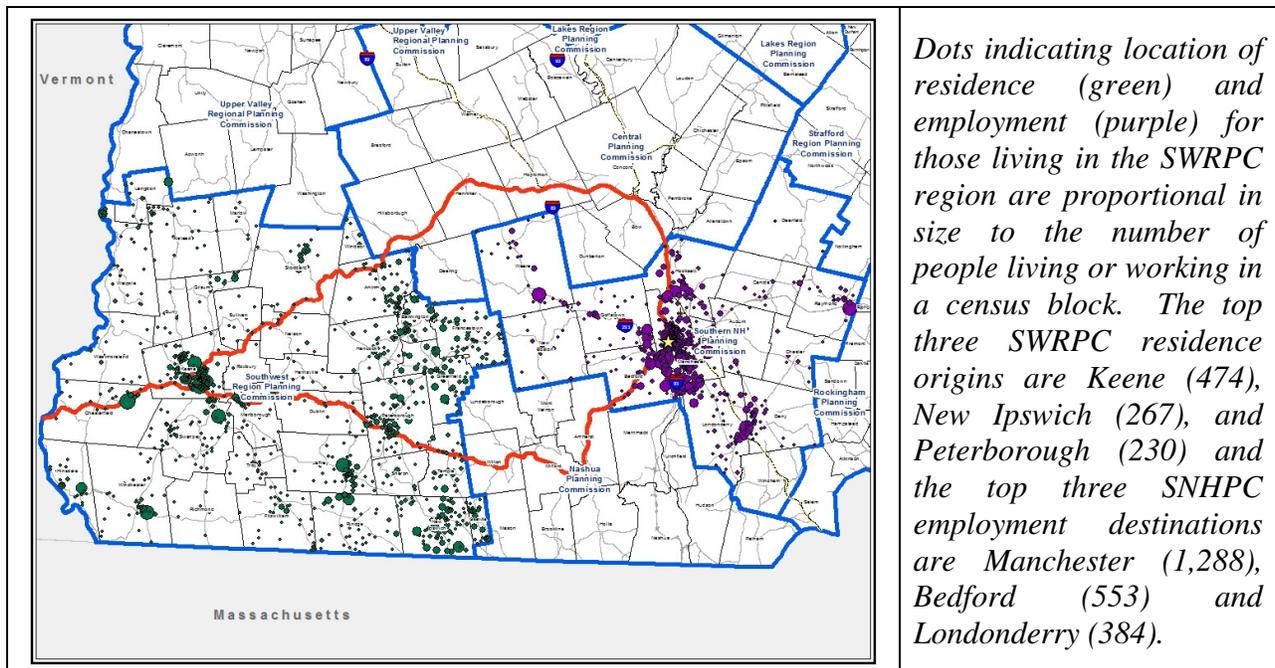
FIGURE 4: WORK TRIP TRAVEL - SNHPC AND SWRPC REGIONS (LEHD, 2011)

	SNHPC Region	SWRPC Region
<b>Total Employed</b>	116,543	35,828
<b>Works in Region/Commutes Between Regions</b>	56,316	12,561
<b>Works/Lives in Region</b>	60,227	23,267
<b>Total Employed Residents</b>	107,078	41,428
<b>Lives in Region/Commutes Between Regions</b>	46,851	18,161
<b>Lives/Works in Region</b>	60,227	23,267
<b>SNHPC Region Residents Employed in SWRPC Region</b>	1,280	
<b>SWRPC Region Residents Employed in SNHPC Region</b>		1,302

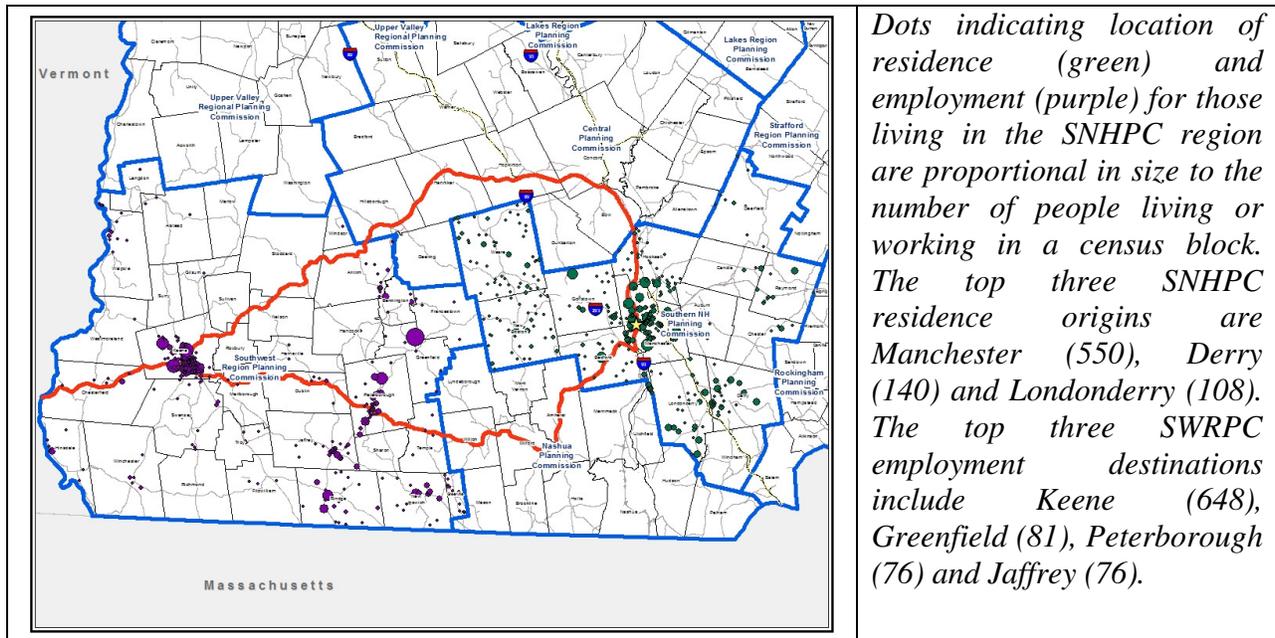
Figures 5 and 6 below show that Manchester and Keene 1) have the highest number of residents commuting between regions and 2) also represent the most popular destinations for work trip travel between the regions. Residents of Keene comprise almost half of all SWRPC Region residents working in the SNHPC Region. Similarly, Manchester residents make up 43% of all SNHPC Region residents working in the SWRPC Region. Thirty-seven percent of all SNHPC residents employed in the SWRPC Region work in Keene and forty-two percent of all SWRPC residents employed in the SNHPC Region work in Manchester.

