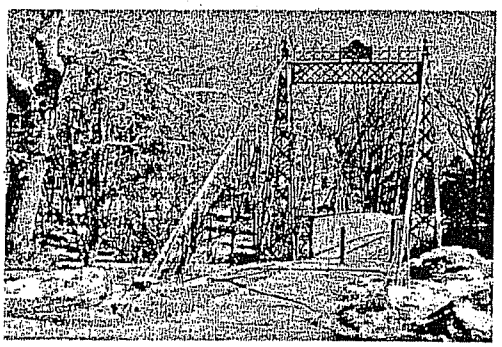
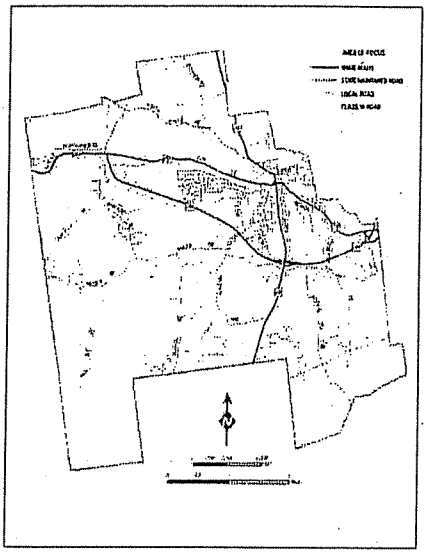
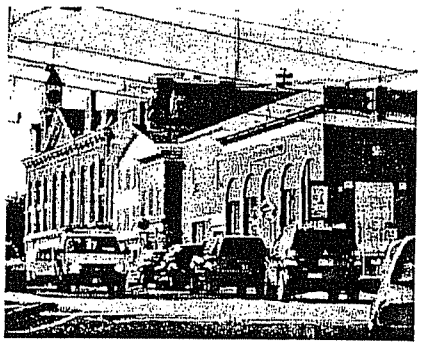
TRANSPORTATION AND COMMUNITY AND SYSTEMS PRESERVATION STUDY

MILFORD, NEW HAMPSHIRE







July, 2006

Prepared by the

Nashua Regional Planning Commission

Table of Contents

CHAPTER I: EXECUTIVE SUMMARY I-1
A. THE ISSUES I-1
B. STRATEGIES I-1
C. NEXT STEPS I-2

CHAPTER II: INTRODUCTION II-1
A. ORIGIN OF THE TCSP STUDY II-1
B. NRPC ROLE II-2
C. STUDY PROCESS II-2
D. REPORT OVERVIEW II-2

CHAPTER III: TRAFFIC PLAN III-1
A. BACKGROUND III-1
B. TRAFFIC ANALYSIS III-2
1. EXISTING TRAFFIC CONDITIONS III-2
2. 24-HOUR TRAFFIC COUNTS III-2
a. 24-Hour Traffic Volumes (average daily traffic) III-2
3. PEAK HOUR TURNING MOVEMENT COUNTS: III-4
a. Turning Movement Count Locations III-4
4. INTERSECTION PEAK HOUR LEVEL OF SERVICE ANALYSIS III-7
a. Existing Level of Service III-8
5. FUTURE (2025) TRAFFIC CONDITIONS III-11
6. FUTURE TRAFFIC VOLUMES III-11
7. FUTURE LEVEL OF SERVICE III-17
C. ANALYSIS OF ADDITIONAL RIVER CROSSINGS III-20
1. BROX CORRIDOR III-21
2. WEST STREET CORRIDOR III-21
3. POWERS STREET CORRIDOR III-21
Summary of River Crossing Scenarios III-21
4. EAST/WEST CORRIDOR III-22
D. KEY TRAFFIC ISSUES III-23
E. STRATEGY FOR IMPROVING TRAFFIC CONDITIONS IN THE STUDY AREA III-25
1. NASHUA STREET CORRIDOR III-25
2. ELM STREET CORRIDOR III-26

Table of Contents (cont)

3. SOUTH STREET CORRIDOR III-26
4. THIRD SOUHEGAN RIVER CROSSING III-26
5. EAST-WEST CORRIDOR III-27
6. NH 101 MILFORD BYPASS EXTENSION III-27
7. GATEWAYS III-28

F. TRAFFIC ACTION ITEMS III-30

CHAPTER IV: LAND USE, REDUCING CONFLICTS BETWEEN LAND USE AND THE TRANSPORTATION SYSTEM IV-1

A. INTRODUCTION IV-1
B. DEVELOPMENT OF LAND USE STRATEGIES IV-1
1. INFILL DEVELOPMENT IV-1
2. TRANSIT-ORIENTED DEVELOPMENT IV-2
3. LIVABLE-WALKABLE DEVELOPMENT DESIGN IV-2
4. VILLAGE PLAN ALTERNATIVE IV-2
5. NODAL DEVELOPMENT IV-3
6. LOCATION OF PUBLIC BUILDINGS IV-3
7. URBAN GROWTH BOUNDARIES WITH MUNICIPAL SERVICE DISTRICTS IV-3
8. OTHER SUGGESTIONS IV-3
C. EVALUATION OF ZONING, SUBDIVISION AND SITE PLAN REVIEW REGULATIONS IV-4
D. LAND USE STRATEGY RECOMMENDATIONS: IV-8
1. MASTER PLAN RECOMMENDATIONS IV-8
a. Future Land Use IV-8
b. Policy for siting public facilities IV-8
c. Policy for Growth Boundary and/or policy for extending municipal services (water, sewer, roads) IV-8
2. ZONING RECOMMENDATIONS IV-8
a. Infill Ordinance IV-8
b. Nodal Development IV-8
3. SUBDIVISION AND SITE PLAN REVIEW REGULATIONS IV-8
a. Incorporate Livable / Walkable Elements into Street Design Standards: IV-8
4. OTHER ISSUES IV-9
E. DEVELOPMENT OF ACCESS MANAGEMENT STRATEGIES IV-9
1. ACCESS MANAGEMENT ISSUE AREAS IV-11

Table of Contents (cont)

2. ACCESS MANAGEMENT STRATEGIES IV-12
3. ACCESS MANAGEMENT RECOMMENDATIONS IV-16
4. ACCESS MANAGEMENT STRATEGIES–RECOMMENDATIONS FOR LAND USE REGULATIONS IV-16
a. Zoning Ordinance IV-16
5. SUBDIVISION/ SITE PLAN REVIEW REGULATIONS IV-17
a. Driveway Alignment IV-17
b. Driveway Design IV-18
F. DEVELOPMENT OF DESIGN STRATEGIES IV-21
1. IDENTIFICATION OF ROADWAY CORRIDORS IV-21
2. DESIGN RECOMMENDATIONS IV-22
CHAPTER V: BICYCLE AND PEDESTRIAN PLAN V-1
A. INTRODUCTION V-1
B. PHYSICAL IMPROVEMENT V-1
1. POLICIES V-2
2. PROGRAMS V-3
3. RECOMMENDED BICYCLE NETWORK V-5
a. Major Bicycle Design Groups V-6
b. Types of Bicycle Facilities V-7
c. Route Hierarchy V-8
d. Designated Bicycle Routes V-8
4. SIDEWALK INVENTORY V-15
a. Inventory Parameters V-15
b. Field Observations V-16
c. Sidewalk System and Condition Assessment V-19
d. Future Pedestrian Goals V-24
C. BEHAVIORAL CHANGE V-24
1. EDUCATION AND SAFETY V-24
a. Strategy for Improving Education and Safety V-25
2. ENCOURAGEMENT AND PROMOTION V-25
a. Strategy for Encouraging and Promoting Bicycling and Walking V-25
3. ENFORCEMENT V-26
a. Strategy for Improving Enforcement Methods V-26

Table of Contents (cont)

D. IMPLEMENTATION V-27
1. ACTION PLAN V-27
2. MANAGEMENT, COORDINATION AND EVALUATION OF PROGRESS V-27
3. FUNDING V-27
4. BICYCLE AND PEDESTRIAN ACTION ITEMS V-29

CHAPTER VI: TRANSIT PLAN VI-1
A. INTRODUCTION VI-1
1. TRANSIT SERVICES IN THE REGION VI-1
2. TRANSIT SERVICES OUTSIDE THE REGION VI-1
3. HISTORICAL TRANSIT RIDERSHIP VI-1
B. ANALYSIS OF TRANSIT NEED VI-2
1. POPULATION DENSITY VI-3
2. YOUTH POPULATION VI-4
3. ELDERLY POPULATION VI-5
4. DISABLED STATUS VI-6
5. MEDIAN HOUSEHOLD INCOME VI-7
6. POVERTY VI-9
7. AUTOMOBILE AVAILABILITY VI-10
8. KEY ORIGINS AND DESTINATIONS VI-12
9. SERVICE OPTION DEFINITIONS VI-16
10. COMMUNITY ANALYSIS VI-16
11. FISCAL ANALYSIS VI-20
12. RIDERSHIP FORECAST VI-21
13. FUNDING SOURCES VI-21
C. KEY RECOMMENDATION VI-23

LIST OF MAPS

Map III-1: Study Area Road Network III-1
Map III-2: 24-Hour Traffic Volumes III-3
Map III-3: Turning Movement Count Locations III-6
Map III-4: 2025 Forecast Volume-No Build III-13
Map III-5: 2025 Forecast Changes in Volume-No Build III-14
Map III-6: 2025 Forecast Volume-Build III-15
Map III-7: 2025 Forecast Changes in Volume-Build III-16
Map III-8: Potential Additional River Crossings III-22
Map III-9: Key Issues III-24
Map III-10: Recommended Improvements III-29
Map V-1: Regional Bicycle Routes V-10
Map V-2: Nashua-Wilton Corridor V-11
Map V-3: Brookline-Mont Vernon Corridor (Southern Segment) V-12
Map V-4: Brookline-Mont Vernon Corridor (Northern Segment) V-13
Map V-5: Milford Local Bike Routes V-14
Map V-6: Milford Crosswalk Locations V-20
Map V-7: Milford Sidewalk Condition Assessment – Eastern V-21
Map V-8: Milford Sidewalk Condition Assessment – Northern V-22
Map V-9: Milford Sidewalk Condition Assessment – Central and Western V-23
Map VI-1: Study Area and Block Group Guide VI-2
Map VI-2: Population Density VI-3
Map VI-3: Youth Population VI-4
Map VI-4: Elderly Population VI-6
Map VI-5: Disabled Population VI-7
Map VI-6: Median Household Income VI-8
Map VI-7: Poverty by Block Group VI-10
Map VI-8: Percentage of Households With Less Than 2 Vehicles VI-11
Map VI-9: Milford Origins and Destinations VI-14
Map VI-10: Wilton Origins and Destinations VI-15
Map VI-11: Transit Route, Amherst VI-17
Map VI-12: Transit Route, Milford VI-18
Map VI-13: Transit Route, Wilton VI-19

LIST OF TABLES

Table III-1: Level of Service Definitions III-7
Table III-2: Level of Service Criteria/Signalized Intersections III-7
Table III-3: Level of Service Criteria/Non-signalized Intersections III-8
Table III-4: Existing (2004) Level of Surface/Signalized Intersections III-8
Table III-5: Existing (2004) Level of Surface/Non-signalized Intersections III-9
Table III-6: Future (2025) Traffic Forecasts III-11
Table III-7: Future (2025) Level of Service/Signalized Intersections III-18
Table III-8: Future (2025) Level of Service/Non-signalized Intersections III-18
Table III-9: Additional River Crossings Model Results (2006) III-21
Table IV-1: Land Use Strategies - Community Audit IV-4
Table IV – 2: Access Management Strategies – Community Audit IV-12
Table V-1: Sight Distance V-16
Table VI-1: Population Density VI-3
Table VI-2: Youth Population VI-4
Table VI-3: Elderly Population VI-5
Table VI-4: Disabled Population VI-6
Table VI-5: Median Income VI-8
Table VI-6: Poverty VI-9
Table VI-7: Availible Vehicles VI-11
Table VI-8: Option 1 ..... VI-20
Table VI-9: Option 2 ..... VI-20
Table VI-10: Option 3 ..... VI-20
Table VI-11: Option 4 ..... VI-21
Table VI-12: Local Government Costs VI-23

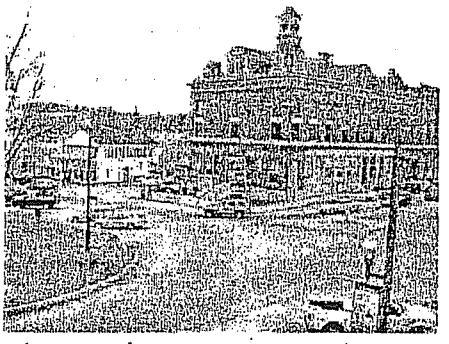
APPENDICES

Appendix A Bicycle Network Development
Appendix B Sidewalk Database
Appendix C Non-ADA Compliant Sidewalks

CHAPTER I: EXECUTIVE SUMMARY

A. THE ISSUES

The Transportation and Community and Systems Preservation (TCSP) study is designed to expand upon the recent NH 101 Corridor study by examining transportation issues town-wide in Amherst, Milford and Wilton. The results of the corridor study have shown that anticipated growth in through-traffic during the next 20 years will necessitate improving NH 101 from a two-lane non-divided cross section to a four-lane, median divided cross section throughout the length of the study area. Development of alternatives, preliminary design and environmental analysis for that improvement to NH 101 will take place as part of the regular MPO and state transportation planning and development process. During the corridor study process the NRPC and local governments recognized that in addition to the narrow focus of issues along the NH 101 corridor there is a need to address three types of issues on a community-wide basis to improve long term community sustainability. The first issue is traffic operations. Although these communities are all relatively small they are among the fastest growing in the state and there are growing needs with regard to traffic and congestion. The second issue is coordination of land use and transportation. Each of the three communities is experiencing pressure for rapid land development. One of the consequences of development pressure has been the lack of planning and coordination between land uses and transportation infrastructure. The third issue that has been identified is the need for planning for the development of alternative transportation modes that are coordinated with land use planning. The location of the three communities on the urban fringe of the Nashua region provide opportunities at this point to integrate planning for alternative modes in the communities planning process.



B. STRATEGIES

The TCSP study aims to improve the interface between land use and the transportation system through strategies that reduce dependence upon the automobile for meeting transportation needs, access management techniques that preserve roadway capacity and reduce safety problems, and design guidelines that decrease visual clutter along local transportation corridors. The benefits of this strategy include decreased wear and tear on the local road system which will lessen the need for future local roadway expansion. Other benefits will include less diversion of traffic from State routes into residential areas which will lead to safer local roads, and development of alternative modes of transportation including bicycle, pedestrian and transit, which will improve air quality and overall quality of life by reducing the number of single occupancy vehicles on the roadways. This policy has several key components in Milford:

- On Nashua Street, the westbound left turn lane at Clinton Street should be extended east past the Edgewood Plaza Shopping Center to Monson Place. A left turn lane should also be installed on the Nashua Street westbound-approach to Powers Street. These projects would improve the poor levels of service that currently exist at those locations.
- The Nashua Street/Ponemah Hill Road intersection should be improved and signalized.
- Nashua Street sidewalks are lacking in the vicinity of Lorden's and Richmond's Plazas. Existing sidewalks should be extended on both sides of Nashua Street from the cemetery all the way to these shopping centers. These improvements will encourage increased biking and walking to help calm traffic.

- Architecture and building design on segments of Elm Street are out of character and scale with the rest of Milford. Sight plan guidelines that maintain residential character and reflect traditional Milford architecture should be adopted. These guidelines have been developed by NRPC and could be applied to Milford.
- South Street is narrow, varies in width, bulges in sections and has many undefined curb cuts which results in concern for the safety of pedestrians and other motorists. The Town has applied for funding to install new sidewalk pavement, curbing, crosswalks, trees, street furnishings/bollard posts, street and pedestrian lighting, curbing, sidewalk pavement/accent pavement, trees, tree grates and guards, benches, bike racks and signage, pavement striping and driveway access reconfiguration (access management).
- There are currently two motor vehicle bridge crossings of the Souhegan River in Milford. A third bridge would potentially relieve traffic pressure at the Milford Oval. A feasibility study of the "West Street Corridor" crossing should be incorporated into the preliminary engineering and design of the future NH 101 widening project.
- The transition from western Milford to Wilton along NH101 is a bottleneck with traffic signals, 2 at-grade railroad crossings and access management issues. An access management plan should be developed for the segment of roadway between the western end of the bypass and the Milford-Wilton town line. A center turning lane should be developed as part of this plan. In the long term the Milford Bypass extension as described in the NH 101 Corridor Study should be implemented.
- The transition from the highway system to the local street system could be greatly enhanced by landscaped gateways at key entries into town. Intensive gateway landscaping should be installed at key locations throughout the study area

- An effort should be made to enhance the perception that Milford is a bicycle and pedestrian friendly town. This could be accomplished by developing programs that help maintain pavement, policies that encourage increased biking and walking and designated bicycle and pedestrian routes.
- The location of Milford on the urban fringe of the Nashua region provides an opportunity to integrate public transit into the planning process. Full day fixed route service would assist Milford in best meeting the needs of households with limited incomes, limited vehicle availability and the disabled population.

C. Next Steps

The NH 101 Corridor Study was the first step towards improving roadway safety and efficiency in Amherst, Milford and Wilton. The TCSP study is the next step towards further action. The Town of Milford should move forward with the recommendations that have been put forward in this document. Many of the suggested improvements are along State routes (NH 13 and NH 101A) and are therefore eligible for federal funding at an 80% level. Since both of these routes are regional in nature and the recommendations are part of a coordinated strategy to improve safety and traffic operations, at least a portion of the remaining 20% of project costs may be born by the state. Also, TCSP implementation funding could be available for the projects that have been recommended in this document. TCSP funds require no local match.

The Town has applied for Transportation Enhancement funding (2005-2006 round) for the South Street improvement project. This is an important project that will improve traffic flow and safety in the Oval. The Town should continue to aggressively pursue funding and implementation of this project.

The NRPC adopted its regional bicycle and pedestrian policy in June 2005 and is in the process of assembling a regional steering committee. The Town should appoint a representative to this committee because many of the recommendations in the regional plan have a direct impact on bicycle and pedestrian issues in Milford. The Town should also develop a local steering committee that will deal with specific local issues as well as coordinate with the regional committee.

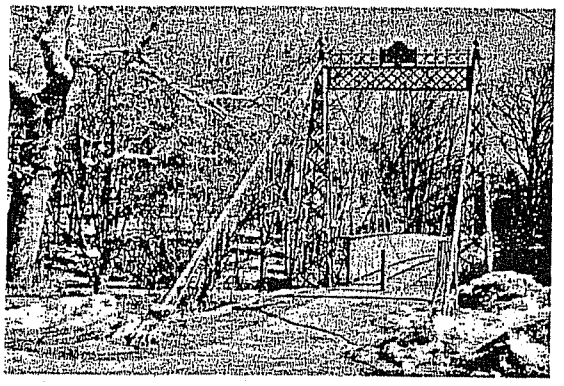
Adopting access management and design guidelines is a town action that can be undertaken over the next year. These guidelines have already been developed by NRPC and are ready for study by the planning board. Typically a public hearing would be required for access management and design guidelines to be adopted as town policy.

CHAPTER II: INTRODUCTION

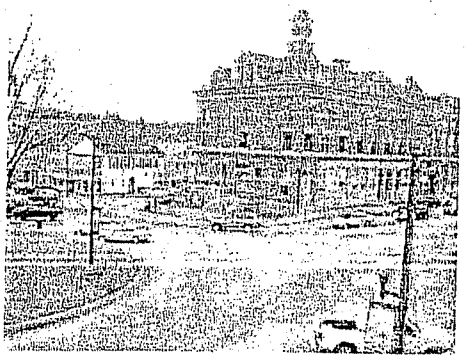
A. ORIGIN OF THE TCSP STUDY

The federal Transportation and Community and Systems Preservation (TCSP) Program is a comprehensive initiative of research and grants to investigate the relationships between transportation, community and systems preservation plans and practices and identify ways to improve such relationships. The purpose of the program is to carry out eligible projects to integrate transportation, community and system preservation plans and practices that:

- Improve the efficiency of the transportation system in the United States,
- Reduce the environmental impacts of the transportation system
- Reduce the need for costly future public infrastructure investments,
- Ensure efficient access to jobs, services and centers of trade.



The Amherst, Milford and Wilton TCSP study is designed to expand upon the recent NH 101 Corridor Plan by examining transportation issues town-wide in Milford as well as in Amherst and Wilton. NH 101 is the principal east-west corridor in southern New Hampshire. As New Hampshire developed over the years and grew in population, motor-vehicle miles traveled increased dramatically, resulting in reduced traffic flow at key intersections, increased numbers of accidents, conflicts between through-traffic and local access to side streets and commercial driveways, and impacts on the quality of life in the towns traversed by the highway. NRPC recognized the need to address current and future problems along the corridor. With the support of New Hampshire's congressional delegation and the New Hampshire Department of Transportation, NRPC obtained funding through NHDOT for the NH 101 Corridor Study in Amherst, Milford and Wilton. The NH 101 Corridor Study began with a series of public meetings and culminated with a set of recommendations that were presented at publicly attended meetings in the Fall of 2002. The Town of Bedford also completed a corridor plan for its portion of the NH 101 corridor. A corridor study steering committee comprised of members from all four towns and NRPC met regularly throughout the development of both planning documents to coordinate the work in all four towns and ensure that the recommendations for both documents are consistent and compatible. The NH Route 101 Corridor Plan was completed in 2002 and it suggests that anticipated growth in through-traffic in the next 20 years will necessitate improving NH 101 from a two-lane non-divided cross section to a four-lane, median divided cross section throughout the length of the study area. Development of alternatives, preliminary design and environmental analysis for NH 101 improvements will take place as part of the regular MPO and state transportation planning and development process.



Transportation issues in Milford, however, are not confined to the NH 101 corridor. Changes in the land development patterns and circulation needs of this community suggest the need for the development of a plan that offers solutions to existing and future traffic issues, emphasizes the connection between transportation and land use planning, and develops

alternative modes of transportation. The TCSP study accommodates this need because it examines existing traffic conditions, forecasts future traffic using the NRPC traffic model, and identifies needed improvements to the local traffic circulation system. The project also seeks to improve the interface between land use and the transportation system. Strategies include reducing dependence upon the automobile for meeting transportation needs, access management techniques that preserve roadway capacity and reduce safety problems, and design guidelines that enhance the appearance and decrease the visual clutter along main local transportation corridors.

B. NRPC Role

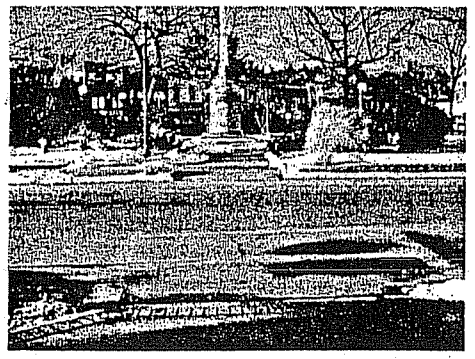
NRPC conducted the TCSP study in Amherst, Milford and Wilton. NRPC maintains a database of information on transportation, land use and natural resources. This information is the basis for many of the maps in this report, with coordinated information provided by the NRPC Geographic Information Systems (GIS) staff. NRPC's transportation staff completed the field work that provided traffic counts at key intersections in the study area and analyzed the data.

C. Study Process

The TCSP Study began with a series of planning board workshops in Amherst, Milford and Wilton. These initial workshops were designed to introduce the scope of the project to the planning boards and to seek input regarding access management and design issues along local transportation corridors. A steering committee was also formed and each town was represented by at least two committee members. The steering committee met numerous times over the course of the study and participated fully in the development of this report. Access management and design issues along specific transportation corridors were identified based on input from these groups. Strategies for improving conditions along the corridors were then developed. A draft report with specific recommendations was developed by NRPC staff. The steering committee was consulted during the development of the draft document and their comments were incorporated. Draft final recommendations were presented to town planning officials in July of 2006 at publicly attended (workshop) planning board meetings. Final revisions were made as a result of these meetings.

D. Report Overview

This Transportation, Community and Systems Preservation Final Report addresses specific transportation and land use issues in the Town of Milford. This report documents the Milford portion of the TCSP study and includes sections on motor vehicle traffic and analysis, land use, bicycle and pedestrian issues, and regional transit. Each section includes analysis of the issues, recommendations for improving conditions in the study area, and an action plan.



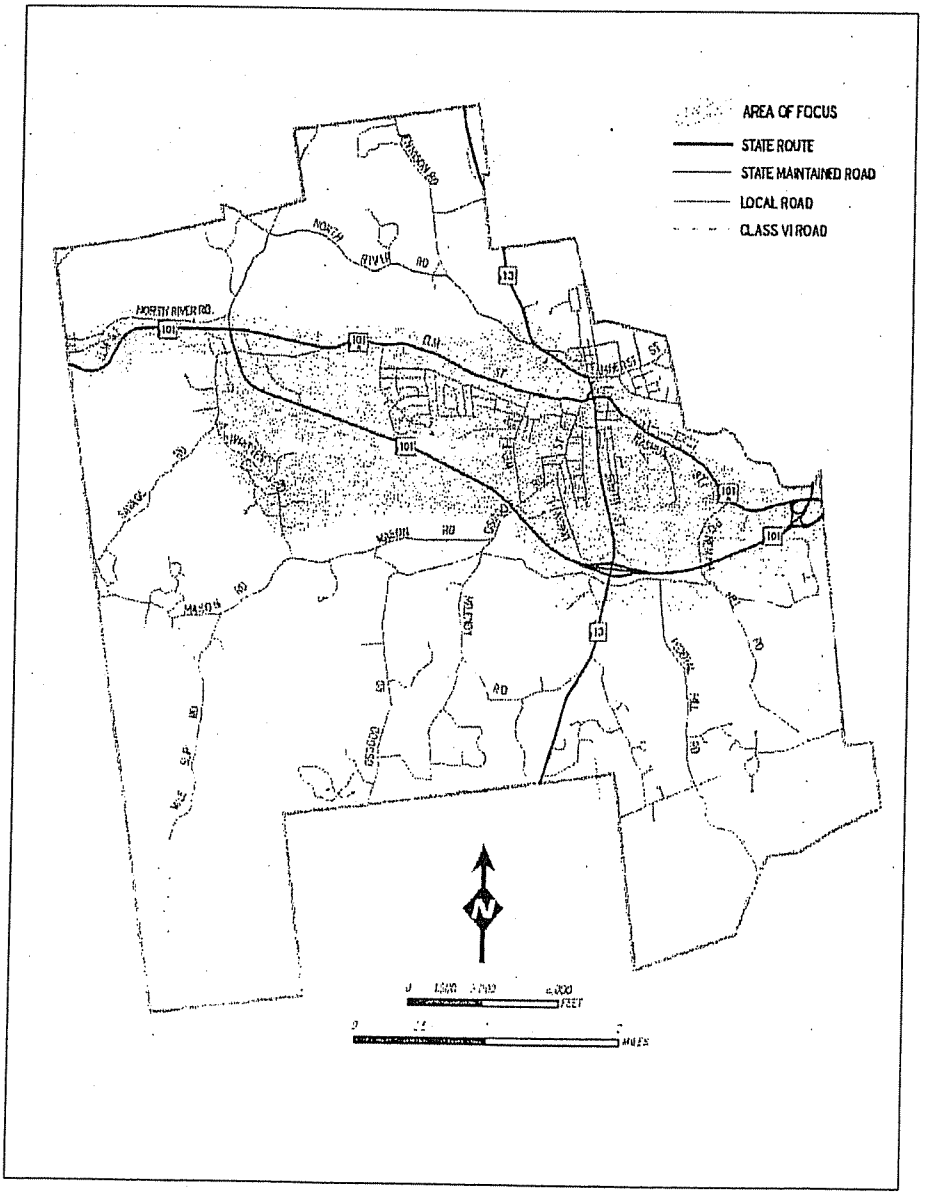
The TCSP project also included the Towns of Amherst and Wilton and it is important to keep in mind that, while separate final reports were also produced for those communities, the issue areas that were identified overlap between all of the communities in the study area.

CHAPTER III: TRAFFIC PLAN

A. BACKGROUND

This section of the TCSP study examines existing traffic conditions in Milford, including traffic volume counts and intersection Level of Service (LOS). In addition, this section forecasts the future traffic volumes and intersection LOS using the NRPC traffic model. Also, a town-wide traffic study was produced for the Town in 2002. That study provided an extensive list of minor and major circulation improvements. NRPC has considered these options, paying special attention to issues resulting from increased traffic on NH101. Additional near and long-term improvements to the local traffic circulation system were identified by the TCSP Steering Committee. Map III-1 shows the study area road network.

Map III-1: Study Area Road Network

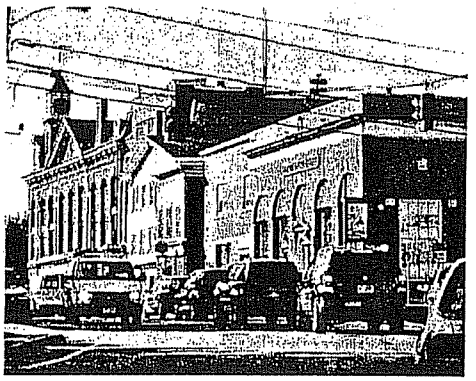


B. TRAFFIC ANALYSIS

This study has been developed to provide the public, elected officials, appointed officials and town staff with information regarding the impacts on traffic, land use and the environment from future improvements to the traffic circulation system.

1. EXISTING TRAFFIC CONDITIONS

The first section of this study identifies existing traffic conditions in Milford. Roads and intersections that serve as town-wide travel corridors were identified by the TCSP Steering Committee. The corridors that were identified include:



- NH 101A (Nashua Street) corridor beginning at the Oval and continuing east to the Amherst town line;
- NH 101A (Elm Street) corridor beginning at the Milford Oval and continuing west all the way to the signalized intersection near the Wilton town line;
- NH 13 (South Street) corridor beginning at the Oval and continuing south to the Emerson Street/ Armory Street intersection;
- NH 13 (Mont Vernon Road) from the Oval to North River Road; and
- Amherst Street from the Oval to Amherst Town line.

Recent traffic volume counts conducted by NRPC in those corridors were reviewed. In addition, morning and afternoon peak hour turning movement counts were conducted at 21 intersections. A Level of Service analysis (LOS) was then conducted for these intersections to describe the current traffic operations in the study area.

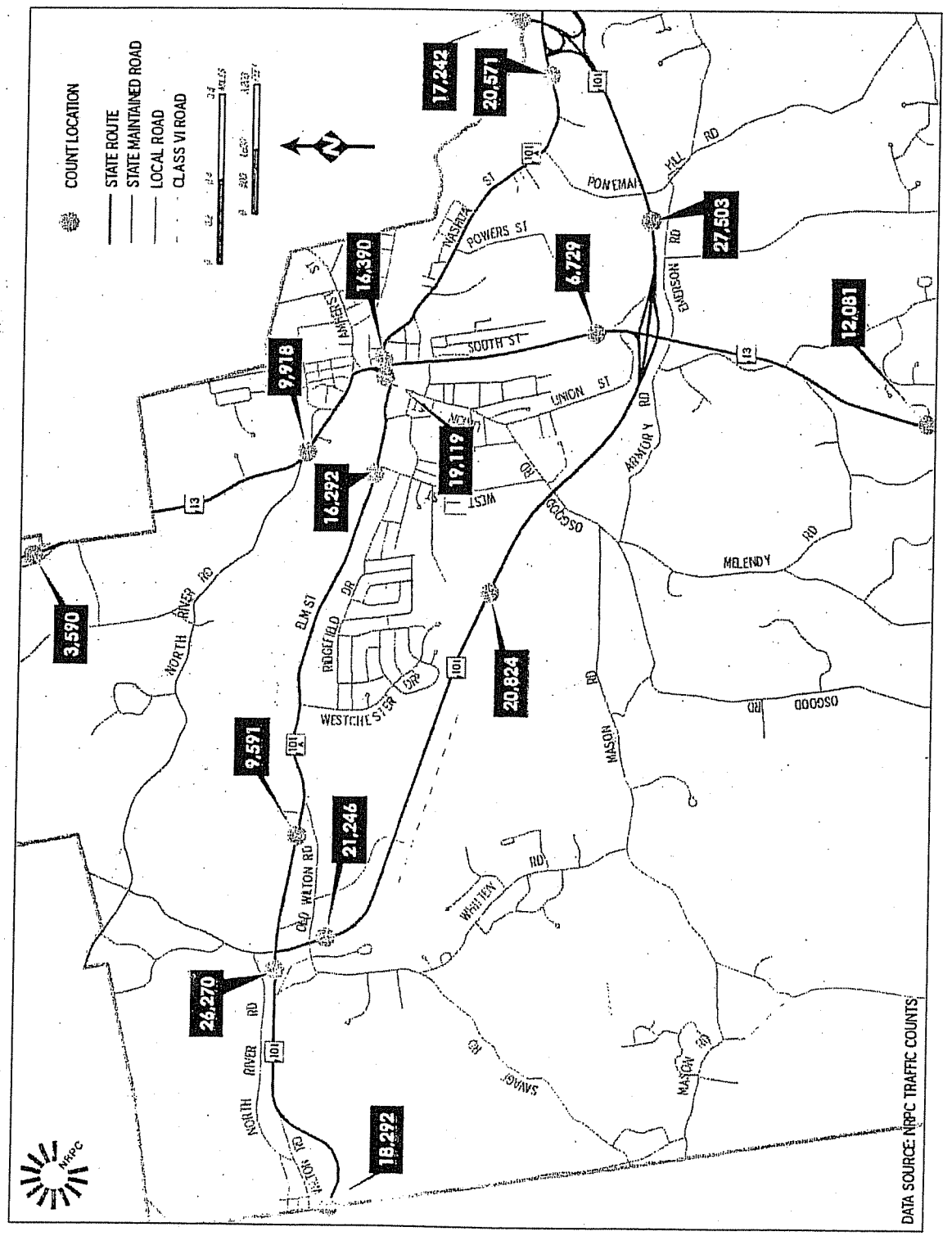
2. 24-HOUR TRAFFIC COUNTS

The study included data from 24-hour traffic volume counts that NRPC conducts on a regular basis for NHDOT as part of the Highway Performance Monitoring System (HPMS). Additional traffic counts were also conducted specifically for this study. The locations of the volume counts are shown on Map III-2 (next page) and summarized below.

a. 24-Hour Traffic Volumes (average daily traffic)

- **Nashua Street (NH 101A):** The volume of traffic on Nashua Street varies from 20,571 near the entrance to Lorden Plaza, to 16,390 just east of the Oval.
- **Elm Street (NH 101A):** The volume of traffic on Elm Street varies from 19,119 just west of the Oval, to 16,292 just west of West Street, to 9,591 just west of Old Wilton Road.
- **NH 101:** The volume of traffic on NH 101 varies from 17,242 at the Amherst-Milford town line, to 27,503 just east of the NH 13 interchange, to 21,246 at the west end of the Milford bypass (south of NH 101A intersection), to 18,292 at Milford-Wilton town line.
- **South Street (NH 13):** The volume of traffic varies from 12,081 near the Milford-Brookline town line, to 6,729 north of NH 101 (near Union Street).
- **Mont Vernon Road (NH13):** The volume of traffic on Mont Vernon Road varies from 16,390 near the Oval on the Stone Bridge, to 9,918 just south of the North River Road intersection to 3,590 at the Milford-Mont Vernon town line.

Map III-2: 24-Hour Traffic Volumes



3. PEAK HOUR TURNING MOVEMENT COUNTS:

NRPC conducted morning and afternoon (peak-period) manual turning movement counts at 21 critical intersections in Milford. These counts helped to identify existing base line conditions. The counts were conducted in the field by NRPC staff on weekdays between the hours of 7:00am and 9:00am and 4:00pm and 6:00pm. The locations for the turning movement counts are shown on Map III-3 (next page) and summarized below.

a. Turning Movement Count Locations

Signalized Intersections

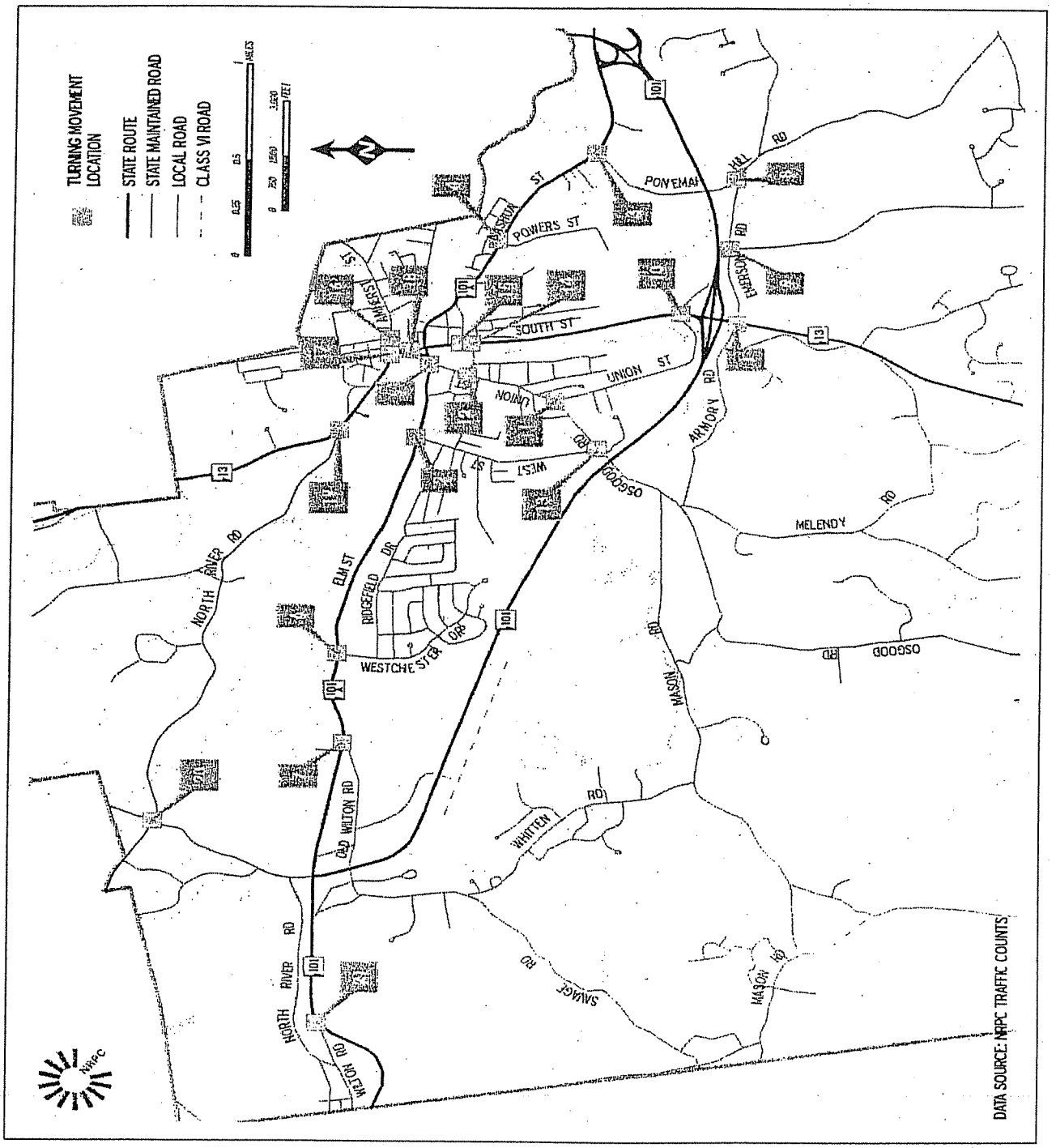
- **NH 13/Emerson St/Armory Road:** This intersection (# 1 on Map III-3) is a 4-way signalized intersection. NH 13 is the major approach and runs north-south. Emerson Street is the westbound approach and Armory Road is the eastbound approach.
- **Elm St (NH 101A)/West Street:** This intersection (# 2 on Map III-3) is a 3-way signalized "T" intersection. Elm Street is the major east-west approach and West Street is the northbound approach.

Non-Signalized Intersections

- **Nashua Street (NH101A)/Ponemah Hill Road):** This intersection (# 3 on Map III-3) is a 3-way "T" stop sign-controlled intersection. Nashua Street is the major east-west approach and Ponemah Hill Road is the northbound approach.
- **Nashua Street (NH101A)/Powers Street:** This intersection (# 4 on Map III-3) is a 3- way "T" stop sign-controlled intersection. Nashua Street is the major east-west approach and Powers Street is the northbound approach.
- **Elm Street (NH101A)/Union Street:** This intersection (# 5 on Map III-3) is a 3- way "T" stop sign-controlled intersection. Elm Street is the major east-west approach and Union Street is the northbound approach.
- **Elm Street (NH101A)/Westchester Street:** This intersection (# 6 on Map III-3) is a 3-way "T" stop sign-controlled intersection. Elm Street is the major east-west approach and Westchester Street is the northbound approach.
- **Elm St (NH101A)/Old Wilton Road:** This intersection (# 7 on Map III-3) is a 3- way "Y" stop sign -controlled intersection. Elm Street is the major east-west approach and Old Wilton Road is the eastbound approach.
- **Emerson Road/Ponemah Hill Road:** This intersection (# 8 on Map III-3) is a 3-way "T" stop sign-controlled intersection. Ponemah Hill Road is the major north-south approach and Emerson Road is the eastbound approach.
- **Emerson Road/Federal Hill Road:** This intersection (# 9 on Map III-3) is a 3-way "T" stop sign-controlled intersection. Emerson Road is the major east-west approach and Federal Hill Road is the northbound approach.
- **South Street (NH 13)/Union Street:** This intersection (# 10 on Map III-3) is a 3-way "T" stop sign-controlled intersection. South Street is the major north-south approach and Union Street is the eastbound approach.
- **Union Street/Osgood Road:** This intersection (#11 on Map III-3) is a 3-way "T" stop sign-intersection. Union Street is the major north-south approach and Osgood Road is the eastbound approach.
- **Union Street/Lincoln Street:** This intersection (# 12 on Map III-3) is a 3-way "T" stop sign-controlled intersection. Union Street is the major north-south approach and Lincoln Street is the westbound approach.

- **West Street/Osgood Road:** This intersection (# 13 on Map III-3) is a 3-way "T" stop sign-controlled intersection. Osgood Road is the major east-west approach and West Street is the southbound approach.
- **South Street (NH13)/Lincoln Street:** This intersection (# 14 on Map III-3) is a 3-way "T" stop sign-controlled intersection. South Street is the major north-south approach and Lincoln Street is the eastbound approach.
- **South Street (NH 13)/Clinton St:** This intersection (# 15 on Map III-3) is a 3-way "T" stop sign-controlled intersection. South Street is the major north-south approach and Clinton Street is the westbound approach.
- **Amherst Street/Summer Street/Grove Street:** This intersection (#16 on Map III-3) is a 4-way stop sign-controlled intersection
- **Mont Vernon Road (NH 13)/Grove St:** This intersection (# 17 on Map III-3) is a 3-way "T" stop sign-controlled intersection. Mont Vernon Road is the major north-south approach and Grove Street is the eastbound approach.
- **Mont Vernon Road (NH 13)/Amherst St:** This intersection (# 18 on Map III-3) is a 3-way "T" stop sign-controlled intersection. Mont Vernon Road is the major north-south approach and Amherst Street is the eastbound approach.
- **Mont Vernon Road (NH 13)/North River Rd:** This intersection (# 19 on Map III-3) is a 3-way "Y" stop sign-controlled intersection. Mont Vernon Road is the major north-south approach and North River Road is the eastbound approach.
- **North River Road/Purgatory Road/Center Road:** This intersection (# 20 on Map III-3) is a 4-way stop sign-controlled intersection. North River road is the major approach (from the south and from the east).
- **NH 101/Wilton Road:** This intersection (#21 on Map III-3) is a 4-way signal-controlled intersection.

