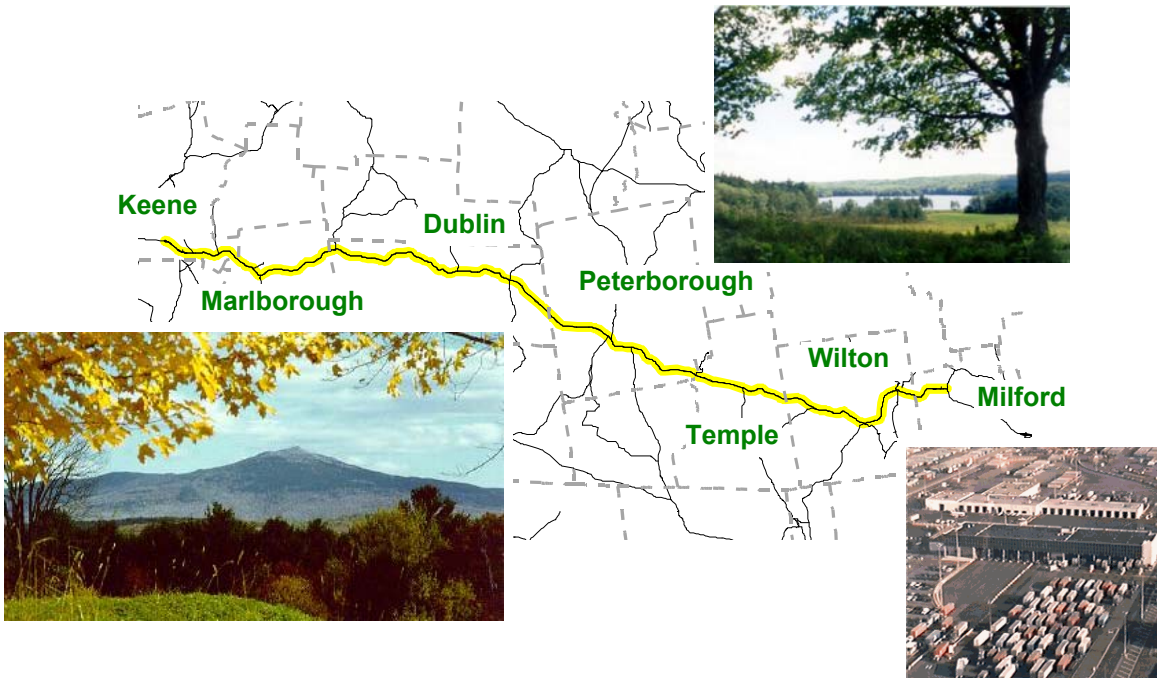
NH 101 Corridor Study

KEENE MARLBOROUGH DUBLIN PETERBOROUGH TEMPLE WILTON MILFORD

SAFETY COMMUNITY PLANNING CAPACITY

Report to the Commissioner of the
NH Department of Transportation



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Report to the Commissioner
Department of Transportation
State of New Hampshire

NH 101 Corridor Study

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Report to the Commissioner
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EXECUTIVE SUMMARY

The 34-miles of NH 101 from its western terminus in Keene to the junction of 101A in Milford has a distinctive character which sets it apart from the remainder of NH 101 east of Milford. NH 101 passes through seven towns in this segment and is Main Street to several of them. While most of this segment is undeveloped forest punctuated by village settings and dispersed rural development, NH 101 also connects significant employment areas including Keene (18,000 jobs), Bedford (10,000 jobs) and Manchester (about 60,000 jobs). The mobility of freight and passenger traffic provided by NH 101 and the other state highways in the region are basic to the quality of life enjoyed by residents and visitors. That mobility has supported continued economic growth and cultural enrichment. However, varied, and in places dangerous highway geometry; growing traffic volumes; high traffic speeds; close proximity of highway traffic to residential, commercial and public land uses (and unsafe conditions for pedestrians and local traffic); pervasive environmental impacts including noise, road dust, vehicle emissions, and storm water runoff; and constant demand for commercial access to the highway are at the root of concerns about the future of NH 101 and the communities it supports.

The need for a regional approach to better understand the many local concerns observed in the study area was identified by the Southwest Region Planning Commission (SWRPC) during successive biennial Transportation Improvement Program development cycles. The NH 101 Corridor Study was undertaken as a cooperative project among SWRPC, the Nashua Regional Planning Commission (NRPC), NH Department of Transportation (NH DOT), and most importantly the seven municipalities that share NH 101: Keene, Marlborough, Dublin, Peterborough, Temple, Wilton, and Milford.

The purposes of the NH 101 Corridor Study are to develop:

- a schedule of local capacity and safety improvements on NH 101 in its current alignment;
- recommendations for local land use controls and economic development approaches which are consistent with the protection of highway capacity and public safety in the existing NH 101 Corridor (with attention to highway impacts on community life); and
- movement toward a comprehensive strategy shared by state and local decision-makers for the development and use of NH 101 between Keene and Milford – a strategy which addresses NH 101 as a shared public resource.

The central principal of the Study is the established public purpose for supporting the development of transportation infrastructure: providing safe and efficient access and mobility. “Safe and efficient” include the social and natural environment of which the infrastructure is a part.

EXECUTIVE SUMMARY

This report provides information and guidance to local officials and citizens for their use in decision and policy making about development and NH 101. Of particular interest is enhancing public understanding of the relationships among regional development trends, local land use management, the physical landscape, and highway function. Publication of this report represents the beginning of the corridor management of NH 101 from Keene to Milford – collaboration of municipal, regional and State planners , policy-makers and residents.

The Study was designed and carried out as a community-based planning project. As such, professional research was used to establish a credible factual basis for public discussions about the future. The Study uses existing data as well as original data from research specific to the Study. The analyses produced a first-time compilation of previously isolated data sets in a unified Geographic Information System created and managed by SWRPC. The subject areas of research are:

- Traffic and Roadway Conditions
- Environmental Resources: Natural and Cultural
- Demographic and Economic Conditions
- Land Use and Development Patterns
- Community Plans and Regional Trends
- Possible Future Conditions in Traffic and Development

A second component of the Study is Public Involvement comprising several elements:

- NH 101 Corridor Study Advisory Committee;
- Community Surveys;
- Local Officials Workshops; and
- Informal Public Information.

Findings

NH 101 is designated as a Principal Arterial - Other in New Hampshire's functional classification scheme and is a link in the National Highway System. Research conducted over the past year by SWRPC and NRPC provided the following characterization of the NH 101 Corridor.

Average daily traffic volumes range from 7,000 at the Dublin/Marlborough town line to over 20,000 in Milford. Traffic volumes predictably peak at village centers and employment and commercial centers of Keene, Peterborough, and Milford. Annual traffic growth for the years 1978-1998 ranges from 2.3% to 3% along the Corridor. Traffic growth on major state routes throughout southwestern New Hampshire for the same years ranged from 2.3% to 3.9%. Highway capacity is constrained in several segments of the highway such as the east side of Marlborough village and the US 202 dogleg in Peterborough. Intersection capacity is sufficient for most legs of the 15 major intersections in the study area. Several unsignalized intersections had level-of-service ratings of E or F for some movement during the day using 1998 turning movement data: Swanzey Factory Road, Keene; NH 124, Marlborough; US 202 north (Granite Street), Peterborough; and NH 123 and Old Street Road, Peterborough. The

signalized intersections of US 202 south and Grove Street in Peterborough and 101A in Milford had overall LOS = D.[1]

The mix of tractor trailers as a percentage of all vehicles measured during 1998 ranged from 4% to 9% at 13 traffic recording stations on NH 101, except for a high mix of 11% at the Peterborough/Temple town line. Vehicle speeds tended to group near the posted speed limits (speed limits range from 30mph to 55mph), although recorded speeds frequently exceeded the limit. Excessive speeds were observed for less than 10% of vehicles.

Origin and destination surveys conducted during 1998 provided observations that 80% of the trips questioned had an origin and/or destination within a Corridor town. Acknowledging a bias of morning and afternoon sampling times, 50% of drivers surveyed were daily commuters (including local deliveries and business travel), 36% were area residents on local errands and the remaining 14% were long distance business and recreational trips.

State of NH accident records for the period 1993-1997 confirmed opinions about hazardous areas on the Corridor. There are several priority problem areas with more than 10 accidents: the intersection of Swanzey Factory Road, Keene (23 accidents); NH 101 between Jewett Street and Ryan Road, Marlborough (13); Cemetery Cove, Dublin (11, 1 fatal); intersection of Upper Union Street, Peterborough (12, 1 fatal); intersection of NH 123 (20); vicinity of Miller State Park, Peterborough (11); the “S-curves”, Temple (18, 2 fatal); and intersection of NH 101A , Milford (18).

Local public policy and opinion regarding development and highway infrastructure in the Corridor emphasize preservation of a rural appearance of the landscape. Public policy and opinion acknowledge the inevitability of continued growth but is not unified on how to address the demands for change. A 1998 survey indicated that most of the businesses in the Corridor are small (fewer than 10 employees and less than 5,000 sq. ft. of floor space). More than half of the business owners had no plans for expansion during the next five years. Property owners expressed concern about traffic volumes and speed encroaching on local community life as well as reducing the efficiency of the highway for personal travel. Business owners and property owners alike predicted traffic pressure to worsen in the coming years and supported the use of shared driveways to improve highway capacity and safety and the business environment.

Municipal master plans vary in their attention to NH 101. The City of Keene Master Plan includes a separate report entitled “NH 101 Corridor Plan”. NH 101 is variously identified among the seven municipal master plans as an economic resource, a detriment to the pursuit of community goals and a negative influence to be overcome.

While the study area comprises 33 unique zoning districts among the seven towns, over 70% of the study area is under rural residential zoning standards which favor residential development on 1-acre to 5-acre lots. Another 20% of the study area is zoned for higher density mixed-use “village” districts. Less than 10% of the study area is zoned exclusively

[1] Level of Service (LOS) analyses vary for signalized and unsignalized intersections. LOS is a measure used to describe operational conditions at intersections and is reported on a scale from A (short delays) to F (extremely long delays).

for commercial and industrial use. Current zoning tends to encourage commercial development adjacent to NH 101.

A 1998 land cover analysis revealed that about 25% of the study area is currently developed in urban, suburban or rural densities. Municipal tax assessor data corroborate that development statistic. Current tax data also report over 1 million square feet of commercial and industrial floor space and about 1,900 housing units within the study area.

The limiting factors for future development are physical landscape characteristics, particularly steep slope and surface water/wetlands, and local zoning standards regarding permitted uses and permitted densities. More than half of the undeveloped land is forested and about 67% of the study area is free of severe environmental constraints (slopes > 25%, surface water and wetlands). Future development is expected to appear in three settings: 1) conversion from low density to high density uses in village areas (e.g. single-family residential to multi-family or commercial); 2) new commercial development at the edges of village areas and adjacent to NH 101; and 3) single-family residential (and to a lesser extent multi-family and condominium) development accessed by local roads and secondary state highways within the Corridor. Multivariate review of growth rates and development potential suggest future annual growth rates for new housing will range from more than 1% to over 3% among the Corridor towns.

Traffic growth will be driven by regional travel demand as well as new development on NH 101. Review of traffic growth during the 1970's through the 90's resulted in the use of logarithmic projections for estimations of future traffic volumes. The traffic volumes projected for the years 2008 and 2018 do not indicate drastic reductions in intersection or roadway efficiency, but do predict increased traffic pressure on the open road, at intersections and in settled areas.

Recommendations

The following possible solutions to problems identified in the Study research are presented for public discussion:

1. Consideration of Highway Improvement Projects:

- Reconstruct between Cheshire Railroad and the Marlborough Town Line, Keene
- Reconstruct between Jewett Street and Ryan Road, Marlborough
- Improve circulation through the US 202/NH 101 dogleg, Peterborough
- Intersection improvements at NH 123, Peterborough
- Reconstruct/realign from NH 45 eastward about 1 mile, Temple (eliminate curves)
- Improve entrance/egress for roadside commerce east of Temple Road, Wilton
- Improve entrance/egress for roadside commerce east of Isaac Frye Highway, Wilton
- Improve intersections and dogleg at Abbott Hill Road and NH 31 north, Wilton
- Improve entrance/egress for roadside commerce east of Wilton Road, Milford

Specific recommendations to the NH Transportation Improvement Program or NH DOT District 4 programming for highway improvements are subject to support by local officials. Accordingly, the recommendations above may be revised in the course of public discussion and other recommendations may likewise be added.

2. Traffic Calming:

High traffic speeds, erratic traffic flow, dangerous encounters between fast and slow drivers, and high accident rates call for measures to slow high speeds and create a uniform traffic flow in keeping with the rural community character of the corridor. Local officials seek roadway and landscape design concepts and speed enforcement approaches to accomplish traffic calming.

While primarily applied in urban and suburban settings, traffic calming techniques are found to mitigate negative impacts of start-and-stop traffic, mixed speed traffic and high speed traffic and thereby provide the following benefits:

- safely integrate pedestrians and bicyclists;
- reduce traffic accidents involving vehicle, pedestrians, bicycles, and other property damage;
- reduce vehicle emissions: noise, exhaust, dust, road spray; and
- relieve intersection congestion

3. Local Zoning and Access Management:

Output from the Study's GIS analysis provides insight into the potential for additional residential and commercial development. This information may stimulate consideration of the original basis for current zoning and the expected outcomes in terms of the distribution of land uses along the highway with its effects on municipal services, state and local highway capacity and community character.

Access management is generally a set of site design and roadway design criteria which impart some level of control over the circulation of traffic between the highway and adjacent development. Principal tools include regulating the spacing of curb cuts, using shared driveways or access roads to serve multiple commercial properties, and requiring landscaped setbacks for commercial development.

4. Next Steps:

This Report documents baseline conditions and sets policy directions for corridor management of NH 101 for the coming years. The publication of this Report precludes neither the development of further recommendations at local or regional levels nor further research or refinement of analyses used in the Study.

IN THE YEAR 2000, THE REGIONAL PLANNING COMMISSIONS WILL CONTINUE TO WORK WITH LOCAL OFFICIALS TO ACT ON THE RECOMMENDATONS UNDER 1-3 ABOVE. WORKSHOPS ARE ANTICIPATED FOR THE TOPICS OF: ACCESS MANAGEMENT, TRAFFIC CALMING, SPEED ENFORCEMENT, PRESERVATION OF ROADSIDE FOREST, AND THE NH SCENIC AND CULTURAL BYWAYS PROGRAM.

PART 1. STUDY DEFINITION

STATEMENT OF PURPOSE

The purposes of the ***NH 101 Corridor Study*** are to develop:

- a schedule of local capacity and safety improvements on NH 101;
- recommendations for local land use controls and economic development approaches which are consistent with the protection of highway capacity and public safety (with attention to highway impacts on community life) in the existing NH 101 Corridor; and
- a comprehensive strategy shared by state and local decision-makers for the development and use of NH 101 between Keene and Milford – a strategy which addresses NH 101 as a shared public resource.

The central principal of the Study is the established public purpose for supporting the development of transportation infrastructure: providing safe and efficient access and mobility. "Safe and efficient" include the social and natural environment of which the infrastructure is a part.

This Report is provided to local officials and citizens for their use in decisions and policy making about development and NH 101. Of particular interest is enhancing public understanding of the relationships among regional development trends, local land use management, the physical landscape, and highway function.

DESCRIPTION OF STUDY AREA AND PROBLEM DEFINITION

NH 101 extends from its junction with NH 9 in Keene eastward to Portsmouth. The 34-mile segment between Keene and NH 101A in Milford has traffic and development characteristics that distinguish it from the remainder of NH 101 to the east (*Base Map, maps 1a-d*). The study area comprises land within 1,000 feet of the center line of NH 101 between Optical Avenue in Keene and NH 101A in Milford. The more than 8,000 acres of mostly forested land is punctuated by village settings and dispersed rural residential and commercial development.

NH 101 passes through seven towns in this segment and is main street to several of them. While most of this segment is undeveloped forest punctuated by village settings and dispersed rural development, NH 101 also connects significant employment areas including Keene (18,000 jobs), Bedford (10,000 jobs) and Manchester (about 60,000 jobs). The mobility of freight and passenger traffic provided by NH 101 and the other state highways in the region are basic to the quality of life enjoyed by residents and visitors. That mobility has supported continual economic growth and cultural enrichment. However, varied, and in places dangerous highway geometry; growing traffic volumes; close proximity of highway traffic to residential, commercial and public land uses (and unsafe conditions for pedestrians and local traffic); pervasive environmental impacts including noise, road dust, vehicle emissions, and storm water runoff; and constant demand for commercial access to the highway are at the root of concerns about the future of NH 101 and the communities it supports.

The need for a regional approach to the many local concerns observed in the study area was identified by the Southwest Region Planning Commission during successive biennial Transportation Improvement Program development cycles. The **NH 101 Corridor Study** was undertaken as a cooperative project among the Southwest Region Planning Commission (SWRPC), the Nashua Regional Planning Commission (NRPC), NH Department of Transportation (NH DOT), and most importantly the seven municipalities that share NH 101: Keene, Marlborough, Dublin, Peterborough, Temple, Wilton, and Milford.

APPROACH

The NH 101 Corridor Study was undertaken as a community-based planning study. The Study might be considered the beginning of a management approach for coordinating land and highway development at the local and state levels. As such professional research was used to establish a credible factual basis for public discussions about the future. The Study uses existing data as well as original data from research specific to the Study. The analyses produced a first-time compilation of previously isolated data sets in a unified Geographic Information System created and managed by SWRPC. The subject areas of research are:

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A second component of the Study is Public Involvement comprising several elements:

- NH 101 Corridor Study Advisory Committee;
- Community Surveys;
- Local Officials Workshops; and
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PART 2. SUMMARY OF FINDINGS

Traffic

- **Historic and Summer 1998 Traffic Counts**

Average Daily Traffic volumes were calculated for 38 locations in the study area using 7-day hourly automatic traffic recorder data collected during the Spring and Summer of 1998. Vehicle classification and speed data were collected at 20 of the locations to further establish vehicle mix and travel speed. (*Traffic Summary, maps 2a-f)*

Traffic volumes peak predictably but significantly in Keene, Peterborough, and Milford: 13,975 east of Optical Avenue, Keene; 14,214 between US 202 S and US 202 N, Peterborough; and 22,605 west of NH 101A, Milford (Figure 1). Average Daily Traffic volumes on NH 101 through the corridor towns of Marlborough, Dublin, Temple and Wilton range from 14,908 at the Souhegan River, Wilton to 7,059 east of the Marlborough/Dublin Town Line.

Tractor trailer truck traffic volumes do not exceed the levels expected for the roadway's classification of "principal arterial - other" with truck mix as a percentage of all vehicles ranging from 4% to 9% at 13 of the traffic count stations, with an exceptionally high percentage of 11% at the Peterborough/Temple town line.

Approximately 74% of the vehicles recorded by speed exceeded posted speed limits. Vehicles tended to group near the posted speed limits (speed limits range from 30mph to 55mph), although recorded speeds frequently exceeded the limit. Excessive speeds (more than 15 mph over posted speed limit) were observed for less than 10% of vehicles (Figure 2). Posted speed limits range from a low of 30 mph in the village centers to a high of 55 mph in the improved highway segment east of NH 137 in Dublin to east of Elm Street in Peterborough.

Historic annual average daily traffic counts (AADT) (1981-1997) were obtained from NHDOT. The average annual increase in traffic for the 17 year period at the Dublin/Peterborough Town Line and Temple/Wilton Town Line was 2.6% – 3.3%. Annual traffic growth rates on other major state routes in the Southwest Region ranged from 2.3% to 3.9% for the 20-year period 1978-1998.

- **Intersection Capacity Analysis**

Capacity and safety analyses were conducted at fifteen intersections (4 signalized and 11 non-signalized) on NH 101 between Optical Avenue in Keene and NH 101A in Milford. The capacity analyses are based on turning movement data collected in the months of May and June of 1998, during the peak travel hours of 6:00 a.m. to 9:00 a.m. and 3:30 p.m. and 6:30 p.m. State of New Hampshire accident records for the intersections during the years 1993-1997 were used for safety analysis.