Figure 5 illustrates the concentration of jobs near Manchester in the SNHPC Region and near Keene and US 202 communities in the SWRPC Region. Despite this concentration of employment, residences of those employed in both Regions (and particularly the SWRPC Region) are more dispersed. Based on a travel time analysis it is likely that there are more people living in the SWRPC Region that use NH 9 to reach the SNHPC Region than NH 101.

FIGURE 5: HOME & WORK LOCATIONS OF SWRPC RESIDENTS WORKING IN SNHPC REGION (LEHD, 2011)



**FIGURE 6: HOME & WORK LOCATIONS OF SNHPC RESIDENTS WORKING IN SWRPC REGION (LEHD, 2011)**



There are several towns along the NH 101 and NH 9/I-89/I-93 corridors between the SNHPC and SWRPC Regions. The following table shows the number of SNHPC and SWRPC residents employed in these towns. This information suggests that there are significant numbers of residents in both the SNHPC and SWRPC Region traveling towards the other Region for work.

**FIGURE 7: EMPLOYMENT IN COMMUNITIES BETWEEN THE SNHPC REGION AND SWRPC REGION**

<b>NH 9/I-89/I-93 and NH 101 Corridor Towns Between SNHPC and SWRPC Regions</b>	<b>Employed SNHPC Region Residents</b>	<b>Employed SWRPC Region Residents</b>
<b>NH 9/I-89/I-93 Route</b>	7,394	796
<b>NH 9 Route (Hillsborough, Henniker, Hopkinton)</b>	634	462
<b>I-89/I-93 Route (Concord, Bow)</b>	6,760	334
<b>NH 101 Route (Wilton, Milford, Amherst)</b>	1,822	566
<b>Totals</b>	9,210	1,362

## 2.4 CURRENTLY PLANNED AND PROGRAMMED PROJECTS

There are a few mobility improvement projects scheduled in the NHDOT FY 2013- FY 2022 Ten Year Transportation Improvement Plan (TYP) that will benefit those using NH 9/I-89/I-93 and NH 101. They include implementation of open road tolling on I-93 in Hooksett, roadway improvements on NH 101 in Bedford, an intersection improvement at NH 101 and NH 101A in Amherst, and a project that plans to add shoulders to a stretch of road on NH 9 in Roxbury and Sullivan. More information on these and other projects is provided below.

## **NH 9/I-89/I-93**

There are two projects planned for NH 9 in the NHDOT FY 2013- FY 2022 Ten Year Transportation Improvement Plan (TYP) in the study area. NHDOT plans to rehabilitate a red list bridge (129/099) on NH 9/12 in Keene with construction planned for 2021. The other project improvement scheduled on NH 9 is in Roxbury and Sullivan. This project would repair a red list bridge over Otter Brook (093/061), remove and replace a deteriorating retaining wall, improve drainage and widen to 32' (24' travel way with 4' foot shoulders) wherever possible. Construction for this project is scheduled for 2017 in the TYP.

As mentioned earlier, NHDOT is currently constructing an open road tolling facility at the existing toll plaza on I-93 in Hooksett. This project, scheduled for completion in 2013, is identified as part of the Turnpike Capital Improvements program identified in the TYP. A great deal of additional work is also planned for I-93 affecting the study area but funding has not yet been identified. NHDOT also plans to widen I-93 from I-89 to I-393, but funding for construction has not yet been identified.

## **NH 101**

Three projects involving the study area portion of the NH 101 corridor are currently included in the TYP. The current TYP includes about \$9,000,000 to widen an approximately two mile portion of the NH 101 corridor from NH 114 to Wallace Road in Bedford to five lanes. The preliminary engineering and right-of-way work for this project is programmed for 2013 to 2018 and construction is scheduled to begin in 2016 or 2017. NHDOT held an initial public informational meeting for this project in March 2013.

SNHPC and NRPC are also currently assisting NHDOT in the development of specific priorities for safety improvements along various locations of the NH 101 corridor in Wilton, Milford, Amherst and Bedford. This work is currently programmed in the TYP between 2014 and 2020. NHDOT has begun work on the first corridor location chosen for improvements under this project in the Town of Milford. NHDOT plans to make improvements to the intersection of NH 101 and NH 101A in Amherst by providing an additional right turn lane and signalization with construction planned for 2018. In addition, there is a red list bridge (087/077) planned for rehabilitation in Peterborough over the Contoocook River in 2018.

## **2.5 EXISTING TRANSPORTATION SERVICES**

As mentioned earlier in the report, regularly scheduled bus service between Portsmouth, downtown Manchester and Manchester-Boston Regional airport was recently implemented. The design of the service was based on the Portsmouth-Manchester Airport Bus Feasibility Study completed by SNHPC and RPC in 2009. This service does not travel any farther west at this time.

There are no regularly scheduled or fixed route transportation services that transport individuals between the SNHPC and SWRPC regions. Although intercity bus services directly connected Keene to Manchester up until the 2000s, there is no service today. Service is now limited to

taxis, limousines/shuttle service, charter bus, and there is some transportation service available from human resource agencies. This study estimates that there are at least 29 service providers that serve both areas, but was only able to confirm through a telephone survey that there are 21 service providers.