Map III-3: Turning Movement Count Locations



4. INTERSECTION PEAK HOUR LEVEL OF SERVICE ANALYSIS

The NRPC performed level-of-service analysis (LOS) for the morning and afternoon peak hour conditions for the study area intersections. Level-of-service analysis was performed based on the industry standards as described in the Highway Capacity Manual 2000 (HCM), published by the Transportation Research Board. The HCM defines the quality of traffic operations at specific highway facilities (roads, lanes, intersections, and intersection approaches) under specific conditions (peak hour) by a means of "level-of-service." The LOS characterizes the operating conditions on a facility in terms of traffic performance measures related to speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.

The levels-of-service range from "A" (least congested) to "F" (most congested). The following table shows the general definitions of LOS.

Table III-1: Level of Service Definitions

Level of Service	General Operating Conditions
A	Free flow
B	Reasonably free flow
C	Stable flow
D	Approaching unstable flow
E	Unstable flow
F	Forced or breakdown flow

Source: "A Policy on Geometric Design of Highways and Streets", AASHTO

Signalized intersection analysis requires peak hour volumes and traffic conditions, intersection geometrics and lane use, and signal timing and phasing operations as input parameters. The average control delay per vehicle is estimated for each lane group and aggregated for each approach and the intersection as a whole. The LOS is directly related to the control delay value. The LOS criteria for signalized intersections are shown in the following table:

Table III-2: Level of Service Criteria/Signalized Intersections

Level of Service	Control Delay per Vehicle (sec./veh.)
A	≤ 10
B	> 10-20
C	> 20-35
D	> 35-55
E	> 55-80
F	> 80

Source: "Highway Capacity Manual 2000", TRB.

Operational analysis at non-signalized (two-way and four-way stop controlled) depends upon the understanding of the interaction of drivers on the minor or stop-controlled approach with the drivers on the major street. The LOS for a stop controlled intersection is determined by the computed or measured control delay and is defined for each minor movement. The LOS is not defined for the intersection as a whole. The LOS criteria for non-signalized intersections are shown in the following table:

Table III-3: Level of Service Criteria/Non-signalized Intersections

Level of Service	Control Delay per Vehicle (sec./veh.)
A	0 - 10
B	10 - 15
C	15 - 25
D	25 - 35
E	35 - 50
F	> 50

Source: "Highway Capacity Manual 2000", TRB.

a. Existing Level of Service

The existing peak hour LOS is summarized in Tables III-4 and III-5.

Table III-4: Existing (2004) Level of Surface/Signalized Intersections

Study Area Signalized Intersections:	AM Peak Delay (sec.)	AM Peak LOS	PM Peak Delay (sec.)	PM Peak LOS
NH13/EMERSON RD/ARMORY RD				
Armory Rd EB left, right, thru	79.8	E	160.4	F
Emerson Rd WB left, right, thru	34.2	C	238.8	F
NH 13 NB left	30.7	C	31.7	C
NH 13 NB thru	17.4	B	22.6	C
NH 13 NB right	12.5	B	12.8	B
NH 13 SB left	41.3	D	50.8	D
NH 13 SB right, thru	17.1	B	25.0	C
Armory Rd EB approach	79.8	E	160.4	F
Emerson Rd WB approach	34.2	C	238.8	F
NH 13 NB approach	17.4	B	22.0	C
NH 13 SB approach	23.0	C	30.4	C
Intersection LOS (overall)	31.8	C	79.6	E
ELM STREET (NH101A)/WEST STREET				
Elm St (NH101A) EB thru	13.8	B	16.8	B
Elm St (NH101A) EB right	46.3	D	68.5	E
Elm St (NH101A) WB left	47.3	D	166.9	F
Elm St (NH101A) WB thru	5.5	A	6.9	A
West St NB left	48.7	D	51.7	D
West St NB right	38.6	D	47.0	D
Elm St (NH 101A) EB approach	18.4	B	26.1	C
Elm St (NH101A) WB approach	12.9	B	50.1	D
West St. NB approach	44.9	D	49.7	D
Intersection LOS (overall)	21.8	C	41.0	D

Table III-5: Existing (2004) Level of Surface/Non-signalized Intersections

Study Area Non-signalized Intersections:	AM Peak Delay (sec.)	AM Peak LOS	PM Peak Delay (sec.)	PM Peak LOS
NASHUA STREET (NH101A)/PONEMAH HILL ROAD				
Nashua St (NH 101A) WB left turn	9.6	A	11.5	B
Ponemah Hill Rd NB left-right-thru	25.3	D	155.1	F
Ponemah Hill Rd NB Approach	25.3	D	155.1	F
NASHUA STREET (NH101A)/POWERS STREET				
Nashua St (NH 101A) WB left turn	9.3	A	9.3	A
Powers St NB left, right, thru	18.2	C	84.5	F
Powers St NB approach	18.2	C	84.5	F
ELM ST (NH101A)/UNION ST)				
Elm St (NH101A) WB left turn	8.8	A	9.7	A
Union St NB left, right	15.0	C	20.9	C
Union St NB approach	15.0	C	20.9	C
ELM ST (NH101A)/WESTCHESTER ST				
Elm St (NH101A) WB left	8.3	A	8.7	A
Westchester Dr NB left, right, thru	16.9	C	29.1	D
Westchester Dr NB approach	16.9	C	29.1	D
ELM ST (NH 101A)/OLD WILTON RD				
Elm St (NH101A) WB left	8.8	A	8.5	A
Old Wilton Rd NB left, right	12.9	B	14.1	B
Old Wilton Rd approach	12.9	B	14.1	B
EMERSON RD/PONEMAH HILL RD				
Ponemah Hill Rd NB left	7.5	A	7.9	A
Emerson Rd EB left, right	10.4	B	11.7	B
Emerson Rd NB approach	10.4	B	11.7	B
EMERSON RD/FEDERAL HILL RD				
Emerson Rd WB left	7.8	A	8.6	A
Federal Hill Rd left, right	11.4	B	25.5	D
Federal Hill Rd NB approach	11.4	B	25.5	D
NH 13/UNION ST				
NH 13 NB left	8.2	A	8.1	A
Union St left, right	13.0	B	11.1	B
Union St approach	13.0	B	11.1	B
UNION ST/OSGOOD ST				
Union St NB left	7.6	A	7.8	A
Osgood St EB left	10.2	B	12.8	B
Osgood St EB approach	10.2	B	12.8	B

Table III-5 (cont.): Existing (2004) Level of Surface/Non-signalized Intersections

Study Area Non-signalized Intersections:	AM Peak Delay (sec.)	AM Peak LOS	PM Peak Delay (sec.)	PM Peak LOS
UNION ST/LINCOLN ST				
Union St SB left	7.6	A	7.8	A
Lincoln WB left, right	9.6	A	13.2	B
Lincoln St approach	9.6	A	13.2	B
WEST ST/OSGOOD ST				
Osgood St EB left	9.3	A	7.9	A
West St SB left	44.2	E	11.8	B
West St SB approach	44.2	E	11.8	B
NH 13(SOUTH ST)/LINCOLN ST				
NH 13 NB left	7.8	A	8.5	A
Lincoln St EB left, right	13.7	B	20.3	C
Lincoln St EB approach	13.7	B	20.3	C
NH 13(SOUTH ST)/CLINTON ST				
NH 13 SB left	8.1	A	8.3	A
Clinton St WB left, right	14.3	B	32	D
Clinton St WB approach	14.3	B	32	D
NH 13/AMHERST STREET				
Amherst St WB approach	E	39.8	F	83.9
NH 13/GROVE ST				
Grove St WB approach	C	-	B	13.4
NH 13/NORTH RIVER RD				
NH 13 NB left	8.1	A	8.5	A
North River Rd EB left, Right	12.2	B	12.7	B
North River Rd EB approach	*12.2*	*B*	*12.7*	*B*
NORTH RIVER RD/PURGATORY RD/CENTER RD				
Center Rd EB left	7.3	A	7.3	A
North River Rd WB left	7.5	A	7.6	A
North River Rd NB left, right, thru	10.2	B	19.5	C
Purgatory Rd SB left, right, thru	11.5	B	15.8	C
North River Rd NB approach	10.2	B	19.5	C
Purgatory Rd SB approach	11.5	B	15.8	C

5. FUTURE (2025) TRAFFIC CONDITIONS

The future traffic conditions for this study are based on traffic projections derived from the NRPC regional traffic model. Two future model scenarios were developed. The "No-Build" scenario estimates future traffic conditions based on the currently existing transportation network and expected growth in population and employment. The "Build" scenario estimates future traffic conditions based on the existing transportation network plus all projects called for in the current NH DOT Ten Year Transportation Plan and NRPC Long Range Transportation Plan. Two of the larger projects involve NH 101 and NH 101A. The NH 101 project includes widening to a 4-lane, median-divided roadway between the west end of the Milford bypass and the Amherst/Bedford town line and creating several grade-separated interchanges. The NH 101A project includes widening the roadway to a consistent 7 lanes (3 in each direction and center turning lane) from Somerset Parkway to the Merrimack town line, coordinating all 22 existing traffic signals, consolidation of curb cuts, expanding inter site connections and other improvements. In both the "Build" and "No-Build" scenarios the expected morning and evening peak hour traffic and turning movements were estimated for the study area intersections. Based on that data, the level-of-service analysis was conducted for both No-Build and Build conditions and compared in order to distinguish the potential impacts of the recommendations in this study.

6. FUTURE TRAFFIC VOLUMES

Future traffic volumes were projected to a 20-year horizon, utilizing the NRPC regional traffic model. The traffic model converts land use inputs, specifically the number of housing units, employment and school enrollment, into vehicle trips based on trip generation equations for each specific land use. The trips are then distributed throughout the regional study area and beyond utilizing a "gravity" model. The future scenario has been developed based on existing land use patterns, local land use policies and zoning, the availability of vacant land and the presence of environmental constraints.

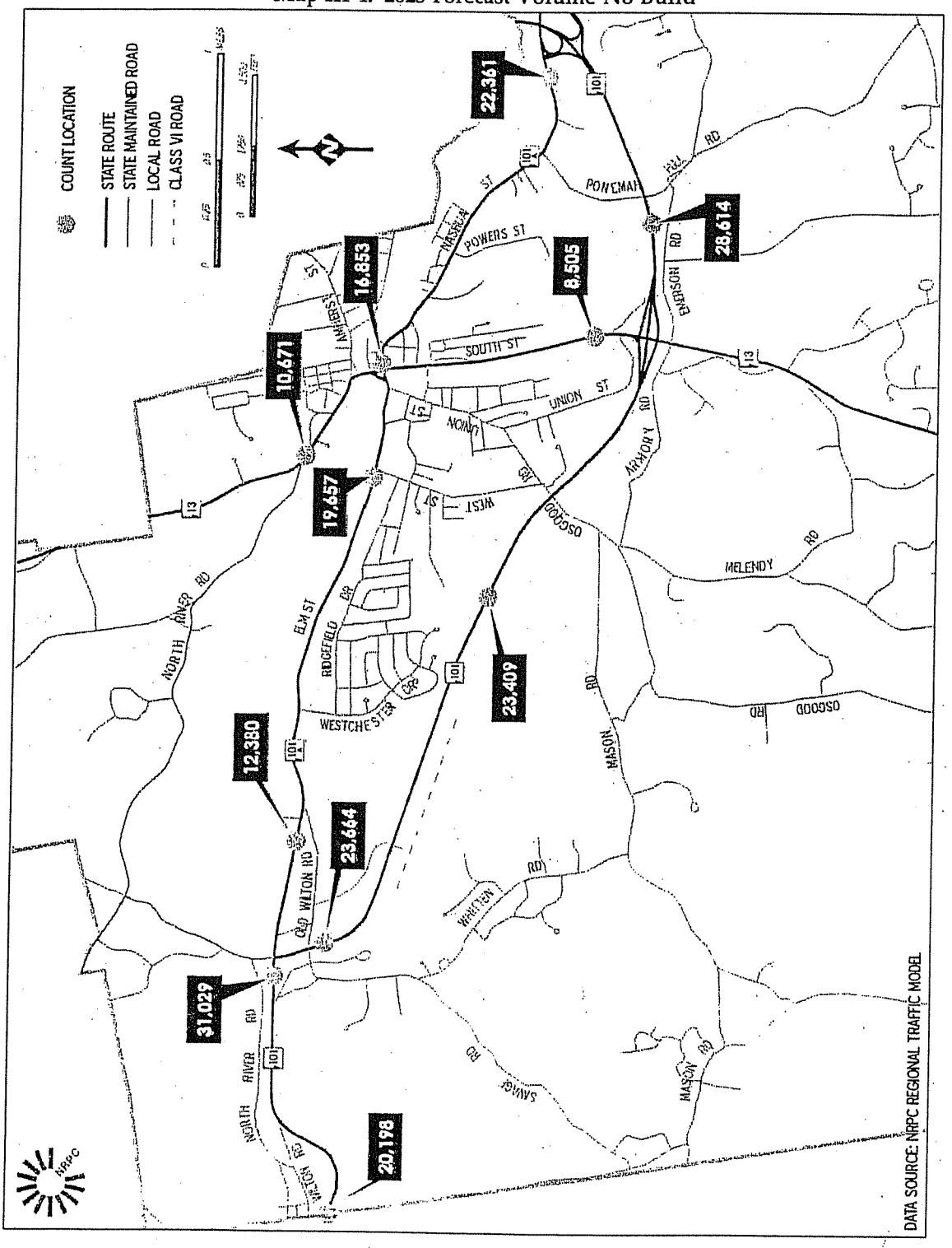
Table III-6 records traffic count locations, the most recent recorded volume (ADT) and the year that traffic was counted at that location. The table also lists the projected future (2025) volume for both Build and No-Build conditions. The percent change between recent traffic counts and future Build and No Build conditions is also given. It can be seen that in most cases traffic volume is projected to increase.

Table III-6: Future (2025) Traffic Forecasts

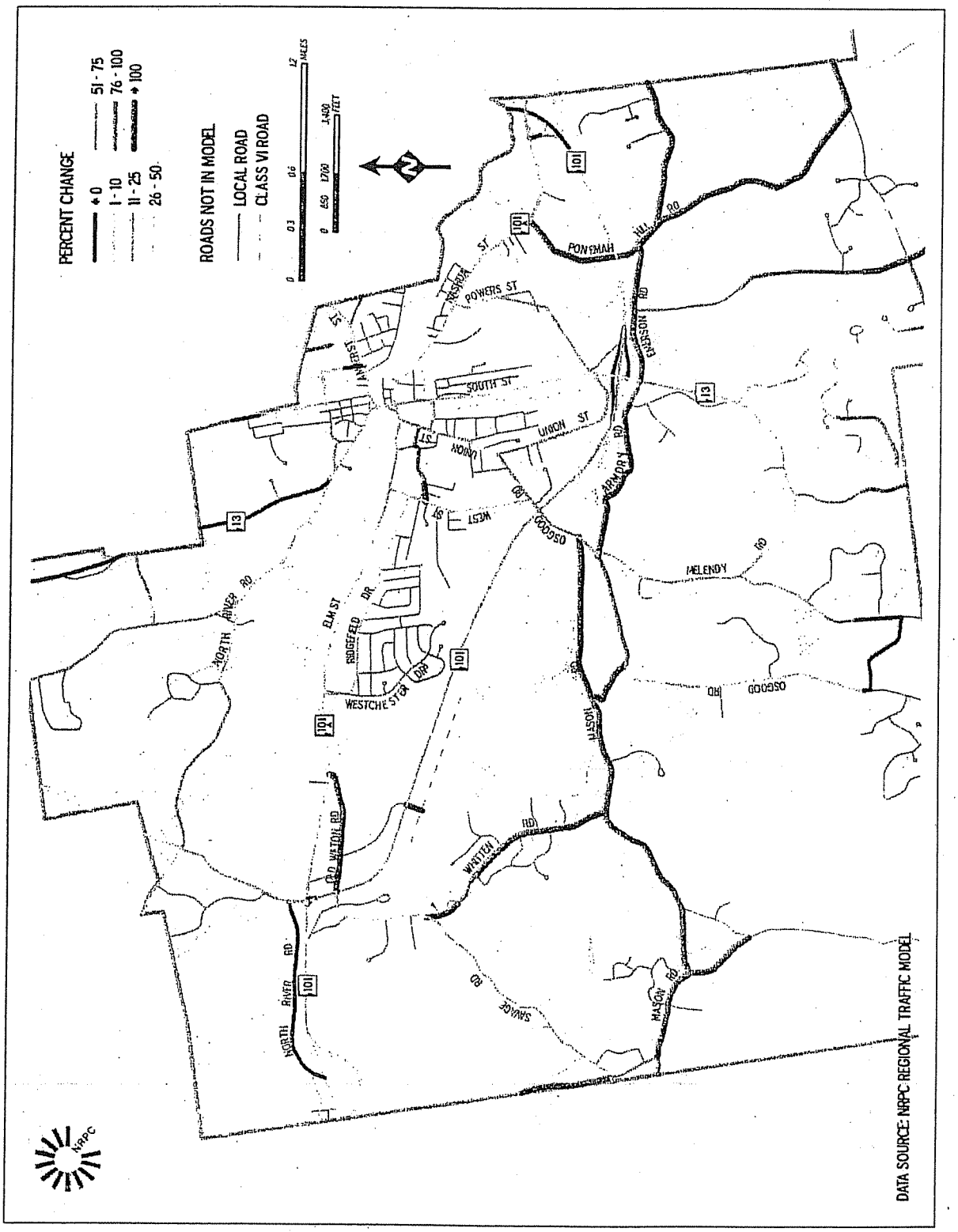
	Most Recent Traffic		2025 Forecast Volume			
Location	Vehicles/Day	Year	No Build	% Change Present/future	Build	% Change Present/future
NH 101A West of NH 101	20,571	2003	22,361	8.7%	20,627	0.3%
NH 101A East of the Oval	16,390	2004	16,853	2.8%	15,443	- 5.8%
NH 101A West of West St	16,292	2004	19,657	20.7%	20,103	23.4%
NH 101A West of Old Wilton Rd	9,591	2003	12,380	29.1%	9,687	1.0%
NH 101 East of NH 13	27,503	2003	28,614	4.0%	35,072	27.4%
NH 101 West of NH 13	20,824	2003	23,409	12.4%	28,086	35.9%
NH 101 East of Old Wilton Rd	21,246	2003	23,664	11.4%	15,689	- 26.2%
NH 101 West of NH 101A	26,270	2003	31,029	18.1%	18,550	- 29.4%
NH 101 @ Wilton T/L	18,292	2004	20,198	10.4%	21,327	16.6%
NH 13 North of NH 101	6,729	2004	8,505	26.4%	8,439	25.4%
NH 13 South of North River Rd	9,918	2003	10,671	7.6%	9,547	- 3.7%

Map III-4 displays projected future traffic volumes and Map III-5 displays the percent change in volume for specific roadway segments for the No-Build scenario. Map III-6 displays projected future traffic volumes and Map III-7 displays the percent change in volume for specific roadway segments for the Build scenario.

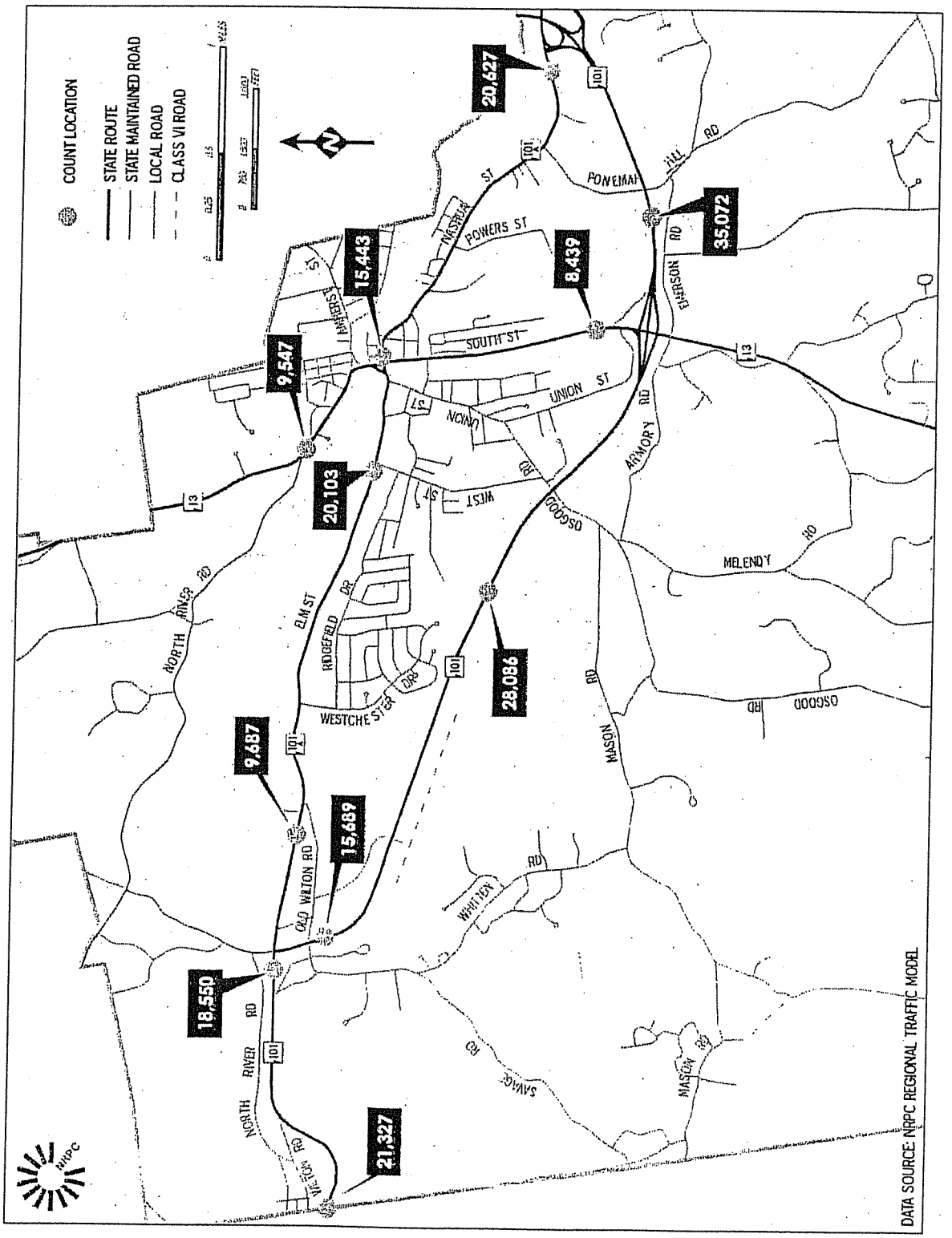
Map III-4: 2025 Forecast Volume-No Build



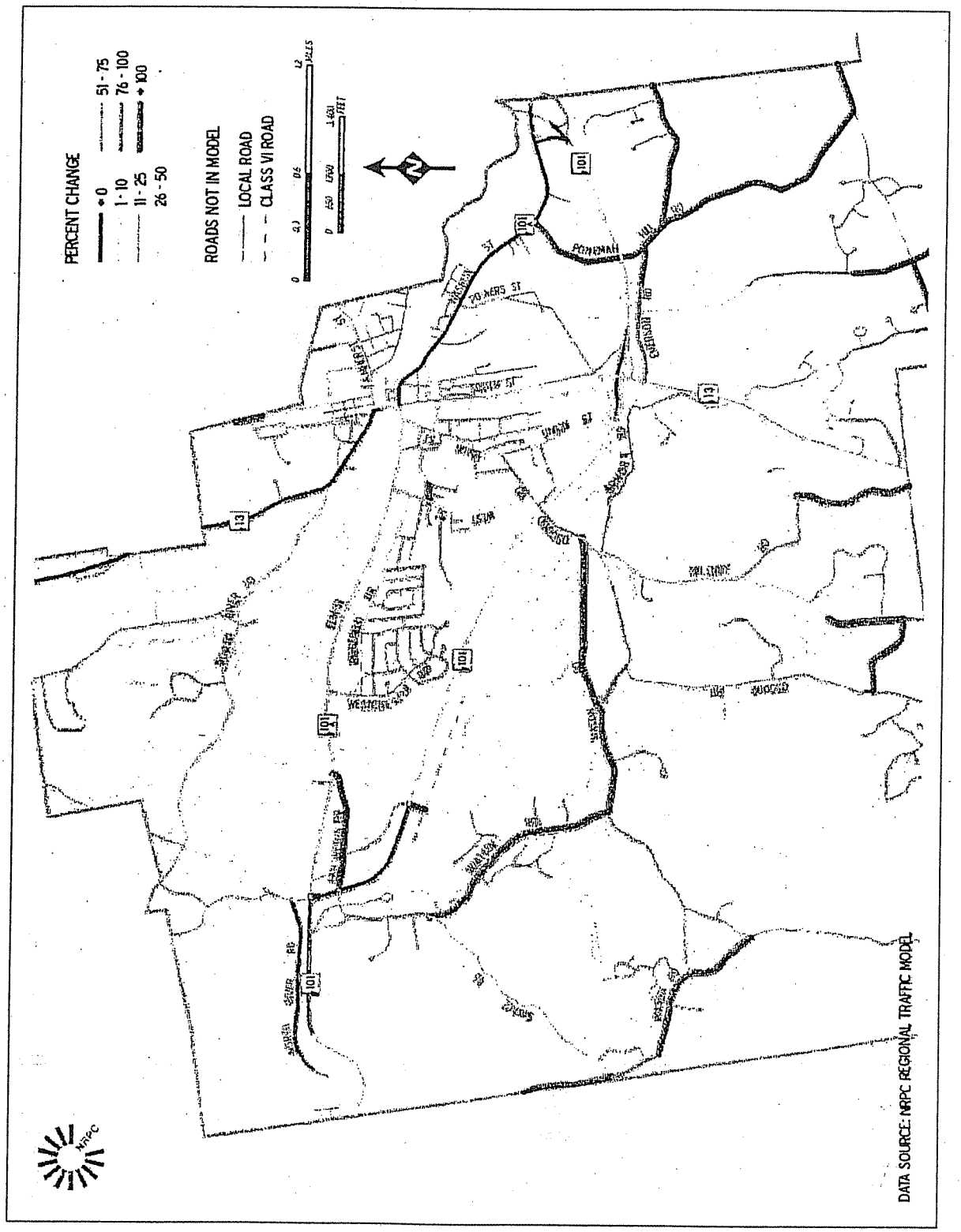
Map III-5: 2025 Forecast Changes in Volume-No Build



Map III-6: 2025 Forecast Volume-Build



Map III-7: 2025 Forecast Changes in Volume-Build



7. FUTURE LEVEL OF SERVICE

As described previously, the No Build scenario represents the traffic conditions that can be expected in Milford in 2025 based on the currently existing transportation network and expected growth in population and employment. Based on that analysis, there is one signalized and four non- signalized intersections in town that will operate at Level of Service "F" in 2025 (Tables III-7 & III-8). The other intersections that were analyzed will operate at LOS "E" or better.

- **NH 13/Emerson/Armory Road:** Overall LOS will be "F".
- **NH101A/Ponemah Hill Road:** The northbound Ponemah Hill Road approach will operate at LOS"F" during the morning and afternoon peak periods.
- **NH101A/Powers Street:** The northbound Powers Street approach will operate at LOS "F" during the afternoon peak period.
- **NH101A/Old Wilton Road:** The Old Wilton Road approach will operate at LOS "F" during the morning and afternoon peak period.
- **Emerson Road/Federal Hill Road:** The northbound Federal Hill Road approach will operate at LOS "F" during the morning and afternoon peak periods.

The Build scenario represents the traffic conditions that can be expected in Milford in 2025 based on NH DOT's Ten-Year Transportation Improvement Program as well as expected growth in population and employment. Based on that analysis there is one signalized and three non- signalized intersections in town that will operate at Level of Service "F" in 2025 (Tables III-7 & III-8). The other intersections that were analyzed will operate at LOS "E" or better.

- **NH 13/Emerson/Armory Road:** Overall LOS will be "F".
- **NH101A/Ponemah Hill Road:** The northbound Ponemah Hill Road approach will operate at LOS"F" during the afternoon peak period.
- **NH101A/Powers Street:** The northbound Powers Street approach will operate at LOS "F" during the afternoon peak period.
- **NH101A/Old Wilton Road:** The Old Wilton Road approach will operate at LOS "F" during the morning and afternoon peak period.

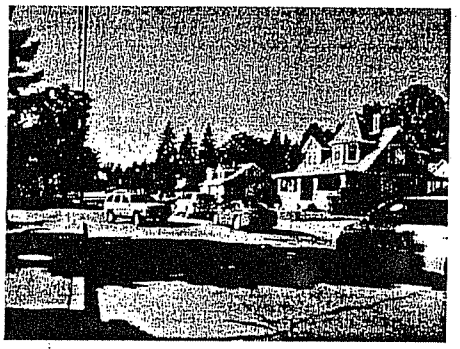


Table III-7: Future (2025) Level of Service/Signalized Intersections

	No-Build Scenario				Build Scenario			
Study Area Signalized Intersections	AM Peak LOS	AM Peak Delay (sec.)	PM Peak LOS	PM Peak Delay (sec.)	AM Peak LOS	AM Peak Delay (sec.)	PM Peak LOS	PM Peak Delay (sec.)
NH13/EMERSON RD/ARMORY RD								
Armory Rd EB left, right, thru	F	534.9	F	449.8	F	559.5	F	2181
Emerson Rd WB left, right, thru	F	278.1	F	209.3	F	222.4	F	139.1
NH 13 NB left	C	31.7	D	45.5	D	39.8	C	31.4
NH 13 NB thru	B	18.5	D	38.4	C	32.2	C	21.6
NH 13 NB right	B	13.8	C	23.8	C	22.0	B	14.1
NH 13 SB left	F	121.0	F	325.5	F	210.4	F	172.5
NH 13 SB right, thru	B	16.7	D	37.2	C	28.7	B	22.1
Armory Rd EB approach	F	534.9	F	449.8	F	559.5	F	2181
Emerson Rd WB approach	F	278.1	F	209.3	F	222.4	F	1391
NH 13 NB approach	B	18.1	D	35.5	C	30.3	C	20.3
NH 13 SB approach	E	58.5	F	138.8	F	97.1	E	71.7
Intersection LOS (overall)	F	197.3	F		F	190.2	F	
ELM STREET (NH101A)/WEST STREET								
Elm St (NH101A) EB thru	B	15.2	C	20.2	B	14.1	B	17.5
Elm St (NH101A) EB right	D	47.2	E	74.8	D	48.6	F	85.8
Elm St (NH101A) WB left	D	46.9	F	154.6	D	48.6	F	201.6
Elm St (NH101A) WB thru	A	6.0	A	8.3	A	5.6	A	7.2
West St NB left	D	40.1	E	62.4	D	39.8	E	59.9
West St NB right	D	47.4	D	46.1	D	50.9	D	48.9
Elm St (NH 101A) EB approach	B	19.1	C	29.0	B	19.4	C	30.8
Elm St (NH101A) WB approach	B	11.9	D	41.3	B	13.3	E	60.4
West St. NB approach	D	44.3	E	56.1	D	46.5	E	55.3
Intersection LOS (overall)	C	21.0	D	39.1	C	22.9	D	48.3

Table III-8: Future (2025) Level of Service/Non-signalized Intersections

	No-Build Scenario				Build Scenario			
Study Area Non- signalized Intersections	AM Peak LOS	AM Peak Delay (sec.)	PM Peak LOS	PM Peak Delay (sec.)	AM Peak LOS	AM Peak Delay (sec.)	PM Peak LOS	PM Peak Delay (sec.)
NASHUA STREET (NH101A)/PONEMAH HILL ROAD								
Nashua St (NH 101A) WB left turn	A	10.0	B	12.1	A	9.4	B	11.5
Ponemah Hill Rd NB left-right-thru	F	84.1	F	676.2	E	44.0	F	594.1
Ponemah Hill Rd NB Approach	F	84.1	F	676.2	E	44.0	F	594.1
NASHUA STREET (NH101A)/POWERS STREET								
Nashua St (NH 101A) WB left turn	A	9.8	A	9.4	A	9.2	A	8.9
Powers St NB left, right, thru	D	27.8	F	98.7	C	21.1	F	54.1
Powers St NB approach	D	27.8	F	98.7	C	21.1	F	54.1

Table III-8 (cont.): Future (2025) Level of Service/Non-signalized Intersections

Study Area Non- signalized Intersections	AM Peak LOS	AM Peak Delay (sec.)	PM Peak LOS	PM Peak Delay (sec.)	AM Peak LOS	AM Peak Delay (sec.)	PM Peak LOS	PM Peak Delay (sec.)
ELM ST (NH101A)/UNION ST								
Elm St (NH101A) WB left turn	A	8.8	A	9.6	A	8.6	A	9.3
Union St NB left	C	21.4	F	54.8	C	19.2	E	42.8
Union St NB right	B	13.4	C	15.8	B	12.7	B	14.7
Union St NB approach	B	14.5	C	21.0	B	13.6	C	18.7
ELM ST (NH101A)/WESTCHESTER ST								
Elm St (NH101A) WB left	A	8.6	A	9.1	A	8.3	A	8.6
Westchester St NB left, right, thru	C	23.7	E	39.3	C	17.7	C	23.8
Westchester St NB approach	C	23.7	E	39.3	C	17.7	C	23.8
ELM ST (NH 101A)/OLD WILTON RD								
Elm St (NH101A) WB left	F	59.1	F	111.4	B	13.0	C	15.5
Old Wilton Rd NB left, right	F	-	F	-	F	322.0	F	215.9
Old Wilton Rd approach	F	-	F	-	F	322.0	F	215.9
EMERSON RD/PONEMAH HILL RD								
Ponemah Hill Rd NB left	A	7.6	A	8.6	A	7.6	A	8.4
Emerson Rd EB left, right	B	12.6	D	27.7	B	11.8	C	20.6
Emerson Rd NB approach	B	12.6	D	27.7	B	11.8	C	20.6
EMERSON RD/FEDERAL HILL RD								
Emerson Rd WB left	A	9.8	A	9.2	A	9.1	A	8.7
Federal Hill Rd left, right	D	29.4	F	55.4	C	20.0	D	28.0
Federal Hill Rd NB approach	D	29.4	F	55.4	C	20.0	D	28.0
NH 13/UNION ST								
NH 13 NB left	A	8.9	A	8.1	A	8.0	A	8.2
Union St left	C	15.0	C	17.7	C	15.5	C	18.7
Union St right	B	10.9	B	10.1	B	11.0	B	10.2
Union St approach	B	11.3	B	10.6	B	11.4	B	10.5
UNION ST/OSGOOD ST								
Union St NB left	A	7.7	A	8.0	A	7.7	A	8.0
Osgood St EB left	B	10.6	B	14.2	B	10.8	C	15.7
Osgood St EB approach	B	10.6	B	14.2	B	10.8	C	15.7
UNION ST/LINCOLN ST								
Union St SB left	A	7.7	A	7.8	A	7.6	A	7.8
Lincoln St WB left, right	B	10.1	B	14.6	A	9.9	B	13.5
Lincoln St approach	B	10.1	B	14.6	A	9.9	B	13.5

Table III-8 (cont.): Future (2025) Level of Service/Non-signalized Intersections

Study Area Non- signalized Intersections	AM Peak LOS	AM Peak Delay (sec.)	PM Peak LOS	PM Peak Delay (sec.)	AM Peak LOS	AM Peak Delay (sec.)	PM Peak LOS	PM Peak Delay (sec.)
WEST ST/OSGOOD ST								
Osgood St EB left	A	9.1	A	8.2	A	9.0	A	8.2
West St SB left	E	44.4	C	16.6	E	41.2	C	16.4
West St SB right	B	10.7	B	10.5	B	10.6	B	10.5
West St SB approach	D	30.8	B	12.6	D	28.7	B	12.5
NH 13(SOUTH ST)/LINCOLN ST								
NH 13 NB left	A	8.1	A	8.7	A	8.0	A	8.5
Lincoln St EB left, right	C	22.8	D	30.8	C	17.3	C	21.3
Lincoln St EB approach	C	22.8	D	30.8	C	17.3	C	21.3
NH 13(SOUTH ST)/CLINTON ST								
NH 13 SB left	A	8.2	A	8.4	A	8.0	A	8.3
Clinton St WB left, right	B	14.3	E	49.0	B	13.0	D	28.1
Clinton St WB approach	B	14.3	E	49.0	B	13.0	D	28.1
NH 13/AMHERST STREET								
Amherst Street WB approach	E	39.8	F	83.9	E	39.8	F	83.9
NH 13/GROVE STREET								
Grove Street WB approach	C	-	B	13.4	C	-	B	13.4
NH 13/NORTH RIVER RD								
NH 13 NB left	A	8.1	A	8.4	A	8.0	A	8.2
North River Rd EB left, Right	B	12.7	B	12.1	B	11.4	B	10.9
North River Rd EB approach	B	12.7	B	12.1	B	11.4	B	10.9
NORTH RIVER RD/PURGATORY RD/CENTER RD								
Center Rd EB left	B	10.7	B	12.3	A	9.9	B	10.5
North River Rd WB left	B	12.4	C	20.9	B	12.1	C	17.0
North River Rd NB left, right, thru	A	7.4	A	7.4	A	7.4	A	7.4
Purgatory Rd SB left, right, thru	A	7.4	A	7.7	A	7.4	A	7.4
North River Rd NB approach	A	-	-	-	A	7.4	-	-
Purgatory Rd SB approach	A				A	7.4		

C. Analysis of Additional River Crossings

The Hoyle, Tanner and Associates study entitled Evaluation of Highway Improvement Alternatives in Milford, New Hampshire (January 2002) analyzed a range of possible scenarios for an additional crossing of the Souhegan River. The corridors were added to the NRPC regional traffic model to determine the relative traffic relief to the Oval that each individual scenario would provide. Developing any of these corridors would require extensive engineering, environmental review and other considerations and should be considered very preliminary. Since the completion of the Hoyle, Tanner study, the NRPC regional traffic model has been updated and improved. The updated model was used in this study in order to re-examine and update the findings of the previous modeling efforts.

Three possible locations for crossing the river were modeled. The locations are shown on Map III-8 (next page) along with the traffic volumes at various places around town that would result from each individual scenario. Each red box on Map III-8 indicates the traffic volume that would exist at that location with no additional river crossing, as well as the volume at that location that would result from each individual river crossing. For example, the red box at the Oval indicates that if no additional river crossing were built, there would be 24,447 vehicles per day on the Oval bridge. If the Brox crossing were built, the volume of traffic on the Oval bridge would drop to 24,002 vehicles per day. If the West Street crossing were built, the volume of traffic on the Oval bridge would drop to 20,764 vehicles per day. Table III-9 displays the change in traffic volume at the Oval for each of the scenarios.

A fourth corridor known as the east-west corridor was also analyzed. The east-west corridor is in southwestern Milford in an expanding residential section of town. This corridor is also shown on Map III-8.

Table III-9: Additional River Crossings Model Results (2006)

Scenario	Traffic Volume @ Stone Bridge w/out river crossing (ADT)	Traffic Volume @ Stone Bridge with additional crossing (ADT)	Change in traffic volume (ADT)	% Change in Traffic Volume
No additional crossing	24,447	n/a	n/a	n/a
Brox Corridor	24,447	24,002	- 445	- 1.80 %
West Street Corridor	24,447	20,764	- 3,683	- 15.07%
Powers Street Corridor	24,447	23,027	- 1,420	- 5.81%

1. BROX CORRIDOR

This corridor would be designed to access the Brox property via a new interchange on the NH 101 Bypass and would also cross the river, connecting with North River Road. Table III-9 indicates that traffic on the Stone Bridge (north of the Oval) would decrease by 445 (1.8%) vehicles per day under this scenario. This corridor provides the least relief of the three that were modeled.

2. WEST STREET CORRIDOR

This corridor would include an interchange with the NH 101 bypass and an extension of West Street, north across the river that would connect with Mont Vernon Road. This scenario results in a decrease of 3,683 (15.07%) vehicles per day at the Stone Bridge, which provides the most traffic relief to the Oval of the three corridors modeled.

3. POWERS STREET CORRIDOR

The Powers Street Corridor would be just east of the Oval and would connect Powers Street to South Street just to the north of the NH 101 Bypass, intersect Nashua Street at grade and then cross the river to connect with Amherst Street. This scenario results in a decrease of 1,420 (5.81%) vehicles per day at the Stone Bridge.

Summary of River Crossing Scenarios

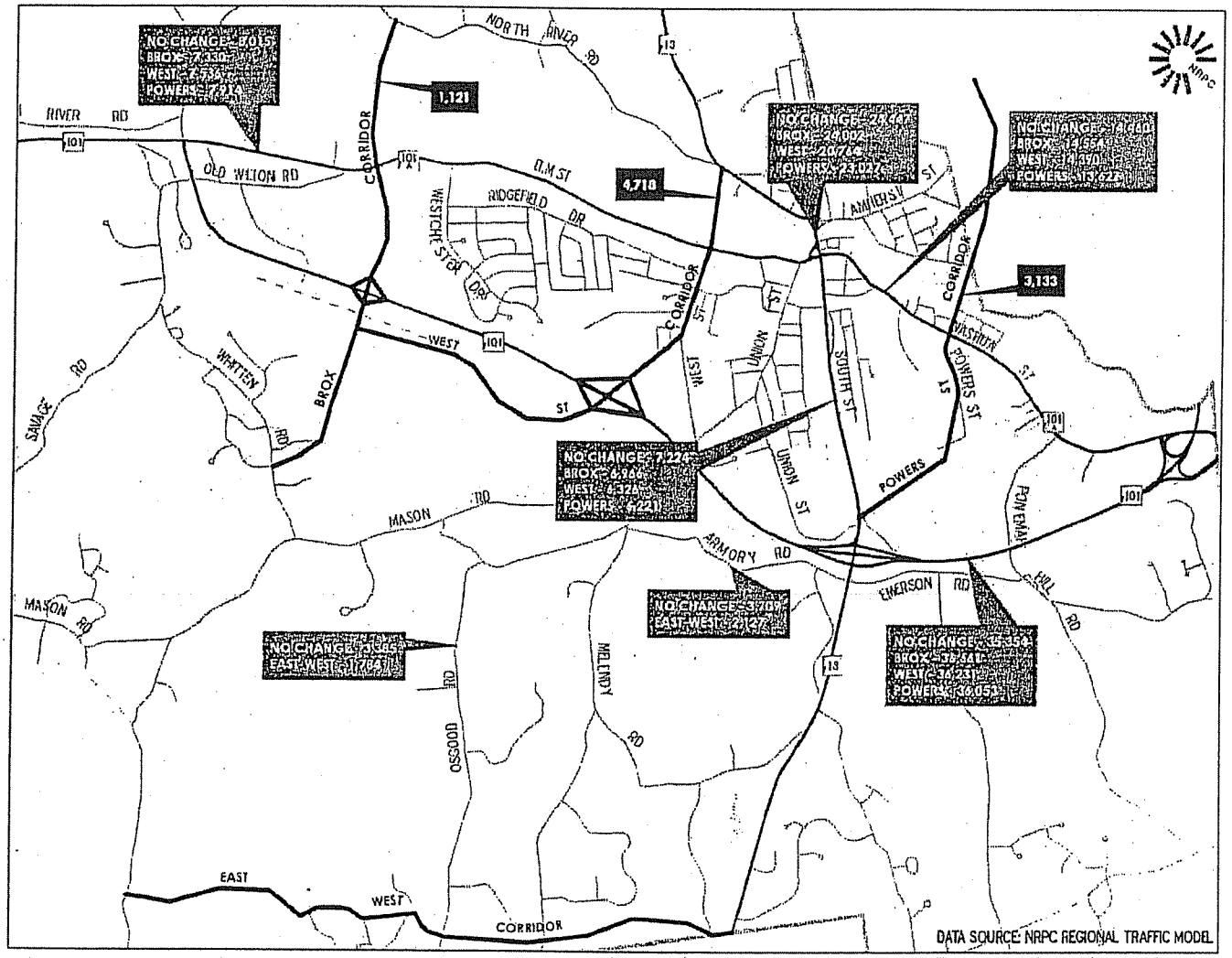
The results of these model scenarios indicate that the costs associated with developing the Brox and Powers Street Corridors significantly outweigh their benefits. Both projects would require extensive engineering, design, right of way, environmental review and construction costs. The Powers Street Corridor would also need to cross the river in a fairly dense residential area and for this reason alone may not be feasible. The West Street Corridor is somewhat more promising, mostly because it provides some traffic relief to the Oval. The Hoyle, Tanner Study recommended a feasibility study of this scenario and this makes sense, given that future plans call for widening NH 101 to a median

divided 4-lane cross section, and related interchange improvements. A feasibility study could be incorporated into the preliminary design and engineering process of the NH 101 widening effort.

