

# **SOUTHWEST NH TRANSPORTATION ADVISORY COMMITTEE**

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## **NH 101 East Corridor**

November 6, 2017

- This marks the last in a series of discussions SWRPC is holding on Corridors identified in *Southwest Connects*, the new Long Range Transportation Plan for Southwest New Hampshire. The meeting will feature the NH 101 East Corridor.
- As part of this series SWRPC staff has reached out to municipalities that are part of the Corridors by inviting municipal elected officials and municipal staff, as well as State legislators representing communities that are part of the Corridor.
- The purpose of the Corridor meetings is to familiarize the TAC with each corridor as well as get feedback from state and local officials and municipal staff about the priority challenges and opportunities of each Corridor, in order to inform future transportation project programming and planning initiatives.
- Officials that are able to come to the meeting can participate in the conversation directly with SWRPC staff and TAC. We know that many people have busy schedules and many people are not able to attend our meetings. In an effort to reach people that are not able to attend, SWRPC will send the presentation, any handouts and meeting minutes to those officials and staff.
- We will also provide municipal and state officials SWRPC staff contact information so that they may follow up with comments and questions regarding the materials sent to them.

## Presentation Outline

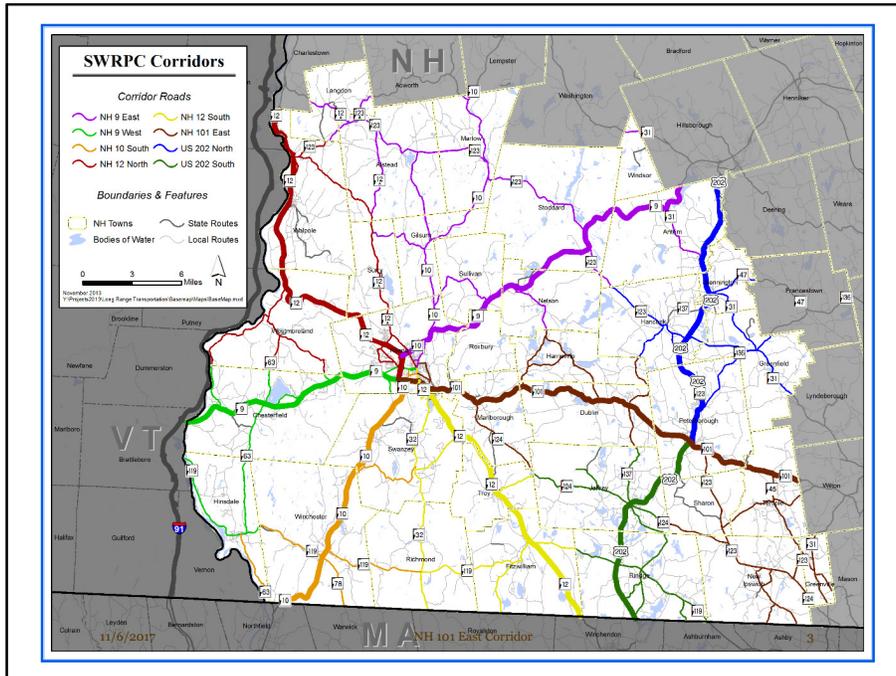
- Corridor Features and Location
- Population
- Commuting & Economy
- Housing & Land Use
- Travel & Vehicle Trends
- Performance Measures
- Challenges & Opportunities
- Past & Future Projects

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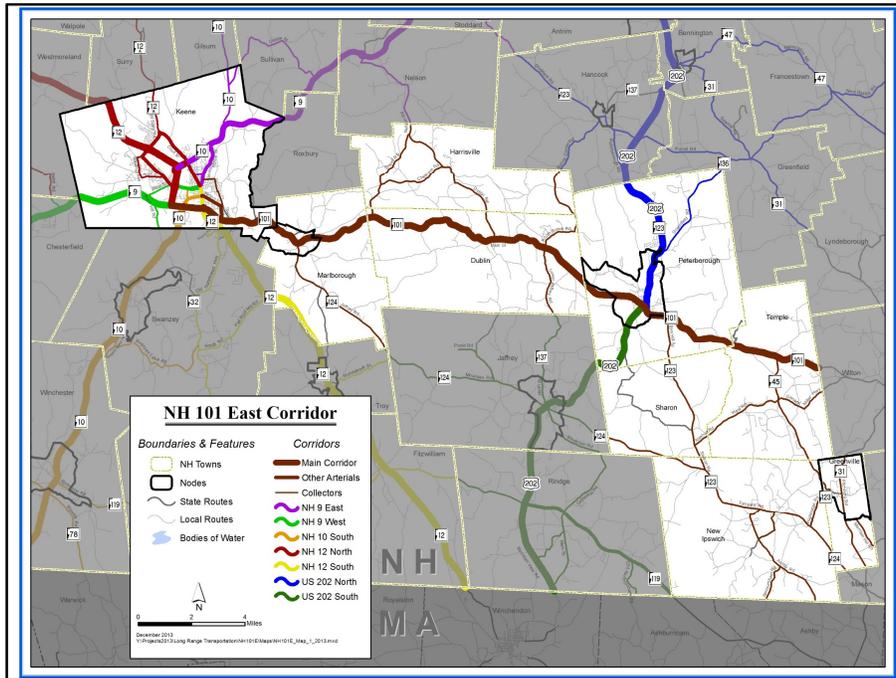
NH 101 East Corridor

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- Today's presentation will begin with an orientation and description of the NH 101 East Corridor including characteristics of the people that live there, how people travel along the corridor, economic characteristics of the corridor, and a description of housing activity and land use in the corridor system.
- NHDOT and USDOT are in the process of adopting performance measures for the transportation system in an effort to better connect funding allocation with state and federal goals. We will talk about these performance measures in the context of the Corridor.
- This presentation will cover the major challenges and opportunities for the Corridor as expressed in *Southwest Connects*.
- Then we will present past and future transportation projects and planning initiatives associated with the Corridor.
- We have set aside approximately 60 minutes to go through the presentation.



- This is a map of Southwest NH showing the eight corridors that were identified in *Southwest Connects*, with each Corridor represented by a different color.
- Corridors are based on data SWRPC collected recognizing direction of travel patterns, traffic volumes, federal highway classifications (federally recognized arterials and collectors) and connections between major origins and destinations inside and outside of the Southwest Region.
- Since highway travel is by far the predominant mode of transportation, Corridors are represented with what the Plan calls backbone arterials highways as well as collector roads that link to the arterial highways. While the highway system is the central framework of each Corridor, the Plan recognizes modes of transportation that use the highway network (pedestrians, bicyclists and community transportation) as well as other transportation infrastructure that interact with the Corridor (active rail lines, rails to trails, intermodal transportation centers, sidewalk networks in downtowns or villages).
- Every town in the Southwest Region is part of at least one Corridor.



- The Corridor we will be speaking about today is the NH 101 East Corridor. The NH 101 East Corridor is represented in dark brown.
- In our region, the corridor extends from the intersection of NH 9/10/12/101 in Keene to the Temple/Wilton town line on NH 101. Towns that are recognized as part of the Corridor from East to West include corridor communities Keene, Marlborough, Dublin, Peterborough and Temple, as well as adjacent communities in Harrisville, Sharon, New Ipswich and Greenville.
- NH 101 is considered a principal arterial by USDOT and NHDOT and minor arterials that are part of the Corridor include Marlboro Street and Optical Ave in Keene.
- Major collectors include NH 31 in Greenville, NH 123 in Peterborough, Sharon and New Ipswich, NH, and NH 124 in Marlborough, Sharon and New Ipswich.
- Twelve minor collectors are part of the corridor system including Chesham Road and NH 137 in Dublin and Harrisville, NH 45 in Temple, Greenville and New Ipswich, NH 123 in Greenville and New Ipswich.
- In our plan we used census designated places as a way to describe town centers that are part of the corridor. These are denser places where walkability and bikeability and a sense of place are extremely desirable and where transportation policy decisions should be context sensitive. Census designated areas along the corridor include the town centers of Keene, Marlborough village, Downtown Peterborough and Downtown Greenville.