**FIGURE 8: ESTIMATE AND CONFIRMED NUMBER OF SERVICE PROVIDERS OFFERING TRANSPORTATION SERVICE FROM SWRPC AND SNHPC REGIONS**

<b>Service Type</b>	<b>Estimate</b>	<b>Confirmed</b>
Taxi	11	7
Limousine/Shuttle/Shared Van	12	10
Charter Bus	2	2
Human Service/Not-for-Profit Transportation	4	2

All transportation service providers were asked what the approximate fare cost of a one-way trip is between Keene and Manchester. Among the fifteen taxis, limousine, shuttle and shared van services that responded to the survey, fare's ranged from \$85 to \$250 one-way. Fares from Peterborough to Manchester ranged from \$70 to \$210 (11 reporting). Fares from Rindge to Manchester ranged from \$75 to \$180 (9 reporting). These fares don't include the human service or not-for profit transportation providers who rely on subsidies and donations.

Since none of the services are regularly scheduled services and they are based on actual passenger demand, all of the services require contacting the service providers beforehand to schedule the trip. Figure 8 breaks down the transportation services' ability to respond to a ride request. Most services require at least 24 hour notice.

**FIGURE 9: TRANSPORTATION PROVIDER'S SELF REPORTED ABILITY TO RESPOND TO RIDE REQUEST**

	<b>One hour or less</b>	<b>24 hours</b>	<b>48 hours</b>	<b>More than 48 hours</b>
<i>Number of providers reporting</i>	4	9	3	3

Providers able to respond to a ride in one hour or less included three airport limousine services and one taxi service.

Transportation providers were asked how many people they transport from the SWRPC Region to the Manchester, NH area in the past year and vice versa. Collectively, the transportation providers reported transporting almost 1,400 people. It is important to note that these numbers were not based on hard data, but based on the provider's own self-reported estimate. Most providers reported transporting the same number of individuals from the Manchester area back to the SWRPC Region, although two human resource providers noted that they do not pick up in the Manchester, NH area to go to destinations in the SWRPC Region. All of their trips must start and end in the SWRPC Region.

**FIGURE 10: TRANSPORTATION PROVIDER'S SELF REPORTED NUMBER OF PASSENGERS  
TRANSPORTED FROM SWRPC REGION TO MANCHESTER AREA**

	<b>10 or less</b>	<b>11 to 99</b>	<b>100 to 200</b>	<b>201 or more</b>
<i>Number of providers reporting</i>	4	9	5	2

Private transportation providers reported that overwhelming majority of trips that they make are to transport people to the Manchester-Boston International Airport from the SWRPC Region. However, many also reported that the Manchester-Boston International Airport is losing traffic and many are transporting even more passengers to Boston Logan International Airport. Other important destinations in the Manchester area were the Verizon Center, the Capital Center for the Arts, the bus stations and the Hospitals. Other than homes and businesses, important destinations named in the SWRPC Region included Keene State College, Franklin Pierce University in Rindge, and the MacDowell Colony in Peterborough.

Transportation providers were also asked if they thought demand would increase, decrease or stay the same over the next three year period, both for trips from the SNHPC Region to the SWRPC Region and vice versa. The majority of respondents believe the utilization of their services will remain the same over the next three years. Those who believe it would increase believed it would increase due to expanded internal business decisions such as increased advertising or adding vehicles to their existing fleet. One respondent suggested that the Manchester Airport is the slowest growing airport in the nation due to increased efforts on the part of Boston's Logan International Airport. Another suggested business might increase due to a lack of transportation providers west of Manchester.

In addition to the transportation providers that were interviewed for this study, intermodal facilities were also interviewed. In the SWRPC Region there is a hub of sorts in Keene, at the City-owned transportation center, which also houses a retail store called the "Corner News." This intermodal area in Keene connects with all three of the City Express bus system routes as well as Greyhound intercity bus services. The Greyhound service connects Keene to White River Junction, VT where it is possible to make bus transfers east or west. To the south, Greyhound connects Keene to Springfield, MA where bus transfers can be made east or west. While trips out of Keene are relatively convenient, traveling to Keene is very inconvenient. Given that 1) the majority of intercity bus services in New England are not provided during the late evening or early morning hours, and 2) arrival and departure times in Keene, NH are in the a.m., it makes it difficult traveling back to Keene from any major regional destinations. A trip from Boston to Keene is over 15 hours and requires an overnight stay in Springfield, MA. A trip from Manchester to Keene is over 19 hours and requires an overnight stay in White River Junction, VT.

FIGURE 11: LEAVING THE SWRPC REGION TO GET TO BOSTON OR MANCHESTER

Route	Route Description	Schedules/Trip Times/Layover Times
Keene, NH to Boston, MA  Greyhound (2033) Peter Pan (6718)	Keene, NH Brattleboro, VT Greenfield, MA Northampton, MA Springfield, MA Springfield, MA (Transfer) Worcester, MA Boston, MA	Depart: 9:45 AM Arrive: 2:25 PM Total Trip: 4 hours, 40 minutes Layover Time: 30 minutes
Boston, MA to Keene, NH  Peter Pan (6733) Greyhound (2010)	Boston, MA Framingham, MA Worcester, MA Springfield, MA (Transfer) Northampton, MA Greenfield, MA Brattleboro, MA Keene, NH	Depart: 8:00 PM Arrive: 11:35 AM Total Trip: 15 hours, 35 minutes Layover Time: 11 hours, 20 minutes
Keene, NH to Manchester, NH  Greyhound (2010) Greyhound (3536)	Keene, NH Bellows Falls, VT White River Jct, VT (Transfer) Hanover, NH Concord, NH Manchester, NH	Depart: 11:35 AM Arrive: 3:40 PM Total Trip: 4 hours, 5 minutes Layover Time: 55 minutes
Manchester, NH to Keene, NH  Greyhound (3537) Greyhound (2033)	Manchester, NH Concord, NH Hanover, NH White River Jct, VT (Transfer) Bellows Falls, VT Keene, NH	Depart: 2:45 PM Arrive: 9:45 AM Total Trip: 19 hours Layover Time: 15 hours, 50 minutes

According to the Keene Corner News ticket agent, the current service is not convenient and therefore people don't use it. Ridership numbers are in decline due to poor scheduling and infrequent service. This bus scheduling issue is not only an issue from Boston or Manchester. The ticket agent pointed out that due to the morning arrival and departure times in Keene, passengers must also leave New York City, perhaps the largest bus hub in the Northeast, at 5am to get back to Keene. She commented that if the service to the Concord/Manchester area continues to Boston it would be, "hugely valuable". The ticket agent predicted that additional people would utilize an east-west service to get to the New Hampshire Sea Coast as well.