Level of service and v/c ratios must both be examined to fully evaluate the operation of signalized intersections. Level of service, expressed in terms of stopped delay time per vehicle, is a measure used to describe the quality of service users experience at a signalized intersection. The v/c ratio, calculated for each lane of an intersection, is the ratio of traffic volume to the physical capacity of the intersection. The closer the v/c ratio is to 1.0, the nearer the lane is to

Figure 1

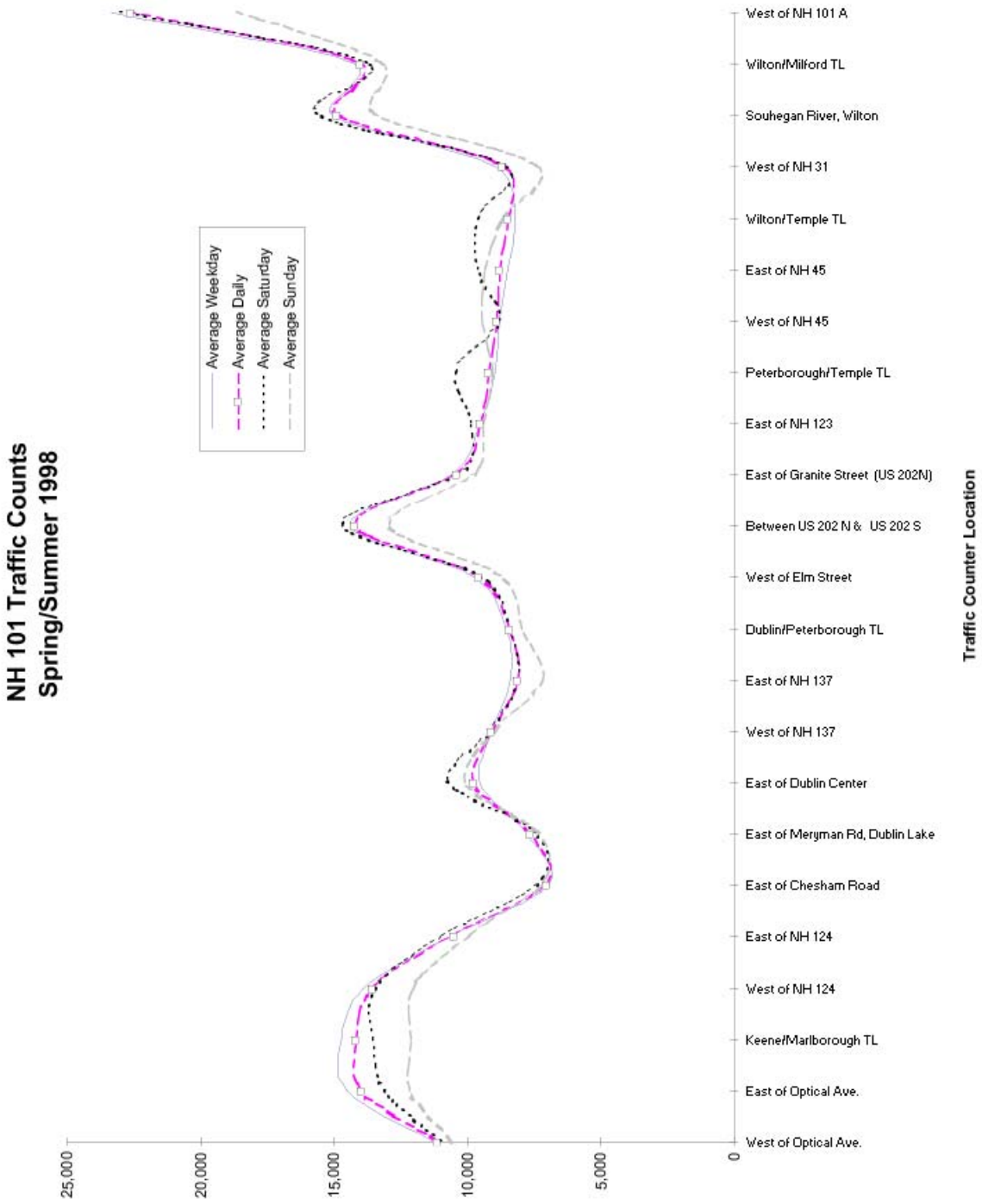
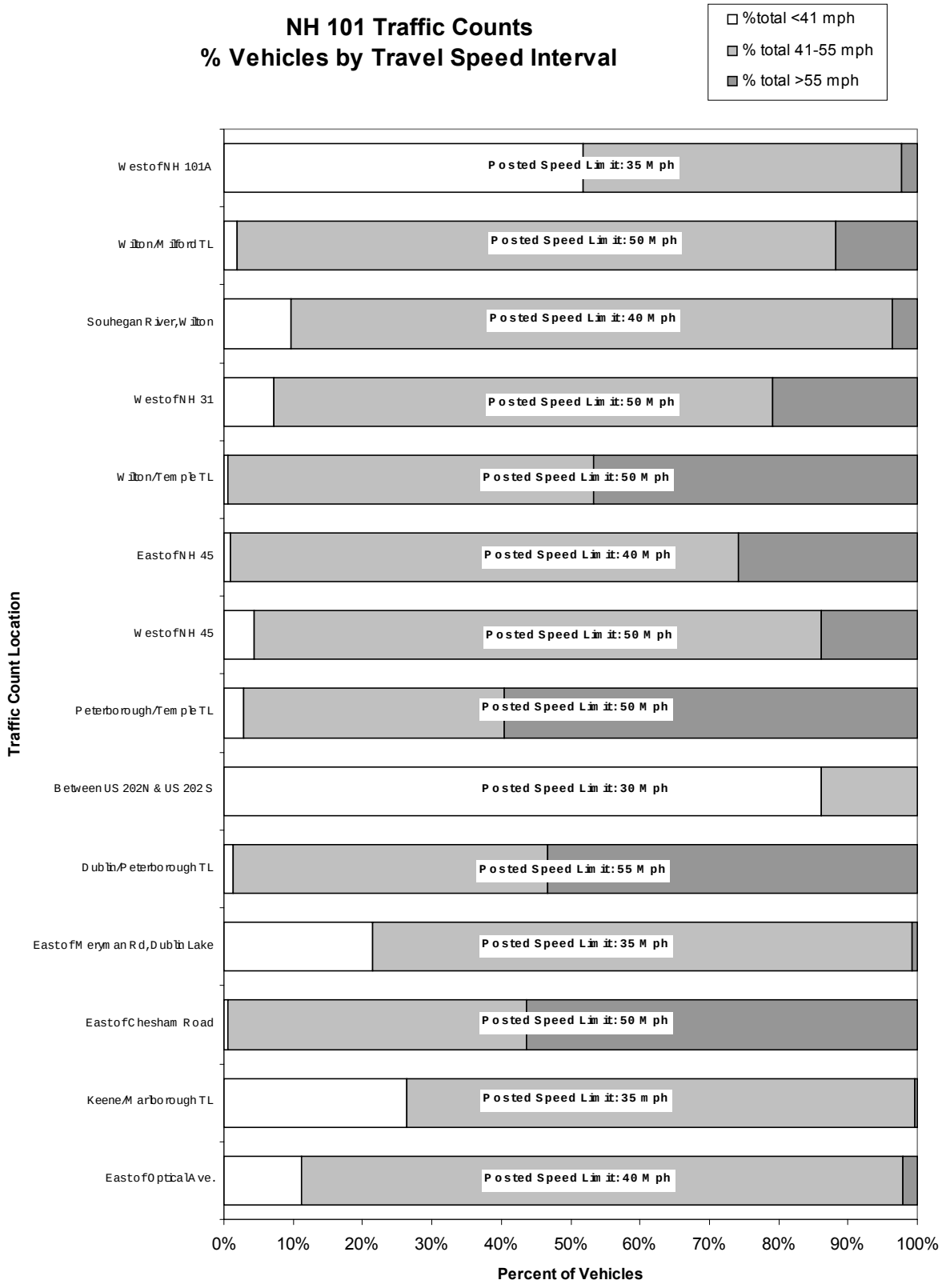

NH 101 Traffic Counts
Spring/Summer 1998
Average Weekday
Average Daily
Average Saturday
Average Sunday
25,000
20,000
15,000
10,000
5,000
0
West of NH 101 A
Wilton/Milford TL
Souhegan River, Wilton
West of NH 31
Wilton/Temple TL
East of NH 45
West of NH 45
Peterborough/Temple TL
East of NH 123
East of Granite Street (US 202N)
Between US 202 N & US 202 S
West of Elm Street
Dublin/Peterborough TL
East of NH 137
West of NH 137
East of Dublin Center
East of Meryman Rd, Dublin Lake
East of Chesham Road
East of NH 124
West of NH 124
Keene/Marlborough TL
East of Optical Ave.
West of Optical Ave.
Traffic Counter Location

Figure 2


NH 101 Traffic Counts
% Vehicles by Travel Speed Interval
%total <41 mph
% total 41-55 mph
% total >55 mph
Traffic Count Location
West of NH 101A
Posted Speed Limit: 35 Mph
Wilton/Milford TL
Posted Speed Limit: 50 Mph
Souhegan River, Wilton
Posted Speed Limit: 40 Mph
West of NH 31
Posted Speed Limit: 50 Mph
Wilton/Temple TL
Posted Speed Limit: 50 Mph
East of NH 45
Posted Speed Limit: 40 Mph
West of NH 45
Posted Speed Limit: 50 Mph
Peterborough/Temple TL
Posted Speed Limit: 50 Mph
Between US 202N & US 202S
Posted Speed Limit: 30 Mph
Dublin/Peterborough TL
Posted Speed Limit: 55 Mph
East of Merryman Rd, Dublin Lake
Posted Speed Limit: 35 Mph
East of Chesham Road
Posted Speed Limit: 50 Mph
Keene/Marlborough TL
Posted Speed Limit: 35 mph
East of Optical Ave.
Posted Speed Limit: 40 Mph
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Vehicles

saturation. Level of service and v/c ratios are calculated for each individual approach as well as for the intersection as a whole.

Level of Service Criteria for Signalized Intersections:

Level of Service	Stopped Delay/vehicle	Description
A	≤ 5.0 seconds	Very short delays; Most vehicles arrive at intersection during green phase.
B	>5.0 ≤ 15.0 seconds	Short delays. Short cycle lengths Many vehicles arrive at intersection during green phase.
C	> 15.0 ≤ 25.0 seconds	Average delays. A significant number of vehicles will be stopped at the red light.
D	> 25.0 ≤ 40.0 seconds	Long delays. Long cycle lengths Individual cycle failures are noticeable as many vehicles are stopped at the red light.
E	> 40.0 ≤ 60.0 seconds	Very long delays. Long cycle lengths. This level of service is considered to be the limit of acceptable delay. Individual cycle failures are frequent occurrences requiring many vehicles to stand through a cycle(s).
F	> 60.0 seconds	Extremely long delays. This level is considered to be unacceptable to most drivers. Many individual cycle failures require several vehicles to stand through a cycle(s).

Source: Highway Capacity Manual, Third Edition, Transportation Research Board, 1994.

Capacity analysis at an unsignalized intersection is defined in terms of average total delay per vehicle for each minor movement and is reported as Level of Service. The delay for any particular minor movement is a function of the capacity of the approach and traffic volume.

Level of Service Criteria for Unsignalized Intersections:

Level of Service	Average Total Delay/vehicle	Description
A	≤ 5.0 seconds	Little or no delay. Little or no safety concerns for vehicles entering/exiting traffic flow of major street.
B	> 5.0 ≤ 10.0 seconds	Short traffic delays. Some conflicting traffic on major street presenting minor safety concerns.
C	> 10.0 ≤ 20.0 seconds	Average Delays. Conflicting traffic on major street will present some safety concerns.
D	> 20.0 ≤ 30.0 seconds	Long traffic delays. Conflicting traffic volume on major street presents moderate safety concerns.
E	> 30.0 ≤ 45.0 seconds	Very long traffic delays. Conflicting traffic volume presents increasing safety concerns.
F	> 45.0 seconds	Extremely long total delays. Conflicting traffic volume presents substantial safety concerns.

Source: Highway Capacity Manual, Third Edition, Transportation Research Board, 1994.

The following 10 intersections were operating at a level of service C or better, indicating that drivers experienced average delays during peak hours: Optical Avenue, Keene (signalized), Chesham Road and NH 137 in Dublin; Elm Street (A.M.) and NH 123/Old Street Road (A.M.) Peterborough; NH 45, Temple; NH 31 South, Abbott Hill Road, and NH 31 North, Wilton; and Wilton Road, Milford.

The following 5 non-signalized intersections had movements operating at a level of service D or below, indicating that drivers experienced long to very long delays during peak hours:

Location	Period	Movement	LOS
Swanzey Factory Road, Keene *T - intersection*	A.M. Peak Hour 7:15 - 8:15 P.M. Peak Hour 4:45 - 5:45	NB Left & Right NB Left & Right	E D
NH 124, Marlborough *T-intersection*	AM Peak Hour 7:15 - 8:15 PM Peak Hour 4:45 - 5:45	NB Left & Right NB Left & Right	F F
Elm Street, Peterborough	P.M. Peak Hour 4:30 - 5:30	SB Left, Thru & Right	D
US 202 North/Granite Street, Peterborough	A.M. Peak Hour 8:00 - 9:00 P.M. Peak Hour 4:30 - 5:30	SB Left SB Left	D F
NH 123/ Old Street Road, Peterborough	P.M. Peak Hour 4:30 - 5:30	NB Left, Thru & Right SB Left, Thru & Right	E E

The following 2 signalized intersections had movements operating at a level of service D or below, indicating that drivers experienced long to very long delays during the peak hours:

Location	Period	Overall LOS	Movement	LOS & v/c Ratio
NH 101A, Milford *Actuated Signal*	A.M. Peak Hour 7:15 - 8:15	C	NB Left NB Left & Thru SB Left SB Thru & Right EB Left WB Left	D v/c = .704 D v/c = .574 D v/c = .219 D v/c = .565 D v/c = .144 D v/c = .202
	P.M. Peak Hour 4:30 - 5:30	D	NB Left NB Left & Thru SB Left SB Thru & Right EB Left EB Thru WB Left WB Thru	D v/c = .848 D v/c = .833 D v/c = .127 D v/c = .368 D v/c = .291 D v/c = .640 D v/c = .311 D v/c = .793

US 202 South/Grove Street, Peterborough *Actuated Signal*	A.M. Peak Hour 8:00 - 9:00	D	EB Left WB Left NB Left NB Thru & Right SB Left SB Thru & Right	D v/c = .411 D v/c = .519 D v/c = .351 D v/c = .700 D v/c = .195 D v/c = .609
	P.M. Peak Hour 4:30 - 5:30	D	EB Left EB Thru & Right WB Left NB Left NB Thru & Right SB Left SB Thru & Right	E v/c = .644 D v/c = .670 D v/c = .764 E v/c = .786 E v/c = .957 D v/c = .656 D v/c = .802

Intersections with poor safety records (10 or more accidents/period) include:

Intersection:	# of Accidents	Period
Swanzey Factory Road, Keene	23 accidents	1993-1997
NH 123/Old Street Road, Peterborough	20 accidents	1993-1997
NH 45/Webster Highway, Temple	11 accidents	1993-1997
NH 101A, Milford	18 accidents	1991-1997

- **Two-Lane Highway Capacity Analysis**

Traffic volumes on rural two-lane highway facilities such as NH 101 rarely challenge the capacity of the facility (Transportation Research Board, 1994) . For example, the theoretical capacity of a two-lane highway with 12-foot lanes and 10-foot shoulders, such as NH 101 in the vicinity of the Dublin/Peterborough town line, is 20,000 vehicle per day – the observed volume there is less than half that. Field observations of several segments of NH 101 conducted in the Summer of 1998 suggest that current traffic volumes do not exceed the highway's capacity.

Determining capacity for two-lane highways is complex as capacity varies with terrain and passing restrictions. Highway capacity analyses for peak travel periods were not conducted in this study. According to a recent NH DOT highway capacity analysis study based on 1997 p.m. peak period traffic, most segments of NH 101 are operating at stable flow (LOS C-D) during the p.m. peak. Three segments of NH 101, 1) South Keene, 2) between Grove Street and NH 123 in Peterborough, and 3) from Temple Road in Wilton eastward to NH 101A in Milford, experience unacceptable delay, or forced flow, (LOS E-F) during the p.m. peak. Reconstruction for capacity and safety are currently proposed for the South Keene segment.

The following chart explains the level of service criteria used for two-lane highway facilities. Capacity analysis for two-lane highways is defined in terms of percent time delay. Percent time delay is defined as "the average percent of the total travel time that all motorists are delayed in platoons while travelling a given section of highway" (TRB, 1997).

Level of Service Criteria for a General Two-Lane Highway Segment:

Level of Service	Percent Time Delay	Description
A	Drivers would be **delayed no more than 30% of the time** on the average by slow-moving vehicles.	Represents highest quality of traffic service where average speeds approaching 60 mph are possible on level terrain, passing demand is well below passing capacity, almost no platoons of three or more vehicles are observed. A max. flow rate of 420 pcph* total in both directions is possible under ideal conditions.

B	Drivers would be **delayed no more than 45% of the time** on the average by slow-moving vehicles.	Average traffic flow speeds of 55 mph or greater are possible on level terrain. Passing demand may become significant and the number of platoons forming increases dramatically above the max. flow rate of 750 pcph.
C	Drivers would be **delayed no more than 60% of the time** on the average by slow-moving vehicles.	Traffic flow remains stable however there are noticeable increases in platoon formation and size. While traffic speed may still exceed 52 mph on level terrain, unrestricted passing demand exceeds passing capacity. A service flow rate of 1,200 pcph total is possible.
D	Drivers would be **delayed no more than 75% of the time** on the average by slow-moving vehicles.	Traffic flow is approaching unstable conditions, mean platoon sizes of 5-10 vehicles are common and passing becomes extremely difficult. Turning vehicles cause major shock-waves in the traffic stream. There is a high probability of flow breakdown when flow rates exceed 1,800 pcph.
E	Drivers would be **delayed more than 75% of the time** on the average by slow-moving vehicles.	Traffic flow speeds drop well below 50 mph and may be as low as 25 mph on sustained grades. Passing is virtually impossible and platooning becomes intense. The highest traffic volume attainable is 2,800 pcph, which defines the capacity of the highway.
F	Drivers would be **delayed 100% of the time** on the average by slow-moving vehicles.	Traffic demand exceeds capacity and is represented by a heavily congested flow.

* passenger cars per hour
Source: Highway Capacity Manual, Third Edition, Transportation Research Board, 1997 Update.

- **Origin and Destination Surveys**

Origin and destination surveys were conducted at the three principal points of ingress and egress in the corridor - the intersections of Optical Avenue, Keene; US 202/Grove Street, Peterborough; and NH 101A, Milford. The surveys were conducted during the hours of 6:30 a.m. and 9:00 a.m. and 4:00 p.m. and 6:30 p.m., on the days July 16 and 30; July 15; and July 9, 1998; respectively. The data collected included trip origin, destination and purpose, vehicle occupancy, driver seat belt use, and state of vehicle registration. A total of 5,441 drivers were surveyed.

Thirty-three percent of trips had both an origin and destination in the corridor; 23% of trips originated in the corridor and had a destination outside of the corridor; 25% of trips originated outside of the corridor and had a destination in the corridor; 20% of trips were through traffic with an origin and destination outside of the corridor.

About 50% of trips were daily commutes, 36% were personal business or errands, and the remaining 14% were recreational and business travel. Of the daily commuter trips, 36% had both an origin and destination within the corridor, 19% originated in the corridor and ended within 15 miles of the corridor, 21% originated within 15 miles of the corridor and ended in the corridor, and about 10% was through traffic with both an origin and destination within 15 miles of the corridor. Of the personal business or errand trips, 38% had an origin and destination within the corridor, 17% originated in the corridor and ended within 15 miles of the corridor, 18% originated within 15 miles of the corridor and ended in the corridor, and about 7% was through traffic with both an origin and destination within 15 miles of the corridor.

Other observations include:

- about 95% of the vehicles surveyed were passenger cars, vans, and motorcycles and 5% were heavy trucks;
- most vehicles surveyed (74%) were occupied by only the driver;
- vehicles with two or more occupants tended to be families or work crews;
- only 60% of drivers were wearing a seatbelt; and
- the majority of vehicles registrations were State of New Hampshire .