4. EAST/WEST CORRIDOR

A fourth corridor was modeled (not a river crossing) to create an east/west collector route in the south part of Milford. The East/West Corridor was not intended to provide relief to the Oval, but to relieve local north/south local roads that are providing access to numerous new residential developments in the south part of Milford. Map III-8 indicates that this alternative provides significant relief to Osgood and Armory Roads.

Map III-8: Potential Additional River Crossings



D. Key Traffic Issues

The TCSP steering committee met on numerous occasions to assess available data as well as to evaluate input from work sessions that were held with the Milford Planning Board. The Milford Town-wide Traffic Study (Hoyle, Tanner and Associates January, 2002), which provided an extensive list of potential circulation improvements, was also evaluated. Special attention has been focused on addressing issues resulting from increased traffic in the future on NH 101 which will result in more traffic congestion, cut-throughs to avoid NH 101, motor vehicle accidents and a continued need for traffic management efforts. As a result of the steering committee meetings, planning board work sessions and evaluation of the Hoyle, Tanner Study, a series of issues and opportunities has been developed.

This study has reconfirmed the need to improve traffic management in the NH 101A Corridor (both Nashua and Elm Streets), NH 13 Corridor (South and Mont Vernon Streets) and in the Milford Oval. Managing traffic is about implementing appropriate access management measures and design guidelines. For example, a key issue on Nashua Street is the fact that westbound traffic intending to turn left into Edgewood Plaza impedes westbound through-traffic. A way to manage this issue is to incorporate a westbound left turn lane that would allow motor vehicles to turn left into Edgewood Plaza without impeding westbound through traffic, which would effectively increase the capacity of this segment of roadway.

A more cost effective approach to addressing key issues is to prevent them from happening in the first place. A way to do this is to incorporate a comprehensive menu of access management guidelines into the site plan review process. This would result in the use of proper access management techniques during the development process, thereby avoiding costly retrofits. The land use section of the TCSP study offers a more complete discussion of access management techniques and how they could be integrated into the site plan review process.

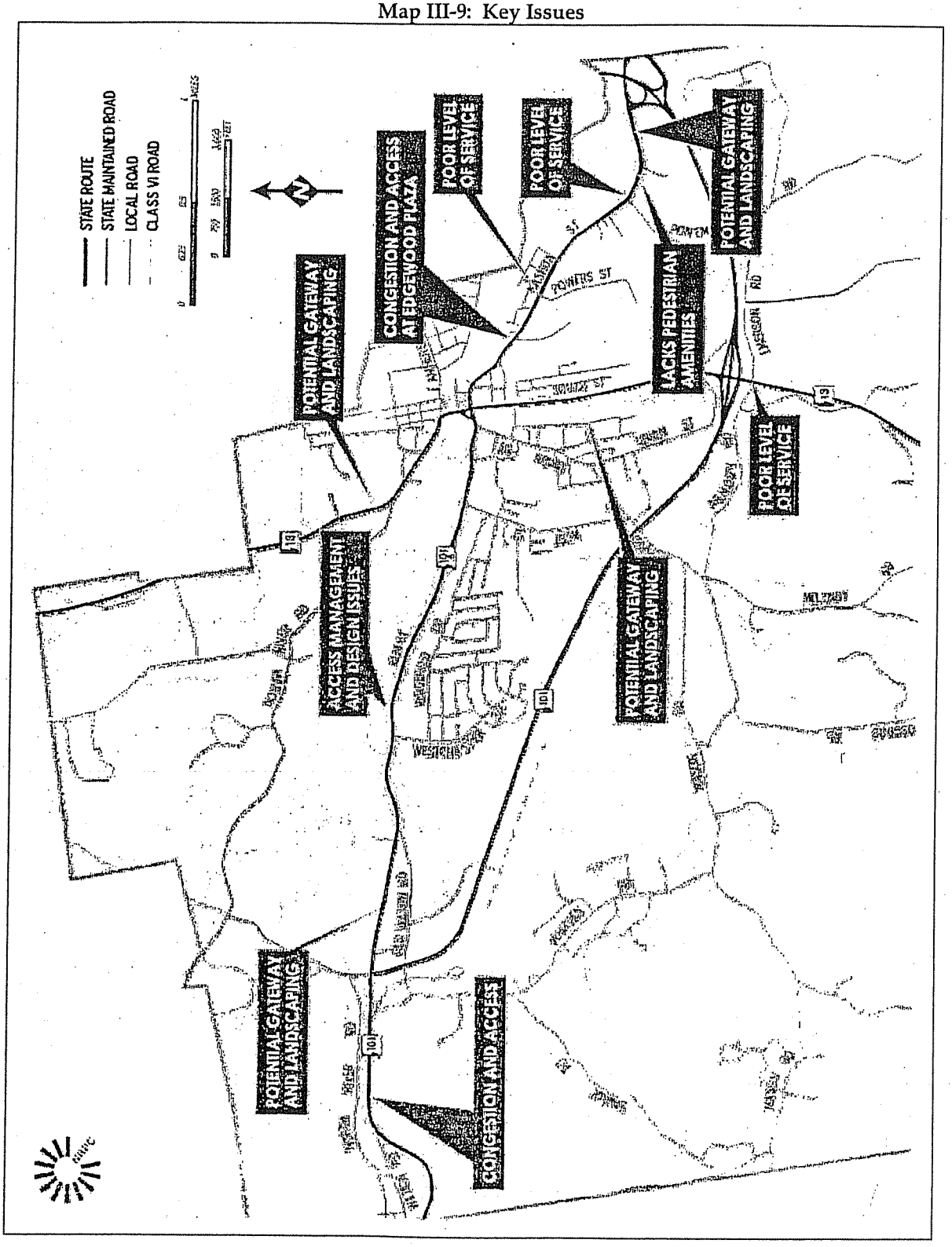
Design issues were also identified in the study area. These issues include buildings whose architecture is out of character and scale with the rest of Milford. This is especially true west of the Oval along Elm Street and it is an issue because it diminishes the visual enjoyment of this of segment town. This gives Elm Street more of a highway feel which in turn encourages increased motor vehicle speeds and less pedestrian and bicycle traffic. This further encourages an even greater perception that Elm Street is out of character with the rest of Milford. Site plan guidelines that encourage building designs that reflect traditional Milford architecture would help give Elm Street a more welcoming appeal.

The transition from the highway system to the local street system could be greatly enhanced by landscaped gateways at key entries into town. Gateways signal the transition from the highway system to the local street system and welcome visitors to town. A good example of gateway landscaping can be found in Amherst at the Amherst Street interchange on NH 101. Segments of roadway where gateway improvements could be made occur along Nashua Street, Amherst Street, South Street and Mont Vernon Road.

Bicycle and pedestrian amenities are lacking in some areas and could be improved. These issues are discussed fully in the Alternative Transportation section of the TCSP study.

The key issues and concerns that were identified during this study are displayed on Map III-9.

Map III-9: Key Issues



E. Strategy for Improving Traffic Conditions in the Study Area

Based on the analysis of existing traffic conditions, anticipated future traffic conditions, and input from the steering committee and planning boards, a strategy has been developed to realize the vision for the future of the study area. The recommended improvements are described below and can be seen on Map III-13.

1. Nashua Street Corridor

Edgewood Plaza Shopping Center Turning Lane

A short left turn lane is currently provided for westbound turns from NH 101A (Nashua Street) to Clinton Street. This left turn lane could be extended 600 feet to Monson Place. The proposed turn lane extension would provide vehicle storage for westbound traffic turning into Edgewood Plaza Shopping Center and to Tonella Road. The existing curb-to-curb width is 29 feet. By taking one parallel row of parking spaces from the Plaza parking lot an additional 9 feet of width would be available for the turn lane. Approximately 11 spaces would be lost. The additional 9 feet would provide adequate width for two 12-foot travel lanes with 2-foot shoulders plus a 10-foot wide turn lane. Construction cost (not including ROW acquisition costs) for this improvement is estimated to be $200,000.

Recommendation

Short Term (2006-2009)

- Develop Edgewood Plaza Shopping Center turning lane as described above.

Powers Street/NH 101A (Nashua Street) Intersection

The existing curb-to-curb pavement width at this intersection is 35 feet. A westbound left turn lane could be developed by re-striping the existing pavement width to provide two 12-foot travel lanes and a 10 foot left-turn lane. This width is slightly less than desirable, but will increase safety and is adequate to decrease delays caused by turning traffic. Laurel Street would need to be restricted to southbound only under this scenario. The reason is that left turns into Laurel Street from eastbound Nashua Street would conflict with the westbound left turn lane. Construction cost for this improvement including a 1-inch pavement overlay, signing and pavement marking is estimated at $50,000.

Recommendation

Short Term (2006-2009)

- Develop westbound left turning lane to Powers Street as described above.

Ponemah Hill Road/NH 101A (Nashua Street) Intersection

The existing afternoon level of service at this "tee" intersection is F. It will become 4-way upon the completion of the new restaurant. A traffic signal is planned for this intersection.

Recommendation

Short Term (2006-2009)

- Town should continue with its plan to convert this to a 4-way signalized intersection. The fourth leg will be formed by the driveway of the newly constructed restaurant.

SIDEWALKS

Sidewalks along the Nashua Street Corridor should be continued to Shaw's Supermarket and to Richmond Center (across from Shaw's). The town is requiring the developer to install sidewalks. Bicycle and pedestrian issues and recommendations are discussed in the Alternative Transportation section of the TCSP study.

2. ELM STREET CORRIDOR

There are segments of Elm Street where the architecture of buildings is out of character and scale with the rest of Milford. This gives Elm Street more of a highway feel which in turn encourages greater motor vehicle speeds and less pedestrian and bicycle traffic. It also diminishes the visual enjoyment of this section of town. Site plan guidelines that encourage building designs that reflect traditional Milford architecture and maintain the residential character of Elm Street near the Oval should be developed.

There are also retail areas along Elm Street that would benefit from access management measures. The land use section of the TCSP study offers a more complete discussion of access management techniques and how they could be integrated into the site plan review process.

3. SOUTH STREET CORRIDOR

SOUTH STREET IMPROVEMENT PROJECT

This project is located in the heart of downtown Milford beginning at the NH 101A (Milford Oval)/NH 13 (South Street) intersection, south to the railroad crossing on South Street. As it is currently configured, the project area has several significant areas of concern. South Street is narrow, varies in width and bulges in sections. This, combined with street level, undefined curb cuts creates a situation where motor vehicles frequently veer onto sidewalks to avoid oncoming traffic. Pedestrian safety is therefore a concern along the entire corridor as well as at specific locations. The crosswalk that connects the east and west sides of South Street at the Oval is particularly dangerous because traffic turning onto South Street from the Oval is hampered by limited sight distance. Pedestrian safety is also compromised by the inadequate turning radius for trucks turning from the Oval onto South Street. This intersection received a Level of Service (LOS) D in the 2002 Hoyle Tanner Study.

This project would provide for the design and construction of pedestrian safety enhancements along the approximately 1,000 linear foot section of the South Street corridor from the oval south to the railroad crossing. The specific work would include widening South Street from the Oval south to the southerly extent of the TD Banknorth property, underground relocation of all utilities in the project area, installation of new street and pedestrian lighting, curbing, sidewalk pavement/accent pavement, crosswalks, trees, tree grates and guards, street furnishings/bollard posts, benches, bike racks and signage, pavement striping and driveway access reconfiguration (access management)..

RECOMMENDATION

MID TERM (2009-2014)

- The Town applied for Transportation Ehancement funding (2005-2006 funding cycle) for this project and the application received the highest ranking at the regional level It was approved by the statewide TE committee and funding will be available in 2011. It is recommended that this be considered the highest priority roadway project in the immediate vacinity of the Oval.

4. THIRD SOUHEGAN RIVER CROSSING

The Hoyle Tanner Study included three possible scenarios for an additional crossing of the Souhegan River. The various corridors were added to the regional model to determine the relative traffic relief to the Oval that each individual scenario would provide. The updated NRPC regional traffic model was used in this current study to update those projections.

The results of these model scenarios indicate that the costs associated with developing the Brox and Powers Street Corridors significantly outweigh their benefits. Both projects would require extensive engineering, design, right of way, environmental review and construction costs. The Powers Street Corridor would also need to cross the river in a fairly dense residential area and for this reason alone may not be feasible. The West Street Corridor is somewhat more promising, mostly because it provides some traffic relief to the Oval. The Hoyle, Tanner Study recommended a feasibility study of this scenario and this makes sense, given that future plans call for widening NH 101 to a median divided 4-lane cross section, and related interchange improvements.

RECOMMENDATION

SHORT TERM (2006-2009)

- A feasibility study of a third Souhegan River Crossing should be incorporated into the preliminary design and engineering process of the NH 101 widening effort

5. EAST-WEST CORRIDOR

A fourth corridor was modeled (not a river crossing) to create an east/west collector route in the south part of Milford. The East/West Corridor was not intended to provide relief to the Oval, but to relieve local north/south local roads that are providing access to numerous new residential developments in the south part of Milford.

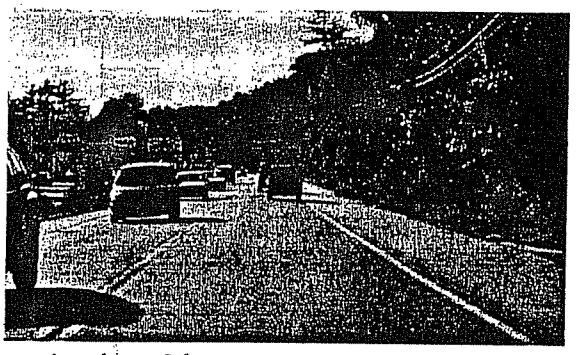
RECOMMENDATION

MID TERM (2009-2014)

- A feasibility study of an east west corridor should be conducted.

6. NH 101 MILFORD BYPASS EXTENSION

The transition from western Milford to Wilton is a "bottleneck" that includes traffic signals at old Wilton Road, Route 101A and Wilton Road, as well as two railroad crossings. Traffic congestion occurs at these intersections and along the commercial strip between the railroad and the Souhegan River, where there is not enough room to widen to the four lanes needed to accommodate the projected traffic volumes.



The recommended long-term solution in the NH Route 101 Corridor Study (2002) would extend the bypass from the existing curve near the State Police barracks, around the north side of Dram Cup Hill, rejoining the existing alignment east of the Wilton Town Line. The existing topography in the area is relatively steep. However, results of a preliminary investigation suggest that the vertical grades along the new roadway can be limited to 4 percent or less. Assuming that a 2-lane cross-section would be retained in Wilton, the cross-section would make a transition from four lanes to two near the eastern end of the bypass extension. Slip ramps connecting with the existing alignment would provide access to and from the east. Access to and from the west would be provided by a short connector road forming a signalized T-intersection with the highway or via the existing alignment. No left turns to eastbound Route 101 would be permitted at this connector intersection. This new section of roadway should be designed so as to make a transition from the higher type design of the Bypass to the narrower section in Wilton.

This solution provides excellent access to the existing industrial and commercial district in western Milford, including the BROX property whose access is via the Old Wilton Road intersection. The existing commercial strip would receive less drive-through traffic but would be more accessible because

congestion would be relieved and a center turn lane could then be accommodated. The existing signals would then operate with good levels of service beyond the 20-year planning horizon.

A more immediate short-term measure would be to develop an access management plan for the segment of roadway between the western end of the bypass and the Milford-Wilton town line. The focus of the plan should be to widen this segment of road enough to install a center turn-lane.

RECOMMENDATION

SHORT TERM (2006-2009)

- Develop an access management plan for the segment of roadway between the western end of the bypass and the Milford-Wilton town line. This will include identifying right of way issues regarding the width of roadway that will be required and environmental issues regarding the proximity of the roadway to the river. A center turning lane should be installed as part of this project.

LONG TERM (2009-2014+)

- The Milford Bypass extension as described above and in the NH101 Corridor Study should be implemented.

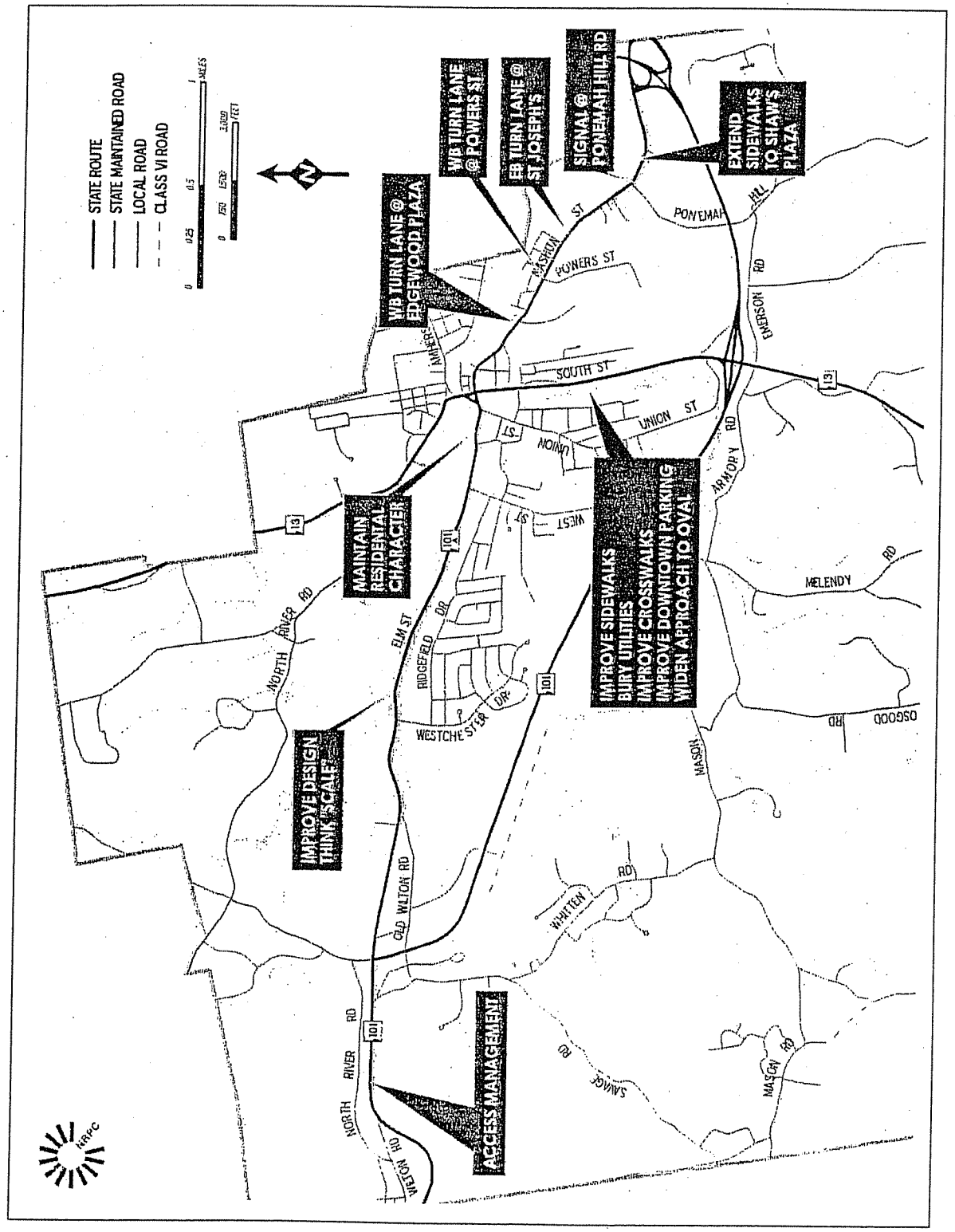
7. GATEWAYS

It is recommended that more intensive gateway landscaping and signage should be installed at key locations throughout the study area, signaling the transition from the highway system to the local street system and welcoming visitors to the town. Potential locations in the study area include:

- Nashua Street (NH 101A) just east of Lorden's Plaza.
- Elm Street (NH 101A) just west of Old Wilton Road.
- South Street, just south of Marshall Street or at the railroad tracks.
- Mont Vernon Road (NH 13) just north of intersection with North River Road.

Combinations of a canopy tree and an under story tree or shrub are suggested, such as white pine with paper birch (used in Amherst Street interchange example) or red oak and witch hazel. Native flowering trees and shrubs can also be used. Milford granite can be used to provide interest to the design in the form of low stone walls or bollards, which may be used for mounting welcoming signage. The design must maintain clear sight lines and provide adequate setback of trees and granite elements to meet safety criteria.

Map III-10: Recommended Improvements



F. TRAFFIC ACTION ITEMS

Key Issue	Recommendation	Approx. Cost	Target Date
NASHUA STREET CORRIDOR			
Traffic congestion near Edgewood Shopping Center	*Recommendation: Extend westbound left turn lane from Clinton Street, past Edgewood Plaza Shopping Center, to Monson Place.*	$200,000	Short Term (2006-2009)
Poor level of service @ Nashua Street/Powers Street intersection.	*Recommendation: Install westbound left turn lane on Nashua Street approach to Powers Street.*	$50,000	Short Term (2006-2009)
Poor level of service @ entry to St. Joseph's Medical Center.	*Recommendation: Investigate feasibility of installing east bound left lane turn into medical center from Nashua Street.*	Design done	Short Term (2006-2009)
Poor level of service at Nashua Street/Ponemah Hill Road intersection.	*Recommendation: Convert this to a 4-way signalized intersection by requiring the driveway of the Giorgio's Restaurant to form the fourth leg. The town already plans to do this.*	$250,000+	Short Term (2006-2009)
Sidewalks are lacking in the vicinity of Lorden's Plaza and Richmond's Plaza.	*Recommendation: Sidewalks should be extended on both sides of Nashua Street from the cemetery all the way to Lorden's Plaza and Richmond Plaza.*	Fund with Impact Fees	Short Term (2006-2009)
ELM STREET CORRIDOR			
Architecture and building design is out of character and scale with the rest of Milford.	*Recommendation: Sight plan guidelines that encourage building designs that reflect traditional Milford architecture and maintain residential character should be adopted. These guidelines have been developed by NRPC and could be applied to Milford.*	n/a	Short Term (2006-2009)
SOUTH STREET CORRIDOR			
South Street is narrow, varies in width, bulges in section and has many undefined curb cuts which result in concern for the safety of pedestrians and other motorists.	*Recommendation: Install new sidewalk pavement, curbing, crosswalks, trees, street furnishings/bollard posts, street and pedestrian lighting, curbing, sidewalk pavement/accent pavement, trees, tree gates and guards, benches, bike racks and signage, pavement striping and driveway access reconfiguration (access management). Town has applied for funding for this project.*	$875,000	Mid-Term (2009-2014)
THIRD SOUHEGAN RIVER CROSSING			
A third bridge across the Souhegan River would potentially relieve traffic pressure at the Milford Oval.	*Recommendation: A feasibility study of the "West Street Corridor" crossing should be incorporated into the preliminary engineering and design of the future Bypass widening project.*	Incorp. Cost of study into NH 101 widening P.E.	Mid Term (2009-2014)
EAST WEST CORRIDOR			
Local north/south roads that are providing access to numerous new residential developments in the south part of Milford will need relief in the future.	*Recommendation: A feasibility study should be conducted to evaluate the need and possible alignment of this corridor.*	Incorp. Cost of study into NH 101 widening P.E.	Mid Term (2009-2014)

Key Issue	Recommendation	Approx. Cost	Target Date
NH 101-MILFORD BYPASS EXTENSION			
The transition from western Milford to Wilton on NH101 is a bottleneck with traffic signals, 2 at grade railroad crossings and access management issues.	*Recommendation: Develop an access management plan for the segment of roadway between the western end of the bypass and the Milford-Wilton town line. A center turning lane should be developed as part of this plan.*	$250,000	Short Term (2006-2009)
	Recommendation: The Milford Bypass extension as described in the NH101 Corridor Study should be implemented.	$5,000,000+	Long Term (2009-2014+)
GATEWAYS			
The transition from the highway system to the local street system could be greatly enhanced by landscaped gateways at key entries into town	*Recommendation: Intensive gateway landscaping should be installed at key locations throughout the study area.*	Varies	Short Term (2006-2009)

CHAPTER IV: LAND USE, REDUCING CONFLICTS BETWEEN LAND USE AND THE TRANSPORTATION SYSTEM

A. INTRODUCTION

The link between transportation and land use is an important consideration in the development of any new transportation facility because land use regulations can actually encourage one mode of transportation over another. For example, bicycling and walking trips cover short distances and these trips are discouraged when barriers force a one or two mile detour. Barriers include the lack of pedestrian connections between cul-de-sacs and housing developments and these barriers can easily be overcome by requiring connections between these land uses that are reserved for non-motorized travel only.

A growing body of research suggests that the cost associated with automobile transportation infrastructure and energy use in conventional suburban development is becoming increasingly unsustainable.[1] Conventional suburban development requires more land and road infrastructure per capita than does more compact development, increasing the per capita cost of land development. As development expands outward, more roads are needed, which in turn require more public expenditure for serving new development. Added to those costs are the ecological and social costs from reduced water and air quality as a result of increased automobile use. It is suggested that modifications made to land use patterns and changes to the built environment can significantly reduce travel demand which results in reduced road infrastructure requirements and lower per capita energy use related to automobiles. Therefore, an objective of the TCSP study is to improve this link between transportation and land use in three specific issue areas:

- Land use strategies that reduce dependence on motor vehicles for meeting transportation needs,
- Access management guidelines that preserve roadway capacity and improve safety, and
- Design guidelines that enhance the appearance and decrease visual clutter along main local transportation corridors.

B. DEVELOPMENT OF LAND USE STRATEGIES

The first objective of this section of the TCSP report is to identify approaches to land use regulation that enable bicycle and pedestrian modes of travel by decreasing dependence on private motor vehicles. Each of the following approaches has been evaluated for its appropriateness for Milford given the limitations of New Hampshire land use law and community acceptance. The land use strategies described below best fit into the category of "innovative zoning" authorized in New Hampshire under RSA 674:21, Innovative land use controls.

1. INFILL DEVELOPMENT

Infill development is the development of vacant or undeveloped land that has been bypassed and surrounded by existing development. Generally the sites are not of prime quality however, they are usually served by existing infrastructure. Use of such lands for new housing or other development is a desirable alternative than to continue extend infrastructure to new "greenfields" development. Infill development can be accomplished by relaxing setback, frontage requirements, density requirements or lot sizes within the zoning ordinance for lots that meet certain criteria. Examples of the criteria are:

[1] University of British Columbia, James Taylor Chair in Landscape & Livable Environments, Technical Bulletin No. 11 November 2001.

- 80% of the land within a 300' radius has been developed and where water, sewer, streets and fire protection have already been developed and are provided
- The land is within a certain radius of a village or downtown zone
- Land has been a "non-conforming lot" more than 15 years.

2. TRANSIT-ORIENTED DEVELOPMENT

Transit oriented development (TOD) encourages a mixture of residential, commercial, and employment opportunities within identified areas that have access to transit centers. The TOD promotes development that supports transit by ensuring access to transit, and attempts to limit conflicts between vehicles and pedestrians and transit operations. The TOD allows for more intense and efficient use of land at increased densities for the mutual reinforcement of public investments and private development. Uses are regulated for a more intense built-up environment, oriented to pedestrian amenities, creating a more pleasant pedestrian environment without excluding the automobile.

A TOD is usually located within walking distance to the transit station and can be new construction or redevelopment. TODs are usually within a ¼ mile radius of either public streets identified as having the location, mix of densities and uses, and development patterns that can generate sufficient ridership to support a frequent and consistent level of transit service, or is near existing transit stations.

3. LIVABLE-WALKABLE DEVELOPMENT DESIGN

Livable-Walkable Communities are places where people of all ages and abilities can easily enjoy walking, bicycling and other forms of recreation. They are areas that support and promote physical activity; have sidewalks, on-street bicycle facilities, multi-use paths and trails, parks, open space and recreational facilities; and promote mixed use development and a connected grid of streets, allowing homes, work, schools and stores to be close together and accessible by walking and bicycling.

Designing communities as Livable-Walkable places means creating a balance between the economic, human, environmental, and social health of a community. Such development considers community planning and zoning practices at a human scale through the implementation of tools such as traffic calming devices, street and intersection design, bicycle and pedestrian facility design, ADA requirements, and community beautification programs. Livable-Walkable development practices protect natural resources by reducing the use of personal automobiles, support business by enabling people to access services locally, promote social capital by encouraging casual interaction, enhance personal physical fitness through increased activity, and diminish crime and other social problems by increasing the number of people on local streets.

4. VILLAGE PLAN ALTERNATIVE

A Village Plan Alternative Subdivision promotes redevelopment of town centers, new development at major crossroads, and mixed-use development adjacent to existing town centers. This zoning and regulatory technique encourages the preservation of open space and the efficient use of land and public and private infrastructure. RSA 674:21 requires that the entire density permitted by existing land use regulations must be located in 20 percent or less of the entire parcel available for development. The remaining 80 percent is to be used for conservation, recreation, or agricultural uses. This type of subdivision is best used with the concept of nodal development.

5. NODAL DEVELOPMENT

Nodal development usually relates to the development of village districts, while encouraging bicycle or pedestrian modes, with lands in between being used for low density, low traffic uses. Nodal zoning encourages development within these villages rather than along the roadway, which typically creates sprawl. A more rural, open countryside character is encouraged along the corridor frontage. Key policies that encourage nodal development include the following:

- Decreased street widths that play a role not only in reducing the speed of traffic, but also in reducing non-point storm water runoff and stream pollution;
- Parking lot design that enhances internal traffic movement, thereby expediting travel from the street into the parking lot;
- Shared driveways that limit the number of access points along busy streets thereby reducing turning movement and other traffic conflicts;
- A mix of residences, certain businesses (banks, service establishments, antiques and craft stores), home occupations and cluster developments.

6. LOCATION OF PUBLIC BUILDINGS

This policy can play a key role in sprawl reduction. If these structures are located within villages, downtowns, or higher density districts, then more people will be able to walk to these facilities instead of driving to them. The State of New Hampshire encourages state agencies to establish priorities for grant programs that strengthen village centers and downtown areas, and to prioritize any investments to locally designated growth areas.

7. URBAN GROWTH BOUNDARIES WITH MUNICIPAL SERVICE DISTRICTS

The Urban Growth Boundary (UGB) technique has been at the center of debate for a number of years, and has been implemented as a key part of growth management legislation in several states. While the jury is still out on how effective growth boundaries have been in the other states, the law has usually mandated that communities work with counties to determine the size of their growth area. A few communities in the state of New Hampshire, including Concord and Keene, have "de-facto" growth boundaries, essentially limiting growth to those areas with city water and sewer service. The urban growth boundary would be identified in the Master Plan as the area where the community is expected to grow. Inside the boundary, density is higher and municipal services are provided. Outside the boundary, zoning is less dense, characterized by fewer developments and where, through utility agreements, municipal services are not extended.

The advantage to UGB's is that they concentrate population growth which leads to the higher population densities that are necessary to support transit. Increased transit ridership leads to less motor vehicle miles traveled and more opportunities for other forms of transportation. UGB's also decrease the per capita cost of public utilities by concentrating the area in which they are provided.

8. OTHER SUGGESTIONS

- Create a pedestrian (sidewalk) and bicycle path master plan to connect activity centers with neighborhoods
- Design developments for connections to road and sidewalk networks
- Encourage safe pedestrian routes to transit
- Situate parking to enhance pedestrian environment and facilitate access between destinations
- Safe routes to schools

C. Evaluation of Zoning, Subdivision and Site Plan Review Regulations

Using the land use strategies developed for the TCSP project, a "Land Use Strategy Audit Checklist" was developed to complete evaluations of each community's Zoning Ordinance, Subdivision and Site Plan Review Regulations. The Audit Checklist and results are included below.

Table IV-1: Land Use Strategies - Community Audit

DOCUMENT	LAND USE STRATEGY	FEATURE	Y	N	Comments/Notes
ZONING ORDINANCE					
	Infill Development				
		Ordinance expressly addresses infill lots		X	
		Reduced setbacks	X		Some areas in the Commercial District are exempt from yard and open space requirements (see Article V, 5.057); Reduced setbacks are permitted by special exception in almost all zoning districts.
		Reduced frontage	X		Article VII, 2.010 Lots of Record are considered to meet the minimum lot size and frontage requirements as long as the lot of record has 15' of frontage on a principal route of access
		Reduced land area		X	
		Increased density to encourage development	X		Article VII, 7.070 Senior Housing Development, allows increased density as an overlay district to accommodate senior housing development. (30 bedrooms per acre of usable land serviced by water and sewer)
	Livable / Walkable Community				
		Allow for more compact development	X		Article VII, 7.070 Senior Housing Development, allows more dense development for senior housing; Article VI, 6.040 allows open space/conservation developments as well as Village Plan alternative
		Allow for mixed uses	X		Mixed uses within districts are permitted by Special Exception. It is unclear if mixed uses are permitted on the same lot.

Table IV-1: Land Use Strategies – Community Audit

DOCUMENT	LAND USE STRATEGY	FEATURE	Y	N	Comments/Notes
		Design commercial destinations for pedestrian access and scale		X	
	Nodal Development				
		Creates low density, low access districts between nodes of mixed use development		X	
		Decreased street widths for speed reduction and reduction of non-point water runoff and stream pollution		X	
		Connections through bicycle and pedestrian trail ways		X	
	Transit Oriented Development				
		Ordinance		X	
		Mixed uses	X		Mixed uses within districts are permitted by Special Exception. It is unclear if mixed uses are permitted on the same lot.
		Higher density	X		Article VII, 7.070 Senior Housing Development, allows more dense development for senior housing
		Transit stop locations		X	
	Urban Growth Boundary with Municipal Service Districts				
		Identified in the Master Plan as the area where the town expects to grow; where growth is concentrated through higher density and where municipal services are located. The area outside the boundary is characterized as lower density, agricultural/forestry or conservation zoning and where municipal services will not be extended.		X	

Table IV-1: Land Use Strategies - Community Audit					
DOCUMENT	LAND USE STRATEGY	FEATURE	Y	N	Comments/Notes
SUBDIVISION OR SITE PLAN REVIEW REGULATIONS					
	Livable / Walkable Community				
		Require sidewalks and sidewalk connections that comply with the ADA Standards for Accessible Design for new development		X	Subdivision Regulations 6.032 Sidewalks and curbing shall be constructed as directed by the Board.
		Require bike lanes to be constructed in new public or private streets		X	
		Require that streets and sidewalks be interconnected.	X		Subdivision Regulations 6.013 New streets shall be laid out so as to accommodate the continuation of the principal streets in adjoining subdivisions or for their proper protection when adjoining property is not subdivided.
		Require cross walks to be clearly delineated through brick, paint or alternative methods		X	
		Require open space and trails as part of subdivisions		X	
		Require pocket parks to be part of new subdivisions		X	
	Open Space & Conservation Zoning Overlay District & Subdivision Design Criteria	Create residential developments that promote preserving of environmental, resources, minimizing negative impacts on environmental resources, preserving natural & historic features, discouraging sprawling, land-consuming development	X		Adopted in 2000, Planning Board continually reviews the implementation and effectiveness of the Ordinance.

Table IV-1: Land Use Strategies - Community Audit					
DOCUMENT	LAND USE STRATEGY	FEATURE	Y	N	Comments/Notes
COMMUNITY POLICIES					
	Location of Public Buildings				
		Require that they be located in or adjacent to already developed areas or in the town center		X	

D. Land Use Strategy Recommendations:

1. Master Plan Recommendations

a. Future Land Use

- Review future land use plans to identify areas in town that are suitable for more compact development either through new or infill/redevelopment projects.
- Investigate options for creating a Transportation Oriented Development District around the "Oval" area. A TOD district may be phased in as development occurs in Milford.

b. Policy for siting public facilities

Review RSA 9-B, State Economic Growth, Resource Protection, and Planning Policy and consider adopting a "Smart Growth" policy for the Town of Milford that incorporates the principles set forth in 9-B:3.

c. Policy for Growth Boundary and/or policy for extending municipal services (water, sewer, roads)

Examine criteria under which the Town would extend municipal services to ensure that surrounding land development would be most efficient and be oriented toward pedestrian and bicycle modes of transportation.

2. Zoning Recommendations

a. Infill Ordinance

Consider adopting an infill ordinance or overlay zone for a "walkable" radius extending out from the Oval that would capitalize on the historic land use patterns established in the area. Incorporate livable/walkable features such as pedestrian ways and bike paths into the ordinance.

b. Nodal Development

Review existing land use patterns to identify other "nodes" in town that may be appropriate for more compact or denser redevelopment through infill and that offer opportunities to be connected to other nodes.

3. Subdivision and Site Plan Review Regulations

a. Incorporate Livable/Walkable Elements into Street Design Standards:

(See Appendix for sample language)

- Sidewalks and sidewalk connections that meet ADA standards for all developments or, as an alternative, within certain radius of schools
- Bike lanes that meet FHWA standards
- Designate specific corridors as "pedestrian/bicycle friendly" corridors and develop requirements for applicants to accommodate pedestrian pathways or bike lanes in site plan or subdivision plans.
- Require interconnection between neighborhoods/developments by pathways or trails
- Require interconnection between sidewalks and streets
- Review park standards to see if they feasibly apply to new developments.

4. OTHER ISSUES

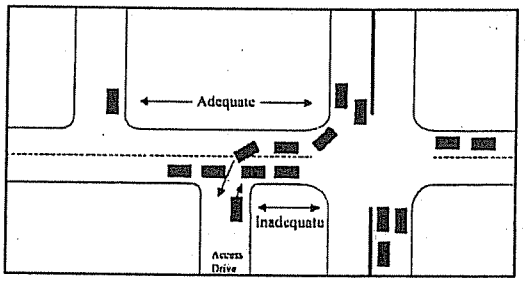
When considering developments proposed under the Senior Housing, Open Space and Conservation Zoning District or Village Plan Alternative:

- Consider amending the regulations to allow for increased density and reducing the lot sizes in relation to how well the proposed development can integrate into the existing street network and neighborhoods
- Require developments to design pedestrian and bicycle connections to existing roadway networks or other neighboring developments where feasible
- Ensure pedestrian scale features and amenities such as benches, directional signs, crosswalks and other streetscape options where feasible

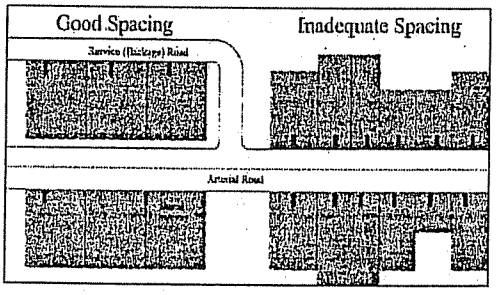
E. DEVELOPMENT OF ACCESS MANAGEMENT STRATEGIES

Access management techniques often implemented are:

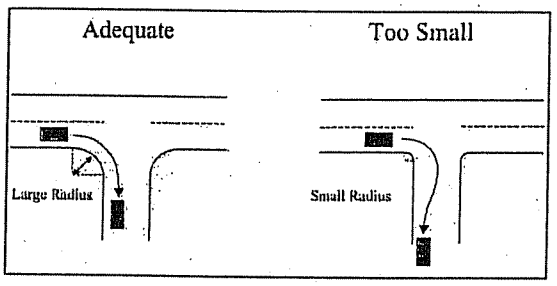
- Controlling the number of access points to minimize congestion and conflicts along roadway corridors;



- Controlling the width, spacing and alignment of access points to limit the number of distractions and limit conflicts and congestion;



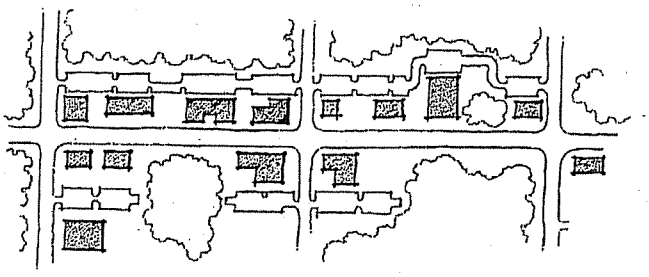
- Providing proper turning radius, turning lanes, sight distance, corner clearance and throat lengths to allow adequate turning and stacking lane width and spacing for vehicles entering and exiting roadways safely from commercial properties and secondary roads;



Turning Radii.

- Providing shared access and parking between sites to allow for more compact design and reduce roadway congestion;

Shared Access

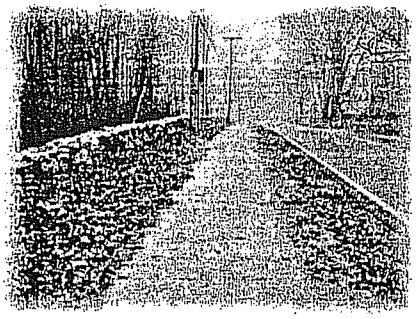


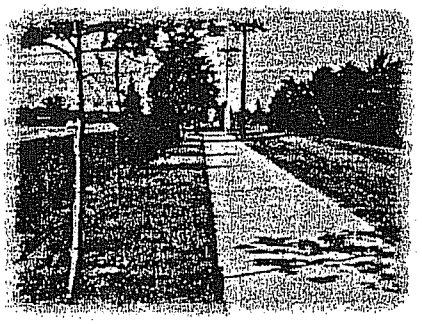
- Utilizing frontage and backage (Service) roads to filter traffic from highways to commercial centers without impeding through traffic;

- Use of medians, roundabouts and other traffic calming methods to limit conflicts and manage speeds at busy intersections; and

- Providing bicycle and pedestrian friendly development by designing connections between residential and commercial activity.

In more rural areas, a "side path" made of asphalt or crushed stone, may be suitable.





These techniques may be determined through corridor studies such as this, encouraged in master plans and implemented through zoning ordinance, subdivision and site plan regulations.