## Population: Past & Projected

Town	1980 Population	% Population Change 1980-2010	2010 Population	Estimated % Population Change 2010-2040	Estimated 2040 Population
Dublin	1,303	23%	1,597	8%	1,724
Greenville	1,988	6%	2,105	-4%	2,022
Harrisville	860	12%	961	-13%	834
Keene	21,449	9%	23,409	4%	24,260
Marlborough	1,846	12%	2,063	3%	2,116
New Ipswich	2,433	110%	5,099	21%	6,148
Peterborough	4,895	28%	6,284	10%	6,898
Sharon	184	91%	352	0%	352
Temple	692	97%	1,366	8%	1,479

Source: US Census and NH Office of Energy and Planning

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- I want to start by talking about population change on the Corridor.
- Town populations represented on the corridor range from about 350 people in Sharon to 24,000 people in Keene.
- This table shows that there was slow to moderate growth for each of the towns over the 30 year period from 1980 to 2010.
- Between 2010 and 2040 the NH Office of Strategic Initiatives projects growth rates will be even slower, while some communities may lose population.

## Population: Special Populations



Youth (Age 14 and under), 14%



Young Adults (Age 15-34), 31%



Middle Age (Age 35-64), 39%



Seniors (Age 65+), 16%



Low Income (At or under 150% of Poverty level), 18%



Single Parent Households, 23%

Source: American Community Survey 5 Year Estimates 2015

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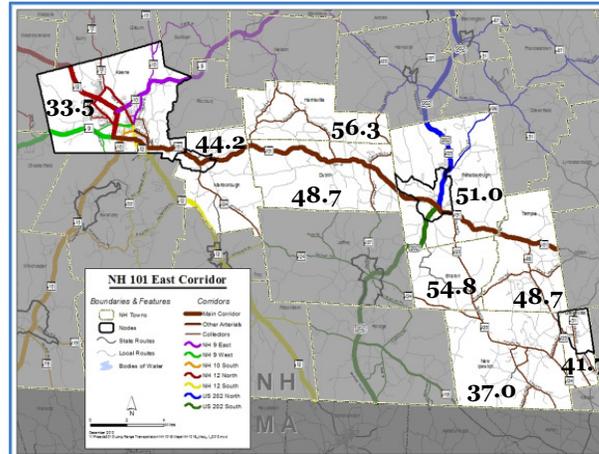
NH 101 East Corridor

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- At the end of the day, who are we planning transportation for? People.
- On this slide, SWRPC shows segments of the population that live on the corridor, because different groups or people tend to have certain transportation needs or can be seen as representing a specific transportation market. Some groups don't drive, some have less resources such as money or time, and some have distinct lifestyles that separate them from others in terms of transportation preferences.
- 14% of the corridor population is made up of youth. The higher concentrations of youth are in Dublin (16%), Marlborough (15%), Greenville (20%), New Ipswich (24%) and Temple (15%). This population cannot drive.
- The percentage of young adults is 31%. This is largely driven by the higher learning institutions based in Keene (39%). There is some evidence that "millennials" are less interested in owning a car, and more interested in having other transportation options.
- The percentage of middle age people is 39%. Keene's young adults population drives this number down somewhat. Dublin, Harrisville, Marlborough, Peterborough, Sharon and Temple actually have middle age populations of 45% or more. This is a population that tends to demand high mobility and transportation flexibility.
- Today, seniors make up about 16% of the corridor population. Peterborough, Sharon and Harrisville in particular, have a high senior populations. The percentage of seniors is 24, 25 and 28%, respectively. According to information from the National Household Travel Survey, 1 out of 5 US seniors 65 and over do not currently drive.

- One-fifth of the population is considered low income in the corridor. Part of this is because of the student population in Keene (Keene's low income population is 23%). However, Marlborough and Greenville have substantial low income populations as well (21 and 24% respectively). Low income populations can be very sensitive to transportation expenses.
- Almost a quarter of all families living in the corridor are headed by single parents. Higher proportions of single parent families can be found in Keene (30%) and Greenville (26%). Single parent households tend to need a flexible transportation options to deal with time constraints.

## Median Age



Source: American Community Survey 5 Year Estimates 2015

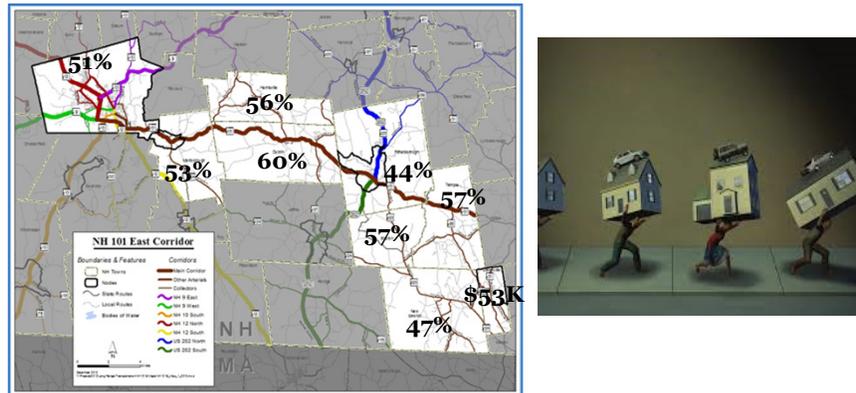
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- More than half of the population living in Harrisville and Sharon are above the age of 50. Dublin and Temple are not far behind.
- The college populations present in Keene bring its median age down.
- As a basis for comparison the median age in the United States is 37.6 and for NH it is 42.2.
- Experts believe that a significant percentage of retirees are expected to age in place in New Hampshire. This is also expected for the NH 101 East Corridor communities.

## Median Household Income as % of Housing + Transportation



Source: Center for Neighborhood Technology

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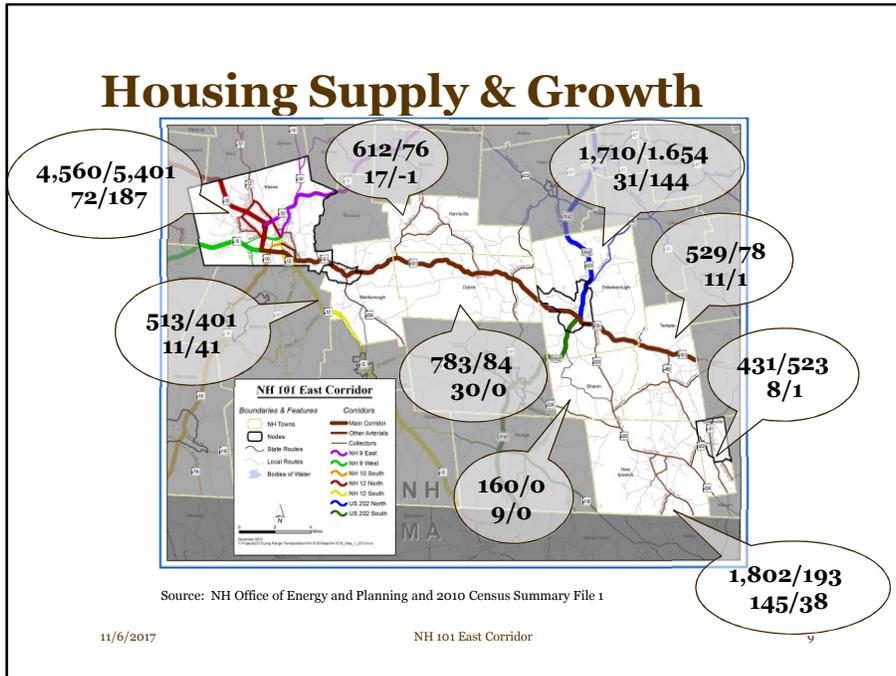
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- Housing experts usually say that if housing is 30% or more of annual household income, then it is not considered affordable because it consumes too much of household's budget to the detriment of other important household needs such as food, clothing, healthcare, education, etc.
- The 30% housing metric continues to be an important metric...however, many experts have updated their metric to account for the second most expensive expense category—transportation—because many people sacrifice inexpensive housing for more cars or longer commutes...in other words...more expensive transportation costs...This updated metric suggests that housing and transportation shouldn't be more than 45% of household income.
- This map shows that the median household in every community in the corridor (with the exception of Peterborough) exceeds the affordability threshold—the cost of housing and transportation are generally on the expensive side along this corridor.
- Of course, affordability shown here is based on the median income, meaning half of the households in each community are above or below the percentage's shown on the map.
- The takeaway here is community or market efforts to create more affordable transportation and or housing may be warranted to make these communities more affordable.
- What are some ways to make transportation more affordable? Providing more options

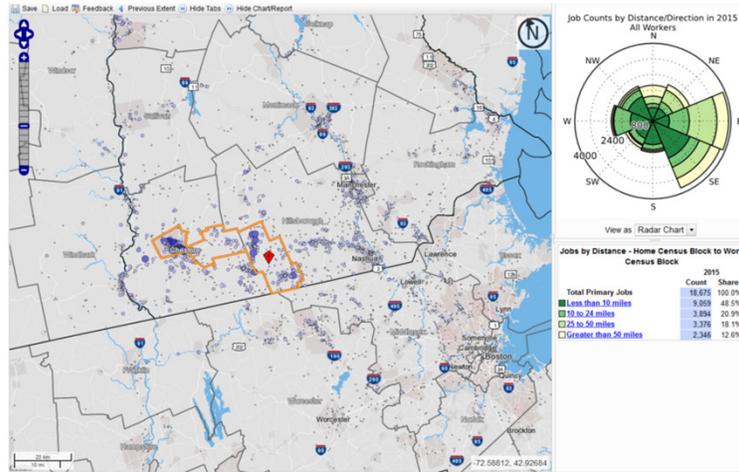
that are affordable for the household unit such as transit, carpooling services and infrastructure, telecommuting options, as well as making jobs and services closer to residents.