## 2.6 SUMMARY OF STAKEHOLDER OPINIONS ON NEED

In an effort to understand current conditions and perceptions, the study included interviews with key stakeholders representing economic development interests and important area institutions. In the SWRPC Region, seven economic development groups were asked to comment on the need and market for east-west transportation services. These groups tended to focus on work

commuting, while one Chamber of Commerce discussed the importance of transportation for tourism purposes. The majority of economic development organizations thought that even though people are traveling farther for good jobs and that it would be a good idea to improve transportation services for employees and businesses, the market for bus services to employers is probably small. One respondent suggested that it would be very difficult to make it convenient for workers. A respondent thought that transportation for the older population to shopping destinations or the Manchester Boston Regional airport would be the most important to focus on. Another respondent suggested that there is interest from the Monadnock Travel Council to improve rail and bus transit in the SWRPC Region for tourism purposes.

Area institutions that were contacted for the study included hospitals, social service agencies and academic institutions. The major hospitals in the SWRPC Region, Monadnock Hospital and Cheshire Medical Center tend to refer patients north to Dartmouth-Hitchcock in Lebanon rather than east to Manchester hospitals. Hospitals point to human resource agency medical transportation American Red Cross, Contoocook Valley Transportation Company, Granite State Monarchs, Monadnock R.S.V.P. as potential transportation services. Ambulatory/wheelchair services are provided by Merit Care, LLC, R. J. Diluzio and the Jaffrey-Rindge Memorial Ambulance Service. These companies provide rides to social service clients as well, although Monadnock Development Services provides transportation to its own clients. Generally speaking, there is already capacity in existing medical facilities and human service agencies in the SWRPC Region that transportation to the SNHPC is rarely needed. Farther trips to specialists in Boston are seen as a greater need.

Among the academic institutions interviewed in this study (Antioch University of New England (AUNE), Keene State College (KSC) and Franklin Pierce University (FPU)), AUNE expressed the most need for additional transportation services to and from the Manchester area, as well as Nashua and Boston. The AUNE spokesperson said that students could use services on a daily basis, with additional demand expected at the beginning and end of semesters. AUNE and KSC spokespeople explained that they are trying to accommodate this need today. They both have carpooling, and allow some telecommuting and flexible hours for some employees to accommodate longer distance workers and faculty. Some faculty members at KSC offer online courses. KSC described a need to transport students to an Occupational Safety Health Administration course at the Manchester-Boston Airport. FPU reported that they used to offer transportation services to Keene, but it was difficult to manage. During breaks and semester ends, FPU has some vehicles that it can put to use to transport students to intermodal facilities like airports, rail stations or bus stops. Both AUNE and KSC representatives explained that they have parking challenges, some of which might be able to be addressed with travel demand management strategies.

### 3. DEMAND ESTIMATION

#### 3.1 EXISTING TRAFFIC & SCENARIO TRAFFIC PROJECTIONS

Existing traffic and traffic projections for selected locations on the NH 101 and NH 9 corridors are shown in Figures 12 and 13. Existing traffic volumes were gathered from information available from the four regional planning commissions represented on the corridors. SWRPC, NRPC, CNHPC and SNHPC all gather traffic volume data through regional traffic counting programs conducted on behalf of the NHDOT and the planning commission member communities. Figure 12 shows existing annual average daily traffic (AADT) for the following locations on NH 101. The year 2040 was chosen as the future year for the study area corridor locations based on the availability of data already created for the New Hampshire Metropolitan Planning Organization’s air quality conformity determination completed in September 2012.

FIGURE 12: CURRENT AADT AND FUTURE AADT PROJECTIONS FOR SELECTED SEGMENTS ON NH 101

Municipality	Traffic Count Location	Most Current Available AADT	Projected 2040 AADT
Keene	NH 101 east of Optical Avenue	14,000 (2012)	16,815*
Peterborough	US 202/NH 101 Over Contoocook River	15,000 (2011)	18,625*
Wilton	NH 101 west of Wilton Center Road	8,500 (2010)	12,700**
Milford	NH 101 east of NH 13	22,000 (2012)	34,400**
Bedford	NH 101 at Amherst Town Line	13,000 (2008)	15,500***
Bedford	NH 101 west of Constitution Drive	27,000 (2009)	34,800***

\*Based on simple regression analysis using oldest available data going back to 1985.

\*\*Based on regional travel demand model of NRPC.

\*\*\*Based on regional travel demand model of SNHPC.

There are short stretches of NH 101 in Keene and the section of NH 101 where it shares its route with US 202 in Peterborough, where there are approaching high volume to capacity ratios (congested) during the peak hour. In these particular sections, it is anticipated that the highest growth in traffic will also occur. All other volume to capacity ratios expected current highway capacity on NH 101 ranges between Level of Service C through D (moderate congestion) in the Southwest Region.<sup>5</sup> Capacity projects will likely need to be examined for Keene and Peterborough in the next decades, but growth is fairly moderate. Intersection improvements will be warranted at various sections of NH 101 over time. The following intersections are expected to require attention to improve traffic flow in the coming years according to a NH 101 Corridor Study conducted in 1999.

- NH 101 and Swanzey Factory Road in Keene
- NH 101 and NH 124 in Marlborough
- NH 101 and Elm Street in Peterborough
- NH 101 and US 202 North/Granite Street in Peterborough

<sup>5</sup> See [https://www.nh.gov/dot/org/projectdevelopment/planning/gis-data-catalog/documents/congestion\\_2006.pdf](https://www.nh.gov/dot/org/projectdevelopment/planning/gis-data-catalog/documents/congestion_2006.pdf)

- NH 101 and NH 123/Old Street Road in Peterborough
- NH 101 and US 202 South/Grove Street in Peterborough
- NH 101 and NH 101A in Milford

FIGURE 13: CURRENT AADT AND FUTURE AADT PROJECTIONS FOR SELECTED SEGMENTS ON NH 9

Municipality	Traffic Count Location	Most Current Available AADT	Projected 2040 AADT
Keene	NH 9/10/12 South of West Street	24,000 (2012)	33,333*
Stoddard	NH 9 at Antrim Town Line	5,300 (2011)	8,088*
Hillsborough	NH 9 West of NH 31	5,801 (2012)	7,802*

\*Based on simple regression analysis using oldest available data going back to 1985.