Uncoordinated commercial growth along some of Milford's travel corridors has resulted in strip development and/or a proliferation of access points. In most instances, each individual development along those corridors has its own access driveway and in a number of instances, individual developments have multiple access points. This results in numerous access points along the corridors that create conflicts between turning and through traffic which can lead to delays and accidents.

The NH 101 Corridor Study dealt primarily with access management issues directly related to the NH 101 corridor. The TCSP Study identified segments of other roadways in Milford where access management issues exist and developed recommendations for improving those segments.

1. Access Management Issue Areas

In addition to preserving capacity, access management techniques can be coordinated with design guidelines to significantly enhance the aesthetics of a roadway corridor. Currently many of the congested roadway corridors are highly diverse, auto-oriented environments that reflect a lack of vision. A common vision that includes guidelines for access in addition to a unified design for signage, landscaping and pedestrian facilities can significantly improve the function and aesthetics of a roadway corridor.

The steering committee identified where multiple curb cuts or land uses are or may create access management issues. These areas included:

- NH Route 101A (east of the Oval already covered by the NH Route 101A Corridor Master Plan).
- NH Route 101 west of NH Route 101A to the Wilton town line.
- The Oval.
- NH Route 13 south of North River Road to the Brookline town line.
- Ponemah Hill Road/Nashua Street intersection– The lot opposite Ponemah Hill Road is being developed and the plan is to signalize the intersection.
- County Stores Plaza at NH Route 101A.
- Rite Aid store at West Street.

NRPC staff then worked with the steering committee and Planning Board to identify appropriate access management measures.

2. ACCESS MANAGEMENT STRATEGIES

NRPC staff worked with the steering committee and Planning Board to identify appropriate access management measures. These measures are based on the Access Management Guidelines that were developed by NRPC in 2002.

Table IV – 2: Access Management Strategies – Community Audit

DOCUMENT	FEATURE	Y	N	Comments/Notes
Zoning Ordinance				
	Limit number of access points per parcel or frontage		X	
	Require use of side roads or shared driveways	X		Definitions allow common driveways for an unlimited number of commercial/industrial developments, but shared residential driveways may only serve no more than two residential lots
	Allow reduced frontage requirements along arterials and collectors when a frontage/backage road is used instead of a driveway		X	Reduced front, side and rear setbacks are allowed by Special Exception in most zoning districts. There is no minimum lot size or frontage requirements for areas of the Industrial District served by municipal water and sewer systems (See 5.064). In areas not served by municipal water and sewer, there is no minimum frontage, but a minimum lot size of 40,000 sf is required.
	Other alternative Zoning Requirements	X		Section 5.057 exempts certain areas in the Commercial District from the open space and yard requirements
	Required Shared parking for commercial establishments		X	
Subdivision and Site Plan Review Regulations				
	Minimum driveway spacing standards to control space between curb cuts	X		See Sub. 5.040 for minimum driveway standards between drives and distance from intersections.
	Minimum and maximum driveway width standards	X		Maximum width is 24' (see Sub. 5.040)

Table IV – 2: Access Management Strategies – Community Audit				
DOCUMENT	FEATURE	Y	N	Comments/Notes
	Minimum and maximum turning radius standards for access points based on land use	X		See Sub. 6.042 for radii ranges based on cross streets and traffic usage.
	Minimum distance between driveways and intersections.	X		See Sub. 5.040 for minimum driveway standards between drives and distance from intersections.
	Require consolidation of driveways or corner clearance during redevelopment of sites.		X	
	Adopt minimum throat length standards for new or redeveloped sites		X	
	Require interconnections between existing and future subdivisions	X		The Planning Board may require that rights-of-way to adjacent land areas be provided (Sub. 4.013, 11. c. 2); Also New streets shall be laid out as to accommodate the continuation of the principal streets in adjoining subdivisions or for their proper protection when adjoining property is not subdivided. (See Sub. 6.013)
	Require rights of way be provided to adjacent undeveloped land	X		The Planning Board may require that rights-of-way to adjacent land areas be provided (Sub. 4.013, 11. c. 2); Also New streets shall be laid out as to accommodate the continuation of the principal streets in adjoining subdivisions or for their proper protection when adjoining property is not subdivided. (See Sub. 6.013)
	Establish standards for shared driveways		X	
	Require commercial developments to establish cross easements and interconnections between developments		X	
	Define standards for intersections, street and driveway alignments		X	

Table IV - 2: Access Management Strategies - Community Audit				
DOCUMENT	FEATURE	Y	N	Comments/Notes
	Establish safe sight distance requirements based on the design speed of the road.	X		See Sub. 5.040 3 for list of minimum sight distance requirements based on speed limit on roadway.
	Require traffic impact studies to identify needed roadway improvements resulting from proposed development.			For major plan reviews, the Planning Board may require a public service impact statement that indicates the extent to which the proposed subdivision will impact the services and facilities of the Town. (Sub. and Site. 2.051 and 2.057)
	Provide safe pedestrian and bicycle access within and between developments		X	Of note: Within 500' of a Municipal Parking lot, the Planning Board may allow the substitution of space with Municipal Parking lots in lieu of the parking requirements (Site 6.050).
	Require parking areas to address pedestrian access and circulation within the site		X	Of note: Parking may be reduced to 80% of what is required where conditions unique to the use will reasonably justify such a reduction (Site 6.047). This may help in dealing with some pedestrian friendly amenities.
	Require bus turnouts and shelters for large retail or employment centers where existing or proposed transit services are provided		X	
	Require construction of frontage/backage roads to service parcels adjacent to arterials or collectors		X	
	Provide for the use of roundabouts in the community, referencing FHWA design criteria		X	
	Develop preliminary review process for applications to receive input into the design of new developments at the outset of a project	X		For major plan reviews, the Planning Board may require a public service impact statement that indicates the extent to which the proposed subdivision will impact the services and facilities of the Town. (Sub. and Site 2.051 and Sub. 2.057)

Table IV – 2: Access Management Strategies – Community Audit				
DOCUMENT	FEATURE	Y	N	Comments/Notes
	Require overall access and development plans for large sites		X	
COMMUNITY POLICIES				
	Promote an interconnected road network for municipal and private roadways	X		See Sub. 6.013: New streets shall be laid out so as to accommodate the continuation of the principal streets in adjoining subdivisions or for their proper protection when adjoining property is not subdivided. This potentially conflicts with the 600' dead-end street policy

3. ACCESS MANAGEMENT RECOMMENDATIONS

Once the appropriate access management measures were identified an access management plan was developed. The plan specifically identifies all proposed access management areas and the steps necessary to carry out those recommendations.

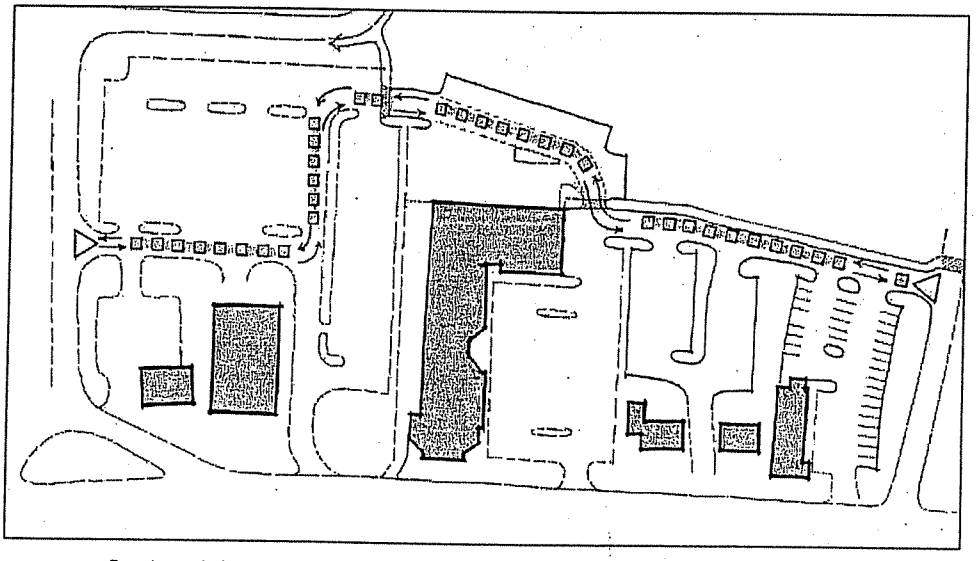
4. ACCESS MANAGEMENT STRATEGIES–RECOMMENDATIONS FOR LAND USE REGULATIONS

a. Zoning Ordinance

Milford's Zoning Ordinance addresses access management in general terms in an attempt to control separation and overall volume of traffic. As detailed below, additional steps may help in an overall access management strategy coupled with complimentary regulations.

- A combination of limited access and requirements for interconnected parking lots should be considered for new commercial and redevelopment projects on all collector and arterial roadways. Incentives can be: reduced frontage requirements along arterials and collectors identified above when a frontage/backage road is used instead of a driveway cut. Every effort should be made to require construction of the frontage /backage roads in anticipation of future connections.

- Require commercial establishments to provide for shared and interconnected parking areas.



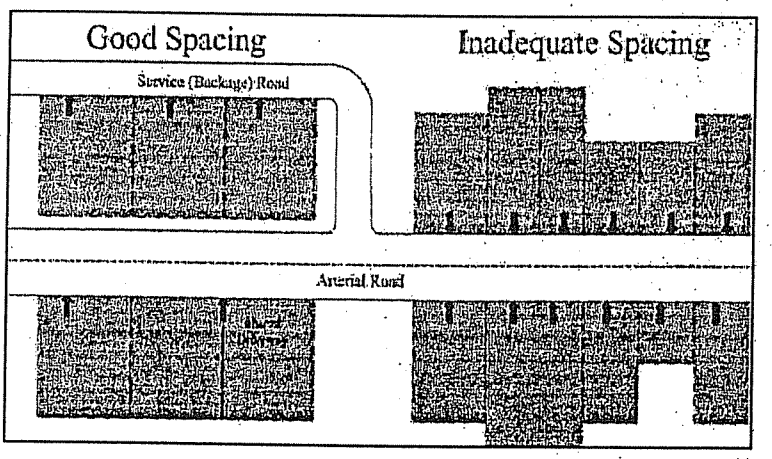
Require each development to provide connections to adjacent lots and limit access to adjoining collector and arterial roadways.

5. SUBDIVISION/ SITE PLAN REVIEW REGULATIONS

Overall, Milford's Subdivision and Site Plan Regulation includes some features of good access management, but there are some additional requirements that the Town may want to consider incorporating into its regulations or in individual application review.

a. Driveway Alignment

- Centerlines of all new driveways should be aligned with existing driveways and road intersections on the opposite side of the highway.



- In redevelopment of sites, require that driveway entrances be repositioned to facilitate better access.
- Minimum distance requirements between driveways should be adopted and should be a function of the posted speed.

Access Separation Distances (feet) based on Spill back Rate*

Posted Speed (mph)	Spillback Rate* 5%	10%	15%	20%
30	335	265(a)	210(b)	175(c)
35	355	265(a)	210(b)	175(c)
40	400	340	305	285
45	450	380	340	315
50	520	425	380	345
55	590	480	420	380

(a) Based on 20 driveways per mile.
(b) Based on 25 driveways per mile.
(c) Based on 30 driveways per mile.

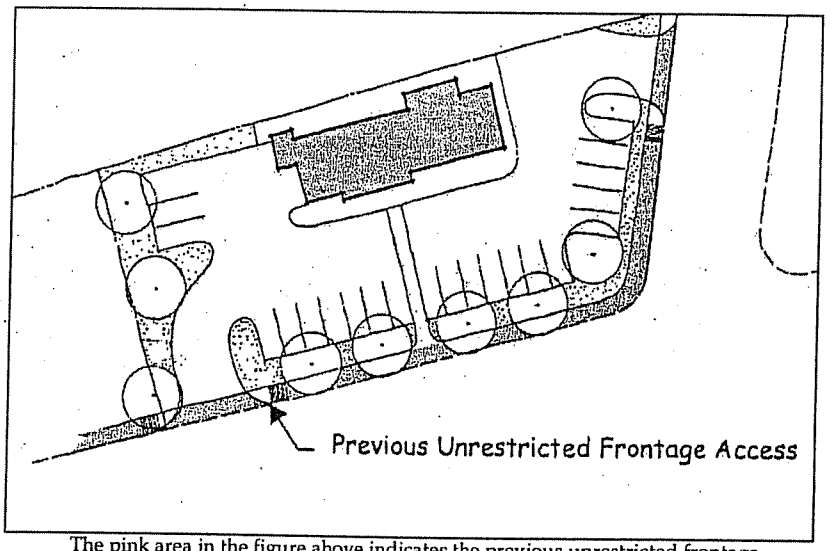
*Based on an average of 30-60 right turns per driveway.

**Spillback occurs when a right-lane through vehicle is influenced by right-turn-in to or beyond a driveway upstream of the analysis driveway. The spillback rate represents the percentage of right-lane through vehicles experiencing this occurrence.

Source: Gluck, J.S., Haas, G., Levinson, H.S., and Jamal Mahmood, Driveway Spacing and Traffic Operations, TRB Circular E-C019, Dec. 2000.

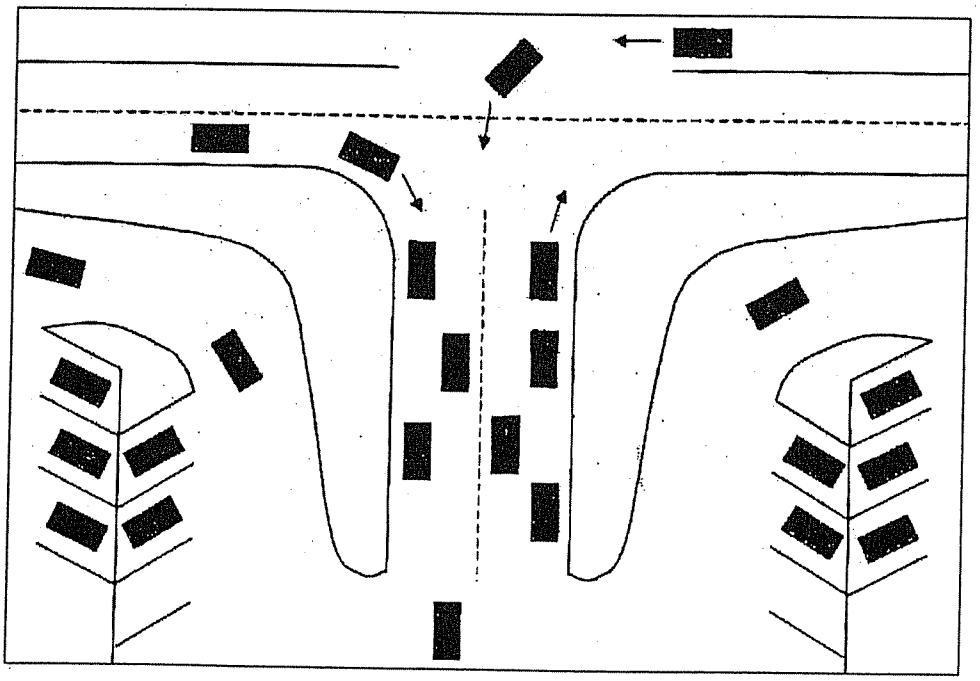
b. Driveway Design

- Consider maximum driveway widths for commercial/industrial development.

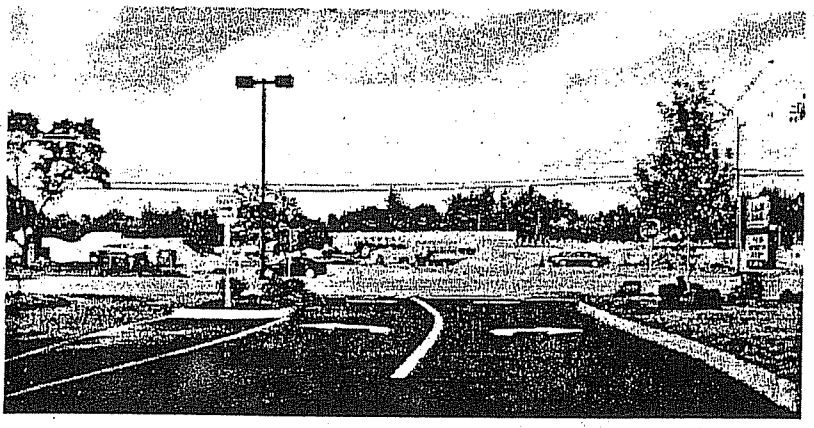


The pink area in the figure above indicates the previous unrestricted frontage access. This site could be redesigned to restrict the width of the access points.

- Adopt minimum throat length of 150' for major driveway entrance with 300' desirable for new or redeveloped sites.



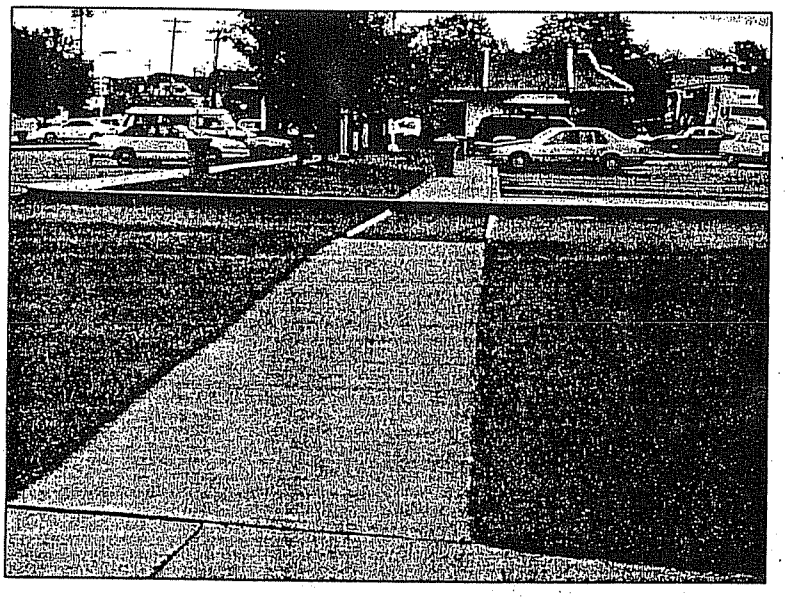
Adequate throat length: vehicles entering the parking lot have room to maneuver without conflict.



Good example of adequate throat length

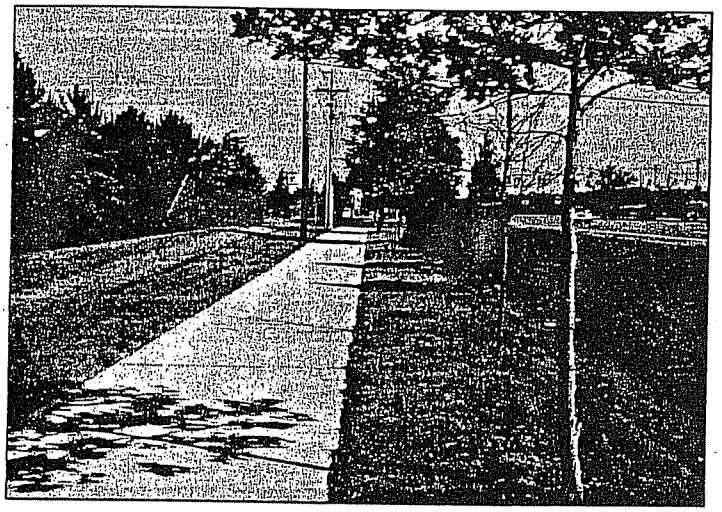
- Develop guidelines for safe pedestrian and bicycle access within and between developments, and for parking areas.

- Require a pedestrian circulation plan be submitted as part of the development application.



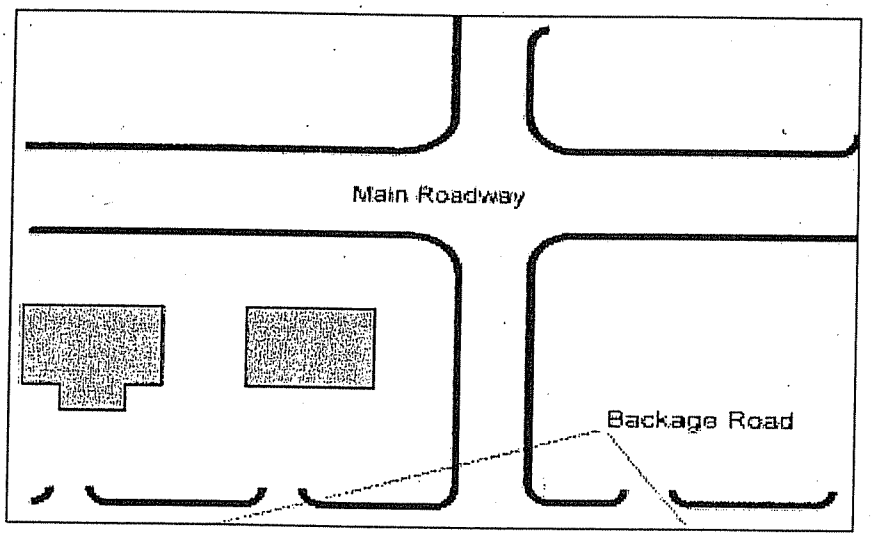
Good pedestrian access through parking lot but not ADA compliant

- Require vehicles to be separated from pedestrians by pathways or sidewalks and that crosswalks are clearly marked and accessible.



Good separation of vehicles and pedestrians

- Require the construction of frontage/backage roads to service parcels adjacent to arterials or collectors through new or redevelopment projects.



- Consider the use of roundabouts in key locations
- Require large sites to provide schematics for possible future development and develop proposed access and interconnection plans.
- Clearly specify that an interconnected road network is highly desired by the community. Review dead end and cul-de-sac proposals with great care to ensure that important interconnections are not lost for future development of the transportation network.

F. Development of Design Strategies

In addition to preserving capacity, access management techniques can be coordinated with design guidelines to significantly enhance the aesthetics of a roadway corridor. Currently, many of the congested roadway corridors are highly diverse, auto oriented environments that reflect a lack of vision. A common vision that includes guidelines for access in addition to a unified design for signage, landscaping and pedestrian facilities can significantly improve the function and aesthetics of a roadway corridor. An example of a common vision and design is the set of Design Guidelines developed for the Milford Industrial Area in the *NH Route 101 Corridor Plan* (see Appendix B). These guidelines deal with site specific design elements, and may be used as a basis for further design guidelines along other corridors.

Community character and design guidelines are often an overlooked tool in assisting communities in accommodating non-residential growth while, being sensitive to natural resources, maintaining appropriate orientation and scale, being compatible with community character and encouraging efficient and coherent development patterns in harmony with local and regional transportation networks.

Design guidelines should identify acceptable site and architectural design principals that promote the community and regional characteristic (e.g. "Rural New England") while allowing for creative and innovative ideas. In general, aesthetics, compatibility, functionality and environmental sensitivity are traits of good design. Community design issues often addressed in design guidelines are:

- Site design, which includes the relationship and orientation of all on-site features and their physical and visual impact on the area around the site,
- Building design, which has significant impact on functionality and community acceptance,
- Access (Access Management), which provides for the safe and efficient movement of pedestrian and both motorized and non-motorized vehicular traffic both on and off-site,
- Parking, which should be optimally sized and orientated in an attractive and efficient manner,
- Public/private open space, which provide habitat for wildlife, screen development and provide opportunity for interconnected greenways and common areas for various uses,
- Landscaping/buffers, which provide separation, screening and enhance site aesthetics,
- Lighting, which provides security, enhances safety, and is sometimes used to highlight architectural features,
- Signs, which should be designed and scaled to compliment a site by attracting attention without being obtrusive,
- Delivery and service facilities, located in a logical and functional manner and screened from the public,
- Drainage/storm water management, that is designed for effectiveness and either inconspicuous or in harmony with environmental characteristics of a site and surrounding area, and
- Special considerations specific to a particular site that may improve overall design.

1. Identification of Roadway Corridors

NRPC and the steering committee, along with assistance from local officials and the public, identified the design issues in each community. The main corridors and locations where design guidelines might be appropriate were identified:

Corridors:

- NH Route 101A (east of the oval already covered by the NH Route 101A Corridor Master Plan).
- NH Route 101 from Old Wilton Road to the Wilton town line.
- NH Route 13 south of Lorisa Lane to the Brookline town line.
- Amherst Street from the Oval to the Amherst town line.

- Emerson Road from NH Route 13 east to Federal hill Road.

Locations:

- The Brox Property.
- Downtown.

The Board identified the following issues related to community design:

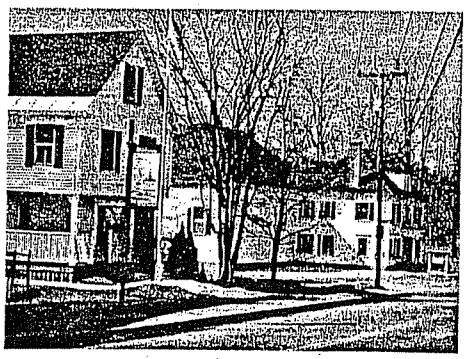
- The land use regulations do not require architectural review and therefore any design enhancements are purely voluntary on the part of the developer. There is no agreement on what onstitutes an appropriate design.
- Big box retail and fast food developments are rapidly appearing and it is difficult to get the developers to produce an appropriate design.

2. DESIGN RECOMMENDATIONS

Examples of attractive and desirable development were identified within Town. Each example was associated with a desired community characteristic.

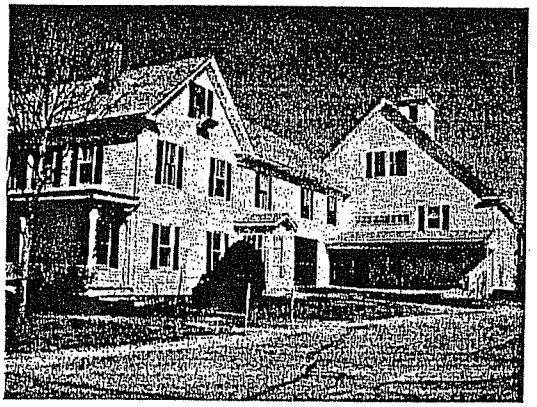
Masonic Building

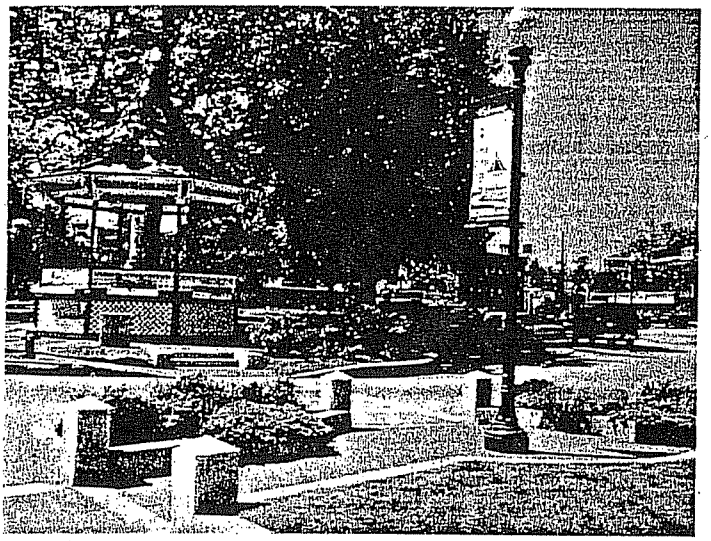
Example of Historic Character



St. Joseph's Medical Center

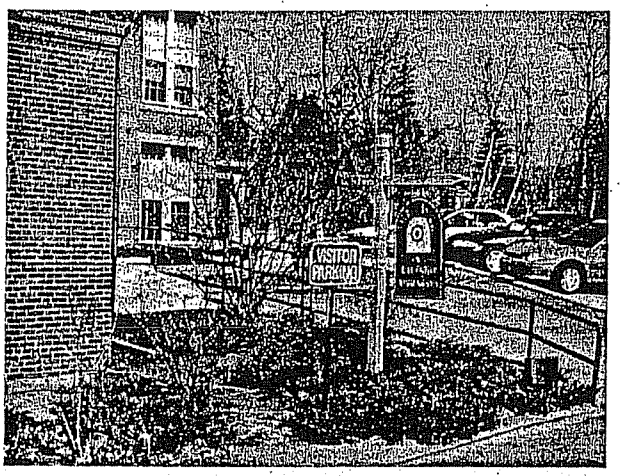
Excellent reuse of agricultural buildings





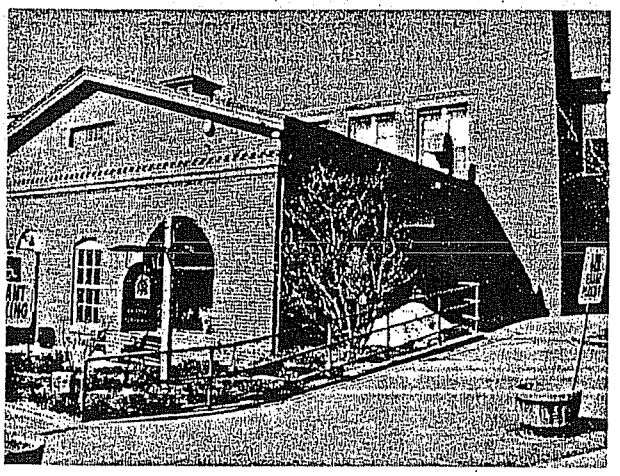
Milford Oval

Example of Vibrant Town Center Hub



The Mill of Milford
Elderly Housing

Excellent conversion of mill building for elderly housing with good access to downtown



Examples of Desirable Development:
The table below identifies the specific sites that the committee determined had the characteristics that should be the foundation of design guidelines for Milford:

Location		Characteristics	
1.	Summit Executive Park (Wilton)	1.	Good scale, design, landscaping, appropriate setback
2.	Classic Cat	2.	Satisfactory trees and buffers, pedestrian scale buildings, good sign
3.	Masonic Building	3.	Historic character retained
4.	Montessori School	4.	Excellent reuse of historic structure with agricultural roots
5.	Bales Elementary School	5.	Solid brick structure, good detailing
6.	Town Hall Block on Nashua Street	6.	Mixed uses, reuse, preservation
7.	Unitarian Universalist Congregation	7.	Attractive stone building
8.	St. Joseph's Medical Center	8.	Excellent reuse of agricultural buildings
9.	Milford Historic Society	9.	Excellent preservation of rural architecture
10.	15 Union Street	10.	Office conversion of historic structure
11.	Milford Oval	11.	Excellent Example of Vibrant Town Center Hub
12.	Nashua St. Block - South of Oval	12.	Great mix of pedestrian scale commercial storefronts
13.	Cabinet Press building	13.	Attractive historic structure
14.	Elisha's	14.	Conversion of residential structure to restaurant, good picket fence
15.	Granite Square Multi-family	15.	Modern structure as infill for residential use near downtown
16.	The Mill of Milford Elderly Housing	16.	Excellent mill conversion to elderly housing with good access to downtown
17.	Swinging Bridge	17.	Excellent pedestrian connection over the Souhegan River connecting neighborhood to downtown
18.	Gregg Bridge	18.	Excellent pedestrian connection between multiple recreational uses

Overall Desirable Community Characteristics:

1. Open Space/Recreation linked by continuous pedestrian walkways & bicycle access
2. Well-defined crosswalks
3. Safe school zones
4. Vibrant pedestrian friendly Town Center
5. River access
6. Context sensitive [infill] development
7. Appropriate site access management
8. Green space along corridors - sufficient buffers
9. Well-defined entrances
10. Parking to side and rear of buildings
11. Ample trees and landscaping
12. Public gathering space
13. Attractive, appropriate scale signs, minimum number per lot

The Committee identified sites that would be appropriate for the Town to consider for requiring design guidelines for new or redevelopment projects.

Sites:

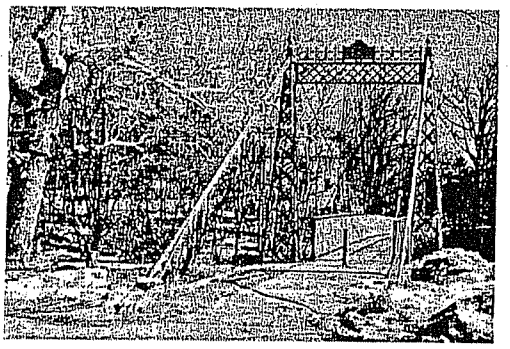
1. South Street @ Clinton
2. Elm Street @ Keyes Park
3. Oval
4. Elm St. (Westchester to West St.)
5. Amherst St. @ Route 13 North
6. Bike-Ped Connection Route 13 South to N. River Road
7. Lordon Plaza 101A and opposite side of road

CHAPTER V: BICYCLE AND PEDESTRIAN PLAN

A. INTRODUCTION

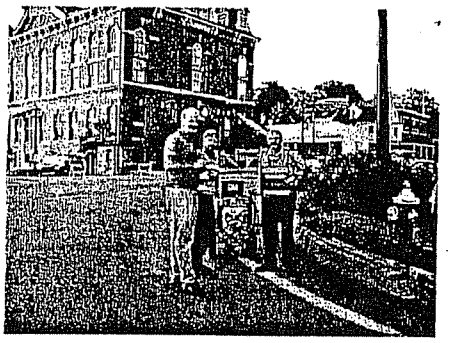
The bicycle and pedestrian section of the TCSP plan has been developed to provide a blueprint that will serve as a guide for the Town to plan, develop and implement safe, usable facilities for non-motorized transportation. This plan will integrate bicycle and pedestrian travel into the local and regional transportation system, and it will serve as the bicycle and pedestrian element of the Milford TCSP Study. This integrated system will benefit drivers because it will encourage bicycling and walking, which will result in less competition for limited roadway and parking space. Bicyclists, pedestrians and other non-motorized travelers will benefit from a safer and more enjoyable biking and walking environment. Additionally, all users of this integrated system will benefit from increased transportation options for both local and regional travel. Finally, improved bicycle and pedestrian facilities will increase awareness of the economic, environmental and social benefits of bicycling and walking.

This plan has three components. The physical improvement component addresses policies, programs and engineering elements that impact the physical biking and walking environment. The behavioral change component addresses the behavioral aspect of the biking and walking environment. The implementation component provides a comprehensive implementation strategy that addresses priorities, phasing, funding sources, monitoring and evaluation. Technical appendices provide details of the methodology used to develop the recommended bicycle and pedestrian facilities, as well as details of the designated routes.



B. PHYSICAL IMPROVEMENT

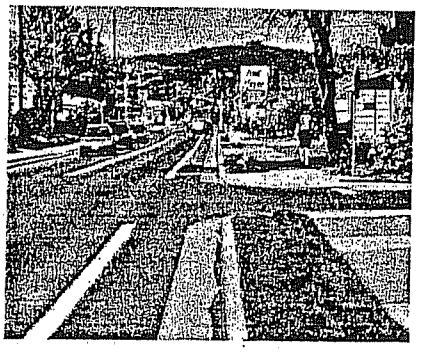
With the exception of NH 101, bicyclists and pedestrians use most of the roadways in Milford, including arterial, collector and local roads. This doesn't mean that every roadway in the Town should be part of a designated bicycle and pedestrian network. It makes sense, though, to enhance the perception that the Town is a comfortable and safe place to ride a bicycle or walk. This section provides recommendations for enhancing the perception that Milford is bicycle and pedestrian friendly.



The phrase "bicycle and pedestrian friendly" suggests an area where it is easy, safe and pleasant to ride a bicycle or walk. Bicycle and pedestrian friendliness are in turn affected in a significant way by transportation policies and programs. Every street and highway on which bicycles are permitted to operate is a "bicycle street" and should be designed and maintained to accommodate shared use by bicycles and motorists. Bicycles are unique vehicles because their small size makes them and their operators vulnerable to road conditions that would not affect motor vehicles. Drainage grates, potholes, cracks, crumbled shoulders and other imperfections in the road surface are significant hazards to bicyclists. Roadside parking spaces and the width of the outside curb lane are also of concern. In order to encourage increased bicycling, it will be necessary to minimize these hazards and increase the perception that the town is a safe and comfortable place to operate a bicycle. Pedestrian travel will also be enhanced because any effort to improve bicycling conditions will also improve conditions that effect pedestrians.

1. POLICIES

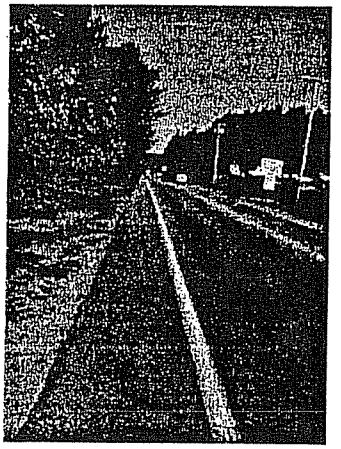
Policies should be developed that will help to enhance bicycle and pedestrian friendliness. The policies that should be considered include:



PAVEMENT MARKING POLICY: Motorists, pedestrians and bicyclists benefit from pavement markings that clearly define travel lanes, crosswalks, shoulders and other roadway characteristics. When a travel corridor is well defined with the proper pavement markings, the users of that corridor have a clear understanding of what their responsibilities are. The example on the right is similar to Nashua Street (NH101A) in Milford and shows how well defined pavement markings can help organize bicycle, pedestrian and motor vehicle flow.

RECOMMENDATION: The Milford DPW pavement marking policy should be reviewed and updated as necessary. The policy should include special attention to practices that clearly define the responsibilities of all users as well as aggressive maintenance of all pavement markings.

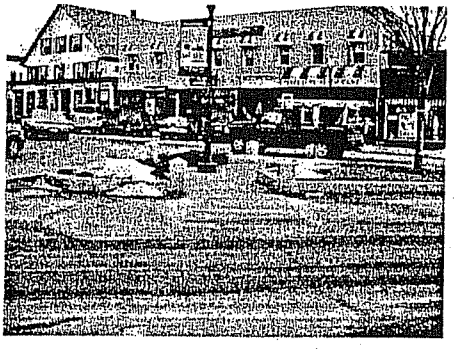
SHOULDER STRIPING POLICY FOR RURAL ROADS: The white stripe on the rural roadway shoulder that marks the edge of the travel lane offers the opportunity to provide added space for bicyclists and pedestrians to operate. Over the years travel lanes have tended to expand with each resurfacing and the white stripe that marks the edge of the pavement has followed right along resulting in travel lanes that are unnecessarily wide. Limiting travel lanes to 11 feet can end up providing 2-3 feet of pavement to the outside of the edge stripe. This is a significant amount of space that can be used by bicyclists and pedestrians. The State of New Hampshire Department of Transportation (NHDOT) has a policy that when numbered routes are re-striped the travel lane will be 11 feet wide where practical.



RECOMMENDATION: Monitor re-striping projects and encourage NHDOT to limit width of travel lanes on State (numbered) routes to 11 feet. The town should also develop a policy similar to NHDOT's that limits the travel lane on town roads to 11 feet where practical. Candidates for re-striping in Milford are listed below.

State maintained roadways in Milford:

- Nashua Street
- Elm Street
- NH101 Bypass
- North River Road
- Amherst Street



Municipally maintained roadways in Milford:

- Osgood Road
- Mason Road
- Union Street
- Melendy Road

TRAFFIC CALMING (LOCAL ROADS): The objective of traffic calming is to achieve slower motor vehicle speeds, reduce motor vehicle collision frequency and severity, create safer and more attractive streets and improve the real and perceived safety for non-motorized users of the street[2]. Traffic calming projects can enhance safety and maintain access for bicyclists and pedestrians. Bicyclist and pedestrian safety is enhanced because the goal of these projects is to slow motor vehicles down. This decreases the speed differential between cars, bicycles and pedestrians which enhances the comfort level of all users of the roadway. Access for bicycles is maintained and the neighborhood environment is improved when roadways are restored to their intended function. On the other hand, traffic calming measures such as road narrowing can place bicyclists, pedestrians and motor vehicles in closer proximity than is comfortable. Care must therefore be taken in advance to ensure that the projected benefits of a traffic calming projects are not offset by the creation of another hazard. Examples of traffic calming include streetscaping, enhanced speed zone enforcement, pavement markings, raised crosswalks and many other options. The type of traffic calming will vary on a case by case basis.

RECOMMENDATION: All roadway projects in Milford should include carefully considered and implemented traffic calming measures where practical. Each project will have unique considerations and require input from various stakeholders in the community.

EXEMPT BIKES FROM SOME TRAFFIC REGULATIONS: Bicyclists share the same responsibilities as motorists. In some cases, though, it does not make sense to apply the same rules to bicycles. For example, turn and entry restrictions at intersections are generally put in place as a traffic calming measure to discourage non-local traffic from travelling through residential neighborhoods. Since the overall objective is to reduce the negative effects of motor vehicles on the neighborhood, these restrictions should not apply to bicycles because it is important to maintain bicycle access to local quiet streets.[3]

RECOMMENDATION: Existing turn and entry restrictions as well as other regulations should be reviewed and amended to exclude bicycles where it is safe enough to do so.

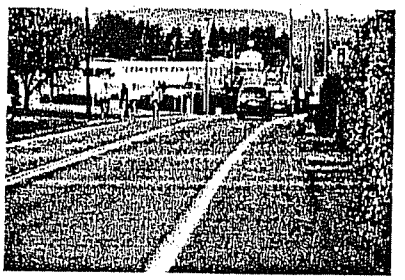
DESIGN PHASE OF NEW OR UPGRADED ROADWAYS: The bicycle and pedestrian amenities of roads that have not been built and those of roadways about to be rehabbed are easiest to get changed during the earliest stages of the design phase. This is obvious, but the practice of including these amenities in roadway construction has not yet become institutionalized into the planning process.

RECOMMENDATION: Develop guidelines that encourage the consideration of the needs of bicycles and pedestrians during the roadway planning process. Guidelines should be developed that can be applied to new commercial and residential development, as well as parcels that will be undergoing redevelopment.

2. PROGRAMS

Roadway programs that focus on bicycles and pedestrians should be developed (or maintained) to enhance safety and improve access for bikers and walkers. These programs need to pay special attention to providing bicycle and pedestrian access to intersections and bridges, as well as to roadways.

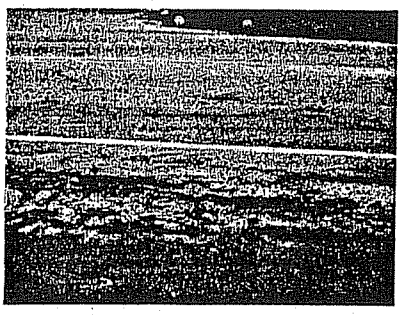
STREET SWEEPING PROGRAM: Debris that ends up on roads tends to accumulate on the shoulders, where bicycles are typically operated. Roadway shoulders should be kept free of debris through regular street sweeping.



[2] NRPC Regional Bicycle and Pedestrian Plan, 2005.
[3] NRPC Regional Bicycle and Pedestrian Plan, 2005.

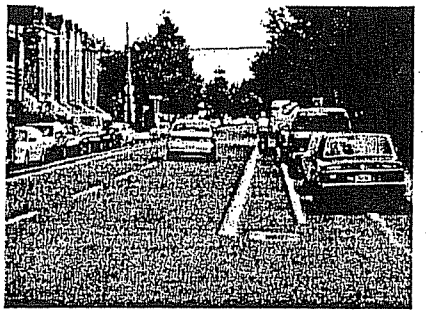
RECOMMENDATION: The Milford DPW street sweeping policy should be reviewed to include practices that recognize and respond to the needs of bicyclists and pedestrians.