- **5-Year Accident Records**

State of New Hampshire accident records for the years 1993 – 1997 (some reports for Wilton and Milford are for years 1991 – 1997) were integrated with the SWRPC GIS. A total of 587 accidents were reported on NH 101, 7 involved fatalities. Accident data were used as a principal criterion in identifying hazardous road segment and intersections (*Traffic Summary, maps 2a-d*). Groupings of more than 10 accidents for the five-year period identify priority problem areas:

LOCATION	ACCIDENTS
Intersection of Swanzey Factory Rd, Keene	23
Water St. to Terrace St., Marlborough	15
Jewett St. to Ryan Rd, Marlborough	13
Cemetery Cove, Dublin	11 - 1 fatal
Vicinity of Upper Union St, Peterborough	12 - 1 fatal
Vicinity of Old Dublin Rd., Peterborough	10 – 1 fatal
Vicinity of Elm St., Peterborough	10
Intersection of NH 123, Peterborough	20
Vicinity of Miller State Park, Peterborough	11
“S-curves” east of NH 45, Temple	18 - 2 fatal
Intersection of NH 101A, Milford	18

Accidents tend to be grouped at locations with the following characteristics on NH 101:

1. Poor sight distance at intersections whereby traffic entering or crossing from side roads can neither see nor be seen by traffic traveling at high speeds on NH 101;

2. Extreme vertical and horizontal curvature of the NH 101 surface causing unsafe conditions at high speeds or under poor weather conditions;

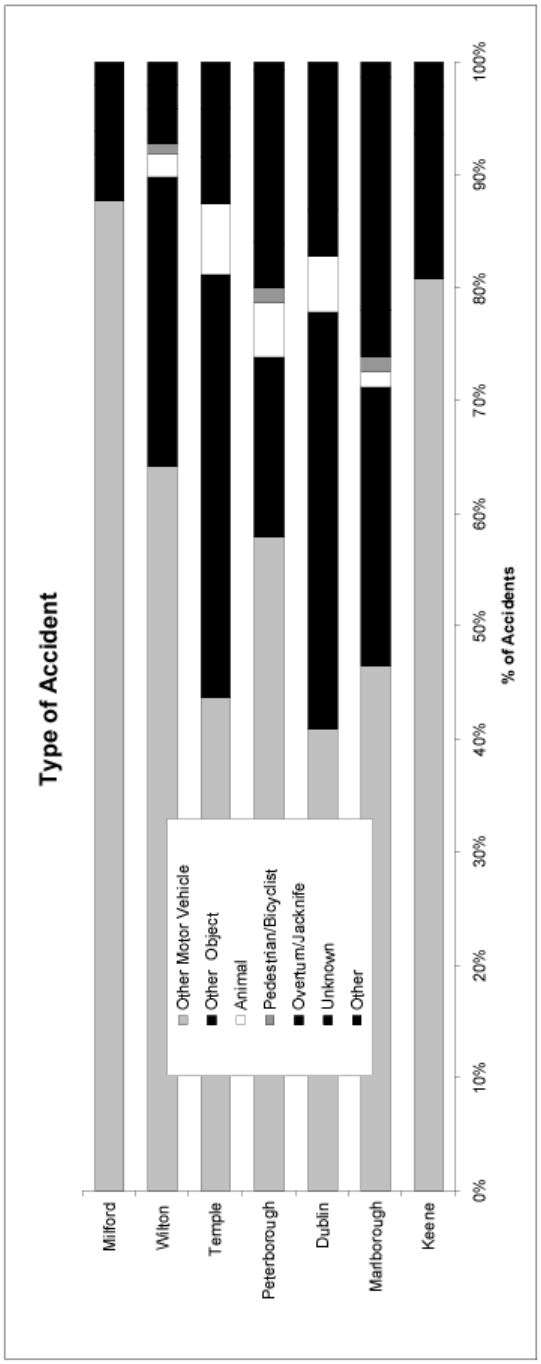
3. Intersections where left turn traffic leaving NH 101 is forced to stand in and negotiate high volumes of high speed traffic; and

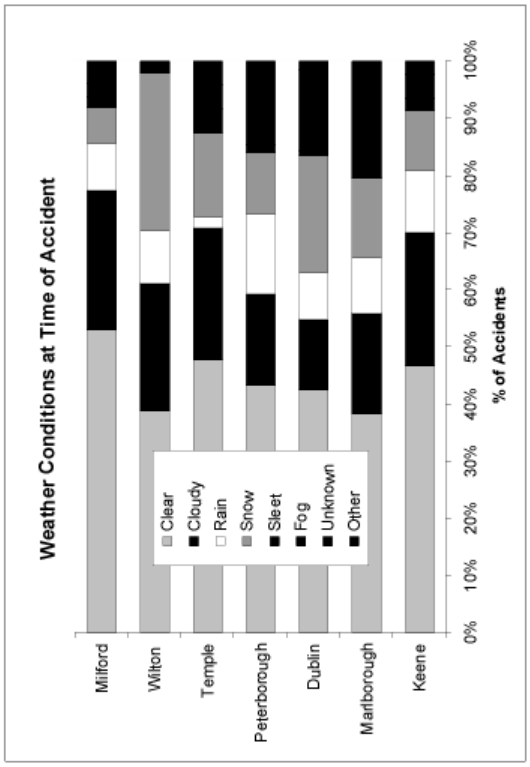
4. Road segments with truck climbing lanes where poor judgement and impatience by drivers cause dangerous decisions to attempt to pass slower traffic too near the end of the passing lane or conflict with turning traffic.

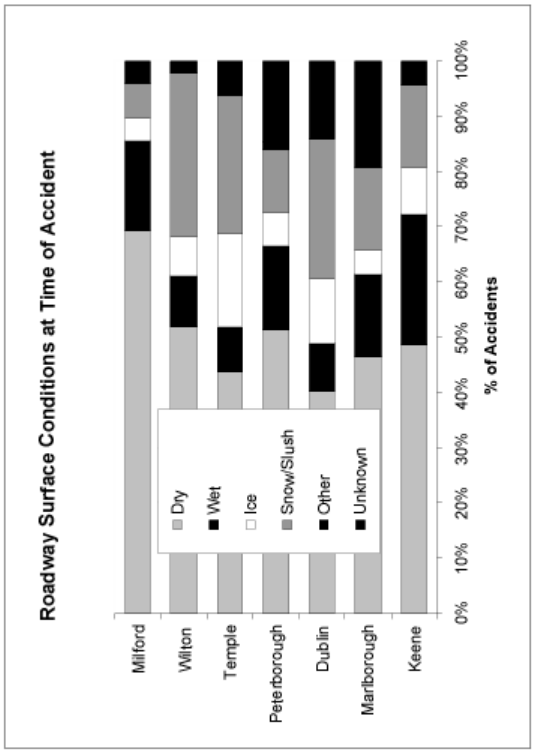
In most cases, over-confidence by drivers regarding the safe speed for weather and highway conditions seems to be involved with accidents on NH 101. Unexpected changes in roadway conditions for visitors also may contribute to high accident rates. Figure 3. presents proportions of accidents by type.

Figure 3

NH 101 Traffic Accidents Reported in NH DOT GIS Database, 1993-1997







Highway

Information regarding highway geometry, right-of-way, pavement management and traffic operations data from NH DOT Bureau of Right-of-Way, Bureau of Transportation Planning and NH DOT District 4 was compiled and reviewed. The project-specific nature of the information (i.e., for construction projects) and the unavailability of the information in electronic format render analysis or description of these variables on a corridor-wide basis infeasible. However, the information is part of the SWRPC information base and will be used in discussions and design of local highway improvements.

In summary, the pavement dimensions, highway vertical and horizontal curvature, safety facilities, and right-of-way characteristics (dimensions, ownership and level of access control) vary throughout the corridor. Right-of-way conditions range from uncertain ownership status between the Cheshire Rail Road and Branch Road in Keene to 4.8 miles of controlled access right-of-way between NH 137 in Dublin eastward past Elm Street in Peterborough and another short segment of controlled access in western Wilton.

Dates and descriptions of significant reconstructions and re-alignment of NH 101 in the study area during the past 45 years (1950-1995) follow:

Year	Town	NH Project #	Description
1963	Keene	P-3435-C	Keene Bypass
1984	Marlborough	P-2868	Main Street Upgrade
1984	Marlborough	P-2919	Bridge Replacement over Minnewawa
1975	Marlborough/Dublin	P-2213	Road Upgrade: Ryan Rd. – Chesham Rd
1981	Dublin	P-2952	Bridge & Road Upgrade: Howe Reservoir
1966	Dublin/Peterborough	P-7333	Realignment: NH 137- Peterborough TL
1958	Peterborough	P-3270	Peterborough Bypass: Dublin TL-Granite St
1964	Peterborough	P-7327	Upgrade: Pine St. – NH 123
1979	Temple	Betterment	Bridge Upgrade: NH 45
1962	Temple	P-4864	Upgrade: east of Temple Mountain
1951	Wilton/Milford	P-2051-A	Wilton Bypass
1986	Milford	P-2225	Intersection Improvement: Wilton Rd.
1995	Milford	P-11483	Intersection Realignment: Wilton Rd.

Environmental and Land Use

The location and qualities of cultural and natural environmental resources in the study area were researched. Resources were considered in three perspectives:

- resources with statutory standing under NH or federal law;
- landscape characteristics which impose physical limitations on development; and
- those attributes of the natural and social landscape that impart community character, principally visual character.

Resources having statutory standing include surface water, wetlands (hydric soils), floodplain, resources included in the NH Natural Heritage Inventory (rare and endangered plant and animal species, rare or special ecological communities and archeological resources), historic resources, and public recreation land or other public projects created with US Department of Interior funds or

Community Development Block Grant funds. These resources have protected status under the National Environmental Policy Act, whereby projects using federal funds must avoid, minimize and/or mitigate diminution of the protected resources. Surface water and wetlands are also protected by state environmental law. Floodplains may also invoke local stipulations or limitations on development (*Cultural and Natural Resources, maps 3a-d*).

Two rare plant species are indicated within the study area, both associated with wetlands or surface water. No archeological resources have been documented within the study area by the Department of Historical Resources. Historic Resources are abundant, ranging from buildings and areas locally considered to be important elements of local heritage to delineated districts and documented buildings recognized as important by the National Register of Historic Places. Historic resources identified within the study area are tabulated below, where potential historic districts are denoted with "*" and historic resources recognized by the National Register of Historic Places are denoted with "#".

Keene — SOURCE: NH DHR

Cheshire Rail Road Stone Arch Bridge
South Keene Area *

Marlborough — SOURCE: Marlborough Historical Society, NH DHR

Depot Street Area *
Little Canada Area *
Water Street Area *
Brig Knight House
Monadnock Blanket Mill Site
Buss/Hodgkins Machine Shop
Charles Beauregard House
Community House
Edgar Robinson Farm
Federated Church
Fisk Mill
Frost Free Library
Legion Hall
Maynard Gates House
Odd Fellows Hall
The Power House
Pine Grove Cemetery
Graniteville Cemetery
Roland Whitney House
Susie Knight House
The Giguere Home
The Croteau Home
NH 124/Laurel St./Pleasant St. Area *
Ludger Beauregard House & Store
McGrath Studios (former School #8)
The Green Home
The Russell Home (former parsonage)
The Shelley Home
The Thomas Home
The Woodward Home
Whtiney Brothers Factory Site
Former Valley Woolen Mills Site
Willette's Garage

Dublin — SOURCE: Dublin Historical Society, NH DHR, and National Register of Historic Places

Dublin Lake Historic District #
Dublin Village Historic District #
Asa Morse Farm/Monadnock - Farm #2 #
B. Marshall /Drury Morse House
Brackett House #
Capt. Samuel Allison House #
Catlin House#
Dublin Inn/M. Greenwood
Dublin Town Hall #
Henry Strongman House #
Isaac Greenwood House #
James Robbe, Jr. House #
Markham House #
Mary Ann Wales House#
Mason House/British - Summer Embassy#
Micajah Martin Farm/Asa Powers #
Richard Strong House#
Richard Strong Cottage #
Spur House #
William Strongman House #
Wood House #

Peterborough — SOURCE: Peterborough Historical Society

Black Swan Building
Bleak House
Juniper Hill
Knights Homestead
Pelletier Property
Peteridge
School House #3
Summerhill
Temple Ski Area
Tewksbury Brackett House
Wilson Tavern

Temple	SOURCE: A History of Temple; NH DHR

Child-Hadely-Odell House	Heald-Hedman-Kullgren House	Lowell-Wheeler-Murphy House
Griffin-Wheeler-Devaron House	Jewett-Kendall-Anderson House	School House #4/Buck House
Heald Bragdon Register House	Johnson-Pratt-Whitcomb House	Wheeler House 1939
Heald-Edwards-Kullgren House	Kilam-Quinn House	

Wilton	SOURCE: NH DHR, and National Register of Historic Places #

Wilton Public and Gregg Free Library #	Wilton Meeting House

Milford	SOURCE: Milford Historicall Society

Colonial Boundary Monument	Jones Crossing Bridge (Green Bridge)
County Bridge	Pine Valley School
Hillsborough Mills	Tavern (Proctor & Greene Offices)

Another set of environmental conditions that may invoke either statutory requirements and/or financial liability compiled for this Study are known and potential contaminant releases, typically subsurface releases. This set includes “groundwater threats” such as leaking underground storage tanks, superfund sites, and landfills; “National Pollution Discharge Elimination System” permitted facilities; and “non-point source pollution” sources such as junkyards, fuel storage tanks, and snow dumps. In general, these data tend to aggregate in village centers.

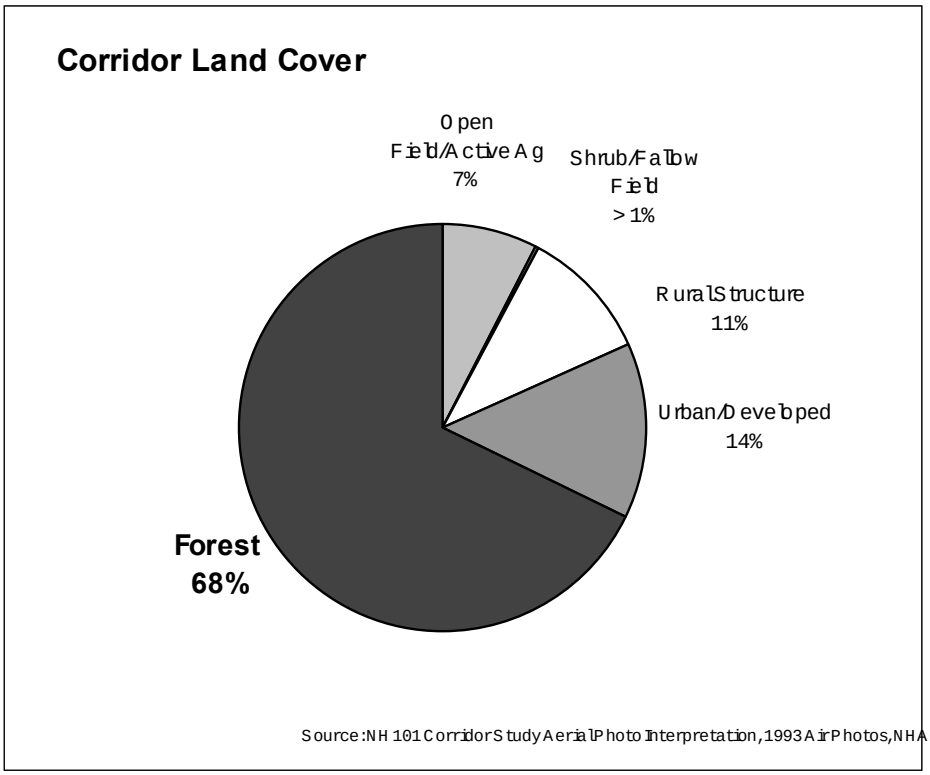
Physical limitations in this study are defined as land with slopes greater than 25% (conventionally considered to be severe slope requiring exceptional engineering and cost for construction of roads and buildings), surface waters and hydric soils. About 67% of the 8,000-acre study area is free of severe constraints. Hydric soils comprise about 3% of the land area, surface water another 6% and less than 1% is floodway. Excessively steep slopes occur on 24% of the land area (Figure 4).

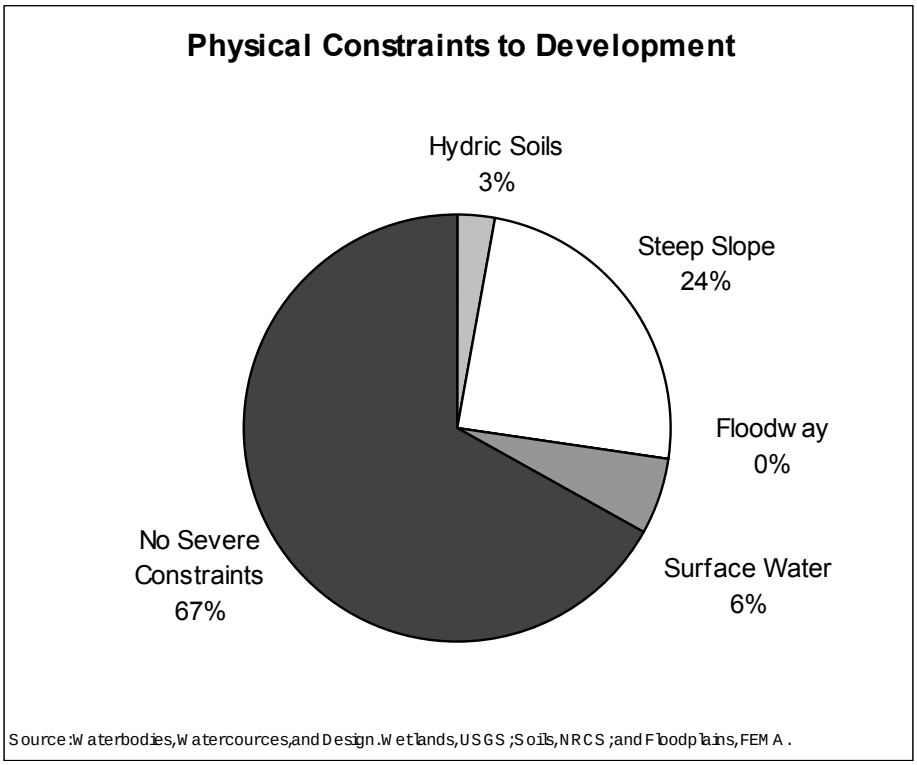
To address the suite of variables collectively known as community character a land cover data base was added to the previous resource inventories. The land cover data were generated by manual delineation of six basic cover types from 1993 high altitude aerial photography: urban/suburban development (areas with contiguous developed properties of 2 acres or less in size – villages and subdivisions, also recreation areas such as golf courses); rural development (structures of any kind distributed other than above); open field (typically under active agriculture for pasture, hay or crops; and three forest types: mixed forest, coniferous, and scrub/shrub (*Land Cover, maps 4a-d*). Land uses associated with the identified rural structures buffered to include a 2-acre area of impact account for 11% of the study area and urban/suburban development another 14%. Only 7% of the study area is under active agriculture and 68% is undeveloped forest land (Figure 4).

Land use ascribed to individual properties using municipal tax assessors’ data was also used to characterize community character and development patterns. These data allow quantification of square feet of commercial and industrial floor space and numbers of housing units in the study area – both basic variables for understanding traffic demand. These data were also the basis for projections of future land use or demand for future development in the study area (*Existing Land Use and Development Potential, maps 5a-d*). The following table presents data for properties intersecting the study area.

Figure 4

Land Cover and Physical Constraints to Development
NH 101 Corridor Study Area





TOWN	TOTAL ACRES*	# HOUSING UNITS	SQ.FT. COMMERCIAL & INDUSTRIAL
Keene	908	101	237,047
Marlborough	1,620	557	55,677
Dublin	4,600	176	- na -
Peterborough	3,156	536	264,224
Temple	2,437	54	17,750
Wilton	2,631	484	260,114
Milford	319	48	219,857
TOTALS	**15,671**	**1,956**	**1,054,669**

* The total acreage represented in the above table is greater than the approximately 8,000-acre study area due to the inclusion of the entire area of properties that may extend beyond the 1,000-foot corridor boundary.

Demographics and Economics

Demographic and economic variables are used here to characterize the individual communities and the corridor as a whole in socioeconomic terms -- the social geography of the study area. Understanding recent trends in population and housing, employment, and commercial activity are also helpful for understanding possible and likely future trends.

Population and housing statistics generated by the US Census Bureau and the NH Office of State Planning were compiled for this study. The following table presents 40-year statistics for populations in the corridor towns (Figure 5).