## Housing Supply & Growth



- In this slide, we are showing housing supply and growth in the bubbles associated with each community.
- The top two numbers in each bubble represent the number of single family units/all other units (multifamily of mobile home units)
- The bottom two numbers in each community show the number of permits issued for single family units/all other units built in the period from 2006-2015.
- The data shows that the supply of multifamily units/mobile homes are much more a proportion of the housing stock in Keene, Greenville, Peterborough and Marlborough. Over the most recent available ten year period, there is a higher number of multifamily unit and/or mobile home development occurring in Keene and Peterborough. Dublin, Sharon, and Harrisville had no multifamily development over the same period.

## Where Residents of the NH 101 E Corridor Work



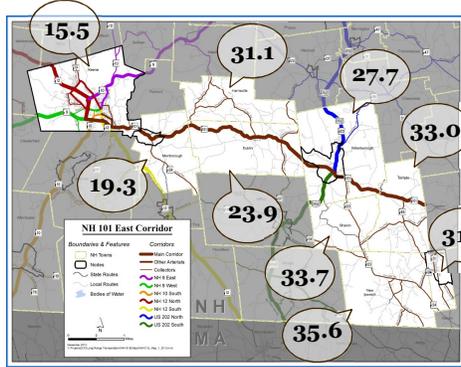
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- Most shopping or services on the Corridor are in Keene and Peterborough.
- Where do residents living in the NH 101 E communities work? This map shows clusters in Keene and the US 202 Corridor of Peterborough. You can also make out work along the NH 101 Corridor to the east and job destinations along 293 and 93.
- As the radar graph shows in the upper right corner of the slide—most longer distance trips—25 miles or greater (yellow and lightest green)—are heading east and southeast to towards Nashua. These longer distance trips represent about 25% of all commuting trips originating in the Corridor towns.

## Mean Travel Time



### Commuting B'twn Corridor Towns

- **8,420 workers**

### Among Top 10 Work Destinations

- **3<sup>rd</sup>, Nashua (609)**
- **5<sup>th</sup>, Manchester (521)**
- **8<sup>th</sup>, Brattleboro (394)**
- **9<sup>th</sup>, Concord (382)**

Source: US Census and NH Department of Employment Security and Local Housing and Employment Dynamics, 2015

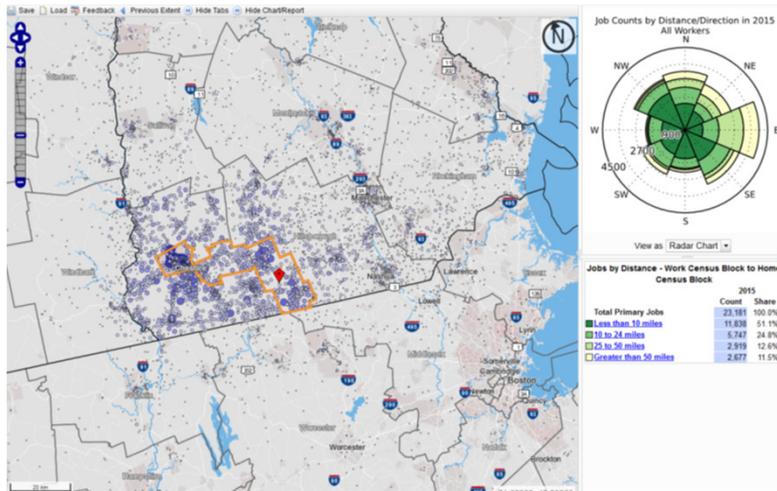
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- This chart provides another picture of work commuting for residents living in the NH 101 East communities.
- According to the US Bureau of the Census, the mean commute travel time for the NH 101 East communities ranges from just over 15 minutes to over 35 minutes.
- Keene has the shortest commute times—15.5 minutes—due to the high concentration of jobs near resident populations.
- On the right side of the slide, you can see that 8,420 people reside and work on the corridor. About 6,000 of those jobs are based in Keene. 8,420 people represents about 45% of the total workforce living on the corridor, so 55% of the workforce commutes outside of the corridor area.
- There is also a list of some of the top work destinations for the NH 101 East Corridor communities. These types of destinations help bring the mean travel times up.
- The numbers in parentheses to the right represent the number of people residing on the corridor that work in those communities. In other words, 609 people residing in the corridor communities worked in Nashua in 2015.
- The commute destination data here does not include self-employed people or the military.

## Where Workers on the NH 101 E Corridor Live



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NH 101 East Corridor

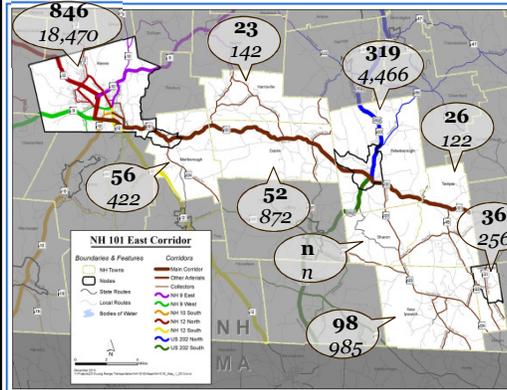
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- For employers located on the NH 101 E Corridor, the draw for workers is quite dispersed with most workers being drawn from the Monadnock Region. About 1 in 4 people working in the corridor area commute 25 miles or more to get to work.

# Economy (2015)

## Work Sites Workers

### Labor Force Δ / Employment Δ (2005-2015)



Dublin = +111 / +110

Greenville = -48 / -47

Harrisville = -45 / -46

Keene = -79 / -107

Marlborough = -13 / -15

New Ipswich = +463 / +455

Peterborough = +857 / +854

Sharon = +16 / +15

Temple = -64 / -75

Source: NH Department of Employment Security

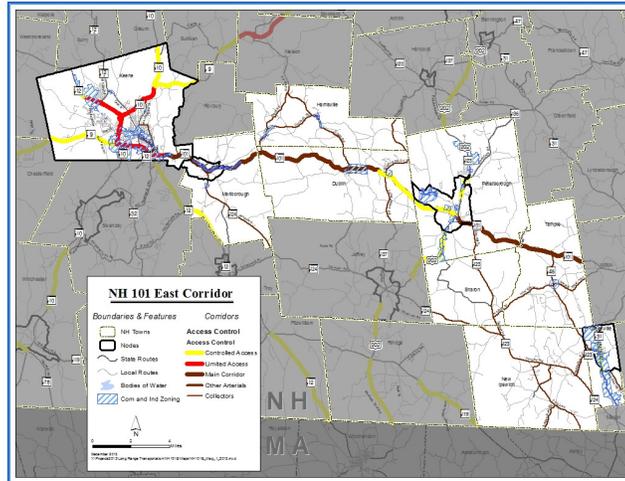
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- This slide looks at some economic indicators to give a picture of the NH 101 East Corridor economy.
- The numbers shown in the bubbles associated with community include a top number which represents the number of work sites in each community tracked by the Department of Economic Security; The italic numbers shown at the bottom of each bubble represent the number of employed.
- On the right I am showing how each community's number of people in the labor force and jobs has changed from 2005 to 2015
- Each town has had very different economic experiences over the 11 year period
  - Peterborough, New Ipswich, Dublin and Sharon saw increases in their labor force and employed, while Keene, Temple, Greenville, Harrisville and Marlborough experienced a reduction in both.
  - For most NH 101 East corridor communities, it is likely that the local labor force will either grow slowly or recede as the labor force continues to age.