SHOULDER REPAIR PROGRAM: The roadway shoulder is where bicycles are generally ridden and it is also where roadway pavement typically begins to deteriorate first. Hazards such as cracks, potholes and crumbling pavement that a motorist might not even notice can have a devastating impact on cyclists. By the time a roadway is resurfaced, the shoulders have long since become dangerous to bicyclists. It is therefore critical that roadway shoulders be repaired more frequently than travel lanes when necessary.



RECOMMENDATION: Procedures should be developed for reporting areas of pavement that are in need of repair. The concerns of bicyclists and pedestrians should be given priority because of vulnerability to damaged pavement.

BICYCLE FRIENDLY GRATES PROGRAM: Catch basin grates are usually located in the shoulder where bicycles travel. Older grates are unsafe for bicycles because they can easily catch a wheel and cause a crash. Bicycle friendly grates are now available.



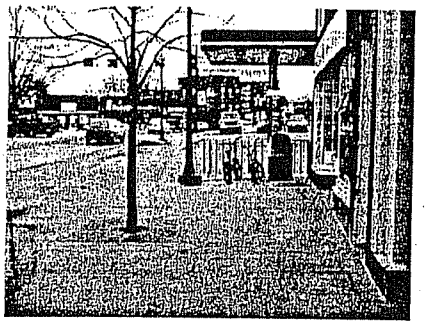
RECOMMENDATION: The Milford DPW should develop a program to replace old style grates with bicycle friendly grates where practical.

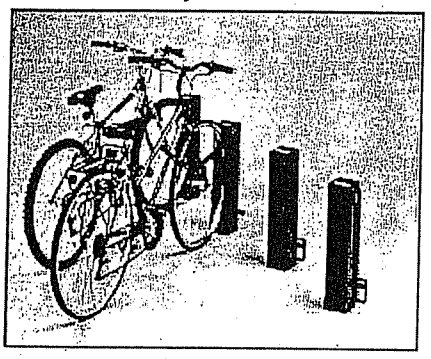
BREAK BARRIERS TO BICYCLE AND PEDESTRIAN TRAVEL: Bicycling and walking tend to be short distance modes of travel which means barriers that force a one or two mile detour can discourage many non-motorized trips. Major barriers include the Souhegan River as well as NH 101 Bypass. The completion of the Gregg Bridge connecting Keyes Field Park and the Souhegan Valley Boys and Girls Club alleviates a mile walk or ride across the busy Veterans Memorial (Granite) Bridge and Oval. Other barriers include the lack of road connections between housing developments or cul-de-sacs. This can be easily remedied by requiring connections between these land uses that are reserved for non-motorized travel only.

RECOMMENDATION: Require connections, reserved for non-motorized travel, between housing developments, cul-de-sacs and commercial properties.

PROVIDE END-OF-TRIP FACILITIES: People will be more willing to ride a bike to work if there are bicycle parking facilities at their destination.

RECOMMENDATION: An inventory should be done in order to determine if bike racks or other bicycle parking facilities exist at strategic locations such as places of employment as well as at parks and other recreational facilities. A "bicycle parking plan" should be developed. This plan will identify ways to provide appropriate parking facilities for bikes. The long standard metal bicycle rack works where there is adequate room such as the library and school property. Preliminary research done by NRPC revealed that bicycle racks such as the one pictured may be a solution for bicycle parking flush against buildings in the downtown business district. Milford Do It has already installed bike racks around Oval at several locations.





BRIDGE AND UNDERPASS IMPROVEMENT PROGRAM: Bridges and underpasses are important because they provide crossing points of major barriers such as rivers and highways.[4] Underpasses are not particularly bicycle or pedestrian friendly because of abutment walls that are close to the travel lanes, as well as poor lighting and drainage and other factors. Overpasses and bridges can be narrow, with no accommodation for non-motorized travel. An example of a properly designed overpass is the bridge (known as the Green Bridge) over the Souhegan River at the west end of the Milford Bypass. The general policy should be to provide bike lanes and sidewalks on bridges and in underpasses even if they are not part of the designated bicycle network. If this isn't possible then travel lanes should be striped as narrowly as possible to provide more room for bicyclists and walkers. Improved lighting and drainage should be included in any underpass reconstruction project.

RECOMMENDATION: An inventory of bridge and underpass conditions should be undertaken in Milford to determine where improvements should be made.

In addition to the programs and recommendations listed above, Milford can play the principal role in shaping land use and development patterns through zoning and subdivision regulations. Density controls, building setback requirements, parking requirements, site plan review requirements and provisions for mixing or segregating land uses all affect bicycling and walking conditions.[5] NRPC has developed a methodology for identifying land use, access management and design strategies that will help to increase bicycling and walking while at the same time decrease dependency on the motor vehicle. This methodology can be adapted for use by the planning board. Please see Chapter IV of this report for a complete discussion of the land use aspect of this study.

3. RECOMMENDED BICYCLE NETWORK

The recommendations for improving the overall "bicycle and pedestrian friendliness" have been discussed. This element identifies a bicycle network that will further enhance the environment for bicycling and walking in the town. Surveys have shown the importance of designated bicycle routes in successfully encouraging more bicycle trips.[6] The proposed network will provide bicycle facilities that are clearly visible through pavement markings, signage and overall design. These priority routes will

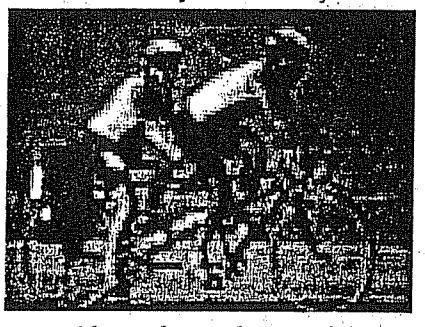
[4] NRPC, *Regional Bicycle and Pedestrian Plan*, 2005.
[5] Massachusetts Pedestrian Transportation Plan, 1998.
[6] 1999 Toronto (Canada) Cycling Survey.

add an additional level of comfort, beyond general bicycle friendliness, that will further encourage potential bicyclists. The major bicycle design groups are also described in this section as well as the types of bicycle facilities that are most appropriate to the town.

a. Major Bicycle Design Groups

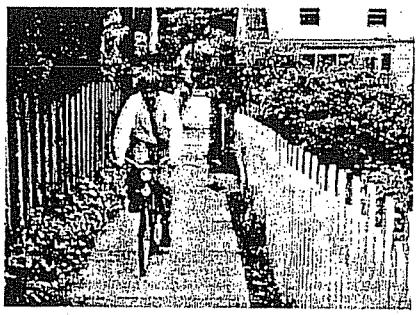
The major bicycle design groups must be considered during the network development process. The American Association of State Highway and Transportation Officials (AASHTO) notes that even though the dimensions of a typical cyclist are relatively consistent, their skill level, confidence and preferences vary dramatically. Some riders are confident riding anywhere they are legally allowed to operate and can negotiate busy and high speed roads that have few, if any, special accommodations for bicyclists. Most adult riders are less confident and prefer to use roadways with a more comfortable amount of operating space. Children may be confident riders and have excellent bike handling skills, but have yet to develop the traffic sense and experience of an everyday adult rider.[7] The major bicycle design groups, as defined by AASHTO, are as follows:

GROUP A–ADVANCED BICYCLIST: These are experienced riders who can operate under most traffic conditions. Group A riders should be anticipated and provided for on all roadways where bicycles are not excluded by statute or regulation, regardless of functional classification. Experienced bicyclists are best served by:



- Direct access to destinations via the existing street systems
- Ability to operate at maximum speed with minimum delays
- Sufficient operating space on the roadway or shoulder to reduce the need to change position when passing

GROUP B–BASIC BICYCLIST: These are casual or new adult and teenage riders who are less confident of their ability to operate in traffic without provisions for bicyclists. Some will develop greater skills and progress to the advanced level, but there will always be millions of basic bicyclists. The basic bicyclist prefers:



- Comfortable and direct access to destinations
- Low-speed and low traffic-volume streets
- Designated bicycle facilities or separated bike paths
- Minimal incline routes
- Well-defined separation of bicycles and motor vehicles on arterial and collector streets

GROUP C-CHILDREN: These are pre-teen riders whose roadway use is initially monitored by parents. Eventually they are allowed independent access to the roadway system. They and their parents prefer:

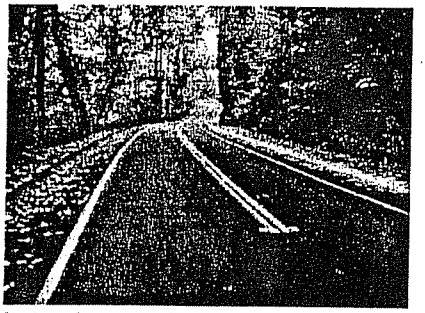
- Access to key destinations surrounding residential areas
- Residential streets with low motor vehicle speed limits and volumes

[7] American Association of State Highway and Transportation Officials; *Guide for the Development of Bicycle Facilities*, 1999.

- Well-defined separation of bicycles and motor vehicles on arterial and collector streets or separated bike paths

RECOMMENDATION: The designated bicycle network should be designed to accommodate and encourage Group B & C riders in particular. This will, by default, provide Group A riders with more than adequate facilities.

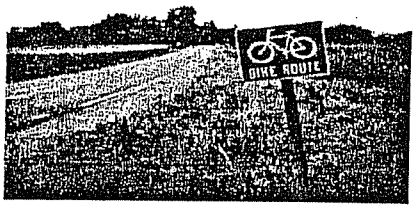
b. Types of Bicycle Facilities

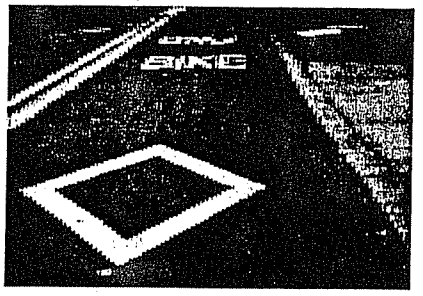


The design of the bicycle network will affect the level of use and the types of cyclists that will be attracted. The network will consist of the following types of AASHTO facilities:

SHARED ROADWAY **(no official bikeway designation):** Most bicycle travel in Milford now occurs on streets and highways without bikeway designations. In some cases, the existing street system is fully adequate for bicycle travel and no signing or striping is necessary. In other cases, the roadway could be completely inadequate for biking and it would be inappropriate to encourage bicycle travel by adding such a designation. In most cases, bicycle facilities in rural areas should only be designated with signs or striping where there is a need to indicate a connection with other designated routes. However, the development and maintenance of 4-foot paved shoulders and 4-inch wide edge stripes can significantly improve the comfort level of bicyclists along such routes.

SIGNED SHARED ROADWAY: Signed shared roadways are designated by bike route signs, but do not have pavement markings. They serve to provide continuity to other facilities or to indicate preferred routes through high-demand corridors. Signing of shared roadways should indicate to bicyclists that particular advantages exist to using these routes compared to alternatives. They mean that action has been taken to ensure that these routes are suitable as shared routes and will be maintained in a manner consistent with the needs of bicyclists. Signing also serves to alert motorists that bicycles are present. Signed routes are typically installed on quiet, residential, local/collector streets. Such streets have a single lane in each direction, and daily traffic volumes in the range of 8,000 vehicles. Apart from 'bicycle route' signs, there are no physical changes made to the roadway.





BIKE LANE: Bike lanes are established with appropriate pavement markings and signing along streets in corridors where there is significant demand and where there are distinct needs that can be served by them. The purpose should be to improve conditions for bicyclists on the streets. Bike lanes are intended to delineate the right of way assigned to bicyclists and motorists and to provide for more predictable movements by each. They are approximately 4 feet wide. Motor vehicles are not allowed to drive, park or stand in a bike lane, but right turning vehicles can enter the lane at intersections to complete their turn.

SHARED USE PATH: Shared use paths are bicycle and pedestrian facilities that are physically separated from the traffic flow of motorized vehicles. They should be used to serve corridors not served by streets or where wide utility or former railroad right-of-way exists.

RECOMMENDATION: The bicycle network should be designed to AASHTO standards.

c. Route Hierarchy

NRPC staff has applied the methodology developed for the 2005 Regional Bicycle and Pedestrian Plan to identify recommended bicycle routes. This methodology is described in Appendix A. A route hierarchy was developed in order to characterize regional, key connector (sub-regional) and local routes:

- MAJOR TRAVEL CORRIDORS enable bicyclists to travel north-south or east-west through the region. These routes are suitable for Group A (expert) riders in general, but there are many segments that can be comfortably used by Group B and C riders (in fact, travel corridors and local routes frequently overlap). Major travel corridors can be used for commuting the somewhat longer distances between municipalities, as well as for longer recreational rides. Segments of these corridors will also be used for shorter, utilitarian trips. Major travel corridors in Milford include NH 101, NH 13, Amherst Street and Merrimack Road.
- KEY CONNECTORS function as sub-regional travel corridors that connect areas of high trip production to desired destinations throughout the region. These routes are also most suitable for expert riders because they are generally used for somewhat longer commuting or recreational trips. Many segments of these routes are suitable for all levels of riders. The only Key Connector route in Milford is Amherst Street.
- LOCAL ROUTES are located within municipalities that connect areas of high trip production (generally residential areas) to desired destinations within the municipality such as the Central Business District, commercial and retail areas, schools and parks. Local routes also connect downtown areas with Key Connector routes and Major Travel Corridors. Local routes should be designed to accommodate all levels of riders.

RECOMMENDATION: The bicycle network that is described in the following pages should be included in the major street rehabilitation and maintenance plan. Consider striping and signage on identified local routes.

d. Designated Bicycle Routes

The NRPC Regional Bicycle and Pedestrian Plan identified Regional, Connector and Local bicycle routes throughout the region and in Milford. The TCSP steering committee also worked with local planning boards and the public to further identify local routes. The routes that have been identified below will most likely need further refinement as the Town moves towards implementing these recommended routes.

- **Regional Routes in Milford**

  The Nashua-Wilton Corridor is an east-west regional route that passes through Milford on Nashua Street and Elm Street (NH 101A). At the intersection of NH 101A and the Milford Bypass (west end) this route passes over the Souhegan River, immediately west on North River Road, then west on Old Wilton road into downtown Wilton (Main Street). The NRPC Regional Bicycle and Pedestrian identified this as a major bicycle and pedestrian route. The NH 101A Corridor Master Plan and Improvements Program calls for numerous additions to the sidewalk system along Nashua Street. These improvements include a pedestrian crossing between Lorden Plaza and the former Lorden Lumber property, extension of the sidewalk on the south side of Nashua Street to NH 101 and extension of the sidewalk on the north side from the cemetery to NH 101. The Regional Bicycle Plan

and the NH101A Master Plan also call for a feasibility study of bicycle/pedestrian trail adjacent to the railroad right of way that parallels NH101A.

The Brookline-Mont Vernon Corridor is a north-south regional route that passes through Milford on NH13. The southern end of this route, from the Milford/Brookline border to approximately the Milford bypass should remain a *shared roadway*, with no official bikeway designation. The section from the bypass through downtown and north to the intersection with North River Road should be a designated *bike lane*, with pavement markings and signs. The section from North River Road to the Amherst town line should be a *signed shared roadway*.

- **Key Connector (sub-regional) Routes in Milford**

  The Milford-Amherst Village Key Connector Route is identified in the regional bicycle and pedestrian plan and extends along Amherst Street from the Amherst Village Center to the NH13/Amherst Street intersection in Milford. This route was also identified by the steering committee in discussions with local authorities. There should be designated *bike lanes* on each side of the road along the entire length of Amherst Street between Milford and the Amherst Village Center.

- **Local Routes in Milford**

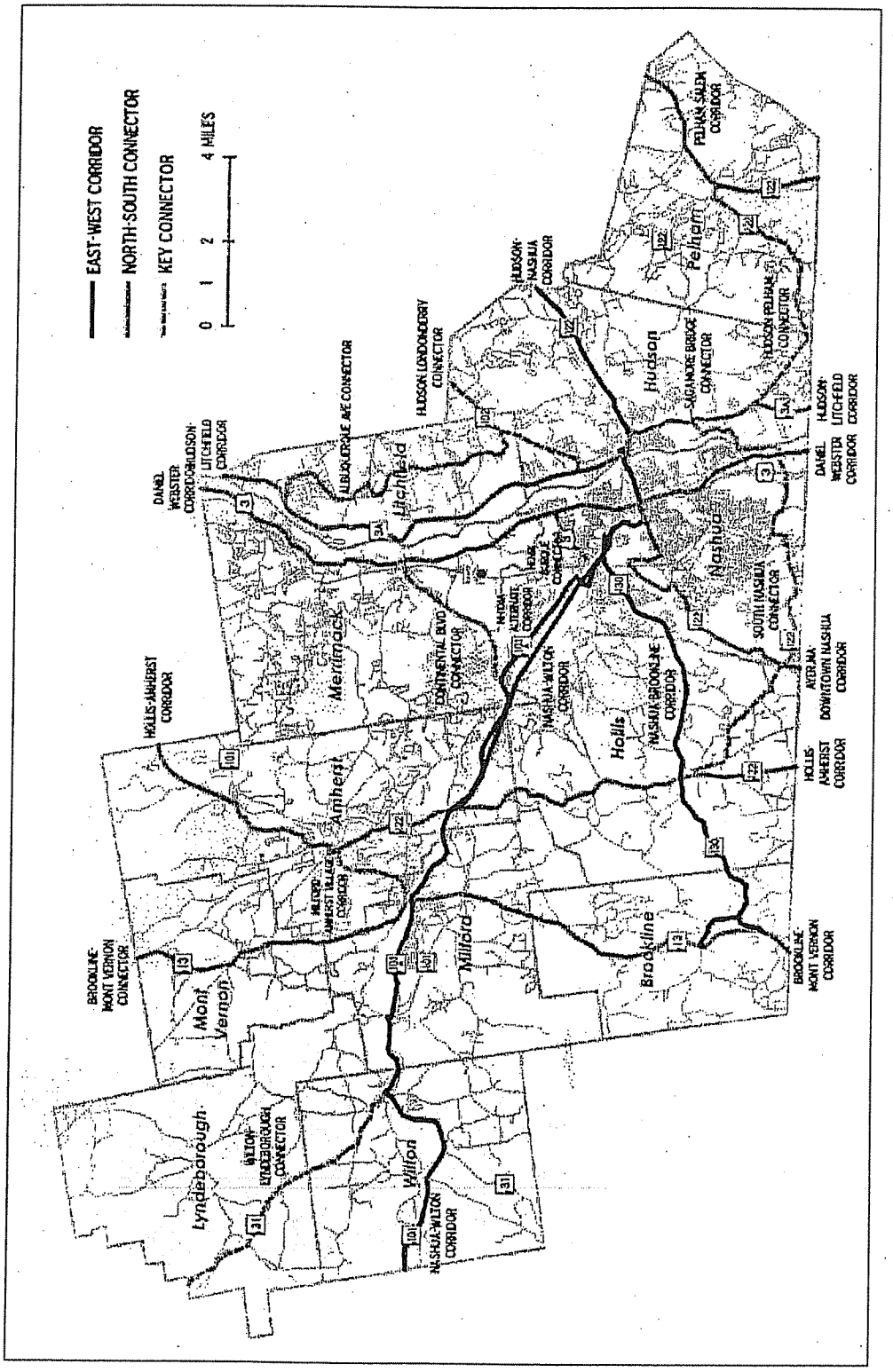
  From South Street, this route heads west on Lincoln Street, north (right) on Union Street, west (left) on Garden Street, north (right) on Cottage Street, and then crosses Elm Street via a bicycle and pedestrian crossing to Keyes Field Road. These segments should have designated *bike lanes* with proper pavement markings and signage. This local route continues over the Gregg pedestrian bridge to the Boys and Girls Club property and then connects to NH 13.

  From Elm Street this route heads south on Union Street (*bike lanes*) to Osgood Street (*bike lanes*), then west on Mason Road (*signed shared roadway*) to Whitten Road (*bike lanes*) where it turns north. It continues on Whitten Road to Savage Road (*bike lanes*) and then turns east on Old Wilton Road (*signed shared roadway*) and continues to Elm Street.

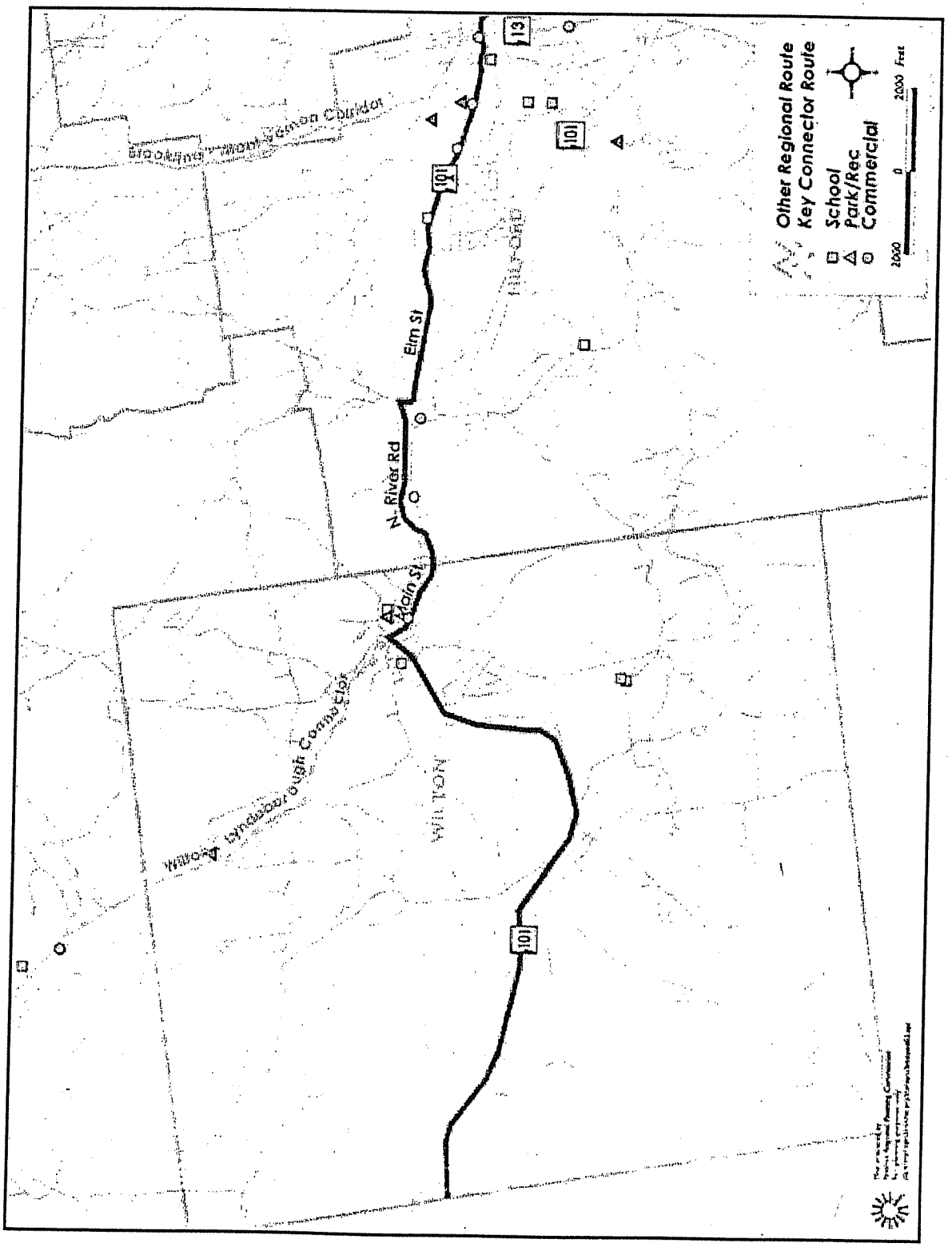
  Ridgefield Drive should have designated *bike lanes* along its entire length.

  North River Road should be a *signed shared roadway* from NH13 intersection to west end of the Milford Bypass.

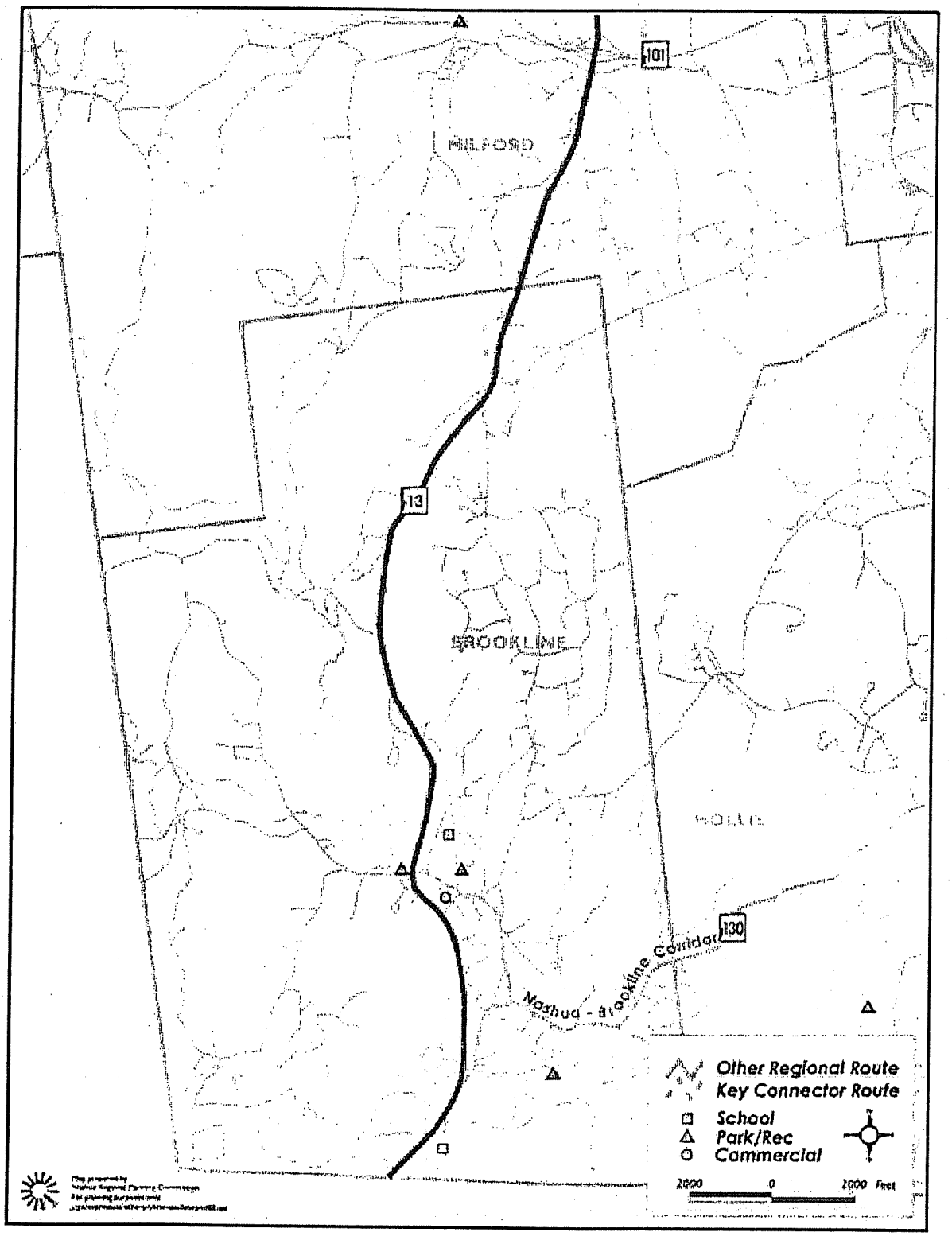
Map V-1: Regional Bicycle Routes



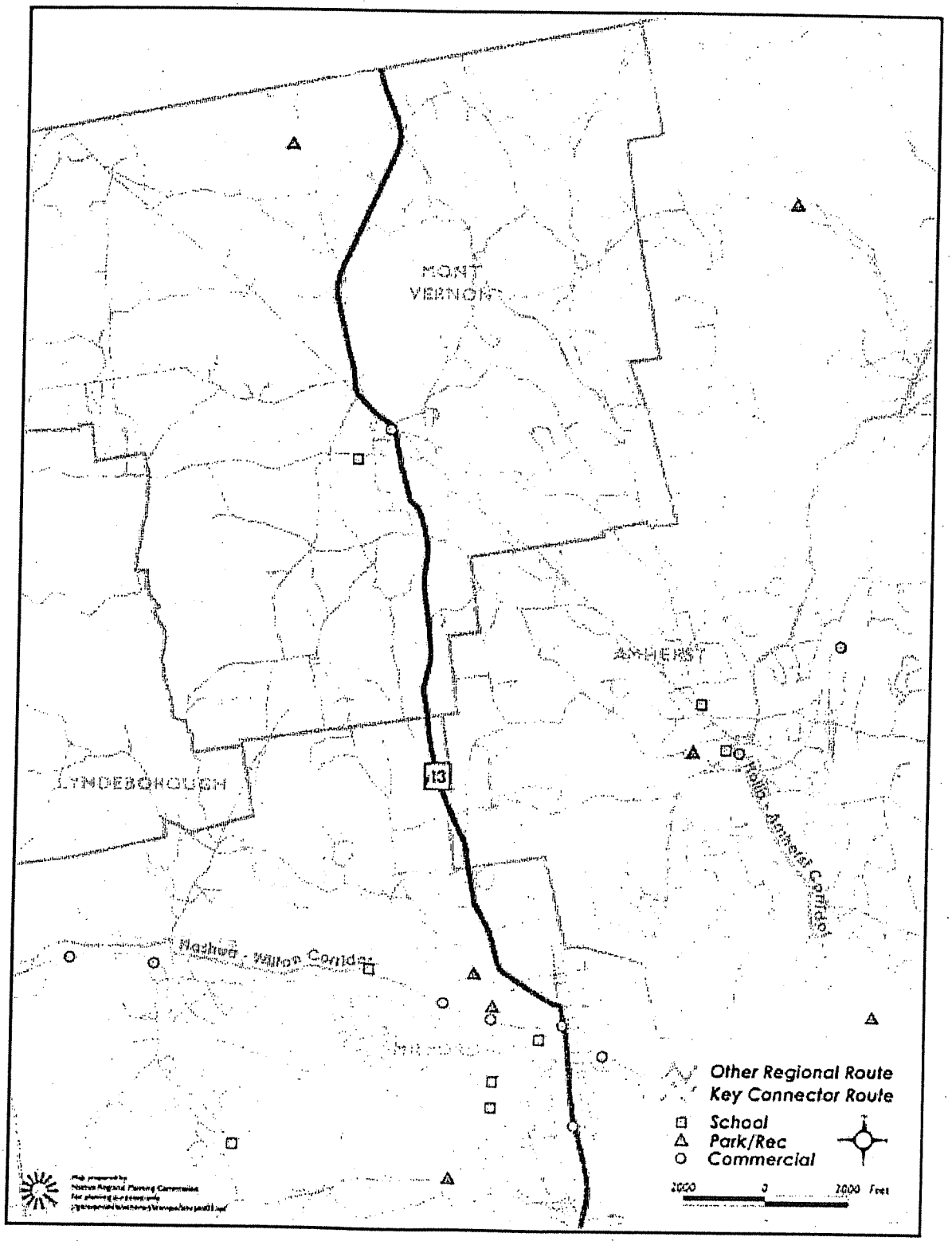
Map V-2: Nashua-Wilton Corridor



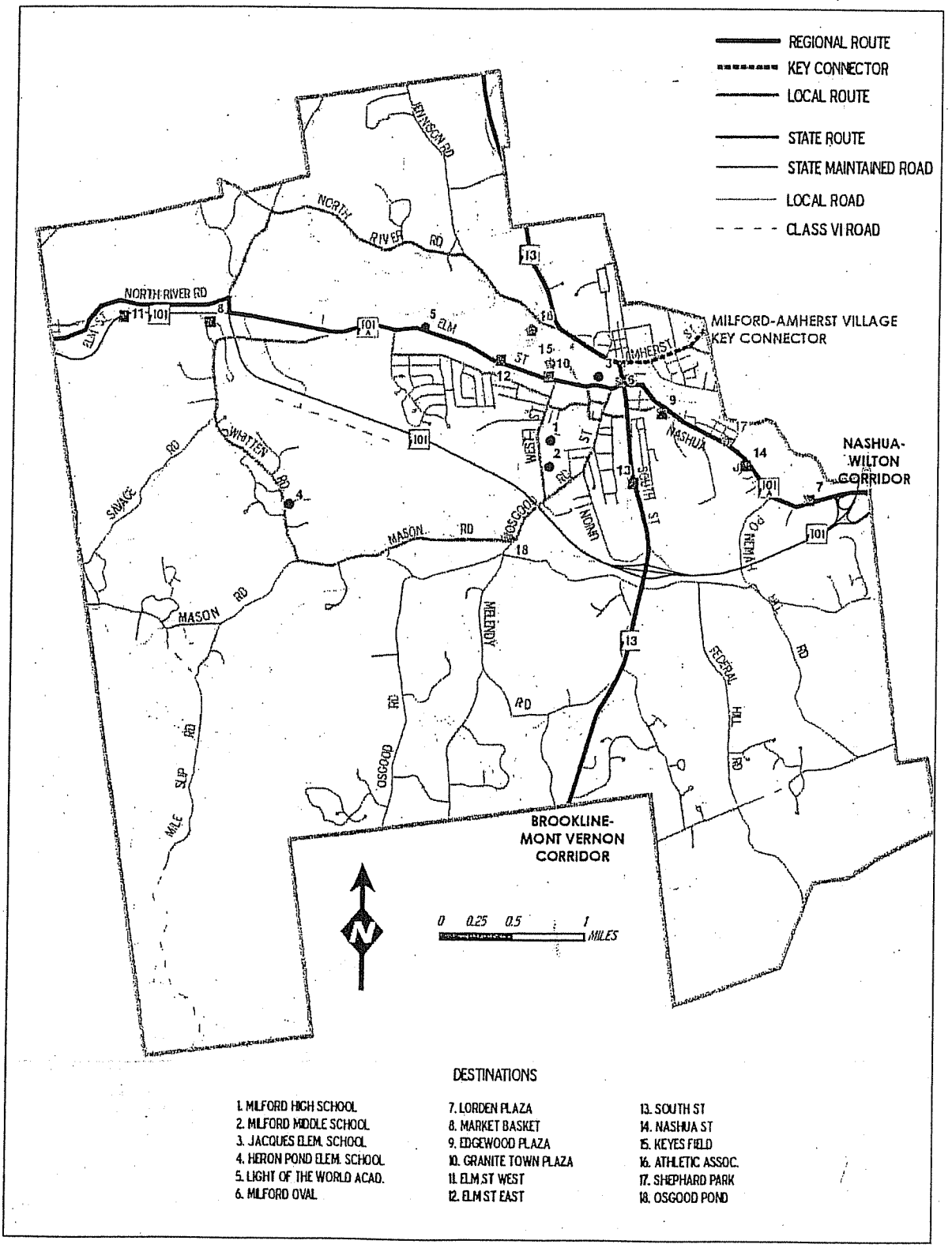
Map V-3: Brookline-Mont Vernon Corridor (Southern Segment)



Map V-4: Brookline-Mont Vernon Corridor (Northern Segment)



Map V-5: Milford Local Bike Routes



4. SIDEWALK INVENTORY

Sidewalks tie a neighborhood together and serve other purposes such as recreation space for children and informal meeting places for neighbors. They also encourage people to walk to a destination rather than drive.

NRPC used Global Positioning System (GPS) equipment to measure and map the existing sidewalk system. Each street was broken down into segments by intersections or by a change in the overall condition of the sidewalk. One field observer was used to keep sidewalk evaluation consistent. The four parameters and their individual components listed below were used to make an overall segment evaluation of good, fair or poor. Mapping the condition data also enabled the staff to identify gaps and assess the need for new sidewalks.

The sidewalk inventory will provide planning benefits to various departments within the town. The information from the inventory can be used for the following tasks:

- Prioritizing sidewalk maintenance projects;
- Determining if town sidewalks meet intended design specifications and guidelines;
- Determining the extent of needed maintenance so that work schedules can be developed;
- Budgeting for sidewalk projects and justification of maintenance funding;
- Identifying portions of sidewalks in need of accessibility improvement;
- Revising and updating Americans with Disabilities Act (ADA) transition plans;
- Sharing data and project plans with disability focus groups; and,
- Creating objective sidewalk information that can be provided to users in various formats such as signage, maps and Websites.

a. Inventory Parameters

A field database was designed to assess sidewalk conditions for each road or segment of road for the longer streets. The complete database is in Appendix B. The parameters were each assigned a point value with 1 representing poor condition, 2 fair condition, and 3 good condition. The overall "condition" of the sidewalk segment was determined using the following parameters:

1. Width of the sidewalk (wheelchair friendly at 5 feet or greater)
2. Obstructions (utility poles, vegetation, signs, walls)
3. Sidewalk surface (surface type, cracking, pitting, heaving, roots)
4. Drainage (depressions, presence of water, sheet flow)
5. Curb cuts
6. Crosswalks

In addition, curb cuts at intersections were documented for the number or lack of cuts and their ability to allow smooth wheelchair transition from sidewalk to road pavement. The location of crosswalks and the condition of pavement and signage were also noted. All six parameters are discussed in the field observation section. The type of curb and separated sidewalk parameters normally used for sidewalk inventory were left out due to the consistent conditions in the town. Field observations were done during the summer of 2005. Particular problem locations and their severity were noted to help the Milford Department of Public Works prioritize repairs.

b. Field Observations

Width

The American with Disabilities Act (ADA) requires that sidewalks be at least 5 feet in width and be handicapped accessible at intersections. Sidewalks received a score of three points if they were five or more feet in width. A score of one point was given to all sidewalks that were not ADA compliant.

Many of the streets in town are physically impossible to expand the width due to property lines, utility poles and on street parking. The sidewalk segments rated non-ADA compliant for width are in Appendix C.

Obstructions

The type of obstructions varied street by street. Some sidewalks would not be compatible for wheelchairs but all can be negotiated by watchful pedestrians. Objects such as fire hydrants and utility poles are generally not an option to relocate but they are usually confined to one side of the street. Comparatively, signage, vegetation and snow can be relocated or removed at a much lower cost.

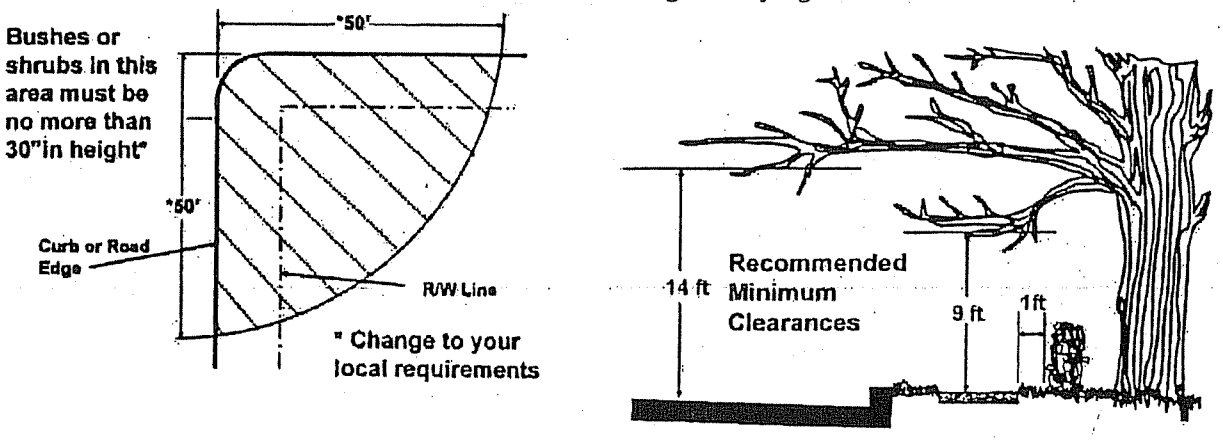
Uncontrolled vegetation will hide bicyclists, pedestrians and drivers from each other. Trimming vegetation will allow for better visibility of signage, oncoming traffic, bicyclists and pedestrians in crosswalks. An unobstructed line of sight allows adequate distance for drivers to read and react to a sign within 3-5 seconds.[8] The figures in Table V-1 may serve as guidelines to establish ordinances for both the street and sidewalk.

Table V-1: Sight Distance

Speed Limit - MPH	Noncritical Signs - Feet	Critical Signs - Feet
30	150	250
40	200	350
50	250	450
60	300	600

Source: University of New Hampshire Technology and Transfer Center, *Road Business*, Winter 2003.

The graphics represent the recommended vegetation trimming clearances for sight distance. The trimming also allows sunlight penetration to increase melting and drying of sidewalk and road surfaces.



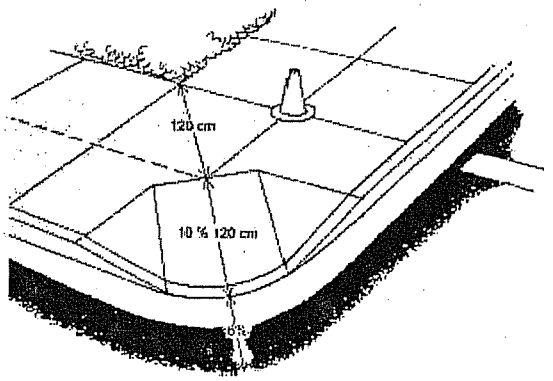
Source: University of New Hampshire Technology and Transfer Center, *Road Business*, Winter 2003.

[8] West Virginia Transportation Technology Transfer Center, *Country Road & City Streets*, March 2003.

Curb Cuts

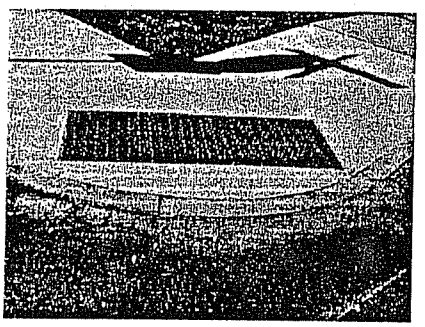
All intersections were observed for curb cuts. In addition to the American with Disabilities Act (ADA) requiring that sidewalks be at least 5 feet in width, all intersections must be handicapped accessible. Curb cuts allow handicapped persons smooth access between the sidewalk and the road. This would include vision impairment, wheel chairs and walkers. Intersection observations included the following:

- Distance to the curb ramp
- Number of curb ramps (0, 1, 2) at every corner.
- Type of curb ramp (parallel, perpendicular, diagonal, combination, built-up)
- Street approach slope (generally the gutter and part of the street) over 24-inch distance and the slope of the ramp in the upward direction
- Ramp length if the ramp slope exceeds 8.3 percent

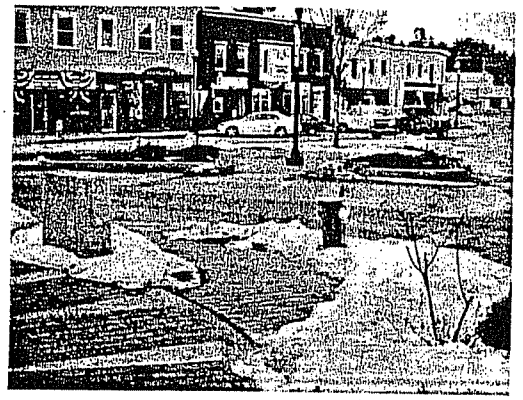


The American with Disabilities Act Accessibility Guidelines (ADAAG) applies to new construction and alterations. Alterations include roadway or sidewalk rehabilitation, reconstruction, and resurfacing beyond normal maintenance. ADAAG considers repainting markings, patching potholes, and similar spot repairs to be normal maintenance. The recent ADAAG does not allow grooves as a detectable warning. Municipalities shall provide a 24-inch wide strip of raised truncated domes at the bottom of all curb ramps. They should install 24-inch detectable warning strips at the following locations:[9]

- At the edge of depressed corners, transit platforms and where railroad tracks cross the sidewalk.
- At the border of medians and islands, raised crosswalks and raised intersections if the ramp slope exceeds 8.3 percent



The dimensions, spacing and alignment of truncated domes are illustrated in the graphic. Domes shall contrast visually with adjoining surfaces, either light-on-dark, or dark-on-light.