POPULATION Source: 1990 US Census

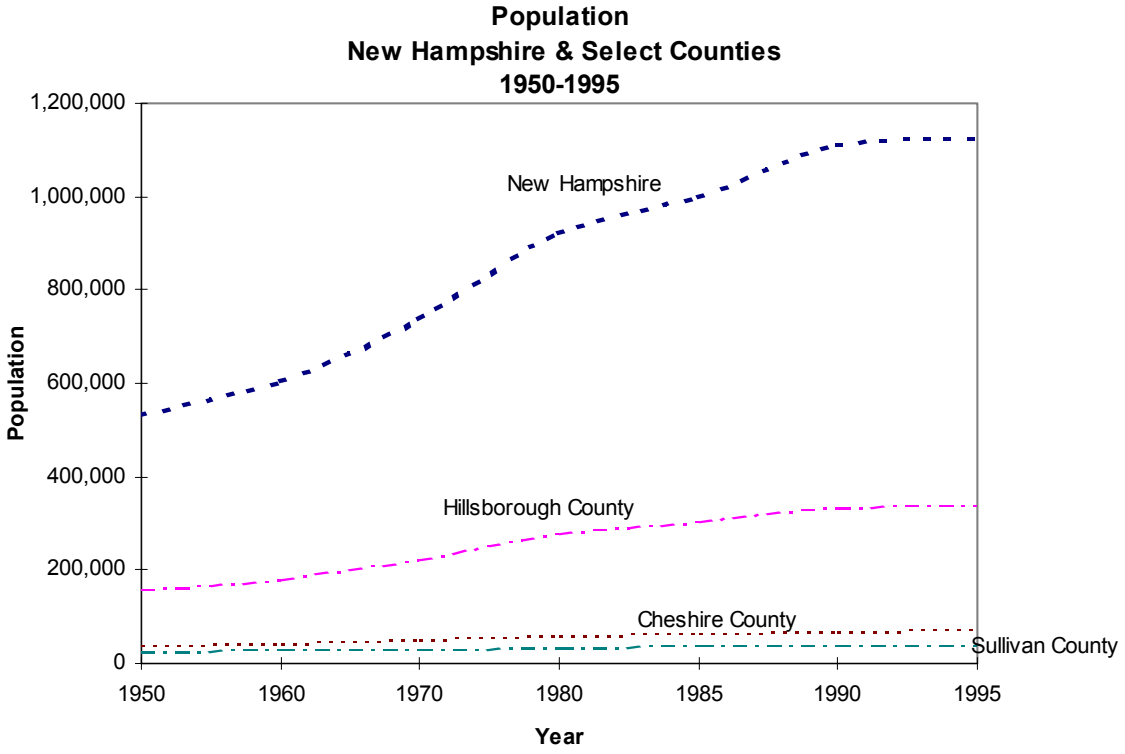
TOWN	1950	1960	1970	1980	1990
Keene	15,638	17,562	20,467	21,449	22,430
Marlborough	1,561	1,612	1,671	1,846	1,927
Dublin	675	684	837	1,303	1,474
Peterborough	2,556	2,963	3,807	4,895	5,239
Temple	330	361	441	692	1,194
Wilton	1,952	2,025	2,276	2,669	3,122
Milford	4,159	4,863	6,622	8,685	11,795
Cheshire Co.	38,811	43,342	52,364	62,116	70,121
Hillsboro Co.	156,987	178,155	223,941	276,608	336,073
State of NH	533,110	606,400	737,681	920,610	1,109,525

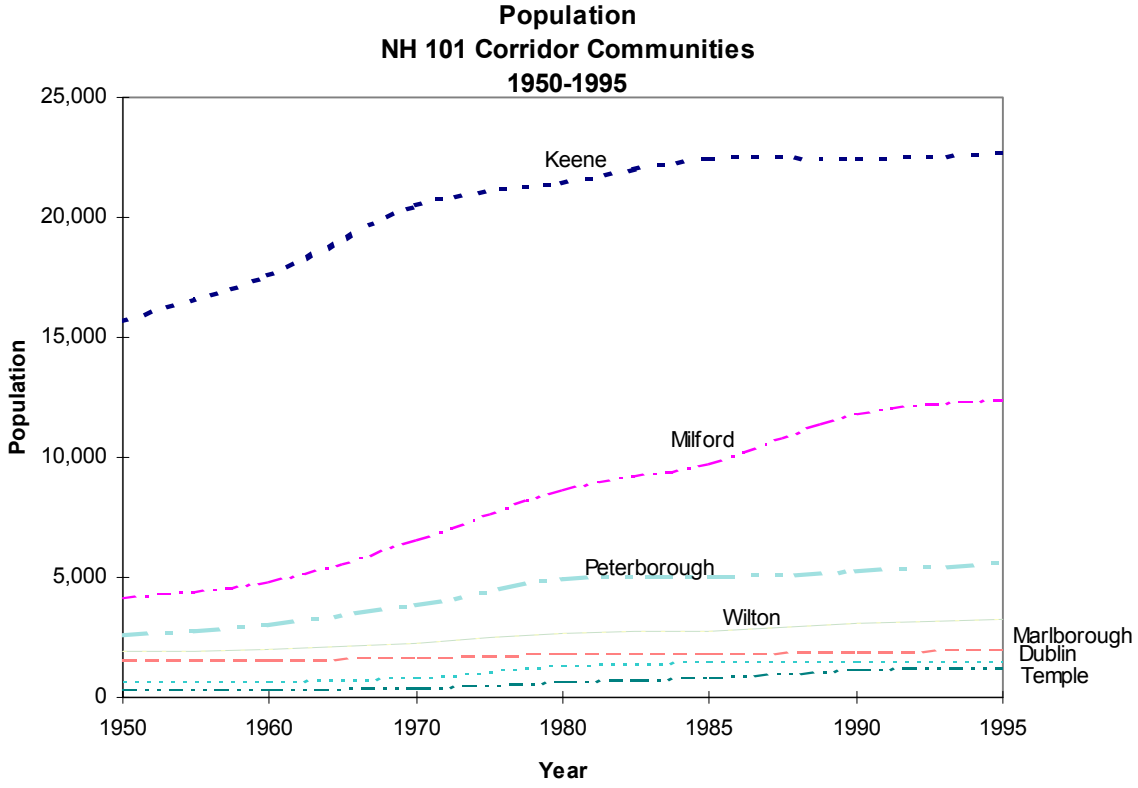
The following table presents 20 year statistics for housing units in the corridor towns.

	HOUSING UNITS			10-Year % Change	
TOWN	1970	1980	1990	1970-1980	1980-1990
Keene	6,823	7,934	8,841	16.3%	11.4%
Marlborough	590	703	856	19.2%	21.8%
Dublin	265	491	651	85.3%	32.6%
Peterborough	1,348	1,952	2,242	44.8%	14.9%
Temple	139	252	429	81%	70%
Wilton	804	904	1,251	12.4%	38.4%
Milford	2,237	3,238	4,793	44.7%	48%

Figure 5

Population Trends
1950-1995





Employment and commuter data used in this Study was extracted from the 1990 U.S. Census and the 1994 NH DES publication New Hampshire Commuting Patterns. As discovered in the origin and destination surveys, daily commuter traffic creates a significant component of demand for highway capacity in the NH 101 Corridor. Accordingly, employment and commuter pattern statistics for the Corridor towns are used in concert to characterize individual towns and relationships among towns (see Figure 6).

The graphics in Figure 6 show that within the NH 101 Corridor, Keene, Peterborough and Milford are job centers, where more workers commute in to work than residents commute out to other towns. A third graphic in Figure 6 also illustrates steady growth in numbers of workers and commuters on the road in the 20 years between 1970 and 1990.

Review of municipal property valuations (see Figure 7) during the period 1990-1997 corroborates the characterization of commercial and residential development in the Corridor towns using worker and commuter statistics. The towns can easily be arrayed in a continuum based on a comparison of residential to commercial/industrial valuations ranging from a high ratio of residential to commercial valuations in Temple to a more balanced ratio of commercial to residential valuation in descending order from Keene, Milford, Peterborough, Wilton, Marlborough, Dublin and Temple.

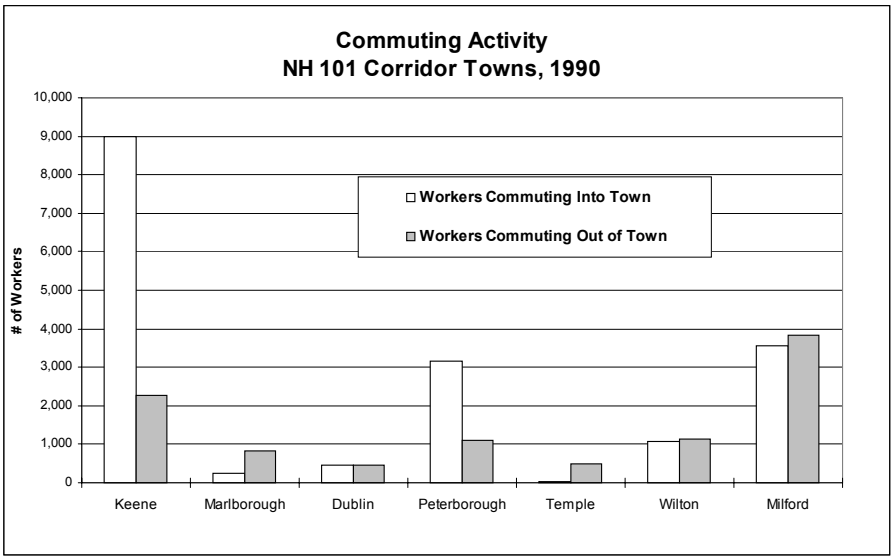
Business Activity and Characteristics

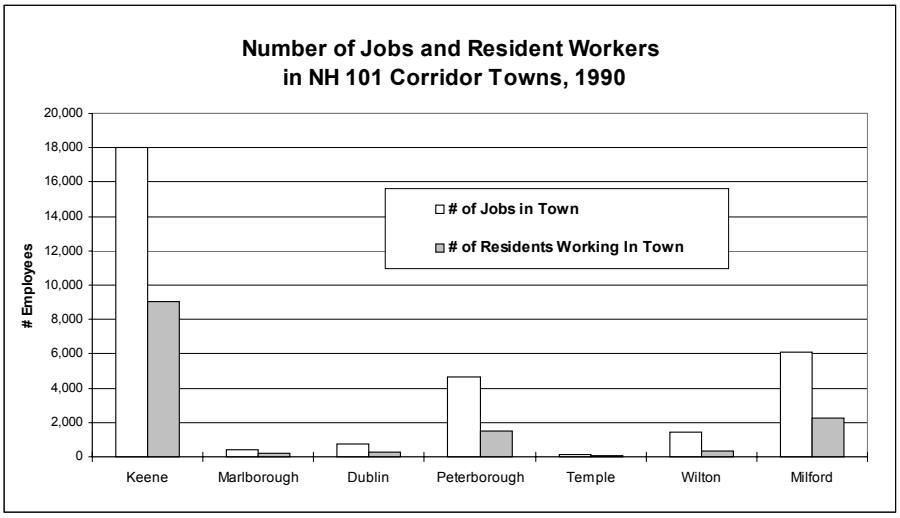
A telephone survey of owners of businesses on properties adjacent to NH 101 was conducted in the Spring of 1998. The data collected included type of business, size of work force, satisfaction with municipal services, tenure at the current location, customer activity, shipping and receiving activity, plans for change during the next 5 years and business owners' opinions regarding NH 101 relative to their business and community. A total of 201 businesses along NH 101 and US 202 were contacted - 138 business owners participated in the survey.

- Two-thirds of the businesses surveyed were retail or service businesses.
- The majority of businesses surveyed were of moderate size: 75% of businesses have a work force of 10 or less; about 60% of businesses have less than 5,000 square feet of floor space.
- About 37% of businesses have been at their current location for 5 years or less; 24% have been at their current location for 6 - 14 years and 36% have been at their current location 15 years or more.
- In general, business owners reported that they chose to locate on NH 101 due to the visibility provided by high traffic volumes and access of NH 101.
- Nearly half of the businesses surveyed indicated that they do not rely on pass-by traffic for their customer base. The majority of businesses have less than 30 customer visits per day and 18% of businesses conduct their business via the telephone, etc. and do not have customers regularly visiting the business.
- About 70% of businesses are affected by the season of the year - with the summer months being the busiest - and 40% are affected by the time of day and day of week - with Friday afternoons and Saturdays being the busiest.

Figure 6

NH 101 Corridor Commuter Activity





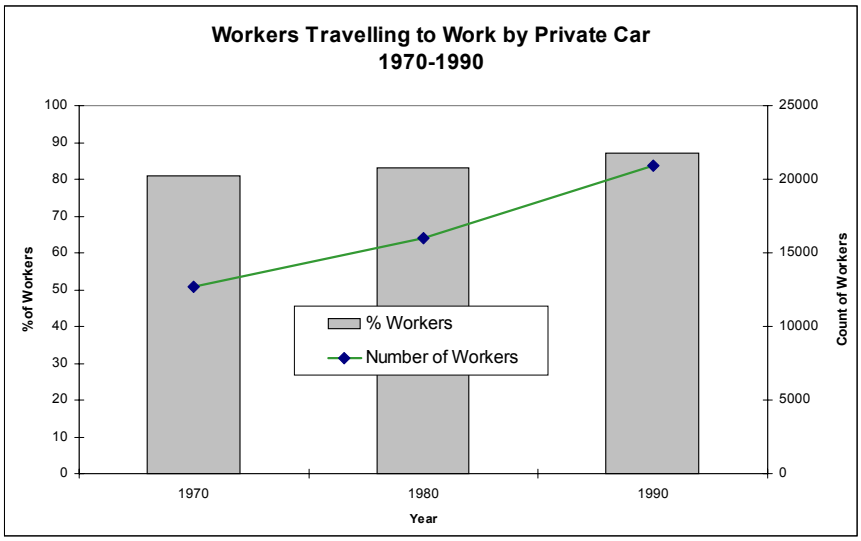
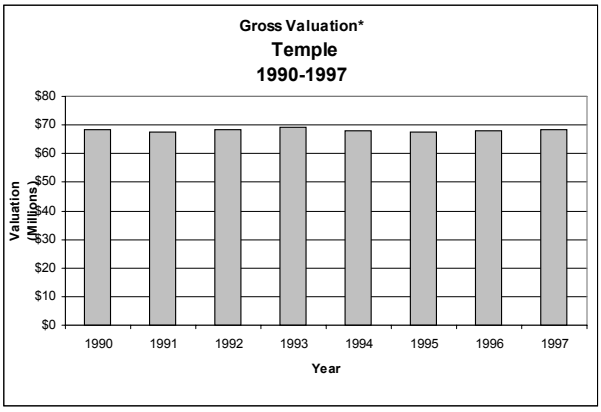
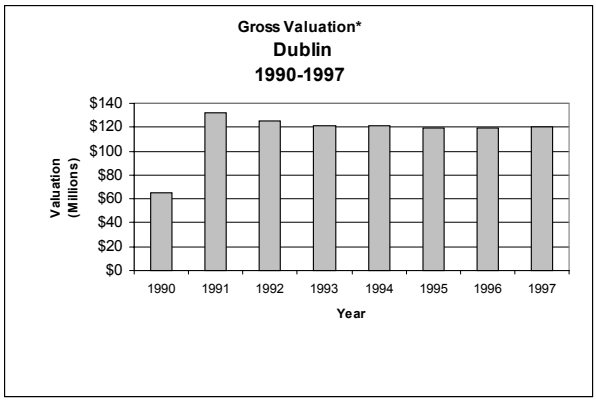
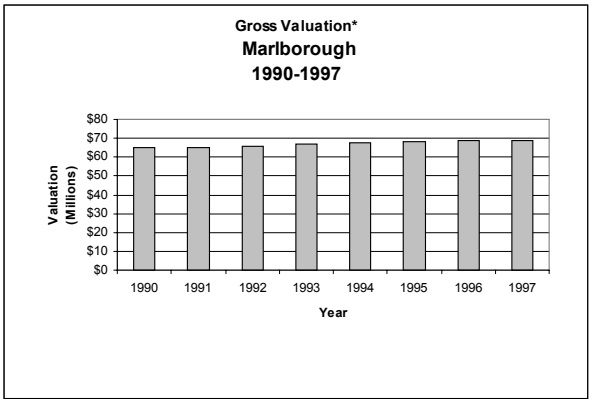


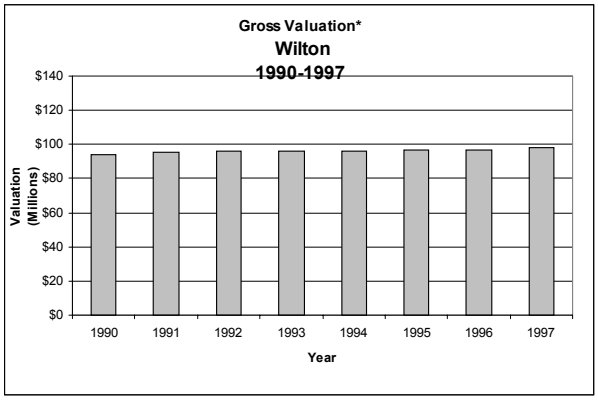
Figure 7

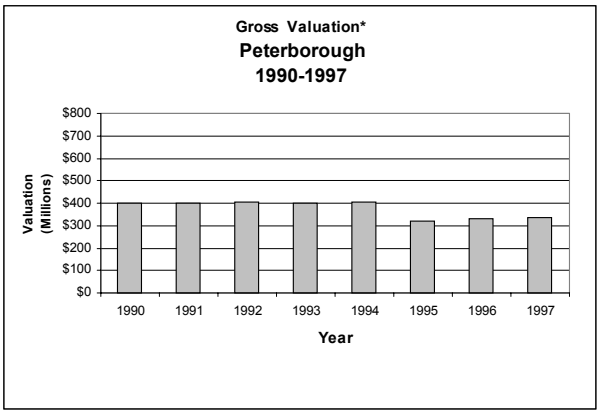
Property Valuation Trends: 1990-1997
Residential and Commercial/Industrial Land

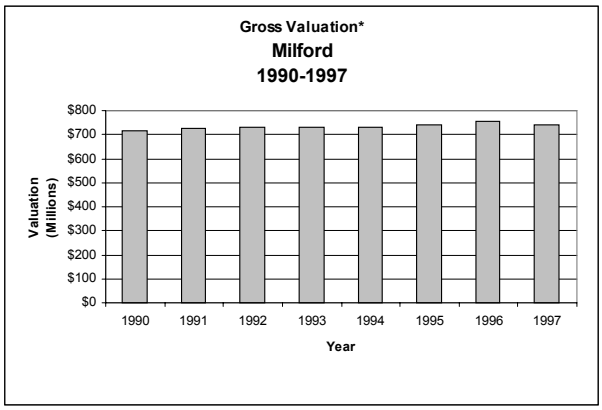


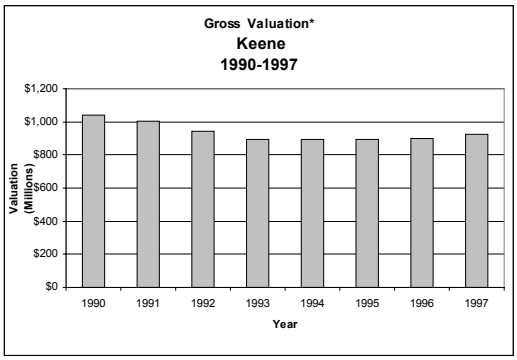












- The majority of businesses receive but do not ship freight. About 70% of businesses receive fewer than 10 shipments per week, with the most frequently reported mode of shipment being panel truck.

- About 60% of businesses indicated that they had no plans for change over the next five years regarding the size of their work force, production level, sales receipts, floor space, shipping rate, or demand for utilities.

- Several business owners reported that the highway was important for their economic success.

- Business owners generally supported the use of shared driveways as a safety measure.

Community Planning

Local land use and development plans, policies and regulations of the seven corridor towns were reviewed for reference to transportation infrastructure, the relationship between highways and development patterns, or specific reference to NH 101. Such references were infrequent. Master Plan language varied between towns on this matter, ranging from simple acknowledgement of the importance to land use decisions of access to local and state roads to a report prepared by the City of Keene's 1996 Master Plan Committee entitled "Route 101 Corridor Study" which provides very specific recommendations for zoning and site plan standards designed to protect highway safety and capacity on NH 101 in South Keene.

Zoning is an important element of highway corridor management in that it is the public's opportunity to control the kinds and densities of land uses within the corridor. Review of municipal zoning ordinances revealed 33 unique use districts in the study area (*Zoning, maps 6a-d*). The 33 districts were grouped into four generalized use districts:

- rural residential (low density residential, commercial and agricultural uses);
- village (high density mixed uses);
- commercial (exclusively commercial uses); and
- industrial (exclusively industrial uses).

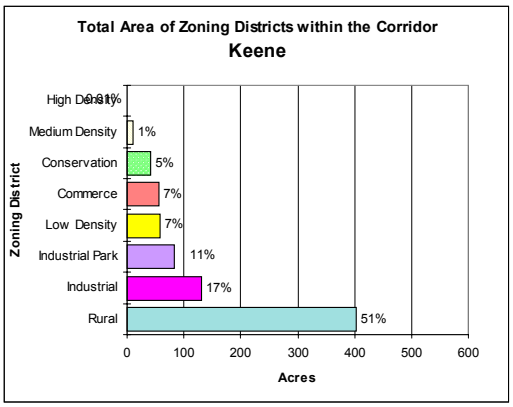
Most of the study area (70%) is subject to zoning standards generally known as rural residential and another 20% has "village" use standards (Figures 8 and 9). Theoretically, development patterns result from the interaction of local zoning standards, physical landscape characteristics and regional economic conditions.