The peak hour volume to capacity ratios on NH 9 are considered predominately “not congested” or “moderately congested”, with one stretch of highway in Henniker and Hopkinton between NH 114 and NH 103 considered congested. Except for a section of four-lane highway in Keene, which currently carries 24,000 vehicles per day on average, traffic levels on this corridor are relatively modest and it is not expected to experience major congestion based on current traffic growth and existing land use patterns. A 2006 NH 9 Corridor Study did not find any intersections on the corridor that were experiencing a poor level of service. Despite these existing conditions, potential changes to existing land use patterns, are a concern on NH 9. There are currently two segments of road on the NH 9 corridor in Roxbury and Sullivan near Otter Brook, and between the intersection of NH 123 in Stoddard and the Hillsborough bypass that are not limited access or controlled access highway. Although many parts of the corridor are considered “unbuildable,” maintaining mobility by practicing good access management in these sections will help ensure longer lifetime of adequate level of service conditions on NH 9.

### 3.2 IDENTIFIED DEFICIENCIES & THE IMPORTANCE OF FUEL COST IN ASSESSING DEMAND

Based on the needs analysis performed by the study, SWRPC and SNHPC identified four transportation deficiencies that appear to be the most significant challenges to east-west travel between the two regions. Most deficiencies relate to the need for SWRPC residents to travel east and back. In the table below, each deficiency is followed by populations that would benefit the most from improvements to the deficiency. A section on “special considerations” provides some additional information to inform the development of potential improvements, followed by a list of possible improvements. All improvements have one thing in common: that they are designed to make inter-regional travel more affordable for household transportation budgets.

**FIGURE 14: IDENTIFIED EAST-WEST DEFICIENCIES & POTENTIAL IMPROVEMENTS**

<b>Deficiency</b>	<b>Target Population</b>	<b>Special Considerations</b>	<b>Potential Improvement(s)</b>
Poor choice of affordable intercity transport options	Interregional travelers with trip origins and destinations in Keene (SWRPC Region)	Intermodal connections available with connections to airports, bus hubs, train stations	<ul style="list-style-type: none"> <li>• Improvements to intercity bus route schedule or new bus route (Section 3.3.1)</li> <li>• Taxi voucher programs</li> </ul>
Poor commuter transport Options	Commuters	There are a disproportionate share of employment and labor force traveling between Manchester and Keene	<ul style="list-style-type: none"> <li>• Improve rideshare services (See Section 3.3.2)</li> <li>• Park and ride lots near Keene and Manchester residences (Section 3.3.2)</li> <li>• New vanpools (Section 3.3.2)</li> <li>• New work at home programs and other TDM measures (Section 3.3.2)</li> </ul>
Limited service to Boston area hospitals	Non-drivers with medical conditions that require specialized medical services	Sporadic, long distance trips can be expensive	<ul style="list-style-type: none"> <li>• Enhanced funding to support volunteer driver programs (3.3.3)</li> <li>• Taxi voucher programs (3.3.4)</li> </ul>
Poor peak level of service in Bedford.	Commuters that travel NH 101 to work in Bedford and Manchester	Population density is limited in upstream communities on NH 101 from Wilton to Marlborough making transit ridership unlikely	<ul style="list-style-type: none"> <li>• Improve rideshare services (Section 3.3.2)</li> <li>• Park and ride lot upstream of Manchester and Bedford (Section 3.3.2)</li> </ul>

Rudimentary-level demand estimates for each of the improvements are outlined below to explain potential modal shift scenarios. None of the demand estimates should be taken as guaranteed demand. Rather, they are intended to illustrate demand estimates within the realm of possibility based on the best available information about the quantities of people for each market and the ability of each improvement to cause a transportation mode shift.

One variable that is expected to support demand for people seeking more affordable transport options is the rising cost of fuel. Research suggests that, in the short-term, consumers respond to rising fuel prices by reducing travel. This change in behavior could be represented in the form of eliminating unnecessary or leisure travel, consolidating trips and reducing the length of unavoidable trips. More long-term examples of changes in behavior resulting from increases in the cost of fuel include purchasing more fuel-efficient vehicles and moving closer to places of employment. Additionally, research also suggests that 1) the magnitude of the response to changes in the cost of fuel increases as the price increases and 2) the four dollar per gallon cost of fuel appears to be a significant breaking point at which consumers begin to modify their travel behavior.

In terms of the actual impacts of rising fuel prices on VMT, FHWA research includes the development of models quantifying price elasticity. They suggest that, based on the 2007 – 2008 data described in a previous paragraph, the price elasticity for VMT and the price of fuel ranges between -0.12 (a 30% increase in the price of fuel resulting in a 3.5% decline in VMT) and -

0.17(a 30% increase in the price of fuel resulting in a 5.1% decline in VMT). USDOT recently estimated that 48 states experienced declines in VMT between September 2007 and September 2008 and nationwide, this decline was accompanied by a reduction in consumption of gasoline of about 3.3 percent

Research has also been conducted on measuring the impact of rising fuel prices on the use of modes of transportation other than the single-occupant automobile. The demand for alternative modes of transportation is impacted by the individual costs of operating a motor vehicle such as the price of parking, tolls and maintenance. The price of fuel must also be included in the list of variables impacting use of other transportation modes. Research completed by Duke University in 2009 calculated cross-price elasticity for fuel prices and demand for various modes of transportation including commuter rail, light rail transit and bus. The results of the research indicated that, for populations of less than 100,000, the cross-price elasticity between fuel price and bus was calculated to be 0.047 (a one percent increase in the cost of fuel resulted in a 0.047 increase in bus ridership. Although the results of the research suggested that this individual finding was not statistically significant, the overall research findings confirmed the results of the USDOT fuel price/VMT research suggested that consumers become increasingly sensitive to rising gasoline prices as those prices reached higher levels.