## Land Use



Source: Towns and NHDOT  
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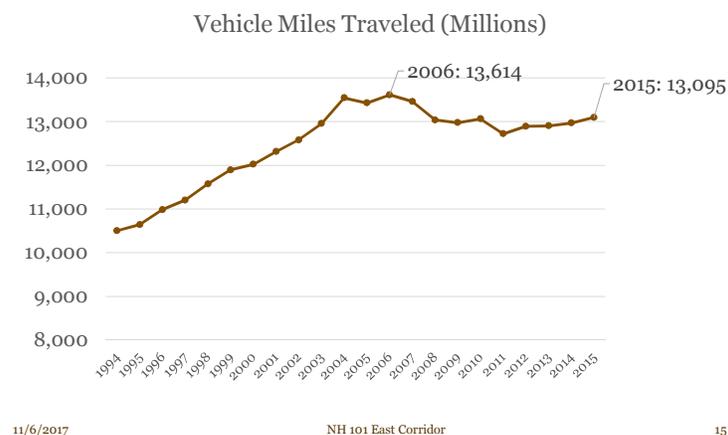
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- Zoning on the corridor is a mixed bag, but there are significant commercial and industrial land abutting the Corridor. This map shows commercial and industrial zoning associated with each Corridor community (blue crosshatch). Among all of the communities on NH 101, only Temple doesn't have any commercial or industrial zoning abutting NH 101.
- About 3.1 miles of the corridor is controlled access (yellow) , 2.5 miles is limited access (red), and 12.7 miles is regular access.

# Travel and Vehicle Trends

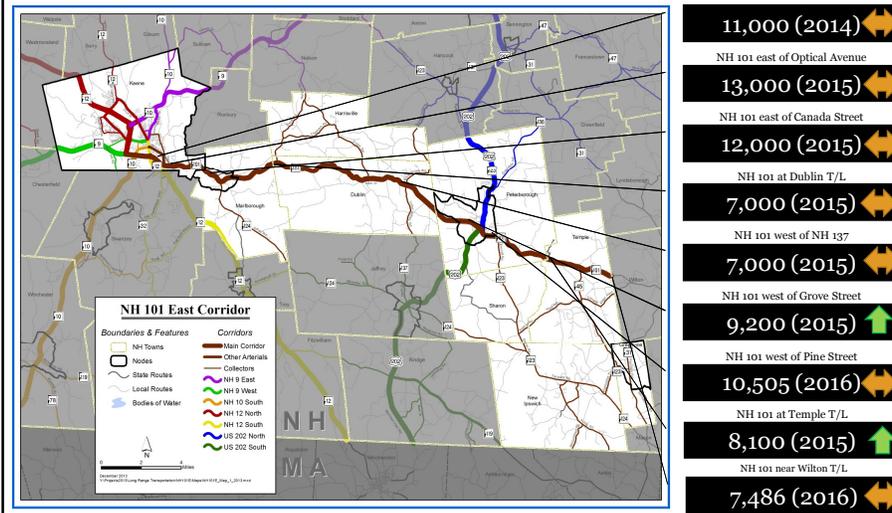
## Travel in New Hampshire



- The chart above depicts the amount of travel, or demand, on New Hampshire roads between 1994 and 2015 (as reported by the New Hampshire Department of Transportation to the Federal Highway Administration)
- The data above provides important context that likely approximates travel in Southwest NH.
- Specifically, the demand for travel peaked prior to the Great Recession, according to annualized estimates. Travel continued to decline throughout the economic recession. In the most recent years, there is evidence of slow growth, likely fueled by a return to pre-recession employment levels and less expensive fuel costs resulting from weaker global demand.
- Any return to pre-recession levels of growth, even in an improved economy would depend largely on an increase in workers, but as previous slides have shown, population is expected to be slow and many workers will be aging.
- Annual 2016 data has not been published by the Federal Highway Administration, but monthly data from 2016 suggests that vehicle travel continues to grow.

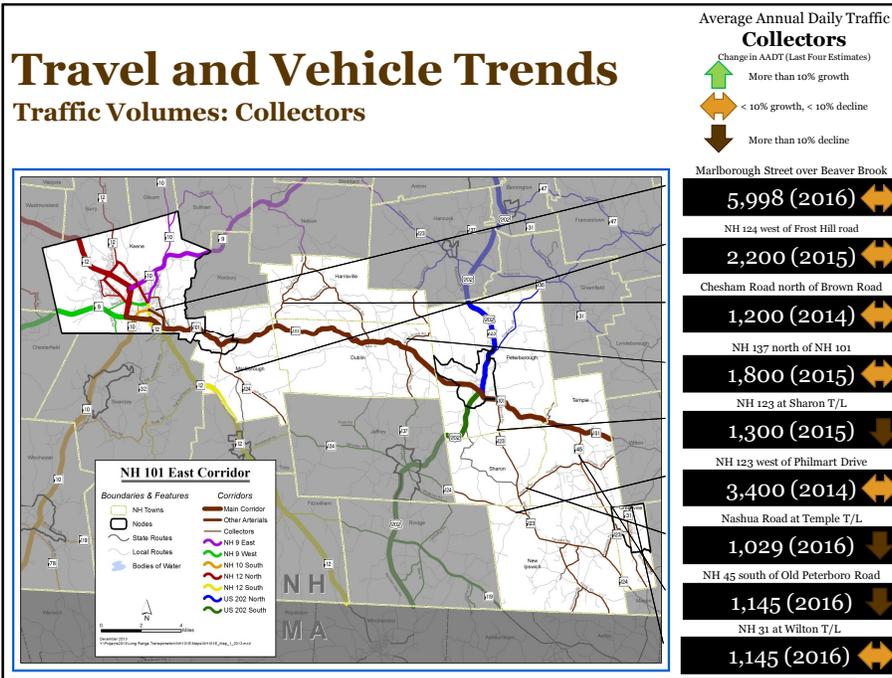
# Travel and Vehicle Trends

## Traffic Volumes: Arterials



- Vehicle travel is monitored throughout the state through the federal Highway Performance Monitoring System. There are roughly 6,000 sites throughout the state that are sampled every three years, over 400 of which are located here in Southwest New Hampshire. The short term samples are then converted to average estimated traffic figures, or Average Annual Daily Traffic (AADT). That is, on average, the number of vehicles that travel a section of highway per day for a given year. Actual figures can vary at each site, sometimes significantly, based on the time of year. In most cases, observed figures are higher than the reported AADT during the summer, and lower during the winter. It should also be noted that estimates can sometimes be impacted by changes in regional travel as a result of detours and construction, sometimes located far from the monitored site.
- First let's look at the primary arterial, NH 101, which is part of the National Highway System. Travel is at it's highest in the vicinity of Keene. Where multiple routes come together, such as on either side of the NH 101/NH 12/Winchester Street roundabout, where daily traffic volumes can be more than double the figures highlighted above.
- The map above shows the NH 101 East Corridor. AADT volumes (and the years of each estimate) are listed below from north to south:
  - NH 101 east of Main Street: 11,000 (2014); 12,000 (2011); 11,000 (2008); 11,000 (2005)
  - NH 101 east of Optical: 13,000 (2015); 14,000 (2012) ; 13,000 (2009) ;13,000

- (2006)
- NH 101 east of Canada Street: 12,000 (2015); 12,000 (2012), 12,000 (2009), 13,000 (2006)
- NH 101 at Dublin town line: 7,000 (2015); 6,700 (2012); 6,100 (2009); 7,300 (2006)
- NH 101 west of NH 137: 7,000 (2015); 6,700 (2012); 7,800 (2009); 7,300 (2006)
- NH 101 west of Grove Street: 9,200 (2015); 9,100 (2012); 8,500 (2009); 8,300 (2006)
- NH 101 west of Pine Street: 10,505 (2016) 9,400 (2013); 10,000 (2010); 10,000 (2007)
- NH 101 at Temple town line: 8,100 (2015); 7,500 (2012); 8,000 (2009); 6,800 (2006);
- NH 101 near Wilton town line (west of Old County Farm Road): 7,486 (2016); 7,229 (2013); 7,575 (2010); 8,024 (2007)
- Traffic volumes were the highest in Keene on the NH 101 E Corridor, though relatively stable when considering the previous three estimates (above) at each location. Factors that may influence changes over this period include the Great Recession and changes to commercial development in this area.
- It should be noted that the following analysis is meant to create a geographic cross section of travel, and does not represent an analysis of every monitored station along the corridor. For more information about the availability of traffic data at these and other locations along the corridor, please contact SWRPC staff.