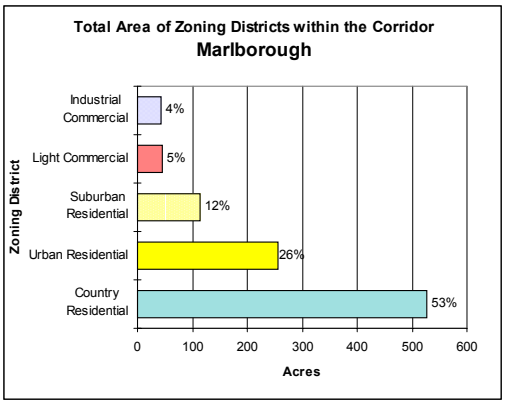
Community Opinion

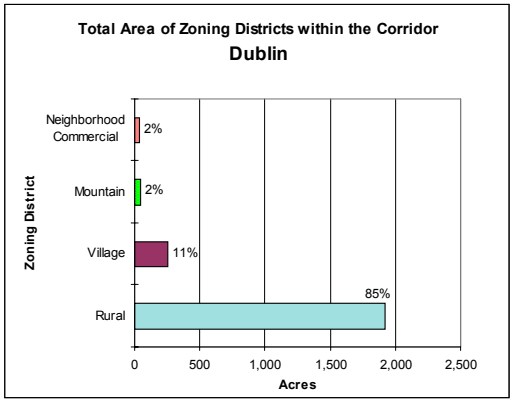
An opinion survey of property owners within the study area was conducted during the Spring of 1998. The Community Survey was designed to gather opinions about existing and future conditions in the NH 101 Corridor from property owners within the Corridor. In May 1998 the survey was mailed to 1,100 resident landowners, business owners and absentee landowners. Respondents were asked to rank traffic conditions within the NH 101 Corridor and indicate whether they felt conditions would worsen over time; indicate their support for improvements to NH 101; evaluate the effect public transportation may have on traffic conditions; and provide their opinions about the use of NH 101 for regional traffic and the effects it may have on the quality of life in communities along the Corridor. By mid-July 1998, 218 completed surveys were returned.

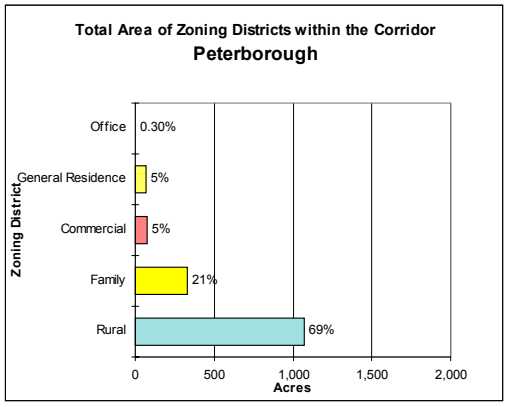
Figure 8

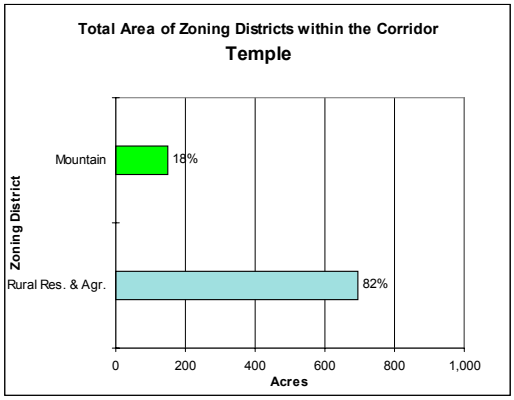
Municipal Zoning Districts in NH 101 Corridor Towns

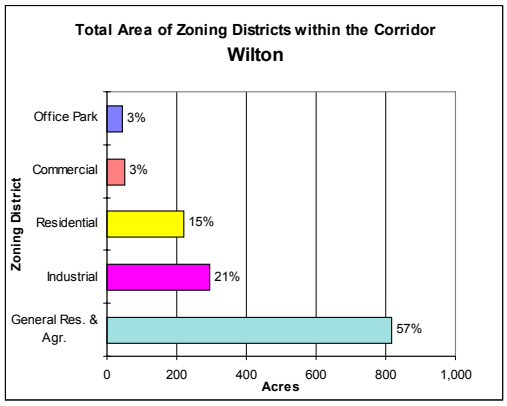












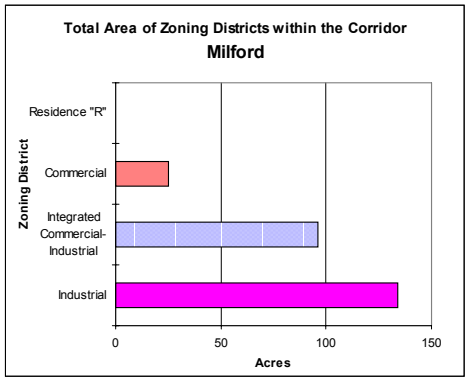
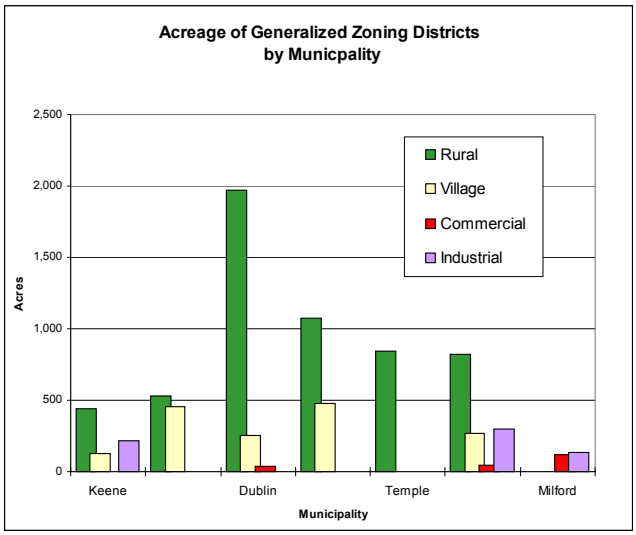


Figure 9

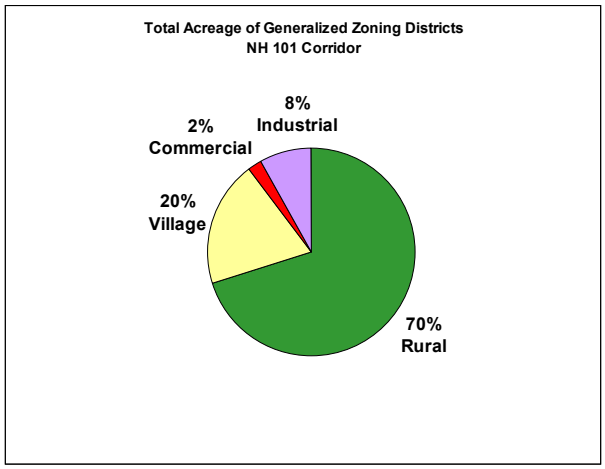
Corridor Zoning Summary - 1998

Municipality	Acreage of Generalized Zoning Districts by Municipality				
	Rural	Village	Commercial	Industrial	Total
Keene	443	125	0	214	782
Marlborough	527	459	0	0	986
Dublin	1967	251	35	0	2253
Peterborough	1075	478	0	0	1553
Temple	843	0	0	0	843
Wilton	818	268	43	295	1424
Milford	0	0	121	134	255
Total Acres:	5672	1581	199	643	8095



Generalized Table of Uses and Lot Requirements by District				
	Rural	**Village**	**Commercial**	**Industrial**
Uses: *	Residential Dwellings Home Occupations Agriculture and Forestry Cultural Facilities & Schools	Retail Consumer Services Offices Residential Dwellings	Retail Consumer Services Offices Wholesale	Manufacturing Offices Research and Development Warehousing/Wholesaling
Lot Requirement	**Ranges:**			
Minimum Lot Size:	1.3 - 5 acres	no minimum - 1.5 acres	20,000 sqft. - 5 acres	no minimum - 4 acres
Frontage:	50 - 350 ft.	no minimum - 200 ft.	150 - 225 ft.	no minimum - 200 ft.
Front Setback:	35- 50 ft.	15 - 50 ft.	30 - 100 ft.	20 - 100 ft.

* List of uses intended only to summarize and characterize general intent of district.



- There was general consensus among business owners, residents and absentee landowners regarding the problematic nature of truck traffic, passenger vehicle traffic, pedestrian safety and traffic turning and entering.

- It was generally indicated that traffic speed, truck volumes, traveler safety, and highway noise are moderate to serious problems.

- Respondents generally predicted that traffic conditions will worsen in the future.

- There was general support for the following roadway improvements: additional shoulders, improvements to major intersections, and additional left turn lanes.

- The survey indicated strong support for shared driveways as a safety improvement.

- In general, respondents sought little or no change to land use patterns within the Corridor.

- There was no consensus among respondents regarding the effect public transportation may have on traffic conditions with division between beliefs that public transportation would have no effect or a positive effect on traffic conditions.

- Respondents offering their opinions about the use of NH 101 for regional traffic generally acknowledged that it impacted both the economic activity within the corridor and the quality of life enjoyed by residents in the corridor towns.

PUBLIC INVOLVEMENT

The second component of the Study is using the findings of research and analysis for discussion among local officials and the general public about the nature of deficiencies and conflicts in the system comprising the study area. The public involvement component includes the work of the NH 101 Corridor Study Advisory Committee, a series of Local Officials Workshops and informal public information activity.

NH 101 Advisory Committee Meetings

The Advisory Committee comprises representatives of each of the seven Corridor towns, nominated by respective Boards of Selectmen, representatives of the Transportation Advisory Committees of the SWRPC and NRPC, personnel of the NH DOT Transportation Planning Bureau, and engineering staff of the NH DOT Maintenance District 4.

Tom Wright, Chairman	Town of Dublin
Larry Biron	Town of Marlborough
Timothy Fiske	Town of Temple
David Glines	NRPC TAC
Jerry Greene	Town of Wilton
Tom Greenman	Town of Wilton
David Krisch	SWRPC TAC
Rep. Jeffrey MacGillivray	SWRPC TAC
Richard Marshall	NH DOT Planning Bureau
Jack Munn, Jr.	City of Keene
Diane Nilsson	NRPC Commissioner
Bill Parker	Town of Milford
Mike Pillsbury	NH DOT District 4
Peter Ryner	Town of Peterborough

Advisory Committee Meetings and Meeting Topics:

January 22, 1998	Study origins and purposes, study design and Advisory Committee role.
August 25, 1998	Environmental, traffic, highway and socioeconomic data.
October 13, 1998	Traffic research.
December 16, 1998	Land cover, land use, future land use plans and land use controls.
January 20, 1999	Preliminary analysis regarding the highway and land use.
March 17, 1999	Review proceedings of Local Officials Workshops; Develop Study recommendations.
April 28, 1999	Review development potential GIS modeling; Develop Study recommendations.
June 16, 1999	Draft Study Report development.
July 21, 1999	Refinement of the Draft Study Report.

Advisory Committee Meeting Summaries:

January 22, 1998, Peterborough Town House: Staff made a presentation of the origins, purposes, approach, goals and schedule of the project. Committee members were charged with the task of reviewing findings, discussing analyses and shaping the project report as liaison with their constituents. Mr. Tom Wright was appointed Chairman of the Advisory Committee by SWRPC TAC Chairman Kendall Lane.

August 25, 1998, Peterborough Town House: The Committee reviewed GIS maps and data: "NH 101 Corridor Study Base Map", "Flora and Fauna"; "Limitations to Development Indicated by Soil Conditions", "Environmental Threats", "Traffic Data – historic traffic counts and safety records", and "Property Lines and Zoning". Staff presented the findings of the property owners survey and the business owners survey conducted during the Spring of 1998.

October 13, 1998, Peterborough Town House: The findings of the traffic research conducted during the Spring and Summer of 1998 by SWRPC and NRPC staff were reviewed: average daily traffic volumes at 38 locations in the study area, calculated using data collected from 7-day automatic traffic recorders, were reported; the vehicle mix and speed data collected at 21 of the 38 traffic count locations were presented; the results of the Origin and Destination Survey conducted at the intersections of NH 101 and Optical Avenue, US 202/Grove Street and NH 101A during peak a.m. and p.m. travel hours were presented; and the intersection capacity analysis based on the turning movement data collected at 15 intersections in the Corridor were reviewed.

December 16, 1998, Peterborough Town House: The Committee reviewed a land cover map created by standard aerial photo interpretation, identifying rural structures, urban areas, and forest cover within a 1 mile radius of the Corridor. The preliminary build-out analysis for the Town of Marlborough created using GIS technology was presented. The future land use plans and land use controls of the seven corridor towns were discussed.

January 20, 1999, Peterborough Town House: Committee members discussed their perceptions regarding problems within the Corridor and identified possible solutions to those problems. Committee members were asked to assist in scheduling a series of Local Officials Workshops in their respective towns.

March 17, 1999, Peterborough Town House: Staff reviewed the dialogue at the four Local Officials Workshops conducted to-date - Temple, Peterborough, Dublin and Marlborough. Workshops in Keene, Wilton and Milford were scheduled to occur during the months of March

and April. Committee members and staff identified eleven problem areas along NH 101 from Keene to NH 101A in Milford.

April 28, 1999, Peterborough Public Library: Staff reviewed the dialogue which occurred at the Local Officials Workshops in Keene, Milford and Wilton. Recommendations for improving the problem areas were discussed, including the use of local access management as a tool for improving safety and preserving highway capacity. The relationship between the NH DOT driveway permitting process and local zoning regulations was discussed. The Committee will receive the Draft Report for their review by May 26, 1999.

June 16, 1999, Peterborough Public Library: Committee members reviewed the NH 101 Corridor Study Draft Report. Staff summarized the components of the Draft Report and requested that Committee members review the Draft with particular attention to the level of detail presented in each part, including the appropriateness and comprehensiveness of descriptions/graphics, and the recommendations to be presented for public discussion.

July 21, 1999, Peterborough Public Library: Staff reviewed the dialogue which occurred at the June 18, 1999, Dublin Planning Board Public Meeting. The second Draft Report was distributed for Committee review and comment. Staff reviewed the quantitative estimates for development potential produced for the Town of Temple and the City of Keene using the SWRPC GIS. The project schedule for the coming months was discussed – the Draft Report will be released for public review following Committee members' comment on Draft 2 and formal public presentations in the seven Corridor Towns will be scheduled during September. The Final Report will be distributed to Planning Boards, Boards of Selectmen and Town Libraries for public review. The public review period is expected to last up to two months.

Local Officials Workshops

The Study design included three rounds of Local Officials Workshops for the purpose of presenting findings of research and analyses to local officials and the general public and inviting local involvement in 1) defining deficiencies and conflicts within the system and 2) developing locally acceptable responses to identified problems.

Round One. An opportunity for regional Planning Commission staff to make presentations of the purposes and approach of the Study and a summary of findings to-date. An opportunity for local officials to provide staff with an explanation of local perceptions about the role of NH 101 in their community, including opportunities or limitations the highway creates today or in the future.

February 17, 1999	Temple Planning Board Workshop
February 22, 1999	Peterborough Planning Board Workshop
March 4, 1999	Dublin Planning Board Workshop
March 11, 1999	Marlborough Planning Board Workshop
April 6, 1999	Milford Planning Board Workshop
April 26, 1999	Keene Planning Board Workshop
April 29, 1999	Wilton Planning Board Workshop

Round Two. Staff presentation of the draft Study Report to local officials and the general public and invitation for public review and comment regarding draft Report.

Round Three. Staff presentation of the final Study Report to local officials and the general public and initiate implementation of local recommendations.

Local Officials Workshop Summaries:

February 17, 1999: The **Temple Planning Board** indicated that traffic and land issues regarding NH 101 are not high priorities in Temple due to the remoteness of NH 101 from the town center. While the Board believes that topography will limit development along NH 101 in Temple, there is support for using local access management to preserve highway capacity and improve safety. The Board supports improvements to the intersection of NH 45 at NH 101 and the segment of NH 101 east of NH 45 known as the "S-curves". The Board finds value in the purpose and approach of the Corridor Study and looks forward to reviewing the Draft Report.

February 22, 1999: The **Peterborough Planning Board** and citizens in attendance identified several problem areas along NH 101 in Peterborough, including the intersection of NH 123 with NH 101 and the US 202 dogleg. There is mutual support among local officials and interested public regarding the use of access management to improve conditions on NH 101. There is a strong desire to "re-humanize" the NH 101 and US 202 streetscapes. The Peterborough Planning Board finds value in the purposes and approach of the NH 101 Corridor Study and looks forward to reviewing the Draft Report.

March 4, 1999: The **Dublin Planning Board** is concerned that widening NH 101 through Dublin will damage community life. Members generally agreed that widening NH 101 through Dublin would increase traffic speed, especially in Dublin center. The Board indicated that there are several intersections in need of improvement, including the intersections of Upper Jaffrey Road and Old Harrisville Road. Board members expressed interest in using local access management to improve conditions along NH 101 in Dublin. The Board finds value in the purposes of the Corridor Study and looks forward to reviewing the Draft Report.

March 11, 1999: The **Marlborough Planning Board** was joined by members of the Board of Selectmen, Conservation Commission and a group of interested citizens. While there appeared to be consensus among those in attendance regarding a need for improvements to NH 101, the types of improvements needed remains undecided. Safety at the intersection of NH 124 and NH 101 is a concern. The Planning Board supports the proposed improvements to the segment of NH 101 east of Jewett Street to Ryan Road to be scheduled in the State's 10-year program. The Board expressed interest in using local access management as a tool to improve safety and preserve capacity on NH 101. The Board supports the purposes of the project and looks forward to reviewing the Draft Report.

April 6, 1999: The **Milford Planning Board** indicated that traffic and land use issues regarding NH 101 are a concern in Milford, especially along the NH 101 bypass. The Board generally believes that conditions in Milford are most directly influenced by development in Amherst, Bedford and Manchester. The Board acknowledges that the open curb cut from Wilton Road to the bypass is a problem area and that policies must be developed to deal with future development pressure in this area. The Board generally expressed interest in zoning and related access management techniques to address the problem. The Board supports the purposes of the project and looks forward to reviewing the Draft Report.

April 26, 1999: The **Keene Planning Board** indicated that traffic and land use issues regarding NH 101 are a concern in Keene. In 1996 a NH 101 Corridor Master Plan was prepared by the Route 101 Master Plan Committee to address some of the traffic and land use problems. The Plan was never formally adopted by the Planning Board, however. The Planning Board agreed that a timely decision must be made with regard to the pending 1996 Route 101 Corridor Master Plan. The Planning Board expressed interest in using local access management to improve conditions on NH 101 through Keene. The Board supports the purposes of the project and looks forward to reviewing the Draft Report.

April 29, 1999: The **Wilton Local Officials Workshop** was well attended by the public. The Wilton Planning Board indicated that while NH 101 does not significantly influence community life

in Wilton, traffic and land use issues regarding NH 101 are a concern. The Planning Board and members of the public in attendance identified several problem areas along NH 101 through Wilton, including the intersections of NH 31 South and NH 31 North; the intersection of Abbott Hill Road with NH 101, and the segment of roadway east of NH 31 South to the House by the Side of the Road nursery. The Board expressed interest in maintaining a consistent visual appearance on NH 101 from Keene to Milford. The Board is interested in using local access management to improve highway conditions. The Board and members of the public in attendance support the purposes of the project and look forward to reviewing the Draft Report.

June 17, 1999: A public informational meeting was held in conjunction with the regular meeting of the **Dublin Planning Board**. Approximately 120 people attended. The meeting was convened by the Planning Board and Board of Selectmen in response to widely circulated rumors that recommendations to widen NH 101 through Dublin Center were incorporated in the Study, and that, in effect, the Study was intended to design uniform improvements to NH 101 throughout the Study area. A presentation was made to clarify the purposes of the Study and the role of local officials and the general public in the development of any recommendations for changes in the layout or dimensions of the roadway. Comments from officials and the general public were recorded and questions addressed. A list of those in attendance is included in the technical appendices under "Public Involvement".

Written Comments Received Outside of Public Officials Workshops:

Marlborough

The Marlborough Board of Selectmen (letter dated July 23, 1999) expressed concern over traffic conditions on NH 101 through Marlborough, citing driver frustration as exacerbating traffic problems in Marlborough. The Board's opinion is that minimizing traffic delays in Marlborough is paramount to improving the quality of life in Marlborough. The Board proposed: 1) a Marlborough bypass feasibility study and 2) the curves between the NH DOT maintenance depot to Chesham Road in Dublin be eliminated.

Dublin

A Dublin resident suggested that the parking area adjacent to NH 101 between Dublin Community Church and the Yankee Magazine Building be eliminated. Designating the area as a No Parking Zone would alleviate traffic hazards created by vehicles backing out onto NH 101 and would provide a safe pedestrian corridor between the church and the Yankee parking lot.

A Dublin resident expressed concern over the volume, speed and type of traffic on NH 101 through Dublin as it is a detriment to Dublin's community character. Pedestrian access around the Lake and Dublin Center is also hindered. The resident endorses 1) strictly enforcing speed limits on NH 101 and 2) taking no actions that would increase the speed of traffic on NH 101 between West Lake Road and Marathon House. The resident offers the following recommendations: 1) develop a creative option to NH 101, 2) reduce commercial traffic through Dublin and 3) stop lights or yellow flashing lights at the intersection of NH 101 and West Lake Road, East Lake Road, Merryman Road and Upper Harrisville Road.