### **3.3 PROPOSED SERVICES/PROJECTS FOR ANALYSIS**

#### **3.3.1 INTERCITY BUS**

As mentioned earlier, direct intercity bus travel did at one time connect the SWRPC and SNHPC Region directly. Today both regions are connected through a transfer point in White River Junction, Vermont. Travel from Manchester to Keene requires an overnight stay in that transfer point with a layover time of nearly 16 hours. Clearly this is not an attractive travel option. In 2011 Greyhound Bus Lines announced that it had plans to pull its service from its I-91 Route between White River Junction, VT and Springfield, MA which includes a stop in Keene, NH. This would have left Keene with no intercity bus service whatsoever in any direction. The announcement spurred the development of a Intercity Bus Task Force including membership from Keene's Major, Senator Molly Kelly representing NH District 10, a representative from Senator Shaheen's office, the Greater Keene Chamber of Commerce, SWRPC, Keene State College, Antioch University and others. The group has been working on ensuring funding is available for the existing route and new east-west routes are considered. In addition they have been working on ensuring signage, long term parking and other services and marketing are available for the intercity bus system. The section includes information about the current market for intercity bus, costs of transportation and anecdotal insights by stakeholder groups.

#### Bus Ridership Demographics

Data from the Bureau of Transportation Statistics' American Travel Survey of 1995 that intercity bus riders are:

- More likely to be under 24 years old or over 60 years old than travelers on other modes;
- More likely to have lower household incomes than those using other intercity modes; and
- Less likely to have a vehicle - about 30% have no vehicle.

The Southwest Region’s number and percent of population for 15 to 24 year olds, 60 years over, population below the federal poverty line, and households without a vehicle are as follows based on the latest Census Data estimates available.

**FIGURE 15: TARGET POPULATION TOTALS FOR INTERCITY BUS USERS**

Category	Total Number	Percentage of Total Population/Households
15-24 Year Old Population	16,677	16%
60+ Year Old Population	21,819	21%
Population Living Below Federal Poverty Line	15,008	15%
Households With No Vehicle	878	2%

College students, recent immigrants, military personnel, and recently released prisoners are consistently considered among the largest intercity bus markets; people with the means to choose other modes of intercity travel generally do not tend to ride a bus. (Laura Higgins, Jeff Warner, Curtis Morgan, and Philip Dunham, *Examining Long-Distance Express Buses as an Extension of and Feeder to Passenger Rail Systems*, 2011).

The Monadnock Region hosts a number of college students including Keene State College (KSC) (5,850), Antioch University (AUNE) (800), Franklin Pierce University (FPU) (2,500) and New England College (NEC) (1,800). There are over 4,500 foreign born residents living in the Region. There are approximately 100 active duty military personnel in the Region according to the latest Census figures. Cheshire County House of Corrections currently has an inmate population of 153. The facility was built recently and is currently housing inmates from other counties in the State, but the total number of inmates is small.

Transportation Cost

Other than driving a personal vehicle, the only known intercity travel alternative connecting Keene to Manchester is taking a taxi or limousine service. There are a number of existing taxi and limousine type services that provide a good option for business travelers or, as shown by Bureau of Transportation Statistics data, for populations age 24 to 60 that prefer not to drive. We expect there is some demographic overlap of young and older riders choosing between intercity bus and taxi/limousine services. However, this is largely an individual choice between cost and convenience.

Based on SWRPC research, with 18 of 22 taxi and limousine companies reporting, the average cost of a trip to Manchester Boston Regional Airport from Keene, Peterborough and Rindge was \$147, \$108 and \$110 respectively. For low to moderate income travelers, an intercity bus service is very competitive. The 2011 Greyhound Bus 5311(f) application submitted to NHDOT proposed a rate of \$23 one way from Keene to Manchester Boston Regional Airport.

Data gathered from SWRPC Region Institutions for Higher Learning

As a follow up in speaking with the educational institutions, SWRPC analyzed zip code home locations of students from KSC, FPU and AUNE to determine where students would likely travel if they went home for summer vacation, spring break, or for a long weekend. SWRPC also examined patterns or groupings of students that existed along the East-West corridor routes in the Monadnock Region. In addition to travelling home for visits, the analysis noted likely destinations college aged students would be traveling and would benefit from using public transportation as an alternative to a personal vehicle.

Figure 11 shows that the preponderance of students - nearly 1,500 - from KSC, AUNE, and FPU are from the Manchester, Concord and Nashua metropolitan areas. An additional 668 students call the Boston metro area (inside of Interstate 495) home and could pass through the Manchester, Concord and/or Nashua en route to their home location directly. This cluster of students in central New Hampshire coincides with urbanized areas where one can connect to other major destinations such as the Manchester/Boston Regional Airport and the Verizon Center where concerts and other events are regularly held. Existing bus services in Manchester and Nashua could connect students to Boston and beyond through the many transmodal options available in the City.

Additionally, another 400 students call the seacoast area of New Hampshire and Maine home. Connection further eastward via Manchester, Concord or Nashua would connect with already existing mass transit options along the seacoast like C&J Transportation in Dover, Durham, and Exeter, which runs down to Boston’s South Station and Logan International Airport. A public transportation connection to the eastern portions of the state would allow riders access to the Downeaster Amtrak train line, which has seen a steady increase in ridership rates over the past decade that runs from Portland, ME to Boston’s North Station / TD Bank Garden where the Boston Bruins and the Boston Celtics play.

The last market area of significance uncovered in this analysis is the I-91 to I-95 corridor that passes through Springfield, MA, Hartford, CT and finally to New York, NY. This accounts for over 900 additional students. A smaller corridor market to the west of Keene consisting of 439 students stretches from Keene, NH to Albany, NY via Brattleboro and Bennington, VT.