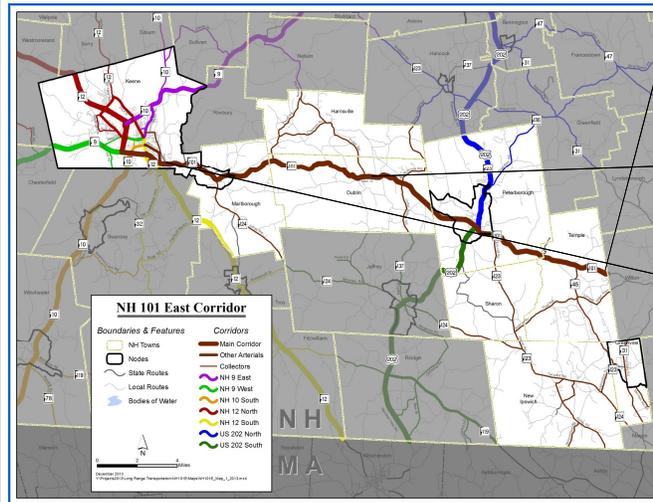


- The map above shows the NH 101 East Corridor, specifically other arterials (Optical Avenue and Marlboro Street in Keene) and collectors that comprise the system. AADT volumes and year of estimate are listed below from north to south:
  - Marlboro Street east of Kelleher Street: 5,998 (2016); 5,700 (2013); 5,900 (2010); 6,400 (2004);
  - NH 124 (Jaffrey Road) West of Frost Hill Road: 2,200 (2015); 2,600; 2,500; 2,200
  - Chesham Road north of Brown Road: 1,200 (2014); 1,100 (2011); 1,100 (2008); 1,100 (2005)
  - NH 137 north of NH 101: 1,800 (2015); 2,200; 1,600; 1,900;
  - NH 123 at Sharon town line: 1,300 (2015); 2,100; 1,700; 1,700
  - NH 124 (Turnpike Road) West of Philmart Drive: 3,400 (2014); 3,400; 3,300; 3,200
  - Nashua Road at Temple town line: 1,029 (2016); 990 (2013); 890 (2010); 1,000 (2007)
  - NH 45 (Senator Tobey Highway) south of Old Peterboro Road (Temple): 1,145 (2016); 1,200; 1,100; 1,300
  - NH 31 at Wilton T/L in Greenville: 4,200; 3,900; 4,000; 4,400
- According to the selected statistics, off-main line routes were more likely to experience declines in travel. Both the trends in traffic on arterials and collectors

support trend of travel statewide.

# Travel and Vehicle Trends

## Vehicle Classification



Vehicle Classification  
%/# per day  
**Light**  
**Medium**  
**Heavy**

NH 101 at Temple T/L in Peterborough

95.2% (8,239)  
2.7% (234)  
2.1% (182)

NH 101 at Dublin T/L in Marlborough

95.4% (7,625)  
2.3% (183)  
1.5% (185)

NH 101 east of Optical Avenue in Keene

95.2% (12,824)  
3.2% (431)  
1.6% (216)

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- Freight is a planning emphasis area according to the most recent federal transportation legislation. SWRPC has responded by creating a dedicated planning support activity designed at better understanding the role of freight in the Southwest Region.
- A subset of these traffic sites were analyzed with respect to the classification of vehicles. Different schemes may be used to classify vehicles. One common way is to separate light duty, medium duty, and heavy duty vehicles. Light duty vehicles include passenger cars and trucks, medium duty vehicles include “single-unit” trucks, such as a box truck or interstate buses, and heavy duty vehicles include tractor trailer combinations of varying lengths and number of axles.
- From a national perspective, New Hampshire is not expected to host as much freight transportation activity as other parts of the country, because of its peripheral geographic position in the National Highway System and because of its rural nature and the relatively small economies that it supports.
- Total vehicles per day at NH 101 at Temple T/L in Peterborough: 8,684 (2012)
- Total vehicles per day at NH 101 at Marlborough/Dublin T/L: 7,993 (2015)
- Total vehicles per day at NH 101 east of Optical Avenue in Keene: 13,471 (2014)

## Infrastructure Condition

### Pavement Condition

% Interstate Good, % Interstate Poor

% NHS Good, % NHS Poor

### Bridge Condition

# Good Condition, # Poor Condition

Deck Area in Good Condition, Deck Area in Poor Condition

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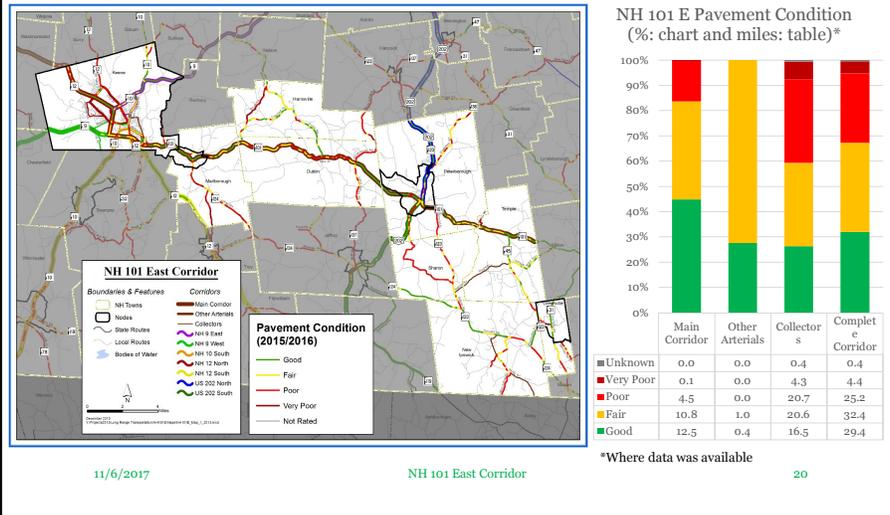
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- *Southwest Connects*, the regional transportation plan for Southwest New Hampshire, incorporates performance measures to understand the states of different assets on each corridor. Some performance measures are borrowed from the federal MAP-21/FAST Act, while others come from NH DOT's Balanced Scorecard.
- Infrastructure condition—specifically pavement condition and bridge condition—are performance measures that are derived from the MAP-21/FAST Act.
- Although federal performance measures prescribe data collection on interstate and sometimes National Highway System (NHS) roads only, SWRPC has collected and will present comparable data (where available) for non-interstate and non-NHS portions of our transportation network.

# Pavement Condition

## Existing Conditions



- Today, pavement condition is recorded utilizing specialized sensors, which record pavement condition attributes in 1/10<sup>th</sup> of a mile increments in one direction of travel. National Highway System and Interstate mileage is surveyed every year. Other numbered routes and unnumbered state highways (like Upper Walpole Road) are surveyed every other year.
- 2015-2016 NH DOT data displayed in the current slide is based on Ride Comfort Index (RCI) only (0-5 scale): Good is > 3.5, 2.5 – 3.5 is fair, < 2.5 is poor.
- The predominant condition of the NH 101, the “Main Corridor” or principal arterial, is Good. However, arterials and collectors off NH 101 were much more likely to be in fair or worse condition.
- It should be noted that 101 was surveyed in May of 2016 which means several substantial improvement projects (Keene 16409, Marlborough 16411, Dublin 16410, Sharon 16403, and Greenville 16402) were not included.
- On the chart next to the map you can see the relative condition of pavement for the main corridor (ie. NH 101), versus other arterials, collectors or the complete corridor (the corridor as a whole). The relative pavement condition for each category is as follows:
  - Main Corridor
    - 45.0% good
    - 38.7% fair

- 16.0% poor
  - 0.3% very poor
- Other Arterials
  - 27.6% good
  - 72.4% fair
- Collectors
  - 26.4% good
  - 33.0% fair
  - 33.1% poor
  - 6.9% very poor
  - 0.6% unknown
- Complete Corridor
  - 32.0% good
  - 35.3% fair
  - 27.4% poor
  - 4.8% very poor
  - 0.4% unknown
- A NH DOT online pavement condition viewer is available online at the following location:  
<http://nh.maps.arcgis.com/apps/webappviewer/index.html?id=c82ded68653d41f4a1f26d80ede584e4>