Peterborough

In a letter addressed to the Peterborough Planning Board and copied to the NH 101 Advisory Committee, a Peterborough resident expressed concern about pedestrian safety on NH 101 at the Contoocook River Crossing and at the intersections of Pine Street and Old Street Road in Peterborough. It was suggested that the Peterborough Planning Board consider conducting a study to assess Peterborough's transportation corridors relative to pedestrian and bicyclist safety, convenience and pleasure.

Wilton

As a result of the April 1999 local officials workshop, a petition was created by Wilton citizens and signed by over 200 residents of Wilton and surrounding communities calling for significant safety improvements at the Abbott Hill Road and NH 101 intersection. NRPC staff feels that improvements to the vertical and horizontal alignment of the approaches (including removal of ledge from the western shoulder of Abbott Hill Road) are necessary to lengthen sight distances and increase safety.

Local Officials Workshops: Review of Draft Report, Summaries

November 2, 1999: The **Milford Planning Board** supports the findings of the NH 101 Corridor Study and the recommendation to improve entrance/egress regarding roadside commerce from Wilton Road eastward to the NH 101A intersection. The Board identifies access management as appropriate means of addressing traffic problems created by traffic turning and entering roadside commerce west of NH 101A. The Board is interested in 1) integrating access management standards into the local site plan and subdivision review regulations, 2) developing a cooperative agreement with NH DOT regarding State support of locally-adopted access management strategy; and 3) establishing a procedure with NH DOT District #5 whereby the Board is notified when District #5 receives applications for driveway permits in Milford. The Planning Board also discussed increasing local police presence as a part of a plan to improve safety on NH 101 in Milford.

The Planning Board and the NH DOT have discussed the feasibility of constructing a left hand turning lane west of NH 101A. The Board generally agrees that a left hand turning lane is feasible and may mitigate some of the hazards on NH 101. The Board requested support from the Planning Commissions about working cooperatively with the State to develop solutions to the observed deficiencies on NH 101.

The Planning Board looks forward to continued dialogue with NRPC, SWRPC and the other Corridor Towns regarding a coordinated approach to managing capacity and safety on NH 101.

November 3, 1999: The **Temple Planning Board** supports the findings of the NH 101 Corridor Study and the recommendation to reconstruct/realign NH 101 from NH 45 eastward about 1 mile (eliminating the “S-curves”).

The Board indicated that development pressures have not been strong in Temple as of yet. However, considering recent development patterns in Wilton, Milford, New Ipswich and Bedford, the Board expects development pressures to increase in Temple in the coming years. The Board acknowledged the tremendous potential for residential and commercial development adjacent to NH 101 in Temple and identified a need to develop a defensible access management plan before development pressures arise. The Board would like to explore access management standards such as encouraging alternative access to NH 101 through local roads.

The Board is interested in 1) scheduling a workshop with the SWRPC in the Spring of 2000 to discuss developing and integrating access management standards into the local zoning and site plan and subdivision review regulations, 2) entering into a cooperative agreement with NH DOT regarding implementation of a locally adopted access management plan, and 3) establishing a procedure with NH DOT District #4 whereby the Board is formally notified of all new driveway permit applications in Temple.

The Planning Board looks forward to continued dialogue with SWRPC and the Corridor Towns regarding a coordinated approach to managing capacity and safety on NH 101.

November 9, 1999: The **Marlborough Planning Board** supports the findings of the NH 101 Corridor Study and the recommendation to reconstruct NH 101 between Jewett Street and Ryan Road in Marlborough and requested that the scope of improvements proposed be described in more detail in the Report.

The Planning Board is primarily concerned with high traffic speed on NH 101 in Marlborough and its destructive impact on community character. The Board is amenable to using traffic calming techniques downtown to slow traffic and improve pedestrian safety. The Board also identified the need for increased enforcement of speed limits as a means to improving safety on NH 101 through Marlborough and indicated that the Town of Marlborough is considering purchasing a SpeedCom, an automated radar speed monitoring machine and driver warning sign. Board discussion included the idea that while public transportation can alleviate capacity and safety problems along NH 101, it is not feasible considering society's dependency on the mobility of the private automobile.

The Board is also concerned with the NH 124 intersection. It was suggested that the addition of a dedicated right turn lane to the NH 124 bridge might alleviate delays currently experienced by drivers entering NH 101 there. It was also suggested that construction of the NH 12 Troy Bypass may reduce traffic on NH 124.

The Board expressed interested in 1) using traffic calming techniques such as pedestrian bulb-outs, islands, chevron strips and painted sidewalks to slow traffic and protect pedestrians on Main Street, 2) improving pedestrian and bicycle access within and through Town, 3) integrating access management standards into the local zoning and site plan and subdivision review regulations, 4) entering into a cooperative agreement with NH DOT regarding State support of locally-adopted access management standards, and 5) establishing a procedure with NH DOT District #4 whereby the Board is formally notified of all new driveway permit applications in Marlborough.

The Planning Board looks forward to continued dialogue with SWRPC and the Corridor Towns regarding a coordinated approach to managing capacity and safety on NH 101.

November 10, 1999: The **Peterborough Planning Board** supports the findings of the NH 101 Corridor Study and the recommendations to improve circulation through the US 202/NH 101 dogleg and intersection improvements at NH 123/Old Street Road.

The Board is primarily concerned with traffic speeds on NH 101 through Peterborough and seeks means by which to reduce traffic speed. There is interest in re-humanizing the streetscape of NH 101 and US 202 . The Board is amenable to using traffic calming techniques to slow traffic down through the US 202/101 dogleg and thereby improving safety and enhancing community character. Mr. Ryner indicated that the Planning Board should address the speed issue in the Master Plan and that Chief Guinard of the Peterborough Police Department is available to discuss options for reducing speed along NH 101 through Peterborough.

Mr. Ryner submitted a memorandum to the Planning Board which included the following for the Board's consideration regarding the NH 101 Corridor Study:

- Safety Measures: the Planning Commission should be asked to give further consideration to specific safety measures that can be taken at each of the intersections along NH 101 in Peterborough where accidents are occurring;
- Visual Appearance: the Planning Commission should be asked to give further consideration as to how to preserve forested buffers adjacent to NH 101;
- Driveway Controls: the Planning Board should establish new driveway standards for Route 101 which require shared driveways and establish a minimum distance between driveways of 400 ft.; NH DOT should be petitioned to revise State driveway standards;

- Lighting: the Planning Board should work with the Lighting Committee, NH DOT and SWRPC to establish small town and/or rural highway lighting standards;
- Drainage: the Town, SWRPC and NH DOT should map out all drainage discharge points along the Corridor in Peterborough and identify areas where sediment containment and/or stormwater treatment should be considered;
- US 202/101 Dogleg: Peterborough must take the lead in developing solutions to the problems of the dogleg and the Planning Board should request that this section of the Corridor be designated in the report as a priority for further evaluation and that a study be undertaken by either NH DOT or by consultants working for NH DOT. The Planning Board should support a US 202 Corridor Study by SWRPC.
- Pedestrian Access: the Town, SWRPC and NH DOT should address and create safe pedestrian crossings for the core Peterborough section of the NH 101 Corridor;
- Old Street Road/NH 123 Intersection: the Planning Board should consider restricting access to Old Street Road from NH 101.

NOTE: The full memorandum appears in the technical appendices under "Public Involvement".

The Board is interested in 1) using traffic calming techniques to improve safety and enhance community character, 2) improving pedestrian and bicycle access within and through Town 3) securing easements on property adjacent to NH 101 to manage access to NH 101 and preserve roadside forested buffer, 4) integrating access management standards into the local zoning and site plan and subdivision review regulations, 5) entering into a cooperative agreement with NH DOT regarding State support of locally-adopted access management standards, and 6) establishing a procedure with NH DOT District #4 whereby the Board is formally notified of all new driveway permit applications in Peterborough.

There was general discussion about accidents on NH 101 associated with climbing lanes in Peterborough. It was suggested that the climbing lanes in east and west Peterborough be converted into left hand turning lanes only. The Planning Board and members of the public in attendance expressed concern about closing Old Street Road to through traffic.

The Planning Board suggested that descriptions of traffic calming, access management and safety improvements at intersections be included in the Report. The Planning Board will submit a written response to the NH 101 Corridor Study Draft Report including an assistance wish list from the SWRPC, in the coming weeks.

The Planning Board looks forward to continued dialogue with SWRPC and the other Corridor Towns regarding a coordinated approach to managing capacity and safety on NH 101.

November 17, 1999: The **Wilton Planning Board** supports the findings of the NH 101 Corridor Study and the recommendation for intersection improvements at Abbott Hill Road and NH 31 North. At the November 1999 GACIT public hearing for NH DOT's 2001-2010 Statewide Transportation Improvement Program, NRPC, with the support of the Town of Wilton, requested that the Abbott Hill/NH 31 North intersection improvement be inserted in the 2001-2010 STIP. The Board also supports the use of access management as a corridor management tool on NH 101.

November 18, 1999: Mr. Webber, Chairman of the **Dublin Planning Board,** welcomed those in attendance and explained that the purpose of the meeting was to make a public presentation of the Planning Board's draft response to the NH 101 Corridor Study Draft Report and provide an opportunity for general public discussion of the same. The Planning Board's response was developed by a subcommittee to the Board. He noted that the Planning Board and Board of Selectmen support the concerns, views and recommendations presented in the Subcommittee's report. The list of those in attendance is included in the technical appendices under "Public Involvement".

Mr. Porter reviewed the purposes of the NH 101 Corridor Study and indicated that the Study's final Report is due to the Commissioner of the Department of Transportation on December 15, 1999. SWRPC will be accepting public comment on the Draft Report until December 1, 1999. Mr. Porter stressed that the submittal of the Report is the beginning not the end of work with the Corridor Towns about managing NH 101.

Elisabeth Langby presented the Subcommittee's extensively researched draft report. Primary concerns are 1) the volume of high speed traffic on NH 101, 2) the volume of tractor trailer traffic, especially wide-load/ heavy load tractor trailers, and 3) overall volume of traffic on NH 101 through Dublin. The volume and speed of traffic on NH 101 through Dublin causes safety hazards for pedestrians/bicyclists and other motor vehicles, generates disruptive noise and, in general, is destructive of Dublin's community character. The subcommittee is of the opinion that Dublin's traffic problems could be alleviated through traffic calming, increased speed enforcement and reduction of traffic volumes on NH 101.

The recommendations of the report are summarized by the Subcommittee thus:

1) lower speed on NH 101 through traffic calming
   - increased speed enforcement,
   - use of new speed enforcement technology such as the SpeedCom;
   - review speed limits,
   - safe lanes for bicyclists,
   - safe sidewalks and paths for pedestrians;
   - safe pedestrian crossings in the village;
2) reroute tractor trailers, wide loads, tanker trucks and other heavy trucks
   - as first steps: introduce weight limits for tractor trailers through residential areas of NH 101 and reroute tanker trucks and wide loads, and
3) address the problem of excessive traffic volume.

After Dublin's final response to the NH 101 Corridor Study is submitted to SWRPC on December 1, 1999, the Subcommittee intends to continue researching options for improving conditions on NH 101. The following actions will be completed over the next several months:

1. The subcommittee, through consultation with Mike Pillsbury, NH DOT District #4 Office, intends to develop a practical plan for implementing traffic calming techniques on NH 101 through Dublin.
2. The town is researching funding options for the purchase of a SpeedCom speed display device.
3. Grants for increased police enforcement will be sought out.
4. Further analysis of the traffic accident data will be completed.
5. Planning Board member, Susan Peters, will conduct an opinion survey of Dublin residents regarding NH 101.
6. The Planning Board and the highway subcommittee look forward to hosting a Traffic Calming Workshop with the Southwest Region Planning Commission.
7. The subcommittee will conduct field research on noise levels on NH 101 through Dublin and examine possible noise abatement alternatives.
8. Pollution levels in Dublin Lake will continue to be monitored.
9. Explore the possibility of designating NH 101 from Keene to Milford as a Scenic Byway.

In response to Ms. Langby's presentation, Mr. Porter stated that SWRPC finds the Subcommittee's report constructive and supports their recommendations for managing NH 101 through Dublin. Mr. Porter cautioned, however, that there will be challenges associated with adapting urban traffic calming techniques to a rural arterial highway such as NH 101. The most effective use of the traffic calming might be in Dublin Center were bicycle and pedestrian access

could be enhanced. Mr. Porter further indicated optimism for inter-municipal workshops for managing NH 101 as preserving NH 101's scenic character, use of the scenic byway program, traffic calming, speed enforcement and access management are goals of nearly all of the seven Corridor towns.

Following the presentation and SWRPC response, local officials and members of the public inquired about and discussed the following issues:

- There was general support of the views and recommendations presented by the subcommittee among the members of the public in attendance.
- NH's permitting process and fee schedule for wide/heavy loads
  - NH has the lowest permitting fee and the highest legal weight limit of the New England States and, as such, wide/heavy loads are compelled to travel through NH.
  - it was suggested by several members of the public in attendance that NH should consider lowering the maximum legal weight limit and increasing the permitting fee.
  - it was suggested that a weigh station be constructed in Peterborough.
  - State Representative Burnham indicated that changing the weight/fee structure is only possible through the State legislature. He cautioned that the trucking industry is very powerful and influential in New Hampshire and that changing the weight and/or fee structure would be challenging. It will be necessary to rally support from several state representatives to initiate change.
- Speed limits on NH 101 and recipients of speeding fines:
  - Chief Letourneau stated that the speed limits are set by NH DOT and the revenue collected from speeding tickets issued on state highways goes to the state.
- Representative Steve Avery expressed his support for the subcommittee's response and suggested consideration of mandatory use of headlights on NH 101 as a safety improvement.
- NH 101 Dublin Bypass:
  - three members of the public in attendance indicated that Dublin's traffic problems could only be solved through a Dublin bypass
  - Mr. Webber suggested that rather than focus on the contentious bypass issue, Dublin work to create changes to NH 101 which can be implemented, such as traffic calming, access management and speed enforcement.
- A member of the public raised concern over the recent changes to lane configuration of the NH 137 intersection indicating that the changes cause confusion and are hazardous. It was suggested that the passing lane west of NH 137 be eliminated.
- Shoulder/Roadway widening:
  - Mr. Pillsbury, NH DOT District #4, indicated that the Department does not have any plans to upgrade the shoulders or widen the highway through Dublin. There is a routine resurfacing project proposed for Dublin Center in 2001.

November 22, 1999: The **Keene Planning Board** supports the findings of the NH 101 Corridor Study and the recommendations for improvements to NH 101 from Optical Avenue to the Keene/Marlborough Town Line as proposed in the 2001-2010 Statewide Transportation Improvement Program.

The Board is acting to formally adopt Keene's 1996 NH 101 Corridor Plan as an addendum to the City's Master Plan. The Plan was reviewed by the board following the April 26, 1999 meeting with SWRPC regarding the NH 101 Corridor Study. The Plan has been updated and a Draft is available for public comment. The Board anticipates the public hearing on the Draft will be scheduled in January of 2000. The Keene Planning Department will provide Southwest Region Planning Commission with a copy of the Draft Plan prior to December 1, 1999.

Future Conditions

Development

Projection of future development was approached by analyzing recent trends in population and housing, numbers of employees, and issuance of building permits during the last 20 years. A combination of data from the U.S. Census Bureau and the NH Office of State Planning were used to establish a defensible methods of projecting future population and demand for housing. Growth in commercial development within the study area has not been rigorously analyzed given the relatively small amount of existing commercial development and the volatile and difficult to predict nature of commercial activity. Accordingly, specific projections of future commercial variables e.g. employment and growth by business type are not part of this Study.

The NH Office of State Planning population projections were used in this Study:

TOWN	1990	2000	2010	2020	ANNUAL RATE
Keene	22,430	23,412	24,524	25,835	0.5%
Marlborough	1,927	2,092	2,190	2,303	0.6%
Dublin	1,474	1,554	1,633	1,713	0.5%
Peterborough	5,239	5,935	6,718	8,032	1.4%
Temple	1,194	1,338	1,608	2,125	1.9%
Wilton	3,122	3,433	3,889	4,363	1.1%
Milford	11,795	13,392	15,106	17,006	1.2%

Housing demand was projected using a logarithmic projection based on 1990 U.S. Census housing characteristics data and Office of State Planning population projections:

	U.S. Census Data			Logarithmic Projections		
TOWN	1970	1980	1990	1998	2008	2018
Keene	6,823	7,934	8,841	9,203	9,626	9,969
Marlborough	590	703	856	889	943	987
Dublin	265	491	651	726	808	874
Peterborough	1,348	1,952	2,242	2,452	2,644	2,799
Temple	139	252	429	460	519	567
Wilton	804	904	1,251	1,266	1,354	1,426
Milford	2,237	3,238	4,793	5,069	5,590	6,013

To address the issue of the distribution of future development within the corridor, a GIS model was developed by which the environmental constraints, zoning standards and actual property dimensions and land use are interrelated to identify those properties with potential for additional or new development (*Land Use and Development Potential, maps 4a-d*).

Quantitative estimates of the current unused capacity for development indicate substantial opportunity for additional commercial floor space and housing units – far more than would be expected to be developed under historic growth rates. Tables 1 and 2 present a Corridor-wide summary of the development potential analysis. Tables 3 - 22 present development potential summaries by zoning district for each of the Corridor towns. These tables are intended for use by Planning Boards to foster discussion about potential for development created by existing zoning standards and the possible effects such development may have on community character and highway capacity and safety.

Estimates of the theoretical and additional capacity for housing units and commercial/industrial square footage were prepared using the SWRPC GIS. Development potential was calculated for all parcels within the study area, including parcels with acreage extending beyond the study area. All estimates in Tables 1 - 22 account for environmental constraints: with slopes greater than 25% (15% in Marlborough), hydric soils and surface water by excluding acreage under those conditions from the calculations for each parcel.

Theoretical capacities for housing units and commercial/industrial square footage were calculated, where permitted, for each parcel in the study area. The minimum lot size criteria specified in local zoning ordinances was used to estimate capacity for residential units, and minimum lot size and percent lot coverage was used for commercial/industrial square footage estimates. Minimum lot size criteria in Marlborough, Wilton and Milford is dependent on the use of municipal versus on-site sewer and water. Information about properties served by municipal sewer and water was unavailable for this study and theoretical capacities were therefore calculated for both scenarios. Additional development potential was calculated as the difference between the theoretical capacity and the existing land use, where existing land use was quantified using local tax assessing databases. The estimates were then aggregated and summarized by zone for each Corridor Town. The presence of existing development on non-conforming lots accounts for the apparent discrepancy in the additional capacity reported in Tables 1-22.

It is important to note that this simple perspective on development potential presents gross development capacity and therefore over-states actual development potential. Furthermore, the estimates for residential units and commercial/industrial square footage are mutually exclusive.

Review of the *Land Use and Development Potential* maps reveals that village areas are at or approaching saturation and have little or no capacity for new development. Pressure for commercial development and new housing may result in demand for change of use and density standards in the rural areas -- and may ultimately have negative consequences for both highway safety and capacity as well as community character.

Traffic

Projections of future traffic demand is based on an assumption of 2% annual growth rate. The 2% rate is a current standard for southern New Hampshire and appears to provide a conservative estimator for the NH 101 Corridor when compared to observed growth rates for major state highways in southwestern New Hampshire as presented below.

Development Potential Analysis - Corridor Summary

Table 1
Number of RESIDENTIAL HOUSING UNITS
(Assuming on-site sewer and water)

CORRIDOR TOWNS	Count of Existing Units	Theoretical Capacity for Housing Units by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Housing Units considering Zoning, Lot Size, Severe Environmental Constraints & **Existing Land Use**	Projected Additional Housing Units Logarithmic Projection Based on Existing Units and Historic Trends
Keene	101	85	63	9
Marlborough	557	59	32	60
Dublin	176	1,095	1,004	36
Peterborough	536	1,131	951	76
Temple	54	334	309	13
Wilton	484	432	372	62
Milford	48	57	45	9
CORRIDOR TOTALS	**1,956**	3,193	**2,776**	**265**
	Existing Units		***Additional Units Theoretically Possible***	***Projected Growth During the Period 1998 - 2018***

Table 2
Square Feet of COMMERCIAL & INDUSTRIAL Floor Space
(Assuming on-site sewer and water)

CORRIDOR TOWNS	Existing Commercial Space SQUARE FEET	Theoretical Capacity for Commercial Space by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Commercial Space considering Zoning, Lot Size, Severe Environmental Constraints & **Existing Land Use**	Projected Additional Commercial Space 1% Annual Growth Based on Existing Units and Historic Trends
Keene	237,047	1,278,248	1,076,355	52,195
Marlborough	55,677	1,035,646	1,016,401	12,260
Dublin	- na -	- na -	- na -	- na -
Peterborough	264,224	32,670 *	26,682 *	58,179
Temple	17,750	6,504,630	6,488,349	3,908
Wilton	260,114	6,317,229	6,187,678	57,275
Milford	219,857	2,926,000	2,776,673	48,410
CORRIDOR TOTALS	**1,054,669**	18,094,423	**17,572,138**	**232,227**
	Existing Commercial Space		***Additional Commercial Theoretically Possible***	***Projected Growth During the Period 1998 - 2018***

* Theoretical commercial/industrial sf capacity is for the Office District only.