Intersections were rated good if curb cuts were ADA compliant in both directions, fair if there was one compliant curve and poor if the intersection lacked curb cuts or they were inadequate. The following streets were rated poor and did not meet ADA standards. It should be noted that the majority were small segments in front of several lots and were rated a low priority because they did not connect to the sidewalk system.

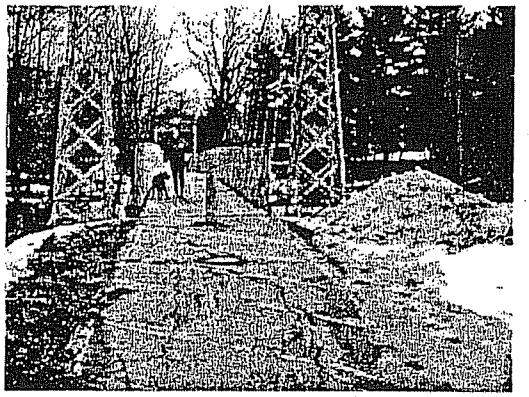
- Olive Street
- Laurel Street
- Oak Street

[9] *ADAAG Requirements for Detectable Warnings, March 2003.* **http://www.access-board.gov/adaag/dws/update.htm**

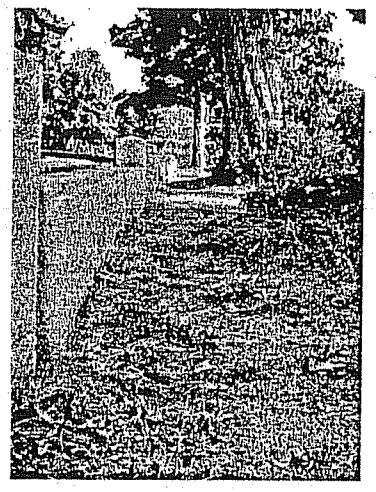
- Willow Street
- Orange Street
- Cottage Street
- Crosby Street
- Adams Street
- High Street
- Garden Street

Sidewalk Surface

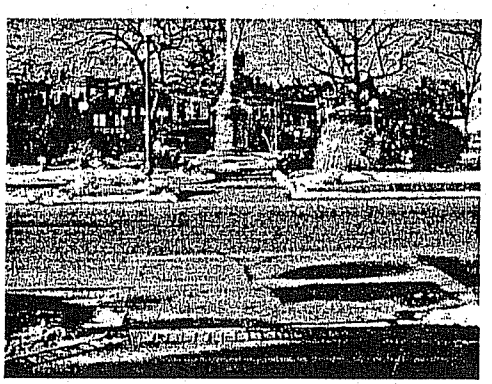
The type of material and the width of any space between the road and sidewalk (buffer) were noted on the field sheets. The overall condition of the sidewalk surface was rated good, fair or poor. Four criteria were used; cracking (amount, severity), roughness (bumps, depressions), drainage and loose aggregate (sand, stones, trash).



A good surface is smooth and has no or very few cracks, bumps or debris. A fair surface may be somewhat bumpy in some areas and may have a certain amount of deterioration and breakage; however, the surface is walkable with a normal degree of awareness. A poor surface exhibits significant deterioration, cracks, debris and an uneven walking surface, which may pose a danger to pedestrians. The following sidewalks were rated as poor:



- Nashua Street from Riverside Cemetery to 452 Nashua Street
- High Street from South Street to 130 High Street
- Souhegan Street from 59 (swing bridge) to Chestnut Street
- Souhegan Street between 29 and 6
- North Side of Souhegan Street needs to be removed and graded
- Nashua Street from Linden Street to Tonella Road
- Tonella Road from Nashua Street to Woodside Commons/Birchwood Road
- Highland Avenue
- Summer Street between 25 and 28
- Amherst Street from North Street to 95 Amherst Street



Crosswalks

The purpose of crosswalks is to concentrate pedestrian movement to selected areas for safety purposes. The Federal Highway Administration (FHWA) provides the broad standard for the placement of sidewalks:

> *"Crosswalks should be marked at all intersections where there is substantial conflict between vehicle and pedestrian movements. Marked sidewalks should also be provided at other appropriate points of pedestrian concentration, such as loading islands, midblock pedestrian crossing or where pedestrians could not otherwise recognize the proper place to cross."*

The town has elected to paint crosswalks across the major roads in green with the exception of Union Square (the Oval) and the majority of roads leading to these roads in white cross bars. There are 47 green crosswalks and 55 white crosswalks for a total of 102 town maintained crosswalks. The crosswalks are illustrated on Map V-6 on the following page. All crosswalks are painted annually, prior to the school year.

Numerous authorities such as the FHWA stress the point that crosswalk markings should not be used indiscriminately:

> *"For marked crosswalks to provide their maximum pedestrian safety potential, it is important that they be installed only where needed. The motorist may lose respect for all pedestrian regulations and traffic controls if marked crosswalks occur at a large number of intersections where the motorist rarely encounter pedestrians."*

On West Street there are crosswalks at every intersection from Elm Street to the high school. The town should consider eliminating the crosswalks at Berry Court and Lewis Street due to their close proximity to each other, good sight distance and a posted speed limit of 30 mph.

c. Sidewalk System and Condition Assessment

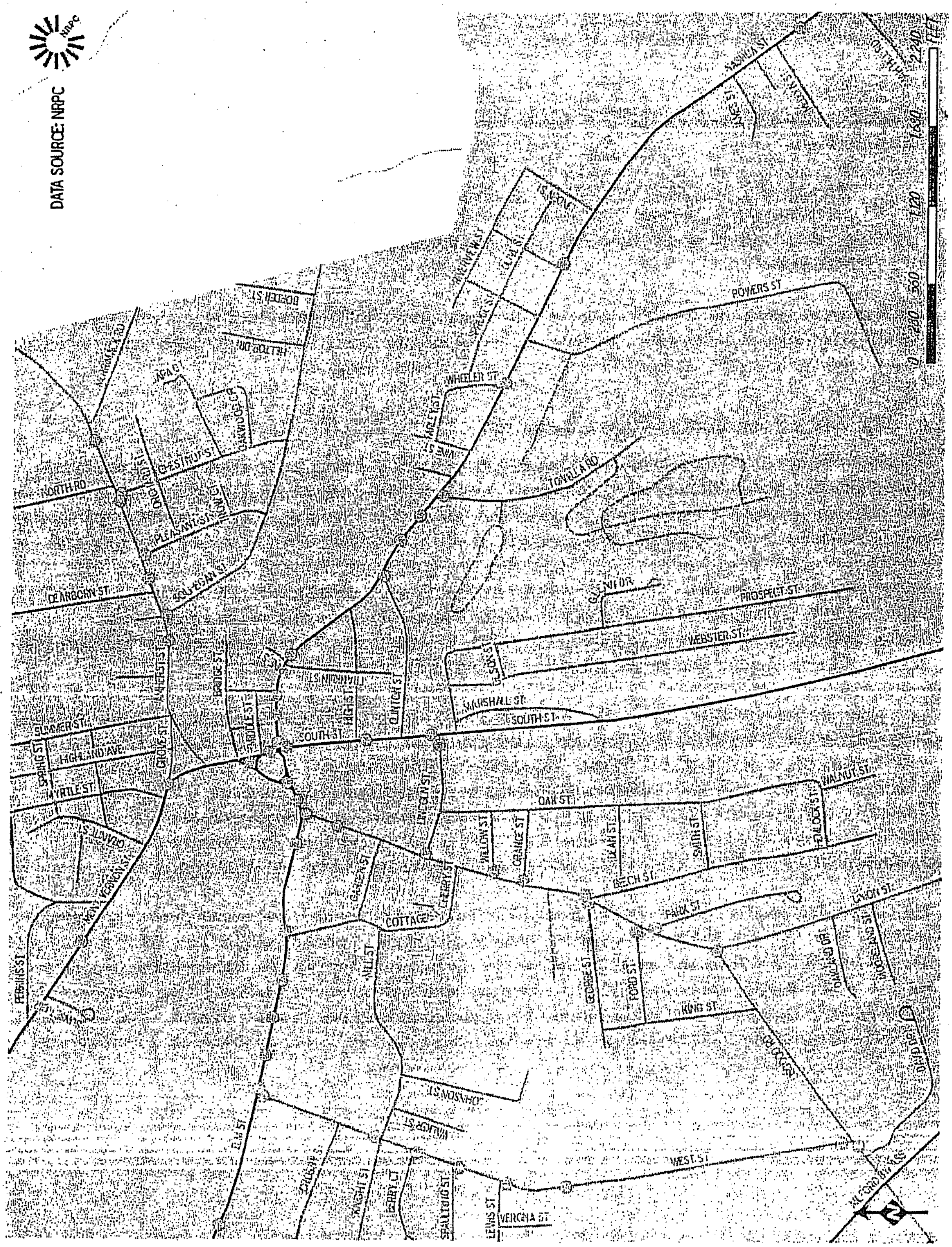
Maps V-7 through V-9 illustrate that the majority of the streets fanning out from the Oval and NH 101 have sidewalks on at least one side of the street. All school properties are adequately served by the sidewalk system, with the exception of Heron Pond School. The Planning Department did require a six-foot detached sidewalk within the sixty foot right-of-way to Heron Pone Road, but the sidewalk only extends the length of Heron Pond Road, and does not extend onto Whitten Road. In addition, all municipal facilities are tied into the sidewalk network with the exception of the Police Station on Elm Street and the Department of Public Works on South Street. Off street parking entrances were problematic due to the quantity and overall condition in some parts of town, primarily South Street (NH 13) and NH 101. The maintenance is the responsibility of the property owner.

The importance assigned to sidewalks was determined by the proximity to destinations such as schools, businesses and municipal facilities and the population density. Sidewalks ranked high are illustrated in yellow, medium in grey and low in blue. The sidewalk parameters (width, obstructions, surface condition, and drainage) were tallied and are listed in the condition index on maps V-7 through V-9. Sidewalks with a score of 10-12 are rated in good condition overall, those with a score of 7-9 are rated in fair condition and those with a score below 7 are rated in poor condition. The complete sidewalk database is in Appendix B. Appendix C lists sidewalk segments that are not ADA compliant.

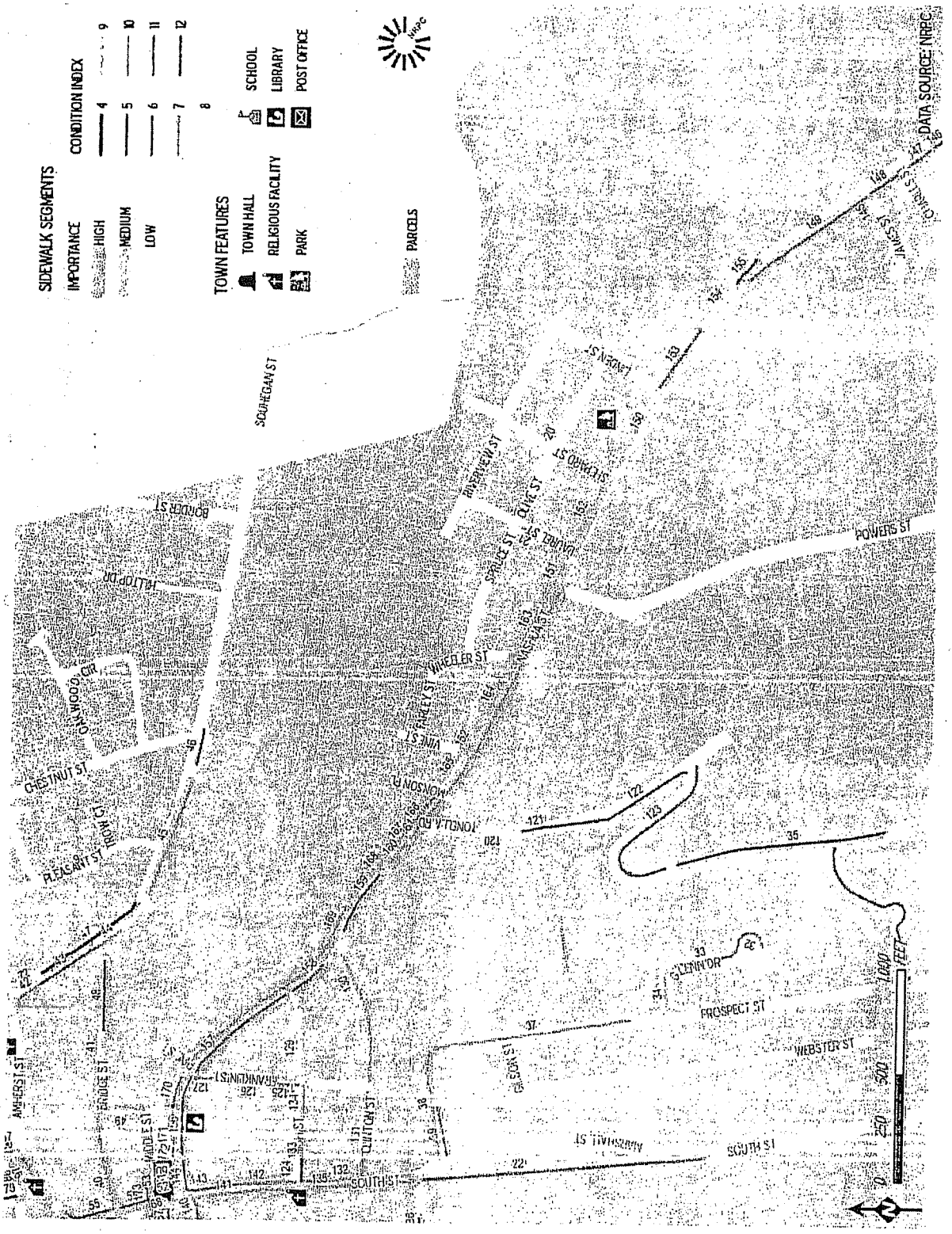
The importance and the overall condition score allow the town to budget and plan sidewalk maintenance projects. It should be noted that the majority of sidewalks rated in poor condition were small segments in front of residential homes and were rated a low priority because they did not connect to the sidewalk system. A new sidewalk has been installed along the south side of Souhegan Street. The remains of the sidewalk on the north side should be removed and graded as they pose a safety hazard. A new sidewalk will be built in summer/fall of 2006 on North River Road from NH 13 intersection to the playing fields.

Map V-6: Milford Crosswalk Locations

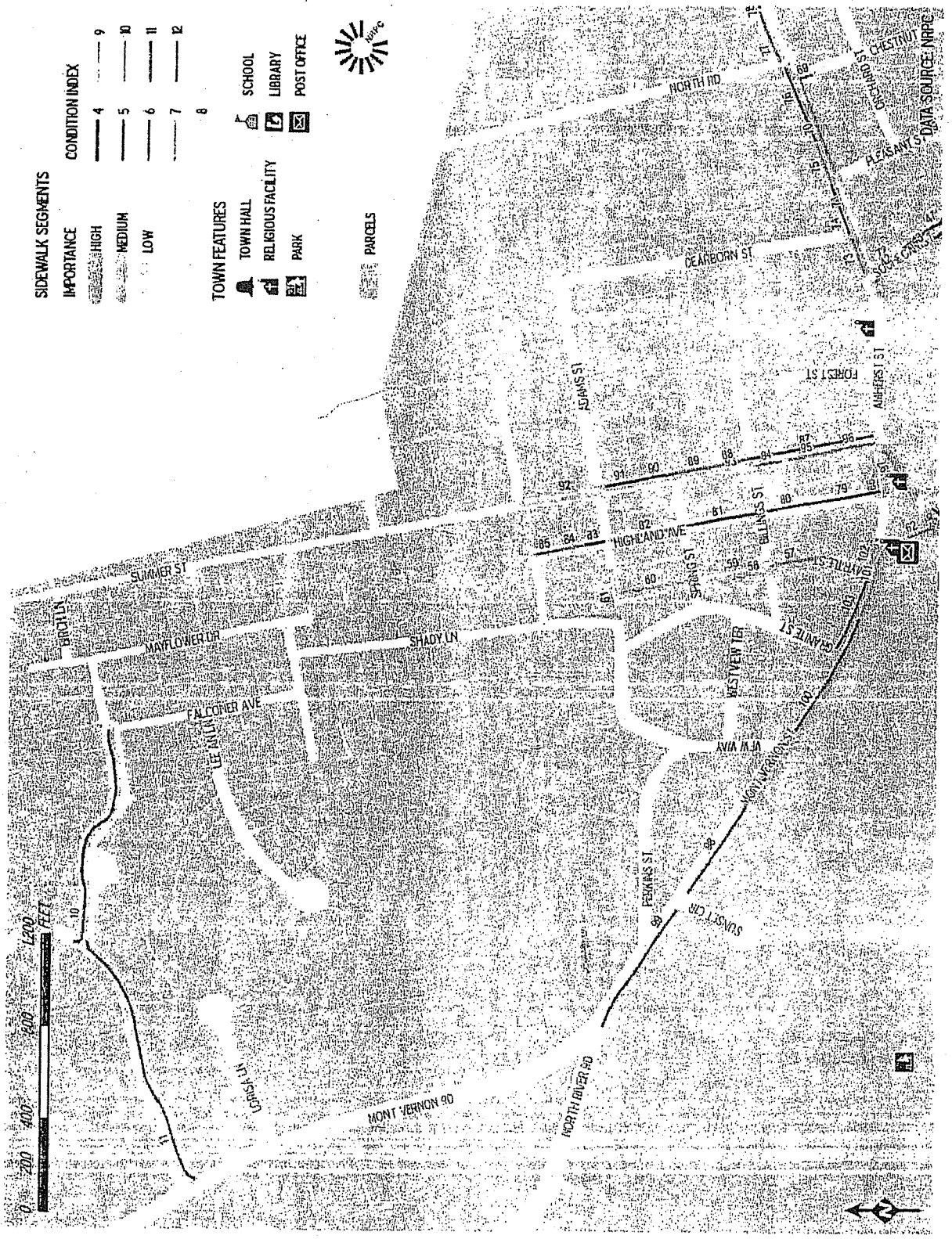
DATA SOURCE: NRPC



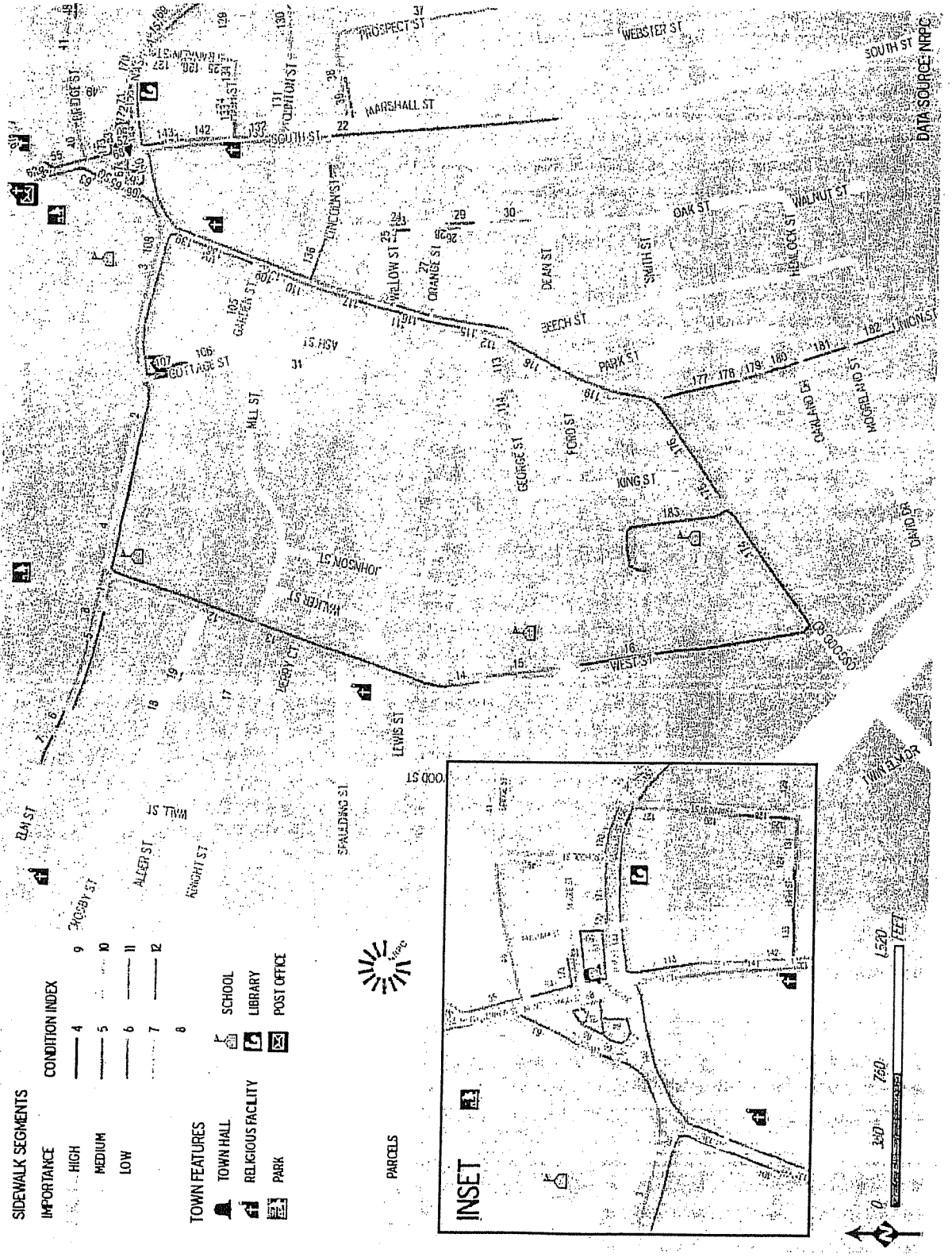
Map V-7: Milford Sidewalk Condition Assessment - Eastern



Map V-8: Milford Sidewalk Condition Assessment - Northern



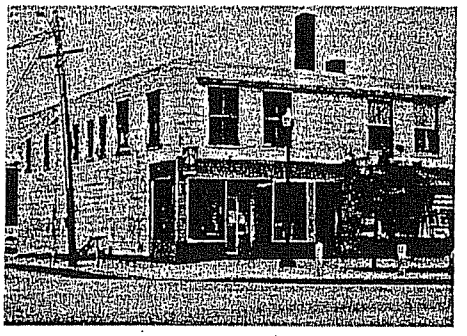
Map V-9: Milford Sidewalk Condition Assessment - Central and Western



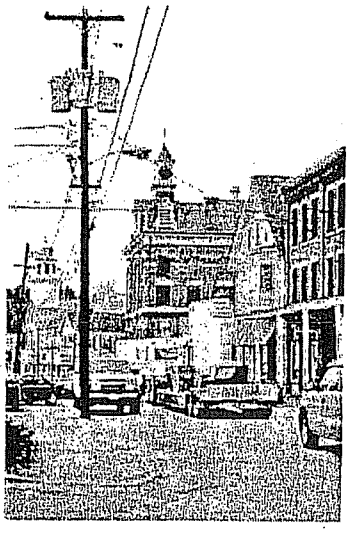
d. Future Pedestrian Goals

Future goals identified by the town are ambitious but as the population of Milford grows continued revitalization of the town and central business district will be essential. In 1992, the Milford Main Street Program Downtown Ongoing Improvement Team (DO-IT) was formed. In 1997, the DO-IT organization applied and was accepted as part of the New Hampshire Main Street Center. The Main Street approach to downtown revitalization involves four elements: organization, design, economic restructuring and promotion. DO-IT effectively addressed this four point approach and was awarded the National Trust for Historic Preservation's Great American Main Street Award in 2002. Ongoing events and locations that attract walkers and bikers include the following:

- Milford's Great Pumpkin Festival
- The Farmers Market
- Summer Lunch Concert Series
- Evening concerts in Emerson Park
- Blooming Sidewalks Art Festival
- Events at the newly opened Souhegan Valley Boys and Girls Club and the Amato Center



Currently, the town and DO-IT are pursuing additional funding to improve the overall safety, physical accessibility and general aesthetic and design of South Street corridor from the Oval south to the railroad tracks in downtown Milford. In 2004, communications with the owner of 285 Union Square (Dyer Building) were initiated about possible improvements on the property. The owner is willing to cooperate on sidewalk improvements, street widening and burying utilities. The Dyer Building as it currently stands has safety code issues and is in a worn down condition. The structure has the potential to be renovated six feet narrower. The inadequate turning radius puts trucks on the wrong side of the road. The entire corridor is narrow with an undefined curb with utility poles that jut out in the street and disrupt the aesthetic appeal.



C. Behavioral Change

1. Education and Safety

A balanced bicycle and pedestrian program should contain a strong educational component. Bicyclists need to develop a thorough understanding of the laws governing motorized vehicles. They also need to develop good cycling skills to co-exist safely with pedestrians and motorists. Educational programs should provide bicyclists with skills and knowledge, emphasize the safety value of helmets, and feature other protective techniques. In designing educational programs, consideration should be devoted to bicyclists of all ages and skill levels. Additionally, a balanced bicycling education program should include special training for motorists.

The best way to ensure that education, safety and training become part of everyday life is through effective educational programs. A strategy should be developed for educating the public about bicycle and pedestrian safety issues and for identifying safety education programs that have been successful in other regions, states or countries. Innovative ways to fund and sustain safety education programs should be developed.

a. Strategy for Improving Education and Safety

Educate key target groups in lawful and responsible bicycling, walking and driving.
Recommendations:

- Teach youngsters important bicycling skills. Bicycling is a lifelong skill that can enhance a person's well being and contribute to good health if done safely. Studies have shown that children's mistakes tend to involve a limited set of basic errors and that these errors can be addressed through education. The City of Toronto, for example, has developed a Kids Can Bike program that teaches basic bicycle skills to 9-13 year olds.
- Teach adults important bicycling skills. Adults also make errors while cycling and given that adults tend to ride in more demanding situations, the ramifications of those mistakes can be serious. Teaching advanced traffic skills to adults may reduce their chances of crashes and injuries while encouraging increased bicycle use.
- Teach drivers how to interact safely and courteously with bicyclists and pedestrians. Many crashes between motor vehicles and bicycles result from mistakes made by motor vehicle drivers. Drivers need a better understanding of how to safely share the roads with the growing number of people who walk and ride bicycles. The City of Toronto has developed a Can Bike defensive bicycling course that teaches all ages how to ride defensively.

2. Encouragement and Promotion

There are many ways to promote and market bicycling and walking as modes of transportation. Many people enjoy bicycling and walking for fitness but may not realize their potential for accomplishing errands, visiting friends and making short trips. Encouragement efforts can change people's perceptions by emphasizing the personal financial benefits as well as the environmental benefits of bicycling and walking. For example, by pointing out air quality and energy conservation benefits of substituting a bicycle trip for a driving trip, and demonstrating that many of their routine destinations are within walking distance, more people may bicycle and walk more often.

Encouragement efforts can take the form of events, promotions and programs. These efforts can serve to re-inspire people who are already committed to bicycling and walking, as well as encourage new participants. Promotion efforts can also encourage recreational riders to consider commuting to work as well as change people's attitudes towards bicycles as an everyday mode of transportation.

a. Strategy for Encouraging and Promoting Bicycling and Walking

Encourage the increased use of bicycling for transportation and recreation
Recommendations:

- Promote bicycle and walk to school programs such as the Safe-Routes-to-School (SRS) pilot program being developed by the NRPC. The purpose of the SRS program is to encourage and enable children to walk and bicycle to school through a combination of educational measures, programs and physical improvements to the transportation infrastructure.
- Promote events, such as a Bike Week or a Bike-to-Work Day. The New Hampshire Department of Transportation (NHDOT) sponsors a bike to work day once a year that takes place on the same day as national bike to work day. These efforts should be continued and expanded.

- Support New Hampshire Celebrates Wellness, which has developed a Livable, Walkable Communities (LWC) program. The LWC program provides a foundation to support human, environmental, economic and community health. The program supports and promotes physical activity, increased safety for children and adults, open space, mixed-use development, trails, paths and on-street bicycle facilities.

3. Enforcement

Law enforcement promotes a safe bicycle and pedestrian environment. A lack of enforcement contributes to a general disregard for the laws pertaining to bicyclists and pedestrians. Bicycle and pedestrian-related traffic rules and regulations in the region would benefit from increased awareness and enforcement. Increased awareness of these rules and regulations will lead to better compliance among bicyclists and pedestrians as well as motorists. This will lead to increased mutual respect between the users of different transportation modes and ultimately a better environment for bikers, walkers and motorists. Opportunities for improvement include better compliance by motorized and non-motorized roadway users with regard to vehicular speed limits and yielding to those within the right of way. Increased awareness of applicable rules and mutual respect between bicyclists and all roadway users are among the means to secure better compliance. Furthermore, it is essential that police and community enforcement programs be developed.

a. Strategy for Improving Enforcement Methods

Improve traffic laws that affect bicyclists and pedestrians
Recommendations:

- Compare the existing traffic rules with the bicycle sections of the Uniform Vehicle Code. City or town codes may contain outdated laws that unnecessarily restrict bicycle and pedestrian travel. For consistency's sake, traffic law should follow or improve upon the nation's models.
- Enforce laws affecting bicycle safety and security.
- Review and modify youthful violator procedures. For youngsters, crashes between bicycles and motor vehicles most often result from their violating some basic traffic laws. But since they have not taken driver training, they seldom know how the traffic system works. As a result, ticketing young children is an unnecessarily tough approach to handling their violations.
- Review and, if necessary, modify procedures for handling bicycle theft and assault on bicyclists. Bicyclists fall prey to certain characteristic types of crimes. They often complain about being insulted or assaulted while traveling. Bike theft is common in some communities.
- Consider fines as an enforcement tool. They can be phased in over time to progressively raise the public's awareness of their responsibilities as both motorized and non-motorized roadway users.

Consider adding bicycle enforcement options to routine police department procedures
Recommendation:

- Permanently fund a mountain bike police patrol. Police departments all over the country are learning the advantages of community-based enforcement efforts. Mountain bikes can be a key part of such an emphasis. They are fast and quiet, allowing new levels of success in drug enforcement, for example, and keeping officers in good health. Such patrols are also very popular with the public.

D. IMPLEMENTATION

1. Action Plan

The TCSP Bicycle and Pedestrian Plan is a comprehensive set of recommendations that will combine to create a system of policies, programs and physical improvements to encourage increased bicycling and walking for everyday transportation over short distances. In order for the goals of this plan to be achieved, an action plan is necessary. The implementation strategy for this plan was developed based on the assumption that the proposed recommendations can be achieved in three phases; short-term (<5 years), mid-term (6-10 years) and long-term (10+ years).

The Action Plan lists the recommendations as they appear in the text of this plan, and assigns each recommendation to a particular phase in the implementation strategy. The recommendations build on each other to bring about the physical improvements and behavioral changes that will lead to an increase in bicycling and walking in Milford. The recommendations are intended to compliment each other. For example, the physical bicycle and pedestrian network will provide comfortable conditions and therefore an incentive to bicycle and walk throughout the region. The education and enforcement efforts will reinforce the perception that bicycling and walking are enjoyable ways to travel short distances. The order and timing of the implementation strategy are intended as a guide and it is understood that as time passes priorities will evolve and the order and timing of implementation will change. Proposed leading roles are shown in bold type in the agency role column. Coordinating roles are shown in underlined type in the same column. **The Action Plan appears at the end of this chapter.**

Recommendation:

- Use the Action Plan as a guide to begin implementation of the plan.

2. Management, Coordination and Evaluation of Progress

The overriding purpose of this plan is to increase the incidence of bicycling and walking in Milford for destination-oriented trips. This goal will only be reached when the recommendations laid out in the plan are implemented. A steering committee should be formed and it should work with key local officials, business representatives and private citizens to translate the goals and policies of this plan into reality. An assessment of progress made towards achieving the goals of this plan should be conducted once per year. The assessment effort must be given serious consideration in order to assure the progress of the improvements made in accordance with the recommendations in this plan. Accomplishments and setbacks will be noted, and goals and strategies will be revised accordingly.

Recommendation:

- A town bicycle and pedestrian steering committee should be formed to oversee the implementation of the regional plan. The steering committee should include a representative cross section of interested members of the public, bicycle advocates and professionals.

3. Funding

The recommendations contained in this plan require funding and program support. Some improvements can be part of regular roadway maintenance. For example, making sure that travel corridors are well defined with the proper pavement markings can be part of the annual DPW maintenance schedule. Other improvements are more community oriented. For example, employers could provide showers and changing areas for employees who choose to commute via bicycle or on foot. Large regional projects, such as construction of the Nashua to Amherst rail with trail, will require funding through a variety of municipal, state and federal programs.

The goals of funding efforts are:

- Provide consistent funding for the bicycle and pedestrian transportation projects and programs;
- Provide adequate funding so that bicycle and pedestrian facilities can be included in all new roadway development;
- Acquire maximum available funding from municipal, state, federal and private sources.

Sources of funding include:

- Transportation Enhancement (TE), Congestion Mitigation and Air Quality (CMAQ). Surface Transportation Program (STP), Bridge & Betterment, Federal Transit Authority.

4. Bicycle and Pedestrian Action Items

Opportunity/Need	Recommendation	Target Date
ENHANCE BICYCLE & PEDESTRIAN FRIENDLINESS		
Pavement Marking Policy Purpose: Motorists, pedestrians and bicyclists benefit from pavement markings that clearly define traffic lanes, crosswalks, shoulder and other roadway characteristics.	*Recommendation: The Milford DPW pavement marking policy should be reviewed and updated as necessary. The policy should include special attention to practices that clearly define the responsibilities of all users as well as aggressive maintenance of all pavement markings.*	Short Term (2006-2009)
Shoulder Striping Policy for Rural Roads Purpose: The white stripe on the roadway shoulder that marks the edge of the travel lane offers the opportunity to provide added space for bicyclist and pedestrians to operate.	*Recommendation: Monitor re-striping projects and encourage NHDOT to limit width of travel lanes on State (numbered) routes to 11 feet. The town should also develop a policy similar to NHDOT's that limits the travel lane on town roads to 11 feet where practical.*	Short Term (2006-2009)
Traffic Calming (local roads) Purpose: The overall objective of traffic calming is to reduce the negative effects of motor vehicles while improving conditions for other modes of travel.	*Recommendation: All roadway projects in Milford should include carefully considered and implemented traffic calming measures where practical.*	Short/Mid Term (2006-2014)
Exempt Bicycles from Some Traffic Regulations Purpose: Bicyclists share the same responsibilities as motorists. In some cases, though, it does not make sense to apply all motor vehicle rules to bicyclists.	*Recommendation: Existing turn and entry restrictions as well as other regulations should be reviewed and amended to exclude bicycles where it is safe enough to do so.*	Short Term (2006-2009)
Design Phase of New or Upgraded Roadways Purpose: Bicycle and pedestrian amenities on new or rehabbed roadways should be planned for during the earliest stages of the design phase.	*Recommendation: Develop guidelines that encourage the consideration of the needs of bicycles and pedestrians during the roadway planning process.*	Short Term (2006-2009)
Street Sweeping Program Purpose: Debris in the roadway tends to accumulate on the shoulders where bicycles are typically operated. Roadway shoulders should be kept free of debris through regular street sweeping.	*Recommendation: The Milford DPW street sweeping policy should be reviewed to include practices that recognize and respond to the needs of bicyclists and pedestrians.*	Short Term (2006-2009)
Shoulder Repair Program Purpose: Shoulder hazards such as cracks, potholes and crumbling pavement can have a devastating impact on cyclists.	*Recommendation: Procedures should be developed for reporting areas of pavement that are in need of repair. The concerns of bicyclists and pedestrians should be given priority because of vulnerability to damaged pavement.*	Short Term (2006-2009)
Bicycle Friendly Grates Program Purpose: Catch basin grates are usually located in the shoulder where bicycles operate. Old style grates can cause a bicycle crash.	*Recommendation: The Milford DPW should develop a program to replace old style grates with bicycle friendly grates where practical.*	Short Term (2009-2014)

Opportunity/Need	Recommendation	Target Date
Break Barriers to Bicycle & Pedestrian Travel Purpose: Barriers that force a one or two mile detour can discourage may non-motorized trips.	*Recommendation: Require connections, reserved for non-motorized travel, between housing developments, cul-de-sacs and commercial properties.*	Short/Mid Term (2006-2014)
Provide End-of-Trip Bicycle Parking Facilities Purpose: People will be more willing to ride a bike to work (or walk) if there are bicycle parking facilities and showers at their destination.	*Recommendation: Conduct an inventory of existing bicycle parking facilities and develop a parking plan.*	Short Term (2006-2009)
Bridge and Underpass Improvement Program Purpose: Bridges and underpasses are key because they provide crossing points of major barriers such as rivers and highways.	*Recommendation: An inventory of bridge and underpass conditions should be undertaken in Milford to determine where improvements should be made.*	Mid Term (2009-2014)
Designated Bike Routes Purpose: Develop a continuous, coordinated local and regional bicycle network.	*Recommendation: Develop the local bicycle network that was described earlier in this plan.*	Short Term (2006-2009)
	Recommendation: Work with NRPC to identify and construct segments of the regional bicycle network.	Short/Mid Term (2006-2014)
	Recommendation: Work with NRPC to develop Nashua/Milford rail-with-trail corridor.	Short/Mid Term (2006-2014)
	Recommendation: Develop the Milford to Amherst key connector route.	Short Term (2006-2009)
EDUCATION AND SAFETY	*Recommendation: Teach youngsters important bicycle skills.*	Mid Term (2009-2014)
	Recommendation: Teach adults important bicycle skills.	Mid Term (2009-2014)
	Recommendation: Educate motorists how to interact safely and courteously with bicyclists and pedestrians.	Mid Term (2009-2014)
ENCOURAGEMENT AND PROMOTION	*Recommendation: Promote bicycle and walk to school programs.*	Mid Term (2009-2014)
	Recommendation: Promote events, such as a Bike Week or a Bike-to-Work Day.	Mid Term (2009-2014)
ENFORCEMENT	*Recommendation: Improve traffic laws that affect bicyclists and pedestrians.*	Mid Term (2009-2014)
	Recommendation: Consider adding bicycle enforcement options to routine police department procedures.	Mid Term (2009-2014)
IMPLEMENTATION	*Recommendation: Develop a town bicycle and pedestrian steering committee.*	
	Recommendation: Use Action Plan as a guide to implement the recommendations in this plan.	

CHAPTER VI: TRANSIT PLAN

A. INTRODUCTION

One issue identified as part of the TCSP project is the need for plans for the development of alternative transportation modes that are coordinated with land use planning. The location of the three communities on the urban fringe of the Nashua region provide opportunities at this point to integrate planning for transit in the community's planning process. For transit purposes, this section of the TCSP project will analyze the:

- demographics of the study area;
- identify the most viable transit services;
- identify a proposed route;
- identify funding sources; and,
- develop ridership forecasts.

1. Transit Services in the Region

Currently, there are no fixed route transit services in the study area. However, transit needs do exist as evidenced by the one service that has been established to provide local transportation on a limited basis. This service is called Friends in Service Helping (FISH) and provides community members with transportation services to and from medical appointments.

FISH is staffed by volunteers, who provide curb to curb service to and from medical appointments, with their own vehicles. Services are available between the hours of 9:00 am and 4:30 pm, Monday through Friday, to the residents of Amherst, Milford, Wilton, Lyndeborough, and Mont Vernon. Although FISH does not place any age restrictions upon its transportation services, the majority of riders are elderly. Volunteers take residents to appointments in the five member communities listed above as well as in Bedford, Manchester, Merrimack, Nashua, and Peterborough. Riders must provide at least 4 days notice and are limited to a maximum of two rides per week, or three rides for dialysis appointments.

2. Transit Services Outside the Region

The *Transit Plan for the Nashua Region* indicates that riders have a strong desire to travel outside of the study area. The first priority based on a survey on the former Milford commuter service is providing access to employment, shopping and medical destinations in the City of Nashua. This will eventually provide a key regional connection to Boston, as the commuter rail extension from Lowell, MA to Nashua is developed. Connections to Nashua may also provide future access to Manchester and Lowell. Potential also exists for service to the Manchester area with connections between Nashua Transit System (NTS) and Manchester Transit Authority along the Bedford and Merrimack border. Likewise a connection between NTS and Lowell Regional Transit Authority could be made at the Pheasant Lane Mall. Other possible connections include service with Peter Pan/Greyhound and Concord Trailways.

3. Historical Transit Ridership

A commuter service between Westside Plaza in Nashua and the Milford Oval was operational between January of 2001 and May of 2004. Service was limited to three runs in the morning and three runs in the afternoon. One of the reasons this type of service was selected was due to its cost effectiveness. Traditional fixed route transit service requires accompanying demand response service. Deviated fixed route service provides curb to curb service within ¾ miles of a fixed route to people with qualifying disabilities. This can be a very costly type of transit service; however, it generally provides the highest level of service.

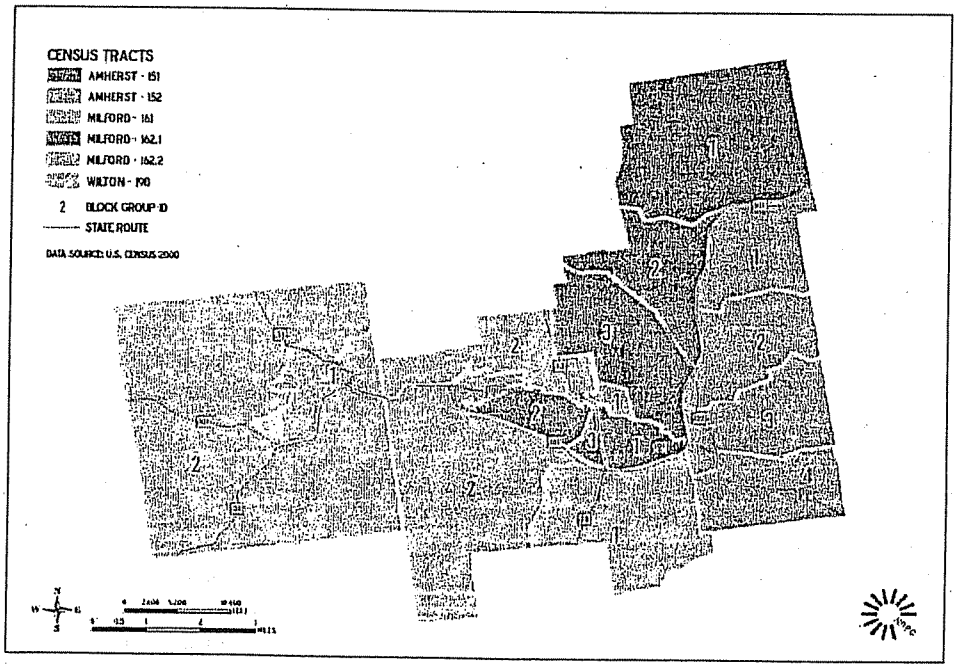
The Milford commuter service aimed to serve the greatest number of riders at the lowest cost and was funded through a Job Access and Reverse Commute (JARC) grant. JARC funds provide public transportation for people to access job sites who would otherwise have no access to transportation. This enables workers in urban areas to access suburban jobs and vice versa. Commuter services cater to peak commuting hours and the Milford service operated between approximately 6:00 – 9:00 am and 3:00 – 6:00 pm. The commuter van connected to Nashua buses at Westside plaza, providing continuing service to the transit station in downtown Nashua. A primary criticism of the service was the inconvenience of service hours.