# Pavement Condition

## CY 2017 and Upcoming Resurfacing Projects

### 17408 – Marlborough/Jaffrey

Route: NH 124  
Length: 6.6 miles  
Limits: From NH 101 in Marlborough  
easterly to the west intersection of US 202 in  
Jaffrey  
Strategy: Light Capital Paving

### 17403, 17404, 18419 - Harrisville

Route: Dublin Road and Chesham Road  
Length: 6.6 miles  
Limits: Various  
Strategy: Preservation

### 18414 – Keene

Route: NH 101  
Length: 1.8 miles  
Limits: From Marlboro St to  
Keene/Marlborough TL  
Strategy: Preservation

### 18426 – Dublin

Route: NH 101  
Length: 2.0 miles  
Limits: From NH 137 in Dublin to US 202 in  
Peterborough  
Strategy: Preservation (crack seal)

### 18433 – Temple

Route: NH 45  
Length: 2.2 miles  
Limits: From north of Mansfield Rd to NH  
101  
Strategy: Preservation

### 18420 – Greenville

Route: NH 123  
Length: 1.2 miles  
Limits: From NH 31 in Greenville to NH 124  
in New Ipswich  
Strategy: Preservation

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- Upcoming resurfacing projects taking place throughout the corridor, according to New Hampshire Department of Transportation, are listed above.
- The first two-digits of each project represent the anticipated calendar year. More information is available via the Bureau of Planning and Community Assistance webpage: <https://www.nh.gov/dot/org/projectdevelopment/planning/amps/facts-figures.htm>
- As a reminder, the Department has a paving strategy which takes into account the priority, or tier, of a route, as well as the cost of a given treatment.

# Bridge Condition

## Methods

Code	Description
9	Excellent Condition
8	Very Good Condition
7	Good Condition
6	Satisfactory Condition
5	Fair Condition
4	Poor Condition
3	Serious Condition
2	Critical Condition
1	"Imminent" Failure Condition
0	Failed Condition

1. Deck  
2. Superstructure  
3. Substructure

Good  
Fair  
Poor

Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges  
USDOT FHWA Report No. FHWA-PD-96-001

11/6/2017

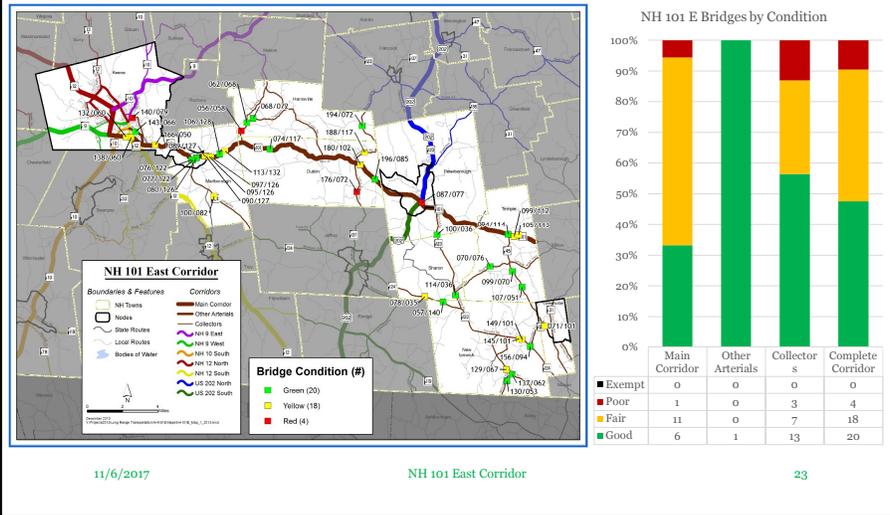
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- Bridge inspection data is available once per year (April) from the Department of Transportation. This can make results somewhat of a lagging indicator, depending on the time of inspection and scheduled maintenance, reconstruction, or replacement.
- In general, a "structurally deficient" bridge is one with a condition rating of 4 or less in the Deck, Superstructure, Substructure, or Culvert categories and an appraisal rating of 2 or less in the Structural Condition or Waterway Adequacy National Bridge Inventory categories.
- Under MAP-21 performance measures, which rely on the National Bridge Inventory (NBI), the deck, superstructure, and substructure of each bridge are rated on a scale from 0-9. If all 3 are 7 or higher, the bridge is in good (green) condition. If 1 item is 4 or less, the bridge is in poor (red) condition. For a Culvert, which only has one rating in the NBI, 7 or higher is good, 5 or 6 is fair, and 4 or lower is poor.

# Bridge Condition

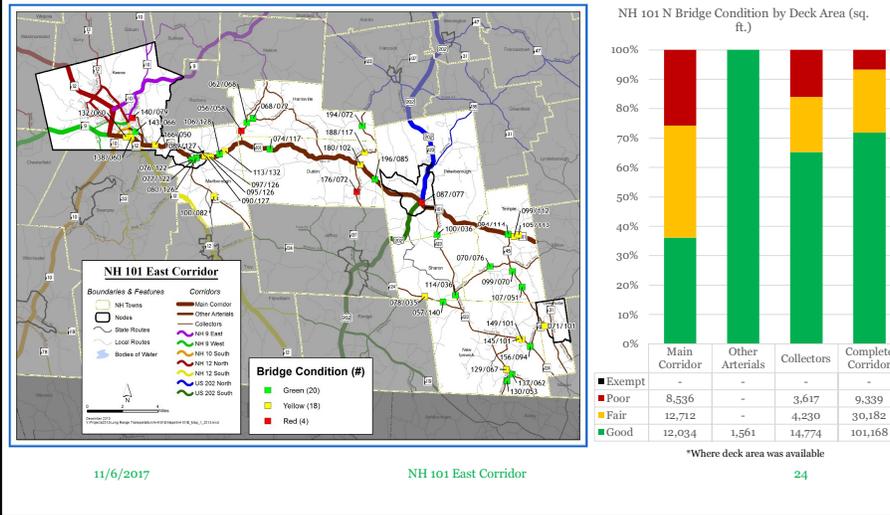
## Existing Conditions



- There are 42 bridges located on highways of the NH 101 E Corridor system (either according to the State: 10ft. span, or federal: 20 ft. span, definition). The map pictured shows that 4 are “red-list” bridges.
- Three of the red-list bridges (with at least one major element in poor condition) are state-owned including:
  - Harrisville 056/058: Chesham Road over Minnewawa River was originally constructed in 1939 and was reconstructed in 1984. The bridge has been on the red list since 2002. It carries about 1,400 cars per day.
  - Dublin 176/072: NH 137 over Stanley Brook carries 1,200 cars per day. It was first constructed in 1936 and was added to the red list in 2016.
  - Peterborough 087/077: US 202/NH 101 over the Contoocook River was added to the red list in 2004. The bridge carries approximately 15,000 cars per day and is scheduled to be replaced in 2020 and 2021.
- One of the red-list bridges is municipally-owned:
  - Keene 140/079, Beaver Street over Beaver Brook carries 2,800 cars per day and has been on the State’s red list since 2004. It was originally constructed in 1923. The bridge will be replaced as part of the State’s State Bridge Aid Program.

# Bridge Condition

## Existing Conditions



- The federal performance measures related to bridge not only account for the number of bridges in good or poor condition, but also the amount of bridge deck area in good and poor condition. Calculating the condition based on deck area provides another way to visualize the condition of bridges throughout the corridor. It demonstrates the influence of the Peterborough bridge over the Contoocook River as having a stronger influence on the “percentage” of bridges in poor condition on the main corridor (NH 101).