Development Potential Analysis - KEENE

Table 3
Number of RESIDENTIAL HOUSING UNITS

Zone	Count of Existing Units	Theoretical Capacity for Housing Units by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Housing Units considering Zoning, Lot Size, Severe Environmental Constraints & Existing Land Use
Low Density	22	25	8
Medium Density	0	38	38
High Density	4	0	0
Commerce	5	NP	NP
Industrial	4	NP	NP
Industrial Park	0	NP	NP
Rural	66	22	17
Conservation	0	NP	NP
TOTAL ALL ZONES	**101**	85	**63**
	Existing Units		***Additional Units Theoretically Possible***

Table 4
Square Feet of COMMERCIAL & INDUSTRIAL Floor Space

Zone	Existing Commercial Space SQUARE FEET	Theoretical Capacity for Commercial Space by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Commercial Space considering Zoning, Lot Size, Seve Environmental Constraints & Existing Land Use
Low Density	0	NP	NP
Medium Density	0	NP	NP
High Density	0	NP	NP
Commerce	20,856	252,000	233,361
Industrial	80,134	721,328	641,194
Industrial Park	127,225	304,920	201,800
Rural	8,832	NC	NC
Conservation	0	NP	NP
TOTAL ALL ZONES	**237,047**	1,278,248	**1,076,355**
	Existing Commercial Space		***Additional Commercial Theoretically Possible***

NP = Not Permitted.

NC = Capacity not calculated as comm/ind uses permitted by special exception only and are extremely limited.

Development Potential Analysis - MARLBOROUGH

Table 5
Number of RESIDENTIAL HOUSING UNITS
Assuming Municipal Sewer

Zone	Count of Existing Units	Theoretical Capacity for Housing Units by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Housing Units considering Zoning, Lot Size, Severe Environmental Constraints & **Existing Land Use**
Country Residential	37	26	23
Suburban Residential	165	35	20
Urban Residential	264	46	22
Industrial Commercial	17	NP	NP
Light Commercial	74	NP	NP
TOTAL ALL ZONES	**557** *Existing Units*	107	**65** *Additional Units Theoretically Possible*

NP = Not Permitted.

Table 6
Number of RESIDENTIAL HOUSING UNITS
Assuming On-Site Sewer

Zone	Count of Existing Units	Theoretical Capacity for Housing Units by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Housing Units considering Zoning, Lot Size, Seve Environmental Constraints & **Existing Land Use**
Country Residential	37	16	14
Suburban Residential	165	17	8
Urban Residential	264	26	10
Industrial Commercial	17	NP	NP
Light Commercial	74	NP	NP
TOTAL ALL ZONES	**557** *Existing Units*	59	**32** *Additional Units Theoretically Possible*

Development Potential Analysis - MARLBOROUGH

Table 7
Square Feet of COMMERCIAL & INDUSTRIAL Floor Space
Assuming Municipal Sewer

Zone	Existing Commercial Space SQUARE FEET	Theoretical Capacity for Commercial Space by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Commercial Space considering Zoning, Lot Size, Severe Environmental Constraints & Existing Land Use
Country Residential	0	328,442 *	328,442 *
Suburban Residential	1,359	322,344	320,985
Urban Residential	3,856	222,156	222,156
Industrial Commercial	19,890	234,135	223,245
Light Commercial	30,572	136,125	124,599
TOTAL ALL ZONES	**55,677**	1,243,202	**1,219,427**
	Existing Commercial Space		***Additional Commercial Theoretically Possible***

* Commercial/Industrial uses are permitted in this zone by special exception only and require a larger minimum lot size than that specified for permitted uses. Commercial/Ind. sf estimates presented do not account for the larger lot requirement.

Table 8
Square Feet of COMMERCIAL & INDUSTRIAL Floor Space
Assuming On-Site Sewer

Zone	Existing Commercial Space SQUARE FEET	Theoretical Capacity for Commercial Space by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Commercial Space considering Zoning, Lot Size, Sew Environmental Constraints & Existing Land Use
Country Residential	0	313,632 *	313,632*
Suburban Residential	1,359	274,428	273,069
Urban Residential	3,856	169,884	169,884
Industrial Commercial	19,890	179,688	171,520
Light Commercial	30,572	98,014	88,296
TOTAL ALL ZONES	**55,677**	1,035,646	**1,016,401**
	Existing Commercial Space		***Additional Commercial Theoretically Possible***

Development Potential Analysis - DUBLIN

Table 9
Number of RESIDENTIAL HOUSING UNITS

Zone	Count of Existing Units	Theoretical Capacity for Housing Units by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Housing Units considering Zoning, Lot Size, Severe Environmental Constraints & Existing Land Use
Rural	114	759	701
Mountain	6	25	23
Neighborhood Com.	4	NP	NP
Village	52	311	280
TOTAL ALL ZONES	**176**	1,095	**1,004**
	Existing Units		***Additional Units Theoretically Possible***

Table 10
Square Feet of COMMERCIAL & INDUSTRIAL Floor Space

Zone	Existing Commercial Space SQUARE FEET	Theoretical Capacity for Commercial Space by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Commercial Space considering Zoning, Lot Size, Seve Environmental Constraints & Existing Land Use
Rural	NA	NC	NC
Mountain	NA	NC	NC
Neighborhood Com.	NA	NC	NC
Village	NA	NC	NC
TOTAL ALL ZONES	**NA**	NC	**NC**
	Existing Commercial Space		***Additional Commercial Theoretically Possible***

NA = Not Available.
NC = Capacity was not calculated as standards/conditions vary by use.
NP = Not Permitted.

Development Potential Analysis - PETERBOROUGH

Table 11
Number of RESIDENTIAL HOUSING UNITS

Zone	Count of Existing Units	Theoretical Capacity for Housing Units by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Housing Units considering Zoning, Lot Size, Severe Environmental Constraints & **Existing Land Use**
Family	223	562	523
General Residence	75	58	51
Rural	225	448	315
Commercial	13	63	62
Office	0	NP	NP
TOTAL ALL ZONES	**536**	1,131	**951**
	Existing Units		***Additional Units Theoretically Possible***

NC = Capacity was not calculated as standards either 1) vary by use or 2) are not specified.
NP = Not Permitted.

Table 12
Square Feet of COMMERCIAL & INDUSTRIAL Floor Space

Zone	Existing Commercial Space SQUARE FEET	Theoretical Capacity for Commercial Space by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Commercial Space considering Zoning, Lot Size, Sewe Environmental Constraints & **Existing Land Use**
Family	20,710	NP	NP
General Residence	16,748	NC	NC
Rural	24,350	NP	NP
Commercial	190,912	NC	NC
Office	11,504	32,670	26,682
TOTAL ALL ZONES	**264,224**	32,670	**26,682**
	Existing Commercial Space		***Additional Commercial Theoretically Possible***

Development Potential Analysis - TEMPLE

Table 13
Number of RESIDENTIAL HOUSING UNITS

Temple

Zone	Count of Existing Units	Theoretical Capacity for Housing Units by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Housing Units considering Zoning, Lot Size, Severe Environmental Constraints & Existing Land Use
Mountain District	6	37	32
Rural Res. & Agr.	48	297	277
TOTAL ALL ZONES	54 *Existing Units*	334	309 *Additional Units Theoretically Possible*

Table 14
Square Feet of COMMERCIAL & INDUSTRIAL Floor Space *

Temple

Zone	Existing Commercial Space SQUARE FEET	Theoretical Capacity for Commercial Space by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Commercial Space considering Zoning, Lot Size, Sev Environmental Constraints & Existing Land Use
Mountain District	6,028	1,074,195	1,068,167
Rural Res. & Agr.	11,722	5,430,435	5,420,182
TOTAL ALL ZONES	17,750 *Existing Commercial Space*	6,504,630	6,488,349 *Additional Commercial Theoretically Possible*

* Commercial/Industrial development permitted by special exception only.

Development Potential Analysis - WILTON

Table 15
Number of RESIDENTIAL HOUSING UNITS
Assuming municipal sewer & water

Zone	Count of Existing Units	Theoretical Capacity for Housing Units by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Housing Units considering Zoning, Lot Size, Severe Environmental Constraints & Existing Land Use
Residential	290	179	117
Residential/Agr.	124	793	740
Commercial	17	NC	NC
Office Park	1	NP	NP
Industrial	52	NP	NP
TOTAL ALL ZONES	**484**	972	**857**
	Existing Units		***Additional Units Theoretically Possible***

Table 16
Number of RESIDENTIAL HOUSING UNITS
Assuming on-site sewer & water

Zone	Count of Existing Units	Theoretical Capacity for Housing Units by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Housing Units considering Zoning, Lot Size, Seve Environmental Constraints & Existing Land Use
Residential	290	62	38
Residential/Agr.	124	370	334
Commercial	17	NC	NC
Office Park	1	NP	NP
Industrial	52	NP	NP
TOTAL ALL ZONES	**484**	432	**372**
	Existing Units		***Additional Units Theoretically Possible***

NC = Capacity was not calculated as minimum lot size not specified.
NP = Not Permitted.

Development Potential Analysis - WILTON

Table 17
Square Feet of COMMERCIAL & INDUSTRIAL Floor Space
Assuming Municipal Sewer & Water

Zone	Existing Commercial Space SQUARE FEET	Theoretical Capacity for Commercial Space by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Commercial Space considering Zoning, Lot Size, Severe Environmental Constraints & Existing Land Use
Residential	6,600	NP	NP
Residential/Agr.	5,098	NP	NP
Commercial	61,919	1,181,505	1,129,611
Office Park	9,089	326,700	326,700
Industrial	177,408	4,809,024	4,731,367
TOTAL ALL ZONES	**260,114**	6,317,229	**6,187,678**
	Existing Commercial Space		***Additional Commercial Theoretically Possible***

NP = Not Permitted.

Table 18
Square Feet of COMMERCIAL & INDUSTRIAL Floor Space
Assuming On-Site Sewer & Water

Zone	Existing Commercial Space SQUARE FEET	Theoretical Capacity for Commercial Space by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Commercial Space considering Zoning, Lot Size, Seve Environmental Constraints & Existing Land Use
Residential	6,600	NP	NP
Residential/Agr.	5,098	NP	NP
Commercial	61,919	1,181,505	1,129,611
Office Park	9,089	326,700	326,700
Industrial	177,408	4,809,024	4,731,367
TOTAL ALL ZONES	**260,114**	6,317,229	**6,187,678**
	Existing Commercial Space		***Additional Commercial Theoretically Possible***

Development Potential Analysis - MILFORD

Table 19
Number of RESIDENTIAL HOUSING UNITS
Assuming Municipal Sewer & Water

Zone	Count of Existing Units	Theoretical Capacity for Housing Units by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Housing Units considering Zoning, Lot Size, Severe Environmental Constraints & **Existing Land Use**
Residence R	18	48	36
Commercial	4	37	34
Integrated Comm/Ind.	25	NP	NP
Industrial	1	NP	NP
TOTAL ALL ZONES	**48**	85	**70**
	Existing Units		***Additional Units Theoretically Possible***

NP = Not Permitted.

Table 20
Number of RESIDENTIAL HOUSING UNITS
Assuming On-Site Sewer & Water

Zone	Count of Existing Units	Theoretical Capacity for Housing Units by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Housing Units considering Zoning, Lot Size, Seve Environmental Constraints & **Existing Land Use**
Residence R	18	48	36
Commercial	4	9	9
Integrated Comm/Ind.	25	NP	NP
Industrial	1	NP	NP
TOTAL ALL ZONES	**48**	57	**45**
	Existing Units		***Additional Units Theoretically Possible***

Development Potential Analysis - MILFORD

Table 21
Square Feet of COMMERCIAL & INDUSTRIAL Floor Space
Assuming Municipal Sewer & Water

Zone	Existing Commercial Space SQUARE FEET	Theoretical Capacity for Commercial Space by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Commercial Space considering Zoning, Lot Size, Severe Environmental Constraints & Existing Land Use
Residence R	0	NC	NC
Commercial	51,372	378,000	358,659
Integrated Comm/Ind.	106,355	2,002,000	1,895,645
Industrial	62,130	1,102,445	1,059,435
TOTAL ALL ZONES:	**219,857**	3,482,445	**3,313,739**
	Existing Commercial Space		***Additional Commercial Theoretically Possible***

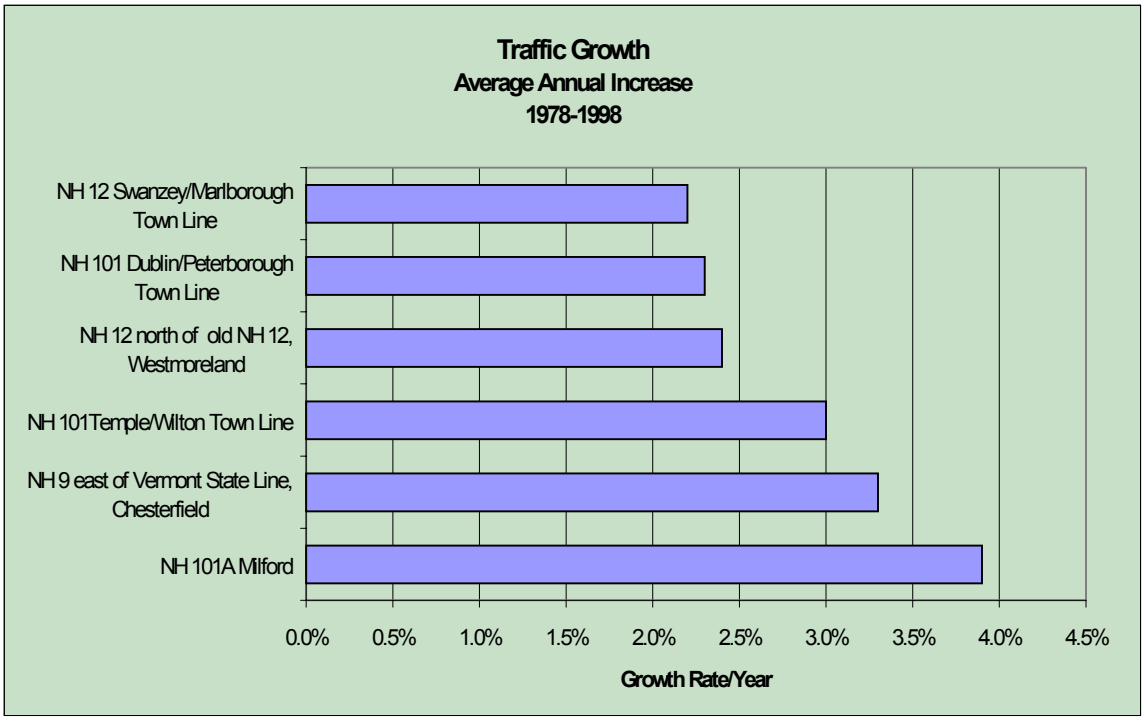
Table 22
Square Feet of COMMERCIAL & INDUSTRIAL Floor Space
Assuming On-Site Sewer & Water

Zone	Existing Commercial Space SQUARE FEET	Theoretical Capacity for Commercial Space by Zoning Standards Existing Lot Size & Severe Environmental Constraints	Unused Capacity for Commercial Space considering Zoning, Lot Size, Sew Environmental Constraints & Existing Land Use
Residence R	0	NC	NC
Commercial	51,372	210,000	203,596
Integrated Comm/Ind.	106,355	1,792,000	1,692,087
Industrial	62,130	924,000	880,990
TOTAL ALL ZONES:	**219,857**	2,926,000	**2,776,673**
	Existing Commercial Space		***Additional Commercial Theoretically Possible***

NC = Capacity not calculated as comm/ind uses permitted by special exception only and are extremely limited.

More detailed analysis was attempted using traffic generation rates tabulated by the Institute for Transportation Engineers from actual traffic impact studies, typically associated with proposals for new development. It was discovered, however, that the tabulated rates did not reflect the trip generation characteristics of the commercial land uses in the rural NH 101 Corridor. Calibration of the published rates to Study area conditions were not feasible due to the magnitude of discrepancy between observed corridor traffic volume and the calculated volumes ostensibly attributable to Corridor land use – application of the published rates to observed quantities of residential and commercial land use in the Corridor predicted traffic volumes in significant excedence of the total observed volumes on NH 101.

The traffic volumes resulting from 2% annual growth are presented below for the locations where 1998 traffic counts were made. The 10-year increase is about 21% for each location. Absolute number increases for 1998 - 2008 range from 1,402 east of Chesham Road to numbers around 2,900 in Keene, Peterborough and Wilton; an increase of 4,754 vehicles is projected for Milford near 101A.



Traffic Counter Location:	Average Daily Traffic			Adjusted Average Daily Traffic[1]		
	1998	2008	2018	1998	2008	2018
	observed	*projected **		*observed*	*projected **	
West of Optical Ave.	11,139	13,578	16,552	10,391	12,666	15,440
East of Optical Ave.	13,975	17,035	20,766	13,353	16,277	19,842
Keene/Marlborough TL	14,171	17,274	21,057	12,792	15,593	19,008
West of NH 124	13,567	16,538	20,160	12,081	14,726	17,951
East of NH 124	10,501	12,800	15,603	9,703	11,827	14,417
East of Chesham Road	7,059	8,604	10,488	6,400	7,802	9,511
East of Meryman Rd, Dublin Lk	7,645	9,319	11,360	6,599	8,044	9,806

[1] Raw data adjusted to account for expected seasonal variation and "axle mix" – i.e. tractor trailers appearing in raw data as multiple cars.

East of Dublin Center	9,773	11,913	14,522	8,281	10,094	12,305
West of NH 137	9,085	11,074	13,499	7,809	9,519	11,604
East of NH 137	8,128	9,907	12,077	7,699	9,385	11,440
Dublin/Peterborough TL	8,452	10,302	12,558	7,352	8,962	10,925
West of Elm Street	9,584	11,682	14,240	8,495	10,355	12,623
Between US 202 N & US 202 S	14,214	17,326	21,120	13,215	16,108	19,636
East of Granite St. (US 202N)	10,380	12,653	15,424	9,833	11,986	14,611
East of NH 123	9,548	11,638	14,187	8,181	9,972	12,156
Peterborough/Temple TL	9,188	11,200	13,653	7,795	9,502	11,583
West of NH 45	8,893	10,840	13,214	7,912	9,644	11,756
East of NH 45	8,775	10,696	13,038	7,377	8,992	10,961
Wilton/Temple TL	8,493	10,352	12,619	7,242	8,827	10,760
West of NH 31	8,715	10,623	12,949	7,926	9,661	11,777
Souhegan River, Wilton	14,908	18,172	22,152	13,098	15,966	19,462
Wilton/Milford TL	14,029	17,101	20,846	13,391	16,323	19,898
West of NH 101 A	22,605	27,555	33,589	21,711	26,465	32,261

Capacity analysis for intersections currently at or below LOS D were performed using the 2% growth rate traffic projections.