Many people wanted to use this service for shopping and errands, however, the hours were not conducive to these activities. For instance, if people wanted to go shopping they had to leave the Milford Oval before 9:00 am and would not return again until after 3:00 pm. This time frame was unreasonably long and inconvenient for routine shopping or medical trips. However, this was not the purpose of the commuter service and this does tell us that a transit market existed which was underserved.

B. Analysis of Transit Need

United States Census data is collected once every decade with the most recent collection year in 2000. The smallest unit of geography for which the demographic data used in the study is the block group. This data can be combined to present data at the larger census tract level and town level. The *Transit Plan for the Nashua Region* (NRPC December 2003) was used to determine the areas of greatest transit need. This report includes an extensive analysis of transit needs at the Census Tract level. Seven factors were identified to determine the areas of greatest need including; population density, youth population, elderly population, disabled status, median household income, poverty and automobile availability. Map VI-1 illustrates the census tracts in the study area.

Map VI-1: Study Area and Block Group Guide



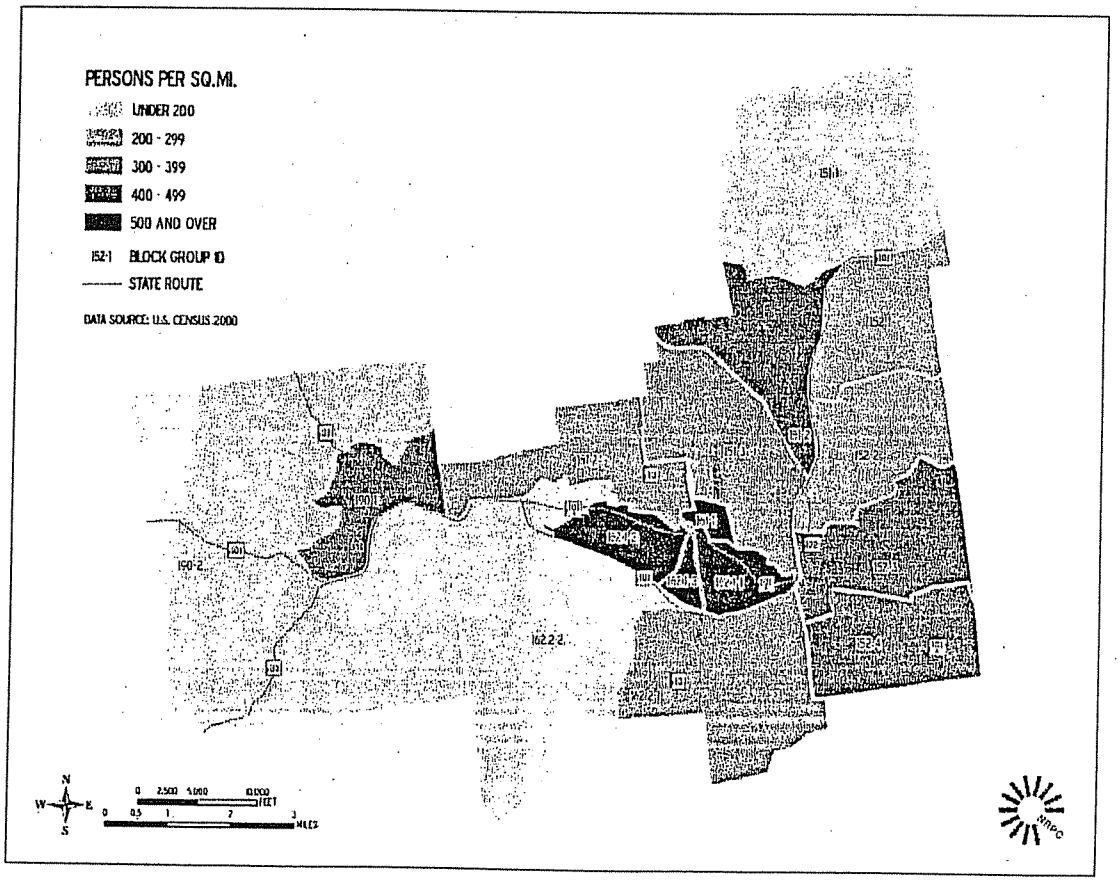
1. Population Density

As can be seen in table VI-1 the greatest population density is located in the center of the study area, specifically in the downtown area of Milford. Block group 161-1 in Milford is the densest while block group 190-02 in Wilton has the lowest density. Block group 152-3 is the densest block group in Amherst with a density of 448 people per square mile. As can be seen in Map VI-2, the block groups with the lowest density are located in the western and northeastern portions of the study area.

Table VI-1: Population Density

Block Group ID	Community	Density / Sq. Mi.	Square Miles
151-1	Amherst	134	9.8
151-2	Amherst	416	4.0
151-3	Amherst	396	5.2
152-1	Amherst	277	3.7
152-2	Amherst	284	4.0
152-3	Amherst	448	4.3
152-4	Amherst	431	4.0
161-1	Milford	3,117	0.4
161-2	Milford	377	4.0
162.1-1	Milford	2,010	1.4
162.1-2	Milford	1,898	1.7
162.1-3	Milford	1,942	0.4
162.2-1	Milford	306	6.4
162.2-2	Milford	200	11.1
190-01	Wilton	494	2.8
190-02	Wilton	103	23.1

Map VI-2: Population Density



2. YOUTH POPULATION

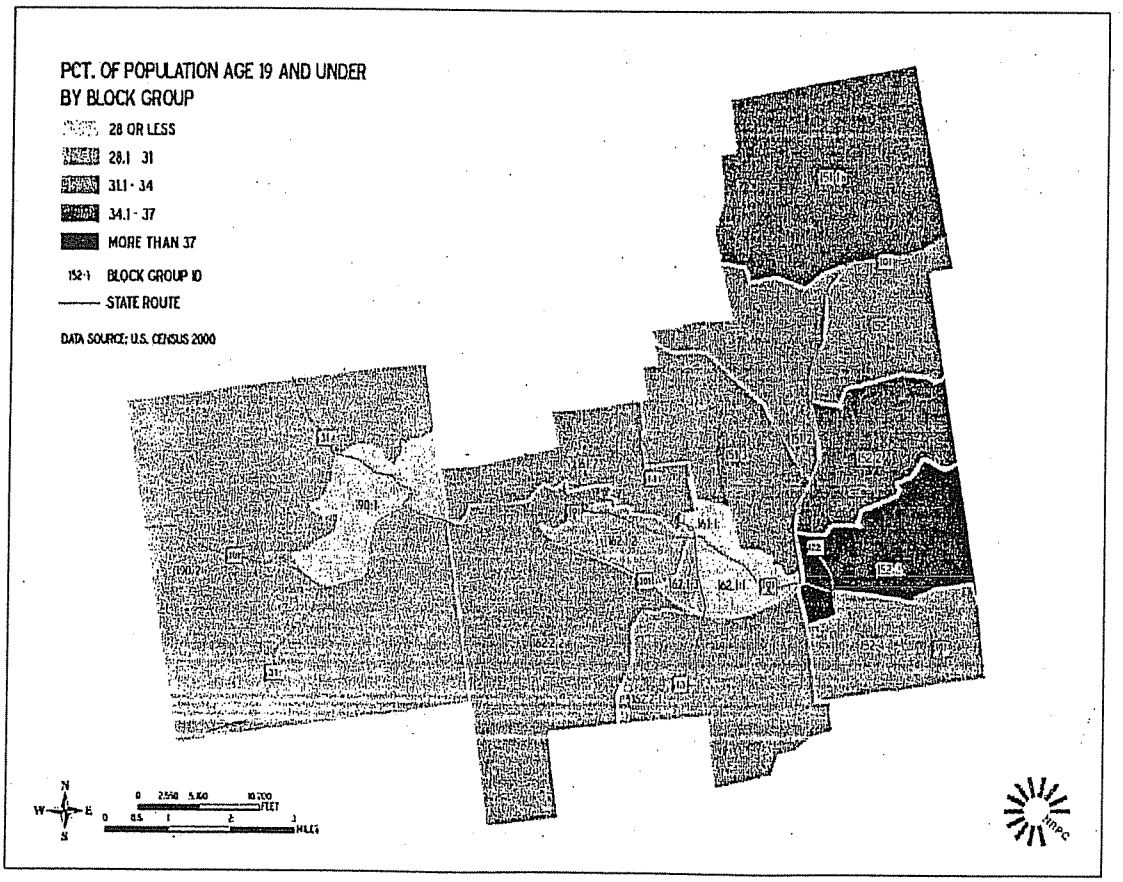
Table VI-2 compares the 1990 and 2000 populations for youth, ages 19 and below, by census tract. Wilton had the lowest percent increase of 13.8 % while Amherst had the highest at 21.3%. The combined area had an average percent increase of 18 %. These are quite substantial increases in the youth population when compared statewide and regionally. Table VI-2 also shows that youth population in the study area is growing over twice the rate as is occurring statewide.

Table VI-2: Youth Population

Municipality	Tract	1990 Ages 19 and below	2000 Ages 19 and below	Net Increase	% Increase	Annual % Increase	% of 2000 Pop 19 and Below
Amherst	151	1,344	1,650	306	18.5%	2.1%	33%
	152	1,535	2,010	475	23.6%	2.7%	35%
Amherst Total		2879	3660	781	21.3%	2.4%	34%
Milford	161	665	838	173	20.6%	2.3%	31%
	*162	2,738	3,214	476	14.8%	1.6%	30%
Milford Total		3,403	4,052	649	16.0%	1.8%	30%
Wilton Total	190	937	1,087	150	13.8%	1.5%	29%
Study Area Total		7,219	8,799	1,580	18.0%	2.0%	31%
Region Total		49,802	57,737	7,935	13.7%	1.5%	29%
State Total		313,395	344,165	30,770	8.9%	0.9%	28%

**Census tract boundaries split between 1990 and 2000. Data combined for purposes of comparability.*

Map VI-3: Youth Population



3. ELDERLY POPULATION

Table VI-3, compares the 1990 and 2000 populations for elderly persons, ages 65 and above, by census tract. The state's elderly population increased at a rate of 18.3% and the study area surpassed this at a rate of 20.1%. Amherst and Wilton experienced the most significant increases at 47.1% and 25% respectively. Milford experienced the lowest increase with a net increase of only 84 persons representing a 6.9% increase.

The elderly population of New Hampshire comprises 12% of the total state population, while the region is slightly below the state rate with 9% of the population over age 65. Map VI-3 represents the percentage of the total population ages 65 and above by block group. Block groups in Wilton had the highest percentage of elderly in the study area. The elderly population in these block groups experienced a 25% increase since the 1990 census.

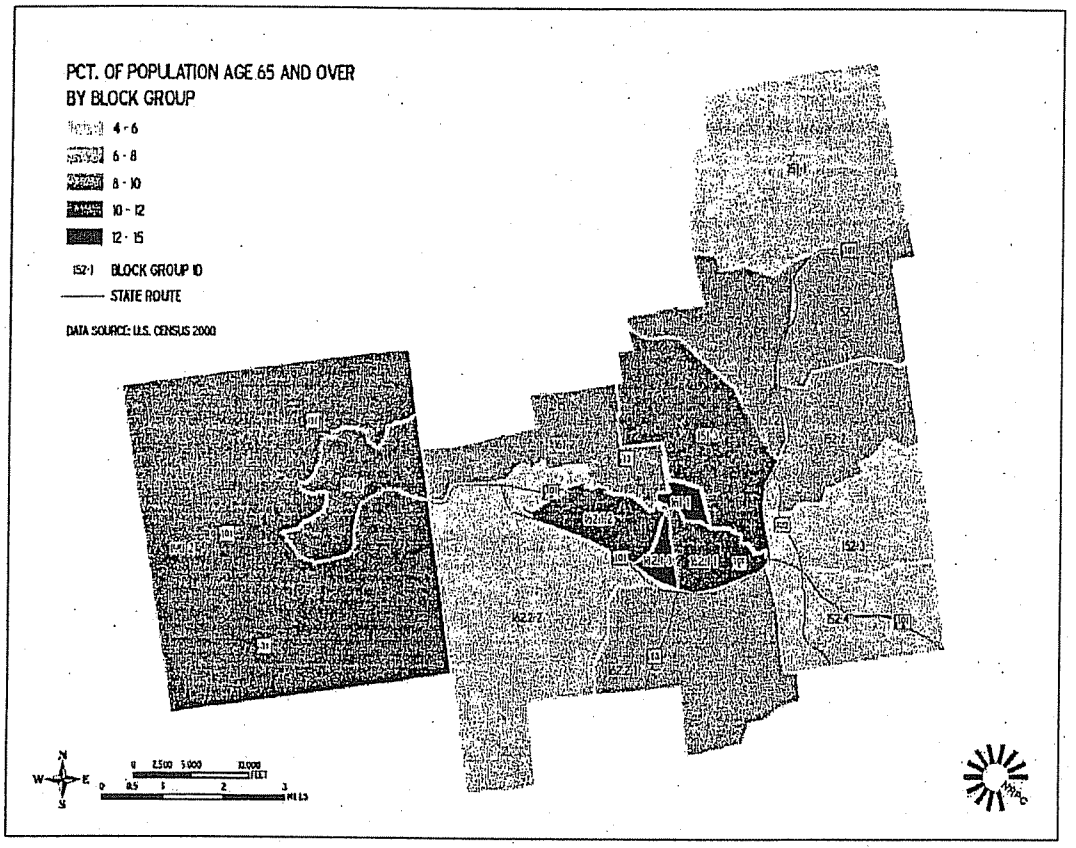
The growth in these block groups is located in downtown Wilton and downtown Milford and is likely due to the elderly housing developments located in these block groups. Amherst experienced the greatest percent increase (47.1%) of the 65+ population in the study area.

Table VI-3: Elderly Population

Municipality	Tract	1990 Ages 65 and above	2000 Ages 65 and above	Net Increase	% Increase	Annual % Increase	% of 2000 Pop 65+
Amherst	151	324	432	108	25.0%	2.9%	9%
	152	209	352	143	68.4%	5.4%	6%
Amherst Total		533	784	251	47.1%	3.9%	7%
Milford	161	271	279	8	3.0%	0.3%	10%
	*162	942	1,018	76	8.1%	0.8%	9%
Milford Total		1,213	1,297	84	6.9%	0.7%	10%
Wilton Total	190	324	405	81	25.0%	2.3%	11%
Study Area Total		2,070	2,486	416	20.1%	1.8%	9%
Region Total		14,141	18,136	3,995	28.3%	2.5%	9%
State Total		125,029	147,970	22,941	18.3%	1.7%	12%

**Census tract boundaries split between 1990 and 2000. Data combined for purposes of comparability.*

Map VI-4: Elderly Population



4. DISABLED STATUS

According to the 2000 Census of Housing and Population, a person was considered disabled if one of the following was applicable:

- *5 years old and over with a sensory, physical, mental or self-care disability or*
- *16 years old and over with a going outside the home disability or*
- *between 16 and 64 years of age with an employment disability*

Source: http://factfinder.census.gov

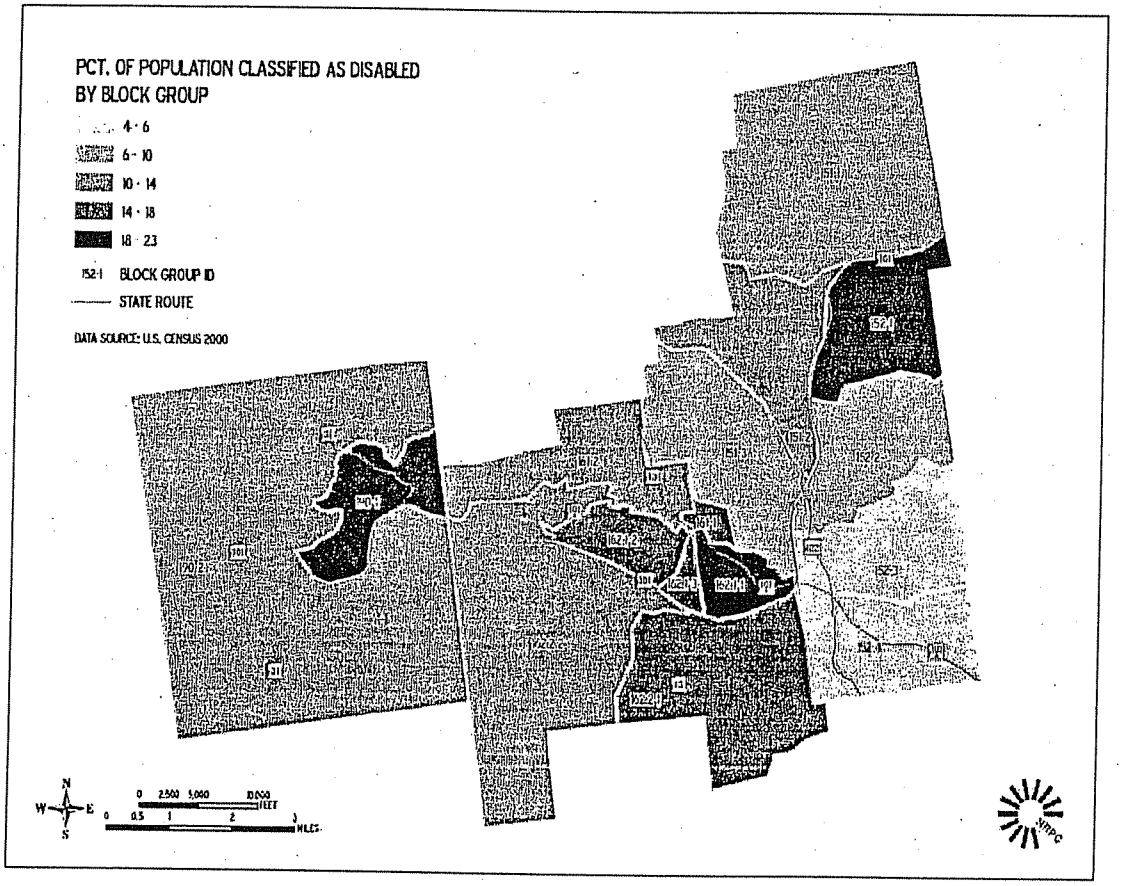
The Nashua Transit Plan estimates that 14% of all riders using transit on NTS were disabled. Table VI-4 identifies the number of disabled persons as a percentage of the total population, at the census tract level. At the state level, 16.7% of the total population was considered disabled, while the study area was slightly below that at 13.8%. At the town level, Milford and Wilton had the highest percentage of disabled persons with rates over 16%, while

Table VI-4: Disabled Population

Municipality	Tract	Disabled Population	Disabled Population Ages 5 +	Percent of Population
Amherst	151	485	4,734	10.2%
	152	478	5,351	8.9%
Amherst Total		963	10,085	9.5%
Milford	161	360	2,488	14.5%
	*162	1,698	9,970	17.0%
Milford Total		2,058	12,458	16.5%
Wilton Total	*190	578	3,489	16.6%
Study Area Total		3,599	26,032	13.8%
Region Total		27,318	181,430	15.1%
State Total		193,893	1,160,101	16.7%

Amherst had the lowest rate at 9.5%. Map VI-5 illustrates the block groups with the highest concentrations of disabled individuals located in the downtowns of the study area.

Map VI-5: Disabled Population



5. MEDIAN HOUSEHOLD INCOME

The following definition of Income is from the glossary section of the United States Census Bureau American Fact Finder;

"Total income" is the sum of the amounts reported separately for wages, salary, commissions, bonuses, or tips; self-employment income from own nonfarm or farm business, including proprietorships and partnerships; interest, dividends, net rental income, royalty income, or income from estates and trusts; Social Security or Railroad Retirement income; Supplemental Security Income (SSI); any public assistance or welfare payments from the state or local welfare office; retirement, survivor, or disability pensions; and any other sources of income received regularly such as Veterans' (VA) payments, unemployment compensation, child support, or alimony. Source: http://factfinder.census.gov

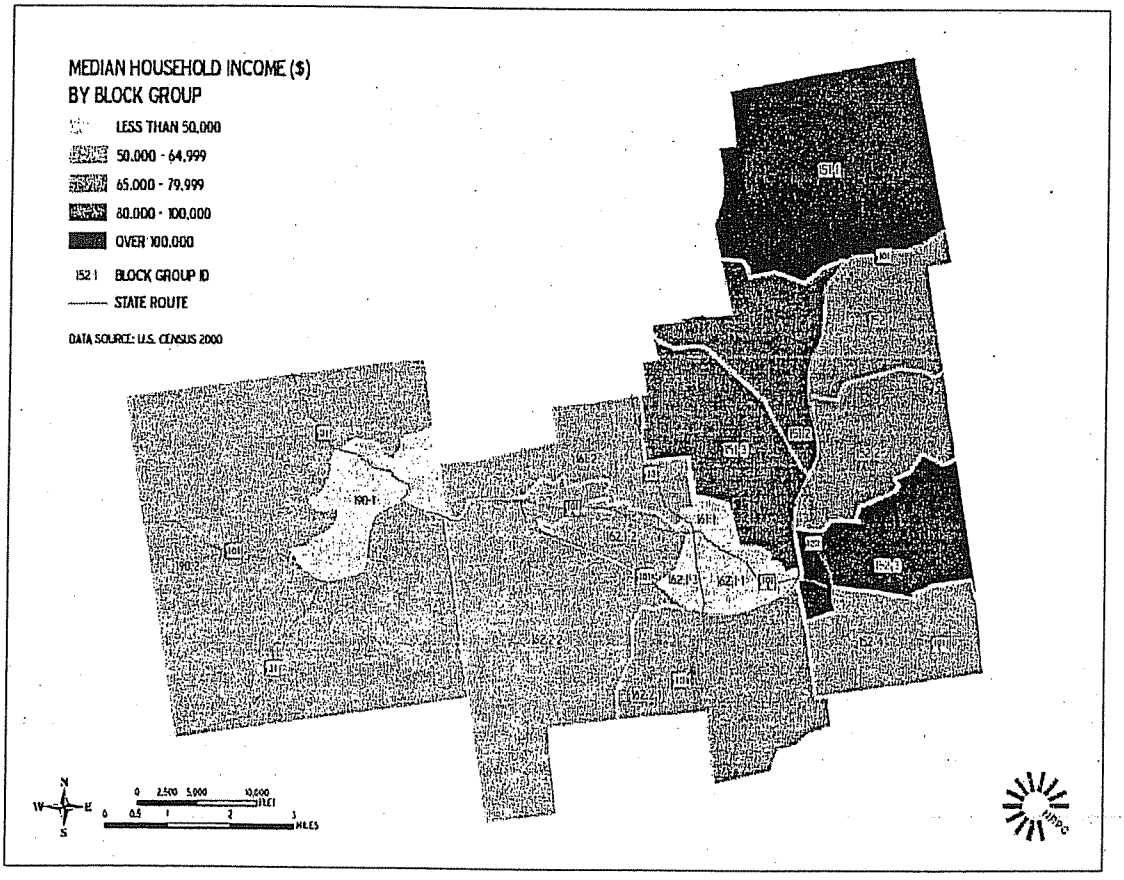
According to the United States Census 2000 information, the median income has an equal number of incomes above and below the median figure. The median income for each tract is listed in Table VI-5 and shown at the block group level in Map VI-5. The 1999 lowest median incomes were in Milford while the highest was in Amherst.

Table VI-5: Median Income

Municipality	Tract	Median Household Income (1989)	Median Household Income (1999)	% Increase
Amherst	151	$64,988	$95,716	32.1%
	152	$60,782	$80,889	24.9%
Amherst Median Income		$62,885	$88,303	28.8%
Milford	161	$35,273	$55,867	36.9%
	162.01	NA	$46,234	
	162.02	$39,284	$63,712	38.3%
Milford Median Income		-	$63,712	
Wilton Median Income	190	$36,098	$54,276	33.5%
Study Area Median Income		$39,284	$63,712	38.3%
State		$36,329	$49,467	26.6%

**Census tract boundaries split between 1990 and 2000. Data combined for purposes of comparability.*

Map VI-6: Median Household Income



6. POVERTY

Poverty Status is determined by the United States Census Bureau as follows:

"... the Census Bureau uses a set of money income thresholds that vary by family size and composition to detect who is poor. If the total income for a family or unrelated individual falls below the relevant poverty threshold, then the family or unrelated individual is classified as being "below the poverty level"."
Source: http://factfinder.census.gov

According to the Nashua Transit Plan for the Nashua Region at least 60% of riders were considered low income and the highest proportion of these riders had an annual household income of less than $20,000. People in these low-income groups typically do not have access to a vehicle due to the costs associated with vehicle ownership. According to the American Automobile Association, the annual cost of owning and operating an automobile in 2000 was $7,654. (This figure was based on 15,000 annual miles and included insurance, license, registration, taxes, depreciation, and finance charges.) It is likely that many of these residents had financial difficulty maintaining personal automobiles. It is also likely that households with incomes less than $15,000 were solely dependent upon public transit due to the expense of owning and operating an automobile. Household income is a key factor to be used in identifying areas in the region that need transit service but are not receiving it at this time.

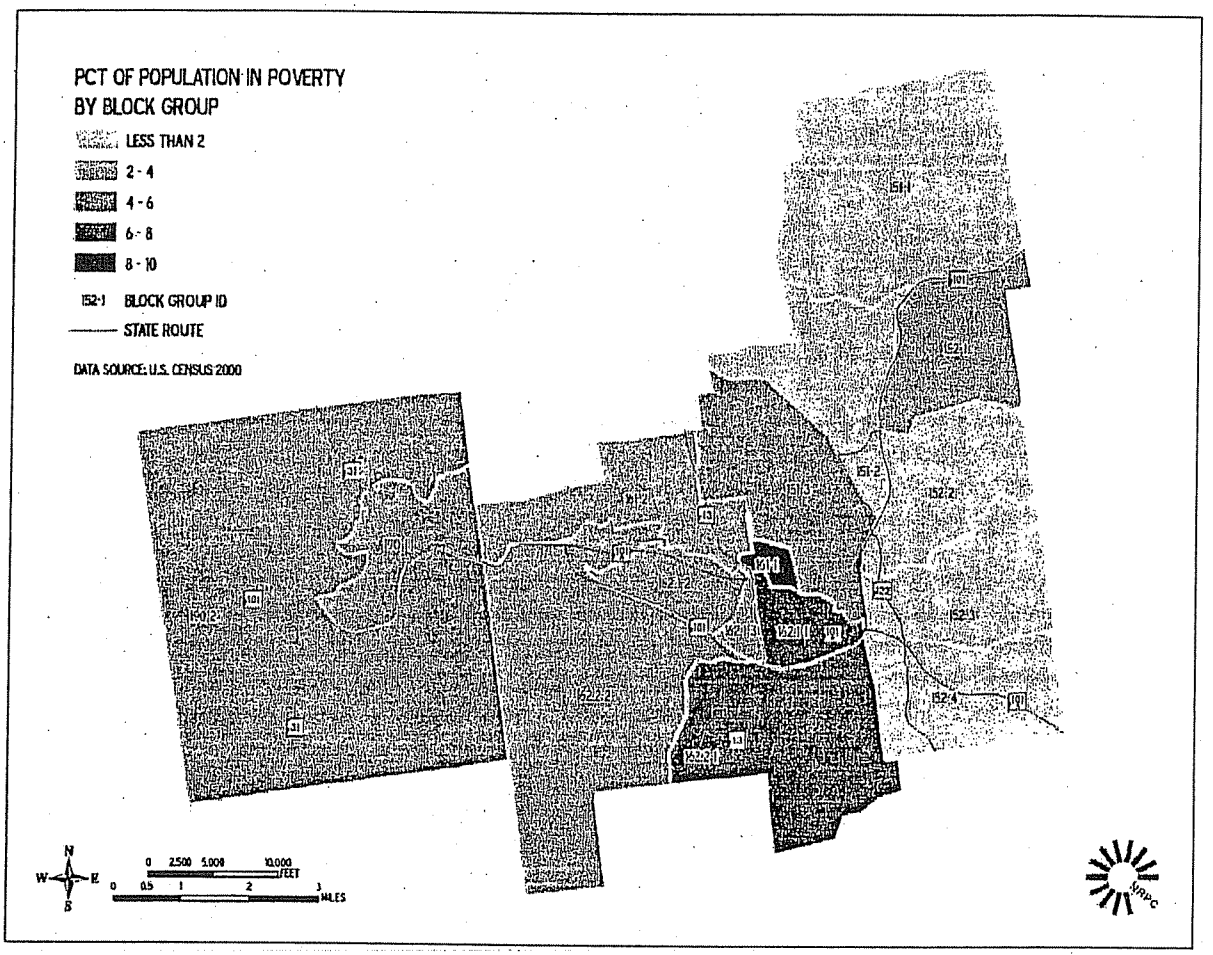
Table VI-6 shows the number of people living in poverty as a percentage of the total population, for the general population, elderly population and female householders with no husband present. 4% of the overall study area population is living in a state of poverty. Milford has 7% of its overall population living in poverty and is the highest percentage of the study area. Amherst with only 2% of its population living in poverty had the least. Overall, the study area is well below the state poverty level.

Table VI-6: Poverty

Municipality	Tract	Poverty Status All Individuals (2000)		Poverty Status Individuals 65+ (2000)		Poverty Status for Female Householders with no Husband Present (2000)	
Amherst	151	136	3%	5	1%	0	0%
	152	65	1%	15	4%	7	8%
Amherst Total		201	2%	20	3%	7	6%
Milford	161	166	6%	17	6%	16	17%
	*162	532	8%	75	10%	25	9%
Milford Total		698	7%	92	9%	41	11%
Wilton Total	190	157	4%	37	13%	13	13%
Study Area Total		1,056	4%	149	7%	61	10%
Region		8,815	5%	988	5%	874	13%
State		78,350	7%	9,992	7%	23,186	31%

**Census tract boundaries split between 1990 and 2000. Data combined for purposes of comparability.*

Map VI-7: Poverty by Block Group



7. Automobile Availability

On May 7th, 2002, an on-board transit survey was conducted on all NTS routes for the Nashua Transit Plan. According to the survey, one of the most common reasons people chose to ride public transportation was lack of access to a motor vehicle. The vast majority, 71% of respondents, used transit because they did not own a personal vehicle. Vehicle availability was a significant issue among transit riders. Forty six percent of riders did not have a vehicle in their household. A marked difference existed between vehicle availability per household compared with vehicle availability for a specific trip. Forty six percent of all households did not own a vehicle; however 79% of riders did not have access to a vehicle for that particular trip. Although more than half of all riders had at least one vehicle in their household, these were often shared with family members, increasing the need for public transit. Once again the cost of annual automobile ownership is significant enough that many Nashua residents do not own vehicles or have limited access due to sharing with other family members. Vehicle availability is also a key factor that should be used to identify populations needing transit service.

Table VI-8 and Figure VI-7 show the percentage of households with no vehicle or one vehicle available in the study area. Milford had the highest households with no vehicles available at 236 or 5% of total households. Wilton has the least number of households with no vehicles available while Amherst has the least total percentage of households without vehicles available.

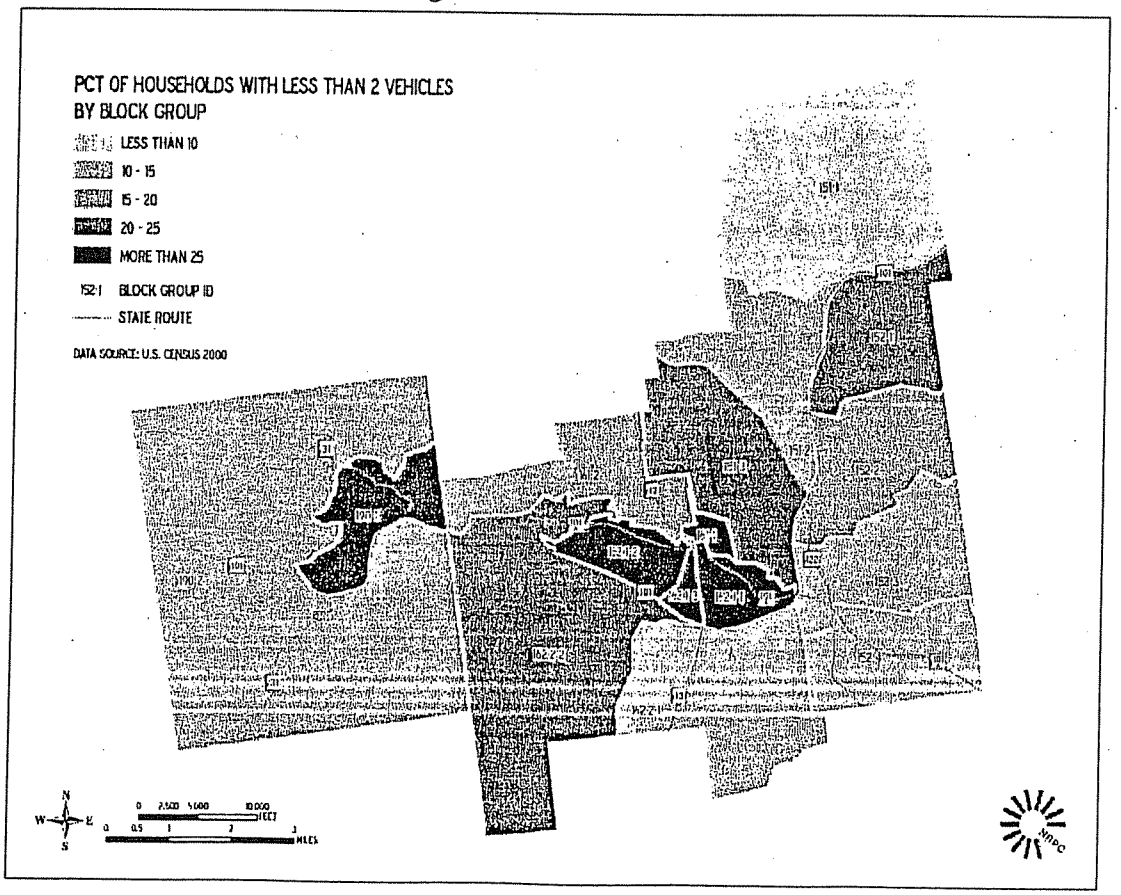
Areas with high percentages on this map indicate that populations in those areas may have significant transportation needs. Downtown Milford has a significant portion of the population with zero or one vehicle available. It should be noted that it is not possible using census data to distinguish one person households with one vehicle from multi-person households with one vehicle available. As a result, this map somewhat over represents that absolute number of households needing transit service because there is only one vehicle available.

Table VI-7: Availible Vehicles

Municipality	Tract	Total Households (2000)	Households with no vehicle available (2000)		Households with 1 vehicle available (2000	
			Number	Percent	Number	Percent
Amherst	151	1,680	33	2%	216	13%
	152	1,910	49	3%	251	13%
Amherst Total		3,590	82	2%	467	13%
Milford	161	1,031	57	6%	242	23%
	*162	4,170	179	4%	1,275	31%
Milford Total		5,201	236	5%	1,517	29%
Wilton Total		1,410	48	3%	319	23%
Study Area Total		10,201	366	4%	2,303	23%
State Total		474,606	27,360	6%	147,377	31%

**Census tract boundaries split between 1990 and 2000. Data combined for purposes of comparability.*

Map VI-8: Percentage of Households With Less Than 2 Vehicles



8. KEY ORIGINS AND DESTINATIONS

According to the Nashua Transit Plan origin and destination comparisons for Nashua indicated that 36% (119) of riders traveled from home to work, and 9% (28) of riders traveled from work to home, for a total of 45% of riders traveling to and from employment. A few riders traveled from work to a destination other than home, however almost all riders traveled from home directly to a destination or from a destination directly home. This is likely due to riders who utilized public transit for their highest priority, such as work trips, and waited for access to a vehicle to carry out other necessary trips, such as grocery shopping and errands. In addition, the on-board transit survey also obtained information on the actual place each rider was traveling to and from. For example, a rider may live in a housing development, which would be considered the place, but may walk to a different location to access the bus. Riders typically originated at points within a large area and walked to central bus stop locations. In December of 2003, The Town of Milford inquired about the number of Milford residents using the commuter service. In response to this request for ridership information, NRPC staff conducted an on-board rider survey for five days on January 12, 14, 20, 22 and 23, 2004. The commuter service was intended to provide transportation to access job sites for people who otherwise would not have transportation.

The results of the survey indicated:

- A total of 45 distinct riders traveled on the commuter service;
- Rider made a total of 138 one way trips;
- An average of 27.6 trips were made per day (This is 100% higher than the average in January of 2003, one year earlier);
- Ridership has steadily increased since the spring of 2003;
- A large number of people utilized the bus for one or two one-way trips;
- A total of 6 passengers traveled eight or more times during the survey period;
- The commuter service provided less frequent transportation to a large number of people and daily transportation to a small group of people; and,
- 65% of riders used the bus to reach employment sites, 22% for shopping and 7% for social destinations.

The following are the most probable origins and destinations for the study area. Amherst origins and destinations include:

- Wal-Mart
- Adult Living Centers
- Meeting House Square
- Salzburg Square

Milford origins and destinations include (Figure VI-9):

- Oval
- Milford Family Practice - Dartmouth Hitchcock / Armory Road
- Hampshire Hills
- Lorden's Plaza
- County Store Plaza
- Granite Town Plaza
- Locations along NH 101A
- High School / Middle School
- St. Joseph Medical Center

Wilton origins and destinations include (Figure VI-10):

- Business District
- Goss Park
- Locations along NH 101A

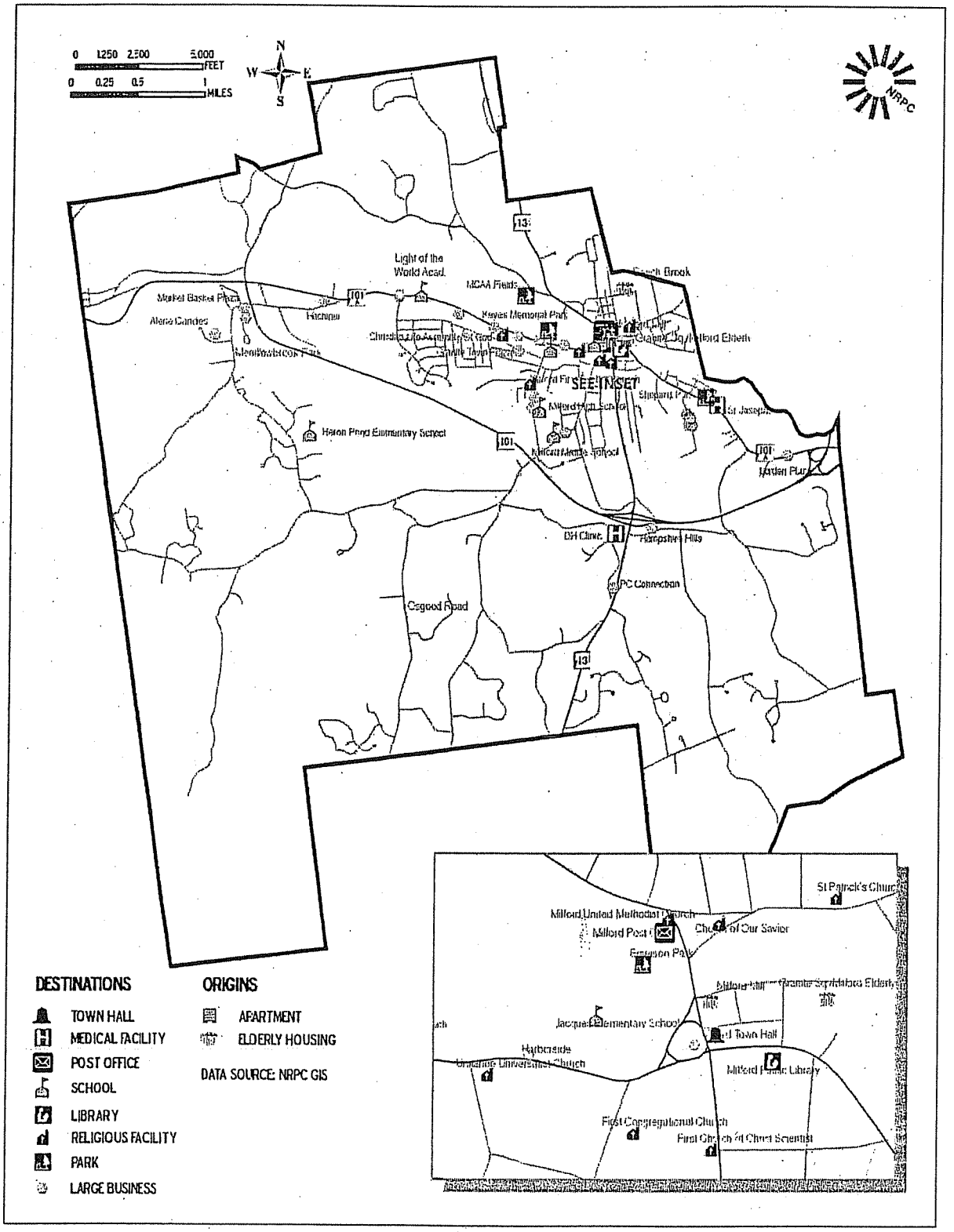
Study Area origins and destinations include:

- Large Employers
- Retail Centers
- Day Car Centers
- Social Service Offices
- Government Facilities
- Apartment Complexes
- Adult Living / Care Centers
- Schools
- Outdoor / Recreation Sites
- Restaurants
- Medical Facilities

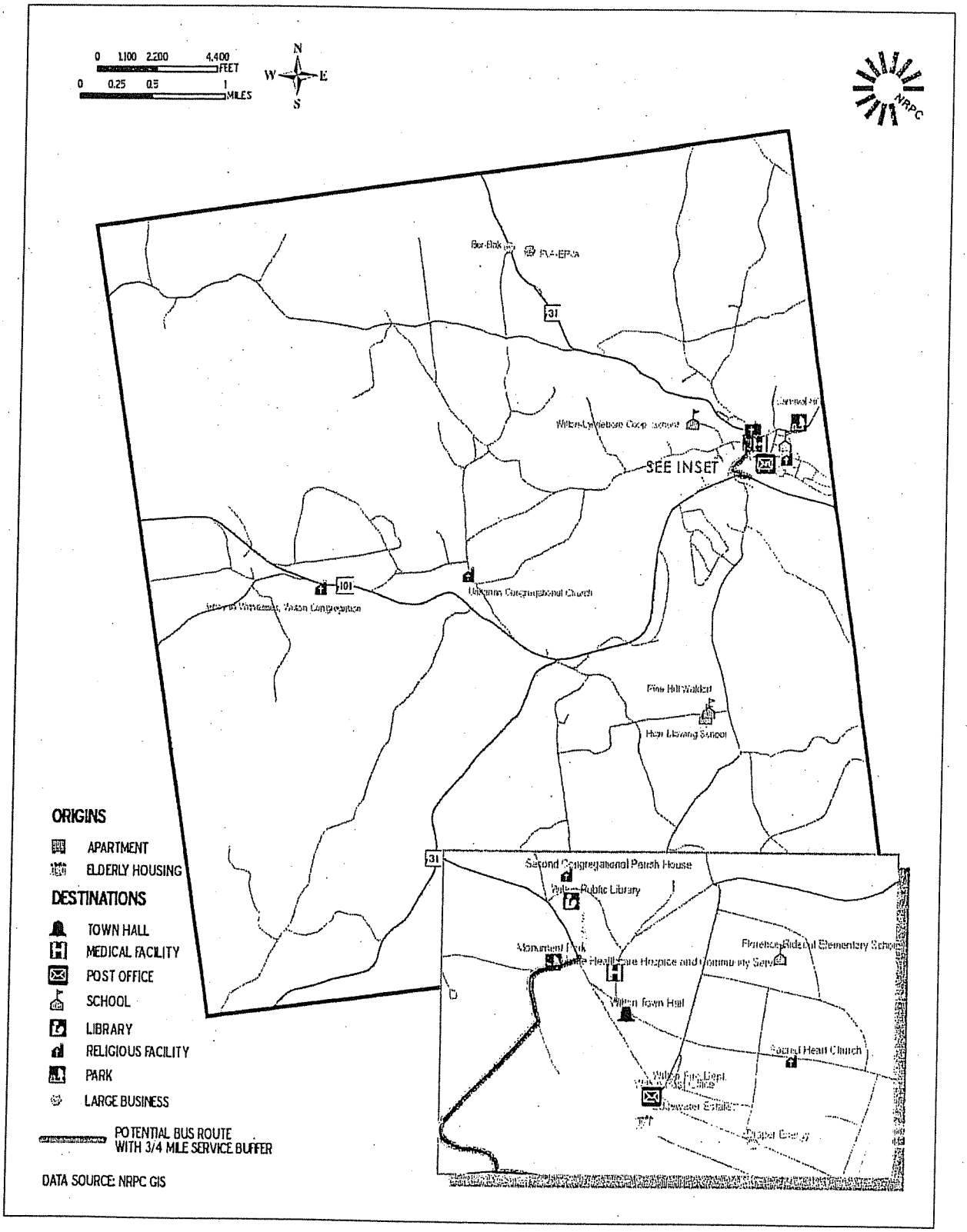
Outside the study area origins and destinations include:

- Connections to Nashua
- Connections to Greyhound / Peter Pan
- Connections to Manchester Airport
- Connections to Logan Airport
- Connections to Boston
- Connections to Lowell commuter Rail Line

Map VI-9: Milford Origins and Destinations



Map VI-10: Wilton Origins and Destinations



9. SERVICE OPTION DEFINITIONS

ADA Complimentary Demand Response – This type of service conforms to the requirements of transit service under the 1990 Americans with Disabilities Act. The act requires transit service providers to assure accessibility of the disabled to the transit vehicle. The demand response service provides door to door service to the disabled within ¾ miles of the fixed route.