# Safety Performance

## Fatalities

Measures: Fatalities according to Fatal Accident Reporting System

Calculation: 5-year average of fatalities per 100 million vehicles miles

## Serious Injuries

Measures: Serious injuries according to NH DOT

Calculation: 5-year average of serious injuries per 100 million vehicle miles

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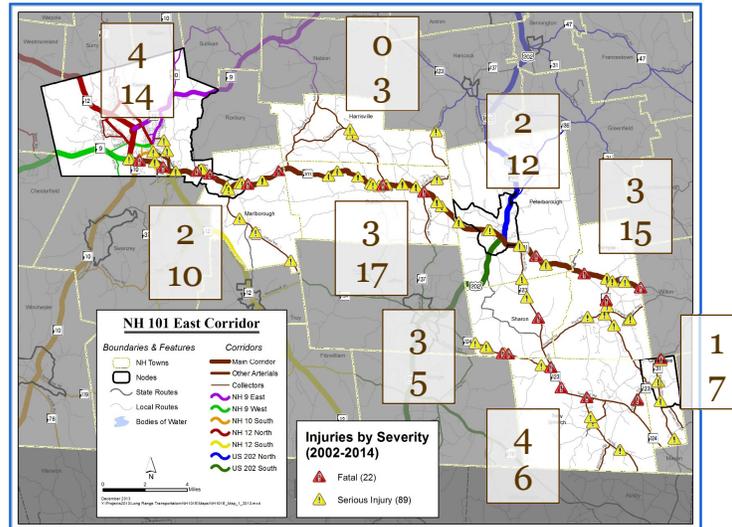
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- Like infrastructure, safety can also be monitored using performance measures.
- Currently, the FHWA requires States to measure safety by tracking fatalities and serious injuries, currently recorded with every crash report. The rates are then normalized relative to the amount of travel (statewide) over a 5-year period.

# Safety Performance

Fatalities and Serious Injuries by City/Town

Fatalities (#)  
Serious Injuries (#)



- Here is a map showing fatality and serious injury crashes on the NH 101 E Corridor for the period we have data available (2002 – 2014).
- The comprehensive crash costs documented in the Highway Safety Manual amount to \$88,195,800 from fatal injuries, \$19,224,000 from serious injuries or a combined total of \$107,419,800 or \$8,263,062 per year (not adjusted for inflation).
- Over that time period, there were a total of 22 fatalities and 89 serious injuries on the NH 101 E Corridor.
- The number of these occurrences is the first “ingredient” to the federal safety performance measure metrics.
- Since the MAP-21/FAST Act performance measure is based on a 5-year rolling average, SWRPC gathered historical data to show changes in fatalities and incapacitating injuries.
- The rolling average of serious injuries and fatalities is useful because it reduces “spikes” that may happen from year to year. NH DOT currently supports this effort through a target of zero deaths and to reduce the five-year average fatalities and serious injuries statewide 50 percent by 2030.
- Adjusting the fatality and serious injury rates based on the amount of travel on each corridor allows SWRPC to make comparisons between corridor systems. When comparing safety performance between an arterial and a less busy collector, it also takes away the bias from the principal arterial carrying the majority of annual daily traffic.
- Two segments of highway on the corridor system appears on a list of 5% worst-

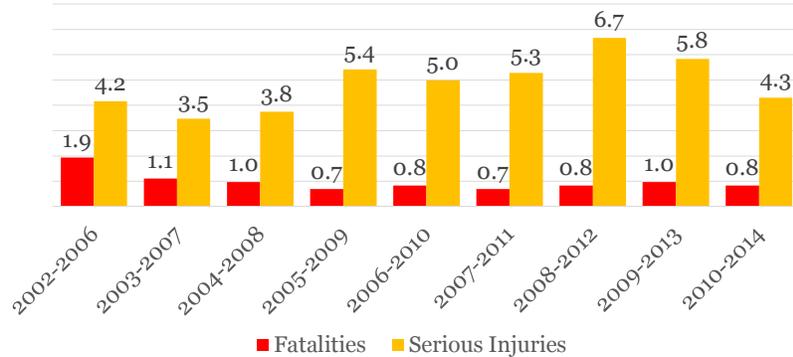
performing roads (based on their expected and actual crash histories) compiled by NH DOT. They are/were (generally) NH 101 in Peterborough, west of the entrance to Miller State Park and NH 101 east of Dublin Lake.

- One intersection on the corridor system appears on a similar list (in this case of the top 100 worst-performing). It is/was NH 101 at NH 45 in Temple.
- These and other areas may be candidates for NH DOT-led Highway Safety Audit to better understand possible causes as well as suggest possible safety countermeasures.

# Safety Performance

## Fatalities and Serious Injuries (2002-2014)

NH 101 E Corridor Injury Severity  
(5-Year Moving Average Per 100 Million VMT)



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- The rate used in this chart (fatalities and injuries per 100 million annual vehicle miles traveled over a 5-year period) is consistent with proposed MAP-21 rulemaking.
- In absolute terms, NH 101 E accounted for approximately 4.3 incapacitating injuries per 100 million vehicle miles travelled per year, and 0.8 fatalities per 100 million vehicles miles travelled per year according to 2010 to 2014 crash data and traffic volume data.
- In comparison, the State of New Hampshire's fatality rate for 2014 alone was 0.73 fatalities per 100 million vehicle miles traveled.

# Mobility

Level of Service

$$\frac{v}{c} = \frac{AADT \times K \times D}{L \times F}$$

Where

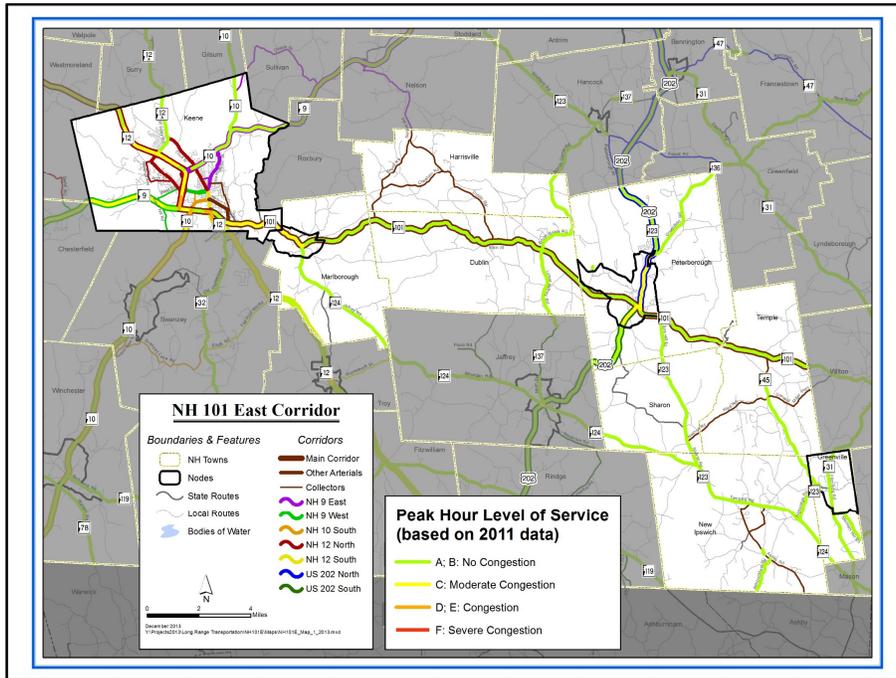
<i>AADT</i>	Average Annual Daily Traffic
<i>K</i>	Percent of AADT occurring during peak hour
<i>D</i>	Directional distribution during peak hour
<i>L</i>	Total number of lanes per direction
<i>F</i>	Maximum flow rate

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- Another key performance measure that MAP-21 and NHDOT are concerned with is mobility, or the relative ease of travel. Measuring delay, either directly or indirectly, is one a common way transportation planners evaluate mobility. Nationally, MAP-21 has the stated goal of congestion reduction on the National Highway System.
- MAP-21 has not finalized its performance measure regarding mobility at this time. NHDOT is currently reassessing the best way to measure mobility.
- Since the status of mobility measures are in flux, SWRPC has temporarily used volume/capacity ratio and level of service (LOS) as a temporary way to measure mobility. A highway's volume to capacity ratio determines its LOS by comparing the peak hourly rate of flow in vehicles per hour, to the capacity of that road.
- The map utilizes the average peak hour of the average peak month. The results factor in the number of lanes, the theoretical maximum flow per lane, as well as directional distribution. A indicates no congestion. B and C indicates moderate congestion.
- In the future, NH DOT will provide actual travel times per road segment for improved measurement of delay.



- The above map depicts level of service for road segments (excluding intersections) during the peak hour of demand.
- The highest modeled rates of peak hour congestion occurred in the vicinity of the NH 101/US 202 in Peterborough, NH 101 between Optical Avenue in Keene and NH 124 in Marlborough, and NH 101/NH 12 west of Main Street in Keene.