Demand Estimate

In order to determine a demand estimate for intercity service heading eastward, assumptions used by the Portsmouth to Manchester bus service study were used for this study. That study determined central locations where express bus stops could be located and then determined a reasonable driving distance to those bus stops to determine the market area. In the case of the SWRPC Region, Keene and Peterborough are widely seen as west and east hubs in the Region where all communities in the SWRPC Region are reasonable distance (1/2 hour or less) to either of these destinations. The Portsmouth to Manchester study chose to include the entire population of that market area assuming that all ages of the population could be customers to the Manchester-Boston Regional Airport. This study makes a similar assumption, however, based on research, there are certain populations that have a greater preponderance to use intercity bus services and those groups are broken out (including the known student population) as well. The low estimate is the same as three percent of the subject population making one round trip per year by intercity bus. The higher estimate is the same as five percent of the subject population making three round trips per year.

**FIGURE 16: INTERCITY BUS DEMAND ESTIMATE**

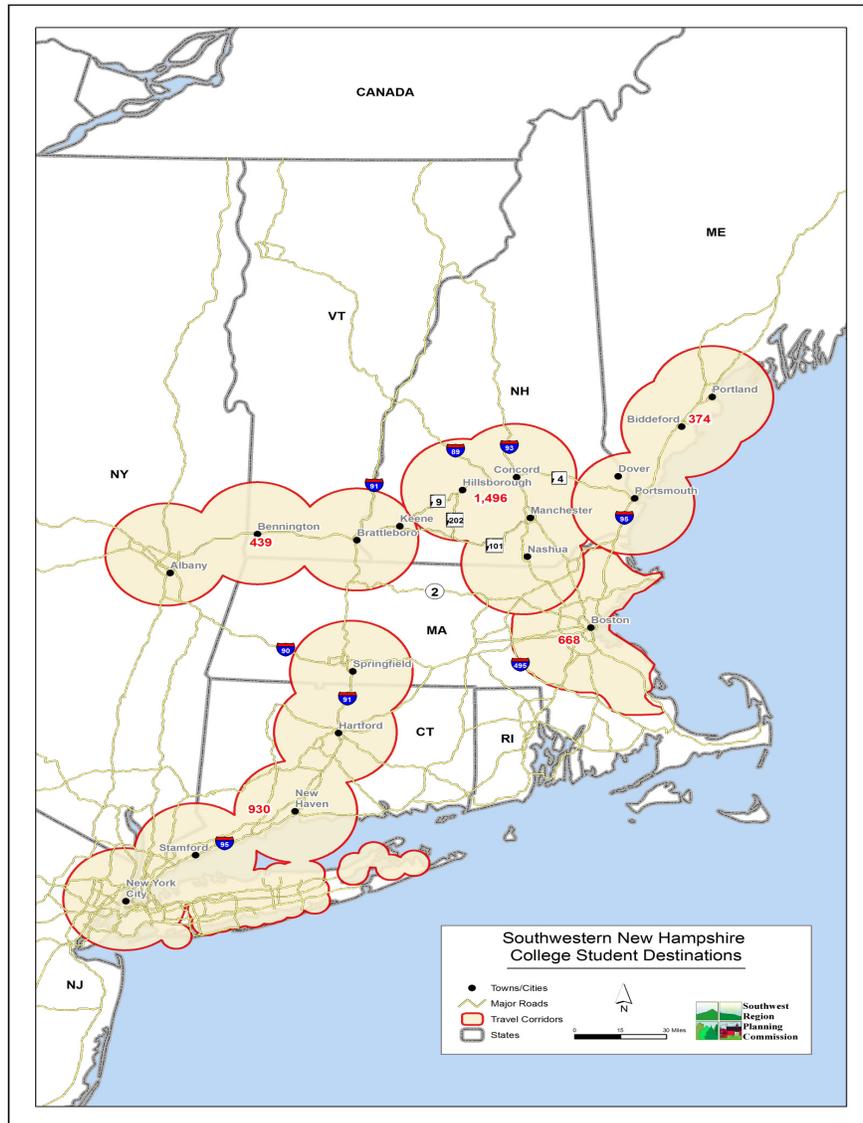
Population Description	Total	Estimate Annual Trips		Estimate Daily Trips	
		Low	Higher	240 days per year Low/Higher	365 days per year Low/Higher
Total Population	102,313	6,139	30,694	26/128	17/84
Total Target Population	40,095	2,405	12,029	10/50	7/33
Age 16-24	16,677	1,000	5,003	4/21	3/14
Age 25-59 and Below Poverty	1,599	96	480	>1/2	<1/>1
Age 60+	21,819	1,309	6546	5/27	4/18

This analysis does not include markets of populations in the SNHPC area. This is because the study suggests that the demand for intercity bus trips is probably higher for SWRPC residents to have round trip

options that take them to eastern destinations more so than SNHPC residents. However, it is important to account for the many college students that live in Manchester, Concord, Nashua, the Seacoast and Boston Metro area (2,538 students last school year). This accounts for an important sector of demand to the east and attending AUNE, KSC and FPU.

This intercity bus analysis above also does not specifically look at intercity bus as a work commuter option either. Existing marketing trends and service schedules used by intercity bus in rural parts of New England suggest that trips taken by intercity bus are more convenient for individuals that are not subject to “9 to 5” schedules. If a service was designed for work commuters, it would likely attract workers commuting to areas with strong central business districts and perhaps city transit connections. Commuter information identified in Section 2.2 shows that there are 648 SNHPC residents that work in Keene and 1,288 SWRPC residents working in Manchester. Assuming that one half of 1 percent of commuters would use a service between the two cities, we can expect 97 workers using such a service. If used 3 days a week that is equivalent to 30,264 trips per year.

FIGURE 16: SWRPC REGION STUDENT HOME LOCATIONS



### **3.3.2 PARK AND RIDE/RIDESHARE & TRAVEL DEMAND MANAGEMENT STRATEGIES**

Using the draft park and ride toolkit created by Central New Hampshire Planning Commission, Strafford Region Planning Commission and SWRPC in 2013, this study analyzed two locations for potential park and ride lots that could be used as resources by the carpooling community heading easterly towards SNHPC for work. The locations chosen for park and ride lots were:

- In the vicinity of the roundabout at Winchester Street/NH 101/NH12 in Keene and;
- In the vicinity of the intersection of US 202 and NH 101 in Peterborough.