Non-signalized Intersection Capacity Analysis, 2008 and 2018

Location	Period	Movement	LOS	Year
Swanzey Factory Road, Keene *T-intersection*	A.M. Peak Hour 7:15-8:15	NB Left & Right	E F F	1998 2008 2018
	P.M. Peak Hour 4:45 – 5:45	NB Left & Right	D F F	1998 2008 2018
NH 124, Marlborough *T-intersection*	A.M. Peak Hour 7:15-8:15	NB Left & Right	F F F	1998 2008 2018
	P.M. Peak Hour 4:45 – 5:45	NB Left & Right	F F F	1998 2008 2018
Elm Street, Peterborough	A.M Peak Period 8:00 – 9:00	SB Left, Thru & Right	B C D	1998 2008 2018
	P.M. Peak Period 4:30-5:30	SB Left, Thru & Right	D F F	1998 2008 2018
US 202 North/Granite Street, Peterborough	A.M Peak Period 8:00 – 9:00	SB Left	D E F	1998 2008 2018
	P.M. Peak Period 4:30-5:30	SB Left	F F F	1998 2008 2018
		EB Left	B C E	1998 2008 2018

NH 123/Old Street Road, Peterborough	A.M. Peak Period 7:30 – 8:30	NB Left, Thru & Right	C	1998
			D	2008
			F	2018
		SB Left, Thru & Right	C	1998
			D	2008
			F	2018
	P.M. Peak Period 4:30-5:30	NB Left, Thru & Right	E	1998
			F	2008
			F	2018
		SB Left, Thru & Right	E	1998
			F	2008
			F	2018

Signalized Intersection Capacity Analysis, 2008 and 2018

Location	Period	Overall LOS	Movement	LOS	v/c	Year
NH 101A, Milford *Actuated Signal*	A.M. Peak Hour 7:15-8:15	C (1998)	NB Left	D	.704	1998
		D (2008)		D	.796	2008
		** (2018)		E	.969	2018
			NB Left & Thru	D	.574	1998
				D	.718	2008
				E	.872	2018
			SB Left	D	.219	1998
				D	.271	2008
				D	.327	2018
			SB Thru & Right	D	.565	1998
				D	.695	2008
				E	.851	2018
			EB Left	D	.144	1998
				D	.171	2008
				D	.211	2018
			EB Right	B	.799	1998
				D	.962	2008
				**	1.196	2018
			WB Left	D	.202	1998
				D	.227	2008
				D	.275	2018
NH 101A, Milford *Actuated Signal*	P.M. Peak Hour 4:30 – 5:30	D (1998)	NB Left	D	.848	1998
		E (2008)		E	1.013	2008
		** (2018)		**	1.237	2018
			NB Left & Thru	D	.833	1998
				F	1.036	2008
				**	1.262	2018
			SB Left	D	.127	1998
				D	.157	2008
				D	.191	2018
			SB Thru & Right	D	.368	1998
				D	.458	2008
				D	.555	2018
			EB Left	D	.291	1998
				D	.355	2008
				D	.435	2018
			EB Thru	D	.640	1998
				D	.781	2008
				E	.950	2018
			WB Left	D	.311	1998
				D	.355	2008
				D	.435	2018
			WB Thru	D	.793	1998
				E	.968	2008
				**	1.182	2018

US 202 South/ Grove Street, Peterborough	A.M. Peak Hour 8:00 – 9:00	D (1998) D (2008) D (2018)	EB Left	D	.411	1998
				D	.422	2008
				F	.770	2018
			EB Thru & Right	C	.509	1998
				D	.659	2008
				E	.917	2018
			WB Left	D	.519	1998
				D	.584	2008
				E	.834	2018
			NB Left	D	.351	1998
				D	.439	2008
				D	.531	2018
			NB Thru & Right	D	.700	1998
				D	.823	2008
				E	.987	2018
			SB Left	D	.195	1998
				D	.235	2008
				D	.284	2018
			SB Thru & Right	D	.609	1998
				D	.676	2008
				D	.702	2018
US 202 South/ Grove Street, Peterborough	P.M. Peak Hour 4:30 – 5:30	D (1998) E (2008) ** (2018)	EB Left	E	.644	1998
				E	.706	2008
				F	.851	2018
			EB Thru & Right	D	.670	1998
				F	1.091	2008
				**	1.126	2018
			WB Left	D	.764	1998
				E	.950	2008
				F	1.071	2018
			NB Left	E	.786	1998
				E	.913	2008
				**	1.113	2018
			NB Thru & Right	E	.957	1998
				E	1.011	2008
				**	1.464	2018
			SB Left	D	.656	1998
				E	.740	2008
				E	1.464	2018
			SB Thru & Right	D	.802	1998
				D	.807	2008
				**	1.241	2018

** g/c * v/c is greater than 1, calculation of capacity infeasible where: g/c = ratio of effective green time to cycle length; v/c = volume to capacity ratio.

Application of the 2%-projected traffic growth to capacity analysis predicts failure of nearly all unsignalized intersections currently at or below LOS D and most movements at the US 202/Grove Street signalized intersection in Peterborough.

Traffic volumes resulting from 2% annual growth and the subsequent future capacity analyses support conclusions made about areas currently in need of geometric and operational changes to protect public safety and previous investment in highway capacity.

PART 3. RECOMMENDATIONS

THE OUTCOME OF THIS PROJECT IS THE DEFINITION OF THE FOLLOWING RECOMMENDATIONS WHICH WILL DRIVE FUTURE PLANNING AND ACTION, AND COLLECTIVELY FRAME CORRIDOR MANAGEMENT, FOR NH 101 BETWEEN KEENE AND MILFORD IN THE COMING YEARS.

It is acknowledged that recommendations presented here represent a snapshot in the larger process. Following research and public involvement summarized in Part 2., this chapter presents technical and policy directions proposed to respond to identified problems. These recommendations vary from requests for specific highway improvement projects and review of local zoning and site standards to identification of issues which may ultimately require review of State and Federal policy to fully understand. An example of the last is an expression by local officials of a desire to depart from convention regarding the primacy of the motor vehicle in downtown, village and rural settings.

Recommendations are discussed in three general categories:

- **highway construction projects**
- **traffic calming for speed reduction and improved pedestrian access**
- **management of access between the highway and private properties**
- **next steps in the process of developing corridor management**

The Corridor Management process will continue with coordination among local planners, the regional planning commissions, NH DOT, and others in developing measures to enact the recommendations included here to the extent possible. It must be acknowledged that the scope of actions intimated here is considerable, ranging from the application of existing policy and technology to a request for development of new state and local policies and new technologies. As such, time will tell us what the ultimate outcome may be for several of the larger policy issues.

HIGHWAY CONSTRUCTION

The following areas have local support for the design and implementation of highway improvements, largely in keeping with conventional highway design and principally on the basis of public safety:

- Reconstruct and provide bicycle and pedestrian access between Cheshire Railroad and the Marlborough town line, Keene
- Reconstruct and provide bicycle and pedestrian access between Jewett Street and Ryan Road, Marlborough

- Improve traffic circulation and pedestrian access for US 202/NH 101 dogleg, Peterborough
- Improve traffic safety at the intersection of NH 101 and NH 123, Peterborough
- Reconstruct/realign for traffic safety from NH 45 eastward about 1 mile, Temple
- Improve entrance/egress regarding roadside commerce in West Wilton
- Improve entrance/egress regarding roadside commerce east of Isaac Frye Highway, Wilton
- Improve traffic operations and safety at Abbott Hill Road and NH 31 north, Wilton
- Improve entrance/egress regarding roadside commerce east of Wilton Road, Milford

Concepts for changes to the roadway in these areas can be developed cooperatively among local officials, planning commission staff and NH DOT personnel. Low-tech, minor changes in roadway alignment and geometry can provide great public safety benefits at these locations without changing the character of the Corridor.

Several other areas identified as hazardous based on accident records (page 8 & 10) are not included in the recommendations above for various reasons:

- Intersection of Swanzey Factory Road, South Keene –currently scheduled as part of a larger reconstruction project in the NH 10-Year Transportation Improvement Program;

- Water Street to Terrace Street, Marlborough – accidents in downtown Marlborough appear to be traffic operations issues, “fender benders”;

- Cemetery Cove, Dublin – at the time of this Report the Town of Dublin is concerned that structural changes to NH 101 in the vicinity of the Lake and Village Center will erode local character and quality of life for residents there;

- Peterborough (except NH 123 intersection) – traffic operations issues that may not easily be solved with structural roadway changes and about which the Town is currently researching options for change.

Local officials are encouraged to discuss concepts for improving parking, local traffic circulation, including pedestrians and bicyclists in village areas with their planning commission and NH DOT staff. The State of New Hampshire’s Transportation Enhancement Program can provide funding for innovative, low-tech projects that can greatly enhance the non-motorists’ safety and experience in village areas under the influence of a major highway.

TRAFFIC CALMING

Variations in traffic speed and flow densities observed on NH 101 are associated with a complex interactive set of variables which include roadway geometry, roadside development patterns, types of trips, types of vehicles, driver expectations, and posted speed limits. Measures to reduce maximum speeds and promote a more uniform flow of traffic are sought for the NH 101 corridor. Local, regional and State planners are encouraged to explore the set of techniques available for urban and suburban settings –

collectively known as traffic calming – for adaptation to the village main street and even the open road.

Traffic calming measures range from enhanced enforcement of traffic laws to concepts for roadside landscaping and roadway design. A basic element of traffic calming is the use of a visual environment to which drivers subconsciously respond with slower speeds, an environment that makes implicit that the rules of the open highway do not apply. Such an environment is typified by vertical landscape elements such as trees or fences nearer to the roadside and requires vehicles to negotiate gentle deviations from a straight path, while providing explicit pedestrian right-of-ways.

Traffic calming techniques are found to mitigate negative impacts of start-and-stop traffic, mixed speed traffic and high speed traffic and thereby provide the following benefits:

- **safely integrate pedestrians and bicyclists;**
- **reduce traffic accidents involving vehicle, pedestrians, bicycles, and other property damage;**
- **reduce vehicle emissions: noise, exhaust, dust, road spray; and**
- **relieve intersection congestion**

A particular challenge for designing traffic calming for the open road is the management of drivers' expectations for travel across a region on a major highway. But, herein also lies the heart of an often expressed concern: much of the traffic on NH 101 travels the main streets of Marlborough, Dublin and Peterborough at inappropriate speeds. A goal of this recommendation is to create an environment to slow high speed traffic throughout the corridor and promote the calm uniform flow of traffic through settled areas.

Following are the major areas of interest for future activity on the recommendation to affect traffic calming in the NH 101 corridor:

- Preservation or creation of wooded buffers to mitigate noise and emissions as well as preserve rural character and provide a vertical landscape element near the roadside to control driver speed. This measure may also accommodate bicycle and pedestrian movement.

- Traffic calming measures for downtown Marlborough, Dublin Center and Peterborough between Elm Street and NH 123 to slow traffic and more safely integrate pedestrian and bicycle movement. These may include the creation of gateway features to transition drivers from open road to village settings.

- Enhanced speed enforcement with the use of automated radar speed monitoring and driver alert machines.

- Pursue use of the NH Cultural and Scenic Byways program for NH 101.

LAND USE REGULATION AND POLICY

Local officials are encouraged to review the results of the GIS development potential modeling of this Study as a basis for discussion and review of local zoning. Review of current zoning to confirm consistency among local development goals, intended effects of current zoning standards and the possible development consequences of the interaction of existing land use, landscape characteristics and zoning standards may reveal opportunities to strengthen local control over future development patterns.

The incorporation of access management tools in local zoning and site plan standards is encouraged. A suite of highway and site design standards has been developed during the last decade by planners and transportation engineers to reduce the debilitating effects of frequent or poorly defined driveways (particularly commercial driveways) and encroachment of buildings, commercial signs and on-site traffic on the public right-of-way.

Local officials of Keene, Marlborough, Peterborough, Temple, Wilton and Milford expressed interest in developing a Memorandum of Understanding with NH DOT regarding the use of access management. Such an agreement might articulate the town's policies for the use of access management and the town's desire to coordinate local implementation of that policy with NH DOT driveway permitting activity.

There is also an interest among NH 101 corridor local officials to work with the regional planning commissions and NH DOT to revisit the State's driveway permitting criteria, with particular interest in development policy and standards for preserving rural arterial and major collectors. Concern has been expressed about an observed transition from rural to urban driveway densities at the periphery of urban and village areas which confounds efforts to preserve the benefits of arterial capacity.

ACCESS MANAGEMENT TECHNIQUES – extracted from the NH DOT Route 16 Corridor Study

1. Distance Between Driveways

Requiring a minimum distance between driveways limits the number of access points that a driver must be aware of and reduces the opportunities for conflicts between turning vehicles and through traffic. This issue can be addressed in Subdivision and Site Plan Review regulations with a requirement that links the distance between driveways to the posted speed limit of the adjacent road.

MINIMUM DISTANCE BETWEEN DRIVEWAYS

Posted Speed Limit	Minimum Spacing
35 mph	150 feet
40 mph	185 feet
45 mph	230 feet
50 mph	275 feet

Source: "Access Management for Streets and Roads" Federal Highway Administration, 1982, as adapted by Route 16 Corridor Study.

2. Corner Lot Access

Access from corner lots should be from adjacent collector or local roads, not the adjacent arterial. Planning Boards should incorporate this requirement into both Subdivision and Site Plan Review regulations. This regulation could be waived in situations where the applicant can demonstrate that such an access to the site is unsafe, would not function properly or is not possible due to some physical characteristic of the parcel.

3. Number of Driveways per Lot

Reducing the number of accesses to arterials reduces the number of conflict points for vehicles and gives drivers a greater opportunity to react to vehicles entering and exiting the road. This issue can be addressed in the Zoning Ordinance, Subdivision Regulation and Site Plan Review regulations. In the Zoning Ordinance a town can adopt an overlay district limiting the number of driveway's per parcel. Subdivision regulations can require that access to arterials be combined wherever possible at the time of subdivision. Site Plan Review regulations can limit the number of accesses along specified arterials.

4. Shared Driveways

Combined access points for residential and non-residential sites reduces the number of points where turning vehicles and through traffic conflict. A single access point can easily serve two lots, and can occasionally serve three or more parcels. Planning Boards should include a provision in their Subdivision and Site Plan Review regulations requiring shared driveways on selected roads in their community. The provision should include requirements for the necessary easements and maintenance agreements. This regulation could be waived if the applicant demonstrates that a shared driveway is unsafe or not feasible because of the geometry of the site.

5. Interconnections Between Developments

Interconnected non-residential sites allow employees and customers to move from site to site without repeatedly entering and exiting the arterial. Site Plan Review regulations should include language requiring developers to provide an easement across their property to an adjacent site. When the adjacent site is eventually developed, the easement can be used to connect the two

sites with a service road and pedestrian facilities allowing customers to move from site to site on foot or in their vehicle. Subdivision regulations should require that developers connect to adjacent development roads, or require that a right of way be provided to the adjacent site, so a connecting road can be constructed when the neighboring lot is developed. Permanent cul-de-sacs and "single point of entry" developments should be discouraged.

6. Driveway Throat Length

Non-residential driveway entrances should be designed to prevent vehicles on the arterial from backing up while waiting to access the site. Providing adequate depth, or "throat length", at the driveway entrance, provides vehicles with sufficient maneuvering space on-site to move away from the entrance and allow other vehicles to efficiently enter or exit the site. Throat length is an issue that can only be addressed as part of Site Plan Review. Based on the results of a traffic impact study, an appropriate throat length can be designed to meet the specific needs of the proposed use and the adjacent arterial. Local Site Plan Review regulations should require that a traffic impact study be completed for developments that will generate high traffic volumes.

7. Right Turn Deceleration/Acceleration Lanes and Tapers

Right turn lanes and tapers remove turning and slow moving vehicles from the travel lane of the arterial. The need for such lanes is generally determined through information provided in a traffic impact study showing the effect of the development on the level of service of the arterial. The length and type of turning lane necessary are a function of the proposed use and volume of traffic on the arterial. Both Subdivision and Site Plan Review regulations should include the provision for requiring a traffic impact study and the mitigation of off-site traffic impacts.

8. Left Turn Pocket

A left turn pocket allows left turning vehicles to move out of the through lane thereby reducing conflicts between through traffic and turning traffic. The pocket provides storage for a number of left turning vehicles depending on the demand created by the site. A traffic impact study will help determine if a left turn pocket is necessary and how much storage the pocket should provide.

9. Driveway Material and Opening

In situations that do not warrant a full right or left turn lane, simple, comparatively inexpensive driveway design methods can minimize the effect of an access on the adjacent arterial. Paved driveways allow vehicles turning off an arterial to exit the road more quickly than unpaved driveways. Site Plan Review regulations should be designed to ensure that new driveways and sites undergoing a change of use provide the maximum safety for turning vehicles and maintain or improve the level of service of the arterial. In cases where a site with uncontrolled access is being redeveloped, creating a definable driveway entrance should occur.

10. One-Way In/One-Way Out

Separating traffic entering a site from traffic exiting a site may best serve a site's on-site traffic flow needs while still minimizing the effects of two accesses to a site. This provision can be included in Site Plan Review regulations for non-residential sites.

11. Frontage/Service Road

Frontage roads are fairly uncommon in New England, but they can be a valuable tool for reducing accesses to an arterial. A frontage road is directly adjacent to and parallels the arterial.

Residences and businesses access the frontage road, rather than the arterial, which intersects the arterial at two or three points.

12. Turning Radius

A large turning radius allows vehicles to make a turn at a higher speed thereby removing turning vehicles from the road more quickly. A large radius also allows vehicles entering an arterial to accelerate more rapidly. This requirement is most useful for non-residential uses and can be incorporated into a community's Site Plan Review regulations.

13. Signs

Proper signage at driveway entrances, and the avoidance of sign clutter can assist travelers using the arterial to identify the site they are trying to find and properly identify the entrance to the site. While this is an access management technique, it is best incorporated into a community's sign regulations. A reduction in sign clutter and distraction can be accomplished by limiting the size, material, illumination, location, and number of signs allowed on each lot. The height, number, type and location of signs can affect the function of an access. Signs that obscure the view of an access, multiple signs, and signs with too much information should be avoided when possible. The legal aspects of regulating signs and sign content should be fully understood and regulations should be reviewed by an attorney.

14. Corner Clearance

Accesses to a corner parcel should be far enough from the intersection of two roads that vehicles using the driveway do not interfere with the function of the intersection. Assuming a 30 mph operating speed, the ideal minimum corner clearance from a signalized arterial is 230 feet. The ideal minimum corner clearance for a stop sign controlled intersection is 115 feet. For rural and other high speed roads, clearances of 460 ft. from signalized intersections and 230 ft. from stop sign controlled intersections should be maintained.

15. Medians

The placement of raised medians along busy and developed or developing sections of an arterial road is an effective way to prevent left turning traffic entering or exiting a development. This reduces the number of potential conflict points for users of the road making the road safer and more efficient. A traffic impact study done as part of a site plan or subdivision proposal should provide the necessary information to determine if a median is warranted. Medians are particularly common near busy intersections to prevent confusing and dangerous situations if too many busy accesses are located in close proximity to each other.

16. Signalization

Busy accesses on arterial roads sometimes require signalization to ensure that the intersection does not present a hazard to the people using it. This is a requirement that must be evaluated by an engineer based on a thorough traffic impact analysis study. An access that might require signalization will also be undergoing the professional scrutiny of the NH DOT. A community's Site Plan Review regulations should inform applicants that signalization is a possible requirement of the planning board, but the board should work closely with the NH DOT and its own engineering professionals.

Next Steps

This Report documents baseline conditions and sets policy directions for corridor management of NH 101 for the coming years. The publication of this Report precludes neither the development of further recommendations at local or regional levels nor further research or refinement of analyses used in the Study.

In the year 2000, the regional planning commissions will continue to work with local officials to act on the recommendations under 1-3 above. Workshops are anticipated for the topics of: access management, traffic calming, speed enforcement, preservation of roadside forest, and the NH Scenic and Cultural Byways Program. Speed enforcement, attention to construction projects and preservation of the rural character of the corridor are nearly universal areas of interest among the corridor towns. This last interest can be addressed with a combination of issues: access management, preservation of roadside forest (buffers), support of pedestrian and bicycle access and possibly implementation of the NH Scenic and Cultural Byways Program.

Issues for Further Consideration

	Keene	Marlborough	Dublin	Peterborough	Temple	Wilton	Milford
Construction Projects	■	■		■	■	■	
Access Management	■	■		■	■	■	■
Traffic Calming		■	■	■			
Speed Enforcement	■	■	■	■	■	■	■
Heavy Trucks			■				
Roadside Buffers	■	■	■	■	■		
Bicycles & Pedestrians	■	■	■	■			
Stormwater Runoff		■	■	■			
Scenic Byways		■	■	■	■	■	

There is also a need for local, regional and state personnel to work together to understand the implications of those recommendations which may challenge existing State or Federal policy regarding highway management.

Policy and Design Involvement

Recommendation	Towns	RPCs	NH DOT	Action	Other Agencies
Construction Projects	■	■	■	Define, Schedule in TIP, Design & Build	
Access Management	■	■	■	Integrate with Local Zoning & Site Plan	
NH Driveway Permits	■	■	■	Access Management MOU with NH DOT; Examine NH Permit Criteria regarding preservation of functional classification	
Traffic Calming	■	■	■	Adapt Urban/Suburban Concepts to Village and Open Road environments; May involve consideration of Federal and State convention and work in concert with Scenic Byways program	FHWA
Speed Enforcement	■	■	■	Develop and fund enhanced program	NH DOS
Routing of Trucks		■	■	A legislative discussion	
Roadside Buffers	■	■	■	Develop local or State level program to develop easement opportunities; Mobilize funds for easement acquisition; seek easement donations	Private Land Trusts
Bicycles & Pedestrians	■	■	■	Community planning to identify desired access; Coordinate with Traffic Calming; Investigate local, state and federal funding	NH DRED
Stormwater Runoff	■	■	■	Investigate opportunities and need for stormwater containment and treatment	NH DES NRCS UNH
Scenic Byways	■	■	■	Investigate applicability and desirability of Program for Corridor towns	NH OSP NH DHR