## Multimodal Accessibility

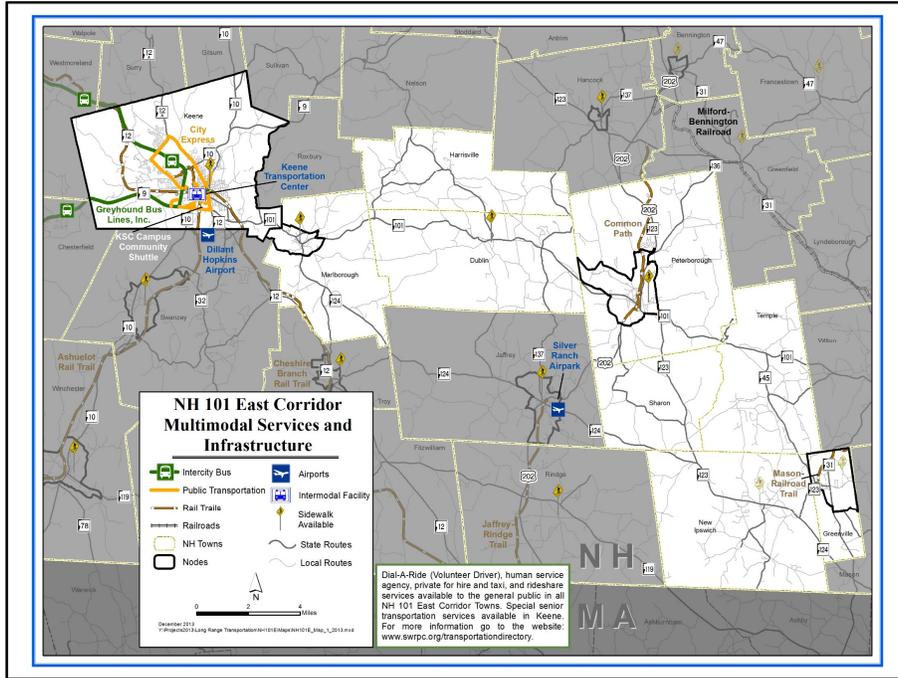
- Sidewalks: From Monadnock Alliance for Sustainable Transportation (MAST)
- Bikeways: From MAST
- # of Park and Ride Lot Spaces: From MAST
- Public Transit Routes: From MAST
- Intercity Bus Routes: From MAST

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- Multimodal accessibility is not a performance measure that is yet being used by MAP-21. NHDOT's Balanced Scorecard has some measures but they are in a state of research and development. As a result, the Southwest Connects Plan, decided to use multimodal measures that are currently being measured by the Monadnock Alliance for Sustainable Transportation in its Action Plan. This plan looks at mileage of sidewalks, bikeways, # of park and ride lot spaces, mileage of public transit routes and mileage of intercity bus routes over time.
- More information is available in *Southwest Connects*.



- For each corridor, the *Southwest Connects* depicts available multimodal services and infrastructure. This includes intercity bus service through Greyhound, public transportation through City Express, rail trails, and activity centers with sidewalks. Today, Greyhound provides an additional service not depicted on the map between Brattleboro and Boston on Friday and Saturday, with stops in Nashua and Manchester.

## **Regional Transportation Challenges – Opportunities?**

- Balancing “Mobility” and “Livability”
  - Marlborough, Dublin, Peterborough
- Bike Ped Safety
  - Keene, Marlborough, Dublin, Harrisville, Peterborough, New Ipswich
- Lack of Transit/Intercity Transit
- Reconstruct NH 101 base in Keene, Marlborough, Dublin and Temple
- Maintenance area challenges
  - Hurricane Hill and Dublin Lake curve area in Dublin
  - Temple Mtn and Pack Monadnock in Peterborough
- Manchester and Keene Branch Rail Trail

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- SWRPC is aware of some transportation challenges associated with the NH 101 East Corridor.
- The following list of challenges and opportunities have been collected by SWRPC staff from various sources.
  - Marlborough, Dublin and to a lesser extent Peterborough use NH 101 as local “Main Streets” in that they host a lot of local traffic, commercial development and governmental buildings, but NH 101 is also an important regional arterial for people wanting to commute east or west, for freight and for other regional travel purposes. Designing the road for both local and regional purposes can be challenging. Dublin and NHDOT have done some recent work to calm traffic through its village center, without infringing on regional traffic too greatly.
  - Bicycle and Pedestrian safety have been noted at a variety of areas along the corridor. In Keene, there may be a connection between Marlborough Street and the Stone Arch Bridge and Cheshire Rail Trail at some point in the future. Along Minnewawa Brook, a bicyclist fatality occurred on NH 101 a few years ago. In Marlborough, there are ongoing issues with the local school children trying to cross NH 101 and people have been hit trying to cross the road. Dublin has recently implemented some traffic calming measures, sidewalks and crosswalks to improve pedestrian safety on NH 101. An activity citizenry in Harrisville is examining ways to make its streets safer for pedestrians. Peterborough is

interested in making parts of NH 101 into a “Complete Street” and has engaged NHDOT on this topic. New Ipswich hopes to improve the pedestrian crossing for students walking and bicycling from their new school to the community’s athletic fields.

- This corridor is considered “underserved” by transit. There is no fixed route transit, although the area is served by some demand response volunteer driver programs. A Greyhound intercity bus route connects Brattleboro, VT and Keene to Nashua and Boston via NH 101, but no stops are made along the way. Peterborough has expressed interest in having a Greyhound stop.
- Many parts of the NH 101 has a concrete base and is in need of reconstruction at some point in order to more easily maintain the highway.
- NH 101 is windy and hilly, several areas have been noted as having icing and snow build up issues including parts of Dublin and Peterborough.
- There is a rail trail associated with the NH 101 Corridor, but it is not owned by the State. Some communities, such as Harrisville, have successfully reclaimed parts of the former Manchester and Keene Branch Rail Trail, but many other parts of the trail have reverted to private property owners when the rail was abandoned.

## Past Projects

- Dublin 16047: Pedestrian/bicycle improvement to downtown area (2017)
- Keene-Swanzey 10309P: Construction of a multi-use trail bridge over NH 101/NH12 (2017)
- New Ipswich 14465: Reconstruct bridge over Souhegan River (2014)
- Keene 22293: Rehabilitation of NH 12/NH 101 bridge over Ashuelot River (2012)
- NH 101 resurfacing in Marlborough (2012)
- Dublin-Peterborough 22092: Improvements to 4.3 miles of NH 101 from NH 137 east to US 202 (2012)
- Keene 16075: Upgrade signal, pavement markings, and signage at NH 101/NH 12/Main Street intersection (2011)
- Keene 10309R: Keene roundabout landscaping HSIP project (2009)

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- Several projects occurred in communities along the corridor over the last several years.
- For more information about these projects contact SWRPC.

## **Future Programmed Projects**

- Peterborough 15698 (Design): Safety improvements at the intersection of NH 101, NH 123 and Old Street Road
- Peterborough 15879 (Design): Rehabilitate and widen NH 101/US 202 bridge over Contoocook River
- Keene 41590 (Planning): Safety improvements and roadway rehabilitation at NH 101 intersection with Swanzey Factory Road

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- The slide lists projects funded (programmed) in the near term in communities along the corridor.

## Other Future Projects?

### Keene

- NH 12/101 add 2 lanes from Winchester St. roundabout to Main St
- Bike/ped crossing at Stone Arch bridge?

### Marlborough

- Context Sensitive Solutions project?

### Dublin

- ?

### Harrisville

- Bike/ped improvements

### Peterborough

- Bike/ped and access management improvements?
- Improve access safety to Mtn trailheads?

### Temple

- S curves?

### Sharon

- ?

### New Ipswich

- Bike/ped improvements near school and rec field

### Greenville

- ?

### Regional

- Transit Service?
- Intercity Bus connection in Peterborough?
- Park and ride infrastructure?

- Over the years, SWRPC has been approached with other project ideas. Here is a list.
- SWRPC encourages you to contact their office to talk about your project ideas. Should they be in the Ten Year Plan or are there funding programs that can help make them reality and address the Corridor community's transportation needs?

# ADDITIONAL DISCUSSION

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- We hope this has provided some useful information for thinking about the NH 101 East Corridor System.
- Our hope is that data and analysis will provide an opportunity for the SWRPC TAC, NHDOT, municipal officials, and state legislators to work together to develop consensus on projects or initiatives that will continue to address the corridor's greatest challenges and opportunities.
- We look forward to hearing your thoughts. Contact J. B. Mack at 357-0557.
- For further reading visit [www.swrpc.org/regionalplan](http://www.swrpc.org/regionalplan) to read *Southwest Connects*