This analysis examined only the existing carpooling populations in parabolic shaped market areas positioned around each potential park and ride location. Data used the most recent American Community Survey 2011 5 year estimate data to determine carpooling rates and Decennial census data to determine the market area population growth rate. Assumptions that were used to determine demand included the following:

- Only one out of every four carpoolers will use a park and ride lot.
- Every two person carpool will require one person to park their car; every three person carpool will require two people to park their car, etc.
- Park and ride lot capacity will be adjusted for population growth out to twenty years.
- The number of carpoolers that could use a park and ride facility could increase by up to 3% in the immediate market area.

Based on this analysis, the capacity required for a park and ride lot in the Keene location would be 70 spaces minimum. The capacity required for a park and ride lot in the Peterborough location would be 60 spaces minimum. An addition of park and ride facilities in one or more of these locations will be helpful to this part of the region where population density is dispersed, but there remain significant traffic movements moving east and west on NH 101 and NH 9.

With the significant number of long distance commuters traveling between Keene and Manchester described in Section 2.3, strategies focusing on reaching out to employers in these two job centers have a potential to reach populations that may be attracted to carpooling, vanpooling or working at home. A number of best practice strategies have been adopted over the years to increase carpooling and vanpooling. Often this can include ridematching services, preferred parking spaces and exposing commuters to tax incentives. Each workplace will have its own unique needs and challenges for adopting these kinds of best practices.

Ridesharing match experts in NH indicate that matching ridesharing partners improve for people that find ridesharing convenient. One important factor are the costs of assembling with others (carpooling adds extra time to the journey to work because it is necessary for the members of the carpool to be assembled at the beginning and disassembled at the end of the work day). If people's origins and destinations are closer to each other or along a heavily traveled route than carpooling is more convenient.

With these factors in mind, the study looked at the municipalities where 1) 100 or more employees work in Keene or Manchester 2) live 10 miles or further away from their place of employment and 3) are likely to travel on either the NH 9 or NH 101 corridors. The results show Manchester attracting workers that live in Milford (316), Keene (303) and Hillsborough (101) which is a total of 720 workers. Likewise, the results show Keene attracting employees that live in Manchester (174), Nashua (171), Bedford (125) and Peterborough (123) or a total of 593 employees.

Through enhanced travel demand management support activities including rideshare matching services, providing vanpool options, and other commuter incentives, the study estimates that 15 to 20% of the employees could rideshare or 197 to 262 carpoolers or vanpoolers. This assumption is based on the fact that the target market group will have a higher propensity to carpool because of short assembly costs and the expense of long distance travel. This analysis assumes carpoolers and vanpoolers will commute three out of five days per week, 248 days per year (average number of workdays (260) minus average number of vacation days which is (12)). Trips saved will depend on the average size of a carpool or vanpool. The assumption used here is based on the NH average carpool size which is x. If vanpooling is encouraged than the number of trips saved would potentially increase since a van will have larger capacity than a passenger vehicle. The result of this analysis suggests a range of between x and y round trips saved per year.

### **3.3.3 VOLUNTEER DRIVER PROGRAM**

### **3.3.4 TAXI VOUCHER PROGRAM**

In June 2013, SNHPC, acting as Lead Agency for the Region 8 RCC, received \$20,000 in FTA Section 5310 Purchase of Service funding from NHDOT to develop a taxi voucher program for the Greater Manchester area. The program, currently under design, will be similar to a program that is now operating in the Region 9 Greater Derry-Salem area. Both programs will be operated by Green Cab of Derry, which currently provides service in the Greater Derry-Salem region as a contractor to the Cooperative Alliance for Regional Transportation.

The Coordinated Public Transit-Human Services Transportation Plan for the SNHPC Region identified a need for community transportation services in the Greater Manchester area that are designed to serve the demand for trips occurring outside of regular business hours and on weekends. The Region 9 and Region 8 taxi voucher programs have been designed to supplement services currently provided by other community transportation providers in the region and address these needs.

The taxi voucher program is a 50/50 cost share arrangement where riders pay half of the fare. A book of ten \$5 vouchers, with a total face value of \$50, is available to eligible riders for \$25. At the time of the ride, as many of the \$5 vouchers required to pay for the taxi fare are redeemed. Taxi vouchers are purchased and used by senior citizens with proof of age 62+ and by individuals with disabilities. There are no restrictions on travel purpose for elderly and disabled riders. There are time restrictions on the use of vouchers for non-medical trip purposes. Potential riders enroll in the program by completing an application and mobility needs

assessment form that is signed by a health care professional. This information is available on the Green Cab website. It is anticipated that funding for the Region 8 program will be continued into FY 2015.

#### **4.0 RECOMMENDATIONS**

Based on the analysis of this report, SWRPC and SNHPC make the following recommendations:

Short term recommendations (1-2 years):

- Develop a new park and ride lot in Keene and/or Peterborough. This project has the potential to have short-term implementation if CMAQ or other funding is available and if suitable land is available.
- Improve ridematching services and provide funding for other ridesharing support activities in New Hampshire. If funding is limited, focus ridesharing support services to large employers in large centers of employment such as Manchester and Keene.
- Examine the feasibility of changing existing intercity bus schedules to improve connections to Keene from eastern locations such as Manchester or Boston.
- Increase funding availability for volunteer driver services and taxi voucher programs.

Medium term recommendations (3-5 years):

- Reinstate daily connection from Keene to Concord or Manchester with connections to Nashua and Boston. If a route is on NH 101, consider a stop in Peterborough. This is considered a medium term recommendation, because it is expected that new funding will need to be identified to help subsidize such a service.
- Re-evaluate the capacity of areas identified in this report as having increasing mobility/congestion issues and develop projects for implementation. Prioritize project development for areas trending to have the greatest deterioration of mobility.
- Ensure that vanpool programs are up and running in New Hampshire with options connecting to Keene and Manchester employers.