Deviated Fixed Route – Is a type of service which combines demand-response with a fixed route service. The service vehicle travels its normal route until such time that a request is made for the driver to deviate from the regular route to a destination nearby, usually within ¾ mile of the route. Although this type of service can accommodate everyone, it is usually only reserved for the disabled.

Commuter bus to Nashua – This type of service typically runs during peak commuting hours with a limited number of stops. The most likely stops would be park and ride lots or other areas where commuters can gather. This service would connect the study area service to the West side of Nashua.

Commuter bus to Manchester - This type of service typically runs during peak commuting hours with a limited number of stops. The most likely stops would be park and ride lots or other areas where commuters can gather. This service would connect the study area service to Manchester.

Fixed Route - Transit - This type of service runs along a fixed route with a fixed schedule. Although it has designated bus stops, passengers can usually board or depart anywhere along the route.

In-town Circulator – Is a type of service which usually runs in a limited area and often only stops at large employers, major transportation facilities, major institutions, etc.

10. COMMUNITY ANALYSIS

Amherst
Amherst grew by over 18% over the past decade with the youth population comprising 34% of the total population, which is the highest in the study area. However, Amherst also has a low percentage of residents with disabilities, or in poverty and the town does have a high automobile availability and high median incomes. Amherst residents do depend on Milford to some extent as a sub-regional center for shopping and services. Therefore, the transit needs that exist in the Town on the basis of the demographic analysis are primarily senior citizens needing regular transit service to access Milford and Nashua for personal needs and medical trips.

Milford
Milford has a relatively large population and serves as an urban core of the study area with a diverse population facing a variety of transit needs. The area east of the Oval (tract 161 and 162.01) has a high concentration of apartments and rental properties and has a correspondingly high population density, disabled population, and persons in poverty status. Median household income is very low at $19,000-$39,000 annually, poverty rates are high, and most notably 39% – 53% of total households have zero or one vehicle available. Transit needs also exist to a lesser degree west of the Oval. Full day fixed route service would assist this community in best meeting the needs of households with limited incomes, limited vehicle availability and the disabled population.

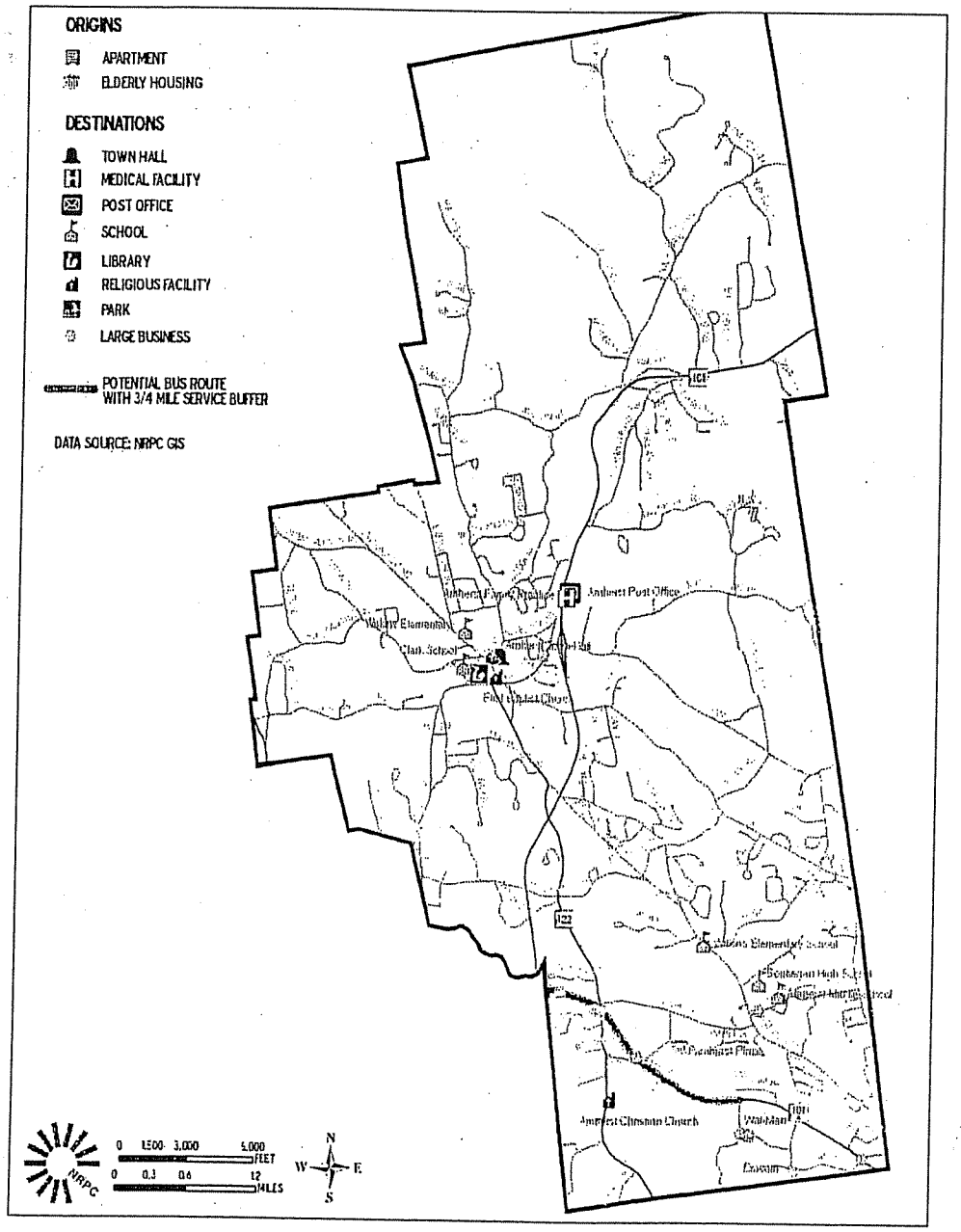
Wilton
Downtown Wilton shows a need for public transit services. Wilton has the second highest elderly population as a percentage of the total population, and the highest percentage of elderly residents in poverty at 13%. Median incomes are low in the downtown and at a moderate level town wide, 16.6% of residents are disabled, the highest rate in the study area, and 31%-38% of residents have 0-1 available vehicle. Public transit needs exist in Wilton. A deviated fixed route between Wilton, Amherst and

Milford would be most cost effective and provide connections in Milford with continuing service to Nashua.

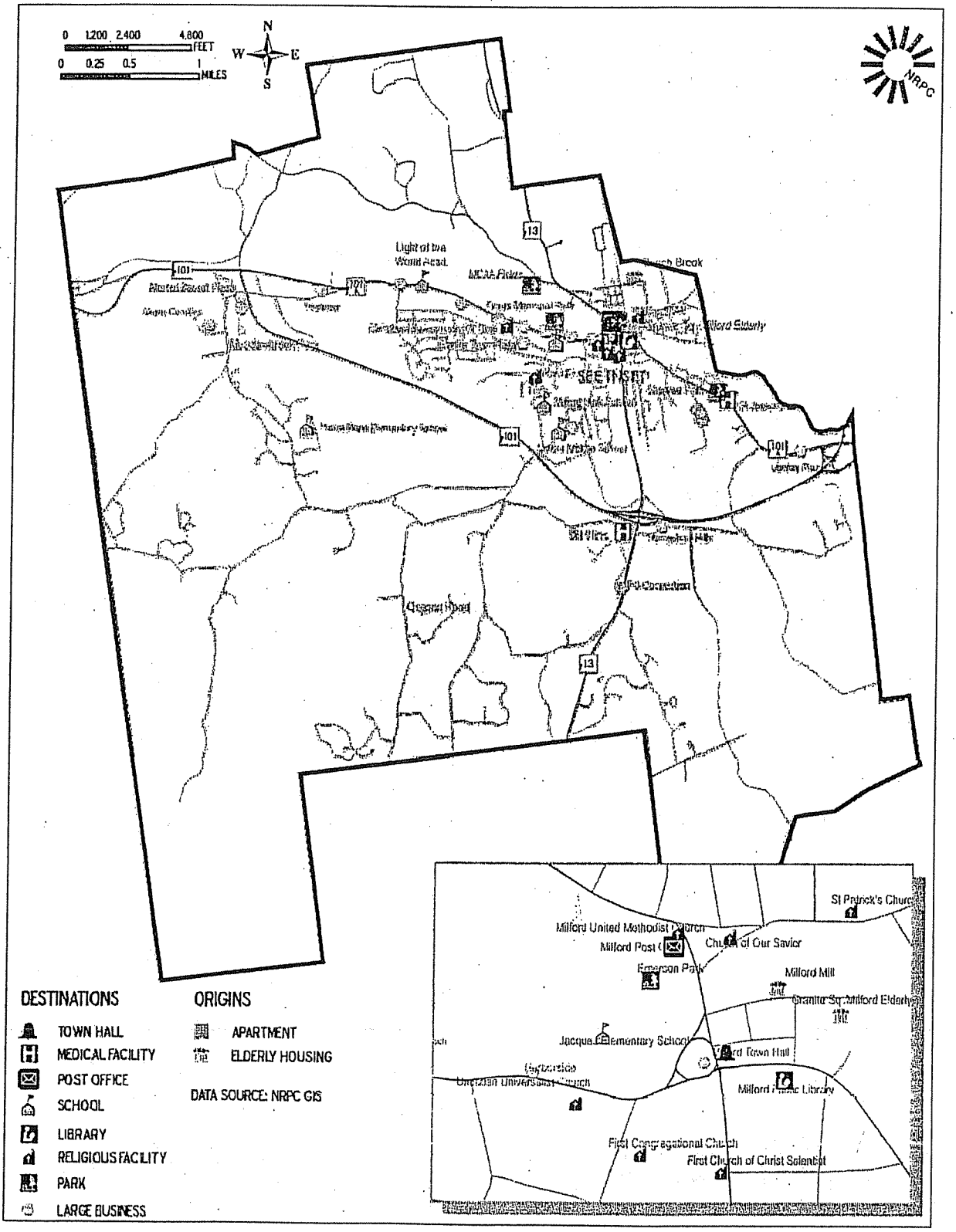
Study Area

Based on the demographic factors and origins and destinations of the study area, the study area does exhibit a need for transit service. The most likely and sustainable route would run along NH 101A near Wal-Mart in Amherst and travel through Milford to downtown Wilton. The bus stops would be determined by each town after assessing the conditions of their proposed locations and upgrading to the appropriate ADA specifications (see figures VI-11, VI-12, and VI-13).

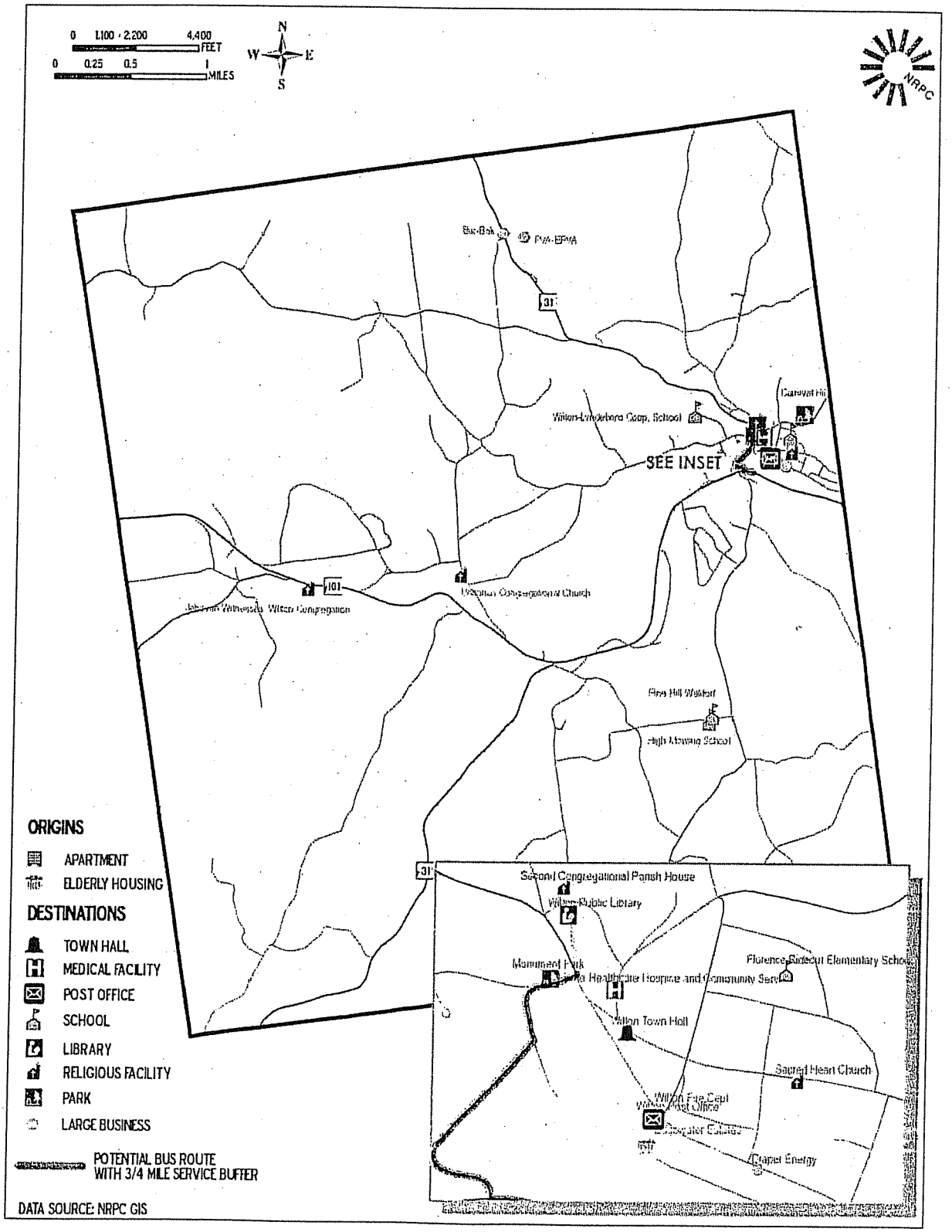
Map VI-11: Transit Route, Amherst



Map VI-12: Transit Route, Milford



Map VI-13: Transit Route, Wilton



11. FISCAL ANALYSIS

Below are various (not all inclusive) possibilities for transit services. The service costs were developed using standard costs for transit service based on 2005 dollars. However, these figures only represent a rough estimate of the costs and further refinement is needed. Personnel operating costs for vans use a factor of $ 21.30 per hour of operation while personnel operating costs for buses use a factor of $ 25.00 per hour of operation. Van and bus operating costs are based on $ 0.72 and $ 0.67 per mile respectively, calculated with the vehicle traveling at 14 mph. Insurance costs are also included. The cost of two hours of service has been included in the analysis to account for deadhead travel.

Option 1 - Fixed Route (Table VI-8): Fixed route traveling on 101 A through the study area with complimentary ADA service. All operating costs for the fixed route are based on the service being in operation 14 hours per day and 70 hours per week. Complimentary ADA service operating costs are also based on the service being in operation 14 hours a day and 70 hours per week.

Table VI-8: Option 1

Service / Vehicle	Service Days / Hours	Personnel Operating Costs/Year	Vehicle Operating Costs/Year	Total Cost
Fixed Route / Bus	Monday thru Friday 6 a.m. thru 6 p.m.	$91,000	$48,768	$139,768
Complimentary ADA Service -van	Monday thru Friday 6 a.m. thru 6 p.m.	$116,298	$75,756	$192,054
Total		**$207,298**	**$124,524**	**$331,822**
Vehicle Acquisition Cost (Van=$75,000 Bus=$300,000)				$375,000

Option 2 - Deviated Fixed Route (Table VI-9): Fixed route traveling on 101 A through the study area with curb to curb service for the disabled within ¾ mile of the fixed route. All operating costs for the deviated route are based on the service being in operation 14 hours per day and 70 hours per week.

Table VI-9: Option 2

Service / Vehicle	Service Days / Hours	Personnel Operating Costs/Year	Vehicle Operating Costs/Year	Total Cost
Deviated Fixed Route / Van	Monday thru Friday 6 a.m. thru 6 p.m.	$77,532	$51,317	$128,849
Vehicle Acquisition Cost (Van = $75,000):				$75,000

Option 3 - Commuter bus to Nashua (Table VI-10): Commuter bus connects to the study area service and travels to downtown Nashua. All operating costs are based on 14 hours per day and 70 hours per week.

Table VI-10: Option 3

Service / Vehicle	Service Days / Hours	Personnel Operating Costs/Year	Vehicle Operating Costs/Year	Total Cost
Commuter Bus to Nashua /Bus	Monday thru Friday 6 a.m. thru 6 p.m.	$91,000	$48,768	$139,768
Vehicle Acquisition Cost (Bus = $300,000):				$300,000

Option 4 - Commuter bus to Manchester (Table VI-11): Commuter bus connects to the study area service and travels to downtown Manchester. All operating costs are based on 14 hours per day and 70 hours per week.

Table VI-11: Option 4

Service / Vehicle	Service Days / Hours	Personnel Operating Costs/Year	Vehicle Operating Costs/Year	Total Cost
Commuter Bus to Manchester / Bus	Monday thru Friday 6 a.m. thru 6 p.m.	$91,000	$48,768	$139,768
Vehicle Acquisition Cost (Bus = $300,000):				$300,000

12. RIDERSHIP FORECAST

NTS employees were consulted in estimating transit ridership for the study area. Recognizing that forecasting ridership has many variables, especially for a new service; the following service option forecasts represent reasonable estimates of expected ridership.

Fixed Route with complimentary ADA service (option 1) – The fixed route bus service operating Monday thru Friday from 6a.m. to 6p.m. is estimated to have a ridership of about eight people per hour; this service would accommodate approximately 96 people per day. The ADA component would be able to transport at least two people per hour, or a minimum of twenty four people per day.

Deviated fixed route (option 2) – Like the fixed route, the deviated service could serve up to an estimated 8 people per hour and approximately ninety six people per day. However, since the vehicle may deviate ¾ miles from its regular route, it is unlikely that it would consistently match the rider-ship of the fixed route service.

Commuter bus to Nashua (option 3) - The commuter bus to Nashua operating Monday thru Friday from 6a.m. to 6 p.m. is estimated to serve approximately four people per hour, or forty-eight people per day.

Commuter bus to Manchester (option 4) - The commuter bus to Manchester operating Monday thru Friday from 6a.m. to 6 p.m. is estimated to serve approximately four people per hour, or forty-eight people per day.

13. FUNDING SOURCES

The transit section proposes a number of different possibilities for future transit service in the study area. The common factor among all the proposed transit options is that they require funding that is not currently budgeted. Clearly, the most important component of the implementation of any new transit service is funding. The following section describes alternative funding mechanisms for the new services identified in the TCSP project.

Currently, there are two main types of federal funding that can be used in the NRPC region to support transit service. These are called Section 5307 funds and Congestion Mitigation Air Quality funds. Job Access and Reverse Commute funds are competitive monies that may also be available for specific projects. The following describes the alternative funding mechanisms and the strengths and weaknesses of each.

Section 5307 funds are provided from the federal government. The amount of funds provided to a region is based on the population of the Urbanized Area. The biggest strength of Section 5307 funds is that

within the constraints of the federal budget process, they are assured. These funds can be used to pay for capital (vehicles and buildings) with 80% of the cost charged to the federal funds and 20% paid from local sources. These funds can also be used to provide direct support for the operation of the transit system with 50% of the cost charged to the federal funds and 50% charged to local sources. Section 5307 funds are best suited to provide long term support for successful transit services with a strong market.

Congestion Mitigation Air Quality (CMAQ) funds are monies that the federal government provides to states to pay for projects that decrease congestion and reduce air pollution from vehicular sources. These funds must be spent in the air quality non-attainment areas within the state. One limitation of the CMAQ funding is that it is distributed by the NH DOT on a competitive grant basis, with funds awarded on the basis of applications that are submitted and reviewed by an appointed committee. As a result, CMAQ funds are not an assured funding source like the Section 5307. CMAQ funds can be spent for either operating support of transit services or for the purchase of vehicles with 80% of the cost charged to federal funds and only 20% charged to local sources. Since CMAQ funds can be used for operating support of transit at the favorable 80% federal, 20% local match rate, they are often used to begin new services with a minimal commitment on the part of the municipalities. However, CMAQ funds can only be used to subsidize new transit services as "pilot projects" for three years. After that point, other funding sources must be identified to contribute towards the cost of the service. Due to this limitation, CMAQ funds are best used to begin a service and prove its viability at a relatively low level of risk to the municipality.

Due to the strengths and weaknesses of Section 5307 and CMAQ funds, transit systems and municipalities nationwide have typically used CMAQ funds to begin new services, or demonstration projects, and Section 5307 funds to maintain the services once they have shown that they are viable. In the study area, using CMAQ funds for capital the first three years of operating support would be the lowest cost way for local governments to begin transit services. Once the service proved to be successful, the local government could make a decision regarding longer term funding commitments and providing the required match for Section 5307 funds.

Job Access and Reverse Commute (JARC) Funds JARC encourage metropolitan areas to provide transportation to work for low income households moving off welfare. These funds could pay for up to 80% of the purchase of transit vehicles or 50% of the operating support for new transit services that met certain criteria. The JARC funds were unique in that the match for the federal money could be paid with federal Temporary Aid to Needy Families funds. The JARC funds were difficult to access due to the fact that they were awarded on a competitive basis to applicants nationwide. Previously, most JARC projects nationwide failed, with few even reaching implementation and even fewer ever providing the service benefits to low income households that were promised. However, under the new transportation bill - Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFTEA-LU) the JARC program will be administered as a formula program beginning in Fiscal Year (FY) 2006. The advantage of the formula program is that the States will be guaranteed a certain amount of JARC funding. However, it will still be competitively awarded.

Passenger Fares are revenue earned from carrying passengers during transit service. Passenger fares include the regular fare as well as other premiums which may be assessed.

Auxiliary Transportation Revenues are the revenue generated by auxiliary funding sources related to the transit service. Types of funding sources include:

- Advertisements placed on the transit vehicle
- Concessions sold at transit stations
- Concessions sold on the vehicle

Table VI-12 shows the costs to local governments to establish new services using either Section 5307 funds or CMAQ funds. The table identifies the proposed transit service, the total transit service cost, the local cost using 5307 funds and the local cost using CMAQ funds. Both operating and capital costs are listed in the transit service. Operating costs are the annual costs of providing the service and capital costs are a one time fee to purchase vehicles. Section 5307 funds provide a 50% federal match of the total operating cost and 80% of the capital cost. CMAQ funds provide an 80% match for both operating and capital; however these funds are only available during the first three years of establishing a new service. The following table provides a summary of various services and costs for the study area.

Table VI-12: Local Government Costs

Service*	Service Hours	Total	Local Share 5307 Funding*	Local Share CMAQ Funding*
Option 1: Fixed Route / Bus- ADA /Van	Monday thru Friday 6 a.m. thru 6 p.m.			
Operating		$331,822	$ 165,911	$ 66,364
Capital – One Time Cost		$ 375,000	$ 187,500	$ 75,000
Option 2: Deviated Fixed Route / Van	Monday thru Friday 6 a.m. thru 6 p.m.			
Operating		$ 128,849	$ 64,425	$ 25,767
Capital – One Time Cost		$ 75,000	$ 37,500	$ 15,000
Option 3: Commuter to Nashua / Bus	Monday thru Friday 6 a.m. thru 6 p.m.			
Operating		$ 139,000	$ 69,500	$ 34,750
Capital – One Time Cost		$ 300,000	$ 150,000	$ 75,000
Option 4: Commuter to Manchester / Bus	Monday thru Friday 6 a.m. thru 6 p.m.			
Operating		$ 139,000	$ 69,500	$ 34,750
Capital – One Time Cost		$ 300,000	$ 150,000	$ 75,000

**5307 funding provides a federal funding contribution of 50% and requires a 50% local match. CMAQ funding provides a federal funding contribution of 80% and requires a 20% local match. CMAQ funding is limited to the first three years of service only. The dollar amounts listed in this table are based on current cost factors and have not been adjusted to account for future inflation.*

C. KEY RECOMMENDATION

Due to the strengths and weaknesses of Section 5307 and CMAQ funds, transit systems and municipalities nationwide have typically used CMAQ funds to begin new services, or demonstration projects, and Section 5307 funds to maintain the services once they have shown that they are viable. In the study area, using CMAQ funds for the first three years of operating support would be the lowest cost option for local governments to begin transit services. Once the service proved to be successful, and before the CMAQ funding expired, the local governments would make a decision regarding longer term funding commitments and provide the required match for Section 5307 funds to continue the service.

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APPENDIX A: BICYCLE NETWORK DEVELOPMENT

1. Network Development Methodology

NRPC staff has developed a methodology for identifying the routes that should be recommended for inclusion in the bicycle network. The methodology has been designed to be used in a GIS environment and to be as quantitative as possible. The steps described below assume that demand for bicycle facilities is influenced by the location, type and intensity of land use throughout the region as well as by the distribution of population. Factors such as directness, barriers, aesthetics and cost of improvements are also considered. The following six steps were used to develop the recommended NRPC regional bicycle network:

- Identify and Quantify Trip Productions
- Identify and Quantify Trip Attractions
- Identify Desired Bicycle Travel Corridors
- Apply Suitability Index to Select Alternative Routes
- Evaluate Route Alternatives Using Performance Criteria
- Identify Recommended Projects

Identify and Quantify Bicycle Trip Productions

The first step in developing the bicycle network is to identify where bicycle trips originate. This methodology assumes that a bicycle trip *originates* at the rider's place of residence. Destinations that include retail businesses, recreation areas, schools and the rider's place of employment also generate bicycle trips, but these are considered trip *attractions*.

The methodology uses GIS-based census block attribute data as well as generally recognized bicycle trip generation information to quantify where bicycle trips originate. NRPC staff developed "trip production rates" (Table A-1) that are applied to each census block group. The production rates are applied to the number of people in each of two different age groups. The age groups exhibit the characteristics of the major bicycle design groups that were described earlier. The number of individuals in each age group in each census block is totaled. The total number of individuals in each age group is then multiplied by the trip production rate for that age group. The result is the total number of bike trips produced in each age group in each census block. The number of trips from the two age groups are then added together and the result is the total number of bike trips for that census block. The resulting number of bicycle trips for that block can then be mapped.

Table A-1: Bicycle Trip Production Rates

Major Design Group	Age	Bike & Walk
A, B	13+ years	3 trips/100 adults
C	For 0-12 years	20 trips/100 kids

Identify and Quantify Trip Attractions

The methodology assumes that bicycle trip attractions are the destinations that people travel to for work, shopping, social gatherings, recreation and other personal reasons. Trip attractions for commercial and

retail businesses, offices, health care facilities and public administration facilities are calculated using the number of employees per square foot of building floor area.[10] The NRPC database contains information about the number of employees at various types of businesses in the region. The number of square feet per worker is calculated using this data. Once the number of square feet of floor area is established a trip attraction rate can be applied and the number of attractions that are produced can be calculated (Table A-2a).

Table A-2a: Bicycle Trip Attraction Rates (business)

	Suburban	Mixed-use Urban	Dense or Special Use
Commercial, retail, public admin, office, health care	4 trips/mil.Sq.ft.	8 trips/mil.Sq.ft.	12 trips/mil.Sq.ft.

The trip attraction rate for schools is different than for businesses. The Center for Disease Control and Prevention (CDC) estimates that 13% of all trips to school are by walking or biking.[11] The National Personal Transportation Survey estimates that walkers to school outweigh bikers by a 10-to-1 ratio.[12] The trip attraction rate for individual schools is determined by first calculating what thirteen percent of total enrolment is for that school. It is then possible to solve for the number of bicycle and pedestrian trips to that school by using the 10:1 ratio.

Table A-2b: Bicycle Trip Attraction Rates (schools)

Type of School	Number of Trips
Elementary	Total enrolment x .13 x .09
Middle	Total enrolment x .13 x .09
High	Total enrolment x .13 x .09
College	2 per 1,000 students

Table A-2c: Bicycle Trip Attraction Rates (parks)

	Number of Trips
Parks	30 (average)

Identify Desired Bicycle Travel Corridors

Once bicycle trip productions (origins) and attractions (destinations) have been quantified it is necessary to identify "desirable" bicycle travel corridors. The corridors should connect the zones that *generate* a significant number of bicycle trips with the zones that *attract* a significant number of bicycle trips. It is assumed that people on bikes want to go to the same places as do people in cars, within the constraints imposed by distance and that the existing system of streets and highways reflects the existing travel demands for the community. Desirable travel corridors therefore may be well represented by the traffic flow on the existing road system. It is true, however, that travel patterns of less experienced riders are influenced by their perception of the bicycling environment they face. Uncomfortable or threatening conditions will cause these bicyclists to alter their choice of route from the most preferred alignment.[13] It

[10] U.S. Department of Energy; Energy Information Administration, *1995 Commercial Buildings Energy Consumption Survey.*

[11] Center for Disease Control data

[12] National Personal Transportation Survey, 1995

[13] U.S. Department of Transportation, Federal Highway Administration, Bicycle and Pedestrian Planning

is therefore important to consider where bicyclists would ideally ride if they could go where they preferred because those ideal routes may not be the same as the routes that bicyclists currently use.

Apply Suitability Index to Select Alternative Routes

Bicyclists will ride on what they perceive to be "suitable" routes. NRPC staff has developed a GIS-based suitability index that helps to identify suitable (preferred) routes. The NRPC maintains a regional road network data layer as part of its GIS database. The suitability index is based on data that is included in the attribute table of the road network. The attributes used for the suitability index are the speed limit, average daily traffic volume (ADT) and pavement width of the road segment.

For each segment of roadway the speed limit and traffic volume are multiplied together. The product of this calculation is then divided by the width of pavement for that segment. The resulting number is a relative measure of the suitability of that segment of roadway for bicycling. The higher the number, the less suitable the segment. This procedure can be applied to all of the road segments in the network. By doing so it is possible to graphically display on a map of the region the most suitable routes that connect various origins and destinations.

Evaluate Route Alternatives Using Performance Criteria

It is important to note that this methodology so far has depended on the accuracy of the GIS database to quantitatively identify suitable bicycle routes. It is possible that in the process a number of alternative routes that connect the same origins and destinations have been identified. At this point in the process it is necessary to apply more specific performance criteria in order to assure the desirability and effectiveness of the bicycle network. During this step it is necessary to field check the alternatives that were identified in earlier steps. The goal of this step is to identify the specific routes that best meet the following performance criteria[14]:

- **Accessibility:** This is measured by the distance a bicycle facility is from a specified trip origin or destination, the ease by which this distance can be traveled by bicycle and the extent to which all likely origins and destinations are served.
- **Directness:** Studies have shown that most bicyclists will not use even the best bicycle facility if it greatly increases the travel distance or trip time over a less desireable but more direct alternative.
- **Continuity:** The proposed network should have as few missing segments as possible. If gaps do exist, they should not include environments that are threatening to B/C riders.
- **Usage:** This is the degree to which a specific route meets the needs of the anticipated users as opposed to an alternative route.
- **Asthetics:** The network should be physically atractive.
- **Safety:** The route should present few conflicts between bicyclists and motor vehicles.
- **Cost:** When comparing route alternatives, the cost of implementation as well as maintenance should be considered.

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overview.

[14] U.S. Department of Transportation, Federal Highway Administration, Bicycle and Pedestrian Planning Overview.

Ease of Implementation

Some proposed routes may be easier to implement than others. For example, a potential bike route may already have adequate shoulders and therefore only require proper pavement markings. This route could be up and running in a relatively short amount of time. Other potential routes may need more extensive upgrading and could therefore take a relatively longer period of time to implement.

Local or Regional Route

NRPC recommends that proposed routes be categorized into two major types; Regional routes and local routes. In many cases, the two types of routes will overlap.

Identify Recommended Projects

Once all of the alternative routes have been evaluated and field checked, specific routes can be recommended. Since this is a regional bicycle plan, recommended projects will emerge based on the following priorities:

- Provide regional continuity and directness;
- Support current and/or potential use patterns;
- Complete bikeways identified in the regional bike corridor concept.

2. Summary of Bicycle Network Development Methodology

The methodology for developing the NRPC regional bicycle network involves identifying where bicyclists begin their trips, the destinations they want to go to and the suitable routes that will get them there. This methodology has also described specific performance criteria that are intended to define the important qualitative and quantitative variables that need to be considered in determining which facilities and routes ultimately get included in the final network recommendations. Finally, this methodology involves establishing minimum standards for all streets and highways where bicyclists are permitted. This will ensure that even the streets not on designated bicycle routes would have minimum accommodations for bicyclists.

APPENDIX B:
MILFORD SIDEWALK ASSESSMENT DATABASE

Width	Surface Type	Curb	Surface Cond	Drainage Cond	Obstructions	Importance Rank	Width Score	Surface Score	Drainage Score	Obstruct Score	Import Score	Sum Score	Length
6	Asphalt	No	Good	Good	Good	High	3	3	3	3	3	12	830
6	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	154
6	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	550
6	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	335
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	105
4	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	129
6	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	195
6	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	253
6	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	502
6	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	920
5	Asphalt	Yes	Good	Good	Fair	Medium	3	3	2	2	2	10	140
5	Asphalt	Yes	Good	Good	Fair	Medium	3	3	2	2	2	10	144
5	Asphalt	Yes	Good	Good	Fair	Medium	3	3	2	2	2	10	163
5	Asphalt	Yes	Good	Good	Fair	Medium	3	3	2	2	2	10	698
4	Asphalt	Yes	Fair	Good	Fair	Medium	1	2	3	2	2	8	1669
4	Asphalt	Yes	Fair	Good	Good	Medium	1	2	3	2	2	8	197
4	Asphalt	Yes	Fair	Good	Good	Medium	1	2	3	2	2	8	355
6	Asphalt	Yes	Fair	Good	Good	Medium	3	2	3	2	2	10	331
4	Asphalt	Yes	Fair	Fair	Good	Medium	1	2	2	3	3	8	220
4	Asphalt	Yes	Poor	Poor	Fair	Medium	1	1	1	2	2	5	148
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	372
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	564
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	189
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	316
4	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	109
4	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	51
4	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	1256
4	Asphalt	Yes	Fair	Good	Good	High	1	2	3	3	3	9	350
4	Asphalt	Yes	Fair	Good	Good	High	1	2	3	3	3	9	475
3	Asphalt	Yes	Fair	Fair	Good	High	1	2	2	3	3	8	190
3	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	190

APPENDIX B:
MILFORD SIDEWALK ASSESSMENT DATABASE

4	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	143
4	Asphalt	Yes	Fair	Good	Good	High	1	2	3	3	3	9	345
5	Asphalt	Yes	Fair	Fair	Good	High	3	2	2	3	3	10	1038
6	Asphalt	Yes	Fair	Good	Good	High	3	2	2	3	3	10	149
10	Asphalt	Yes	Fair	Good	Good	High	3	2	3	3	3	11	185
8	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	8
8	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	439
4	Asphalt	Yes	Fair	Fair	Good	Low	1	2	2	3	1	8	140
6	Asphalt	Yes	Good	Good	Good	Low	3	3	3	3	1	12	209
5	Asphalt	Yes	Good	Good	Good	Low	3	3	3	3	1	12	709
5	Asphalt	Yes	Good	Good	Good	Low	3	3	3	3	1	12	896
4	Asphalt	Yes	Fair	Fair	Good	Medium	1	2	2	3	2	8	456
5	Asphalt	Yes	Good	Good	Fair	Medium	3	3	3	2	2	11	162
5	Asphalt	Yes	Fair	Good	Fair	Medium	3	2	3	2	2	10	140
4	Concrete	No	Fair	Fair	Fair	Medium	1	2	2	2	2	7	209
4	Asphalt	Yes	Fair	Good	Good	Medium	1	2	3	3	2	9	498
4	Asphalt	Yes	Fair	Fair	Good	Medium	1	2	2	3	2	8	436
4	Asphalt	Yes	Poor	Fair	Good	Medium	1	1	2	3	2	7	615
5	Asphalt	Yes	Fair	Fair	Good	Medium	3	1	1	3	2	8	402
Width	**Surface Type**	**Curb**	**Surface Cond**	**Drainage Cond**	**Obstructions**	**Importance Rank**	**Width Score**	**Surface Score**	**Drainage Score**	**Obstruct Score**	**Import Score**	**Sum Score**	**Length**
5	Asphalt	Yes	Fair	Fair	Good	High	3	2	2	3	3	10	295
3	Asphalt	Yes	Poor	Poor	Fair	Medium	1	1	1	2	2	5	290
6	Asphalt	Yes	Fair	Fair	Good	Medium	3	2	2	3	2	10	155
5	Asphalt	Yes	Fair	Fair	Good	High	3	2	2	3	3	10	697
5	Asphalt	Yes	Good	Good	Good	Medium	3	3	3	3	2	12	690
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	465
6	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	250
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	87
9	Concrete	Yes	Good	Good	Good	High	3	3	3	3	3	12	518
5	Asphalt	Yes	Fair	Fair	Good	High	3	2	2	3	3	10	473
5	Asphalt	Yes	Fair	Fair	Good	High	3	2	2	3	3	10	285
9	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	236

APPENDIX B:
MILFORD SIDEWALK ASSESSMENT DATABASE

9	Concrete	Yes	Good	Good	Good	High	3	3	3	3	3	12	133
4	Asphalt	Yes	Fair	Fair	Good	Low	1	2	2	3	3	8	413
6	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	529
4	Asphalt		Fair	Fair	Good	Low	1	2	2	3	1	8	555
4	Asphalt	Yes	Fair	Fair	Good	Low	1	2	2	3	1	8	278
4	Dirt	No	NA	NA	NA	Low	NA					0	**215**
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	847
5	Asphalt	Yes	Fair	Fair	Good	High	3	2	2	3	3	10	95
5	Asphalt	Yes	Fair	Good	Good	High	3	2	3	3	3	11	454
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	685
4	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	239
4	Asphalt	Yes	Fair	Good	Good	High	1	2	3	3	3	9	**218**
4	Asphalt	No	Fair	Fair	Good	High	1	2	2	3	3	8	90
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	450
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	195
4	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	479
6	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	341
5	Asphalt	Yes	Good	Good	Fair	High	3	3	3	2	3	11	547
5	Asphalt	Yes	Good	Good	Good	Low	3	3	3	3	1	12	335
4	Asphalt	Yes	Poor	Fair	Fair	Low	1	1	2	2	1	6	196
3	Asphalt	No	Poor	Poor	Fair	Low	1	1	1	2	1	5	309
4	Asphalt	No	Fair	Fair	Fair	Low	1	2	2	2	1	7	315
3	Asphalt	No	Poor	Poor	Poor	Low	1	1	1	1	1	4	83
4	Concrete	No	Fair	Fair	Fair	Low	1	2	2	2	1	7	123
4	Concrete	No	Poor	Poor	Good	Low	1	1	1	3	1	6	93
4	Asphalt	Yes	Fair	Fair	Good	High	1	2	2	3	3	8	206
5	Asphalt	Yes	Good	Good	Good	Medium	3	3	3	3	2	12	588
4	Asphalt	Yes	Poor	Poor	Good	Medium	1	1	1	3	2	6	103
5	Concrete		Fair	Fair	Good	Medium	3	2	2	3	2	10	194
5	Asphalt	No	Good	Good	Good	Medium	3	3	3	3	2	12	156
5	NA	No	NA	NA	NA	Medium	3	NA	NA	NA	NA	3	138
5	Asphalt	No	Poor	Poor	Good	Medium	3	1	1	3	2	8	324
3	Asphalt	No	Fair	Fair	Good	Medium	1	2	2	3	2	8	154

APPENDIX B:
MILFORD SIDEWALK ASSESSMENT DATABASE

4	Asphalt	Yes	Good	Good	Good	Medium	1	3	3	3	2	10	113
3	Concrete	No	Fair	Fair	Fair	Medium	1	2	2	2	2	7	173
4	Asphalt	No	Good	Good	Good	Medium	1	3	3	3	2	10	206
4	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	232
5	Asphalt	Yes	Good	Good	Good	Low	3	3	3	3	1	12	455
Width	**Surface Type**	**Curb**	**Surface Cond**	**Drainage Cond**	**Obstructions**	**Importance Rank**	**Width Score**	**Surface Score**	**Drainage Score**	**Obstruct Score**	**Import Score**	**Sum Score**	**Length**
5	Asphalt	Yes	Good	Good	Good	Low	3	3	3	3	1	12	594
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	899
4	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	305
5	Asphalt	Yes	Fair	Fair	Good	High	3	2	2	3	3	10	110
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	334
5	Asphalt	Yes	Good	Good	Fair	Low	3	3	3	2	1	11	52
4	Asphalt	Yes	Good	Good	Good	Medium	1	3	3	3	2	10	434
4	Asphalt	Yes	Fair	Fair	Good	Medium	1	2	2	3	2	8	415
4	Asphalt	Yes	Fair	Fair	Good	Low	1	2	2	3	1	8	161
4	Asphalt	Yes	Good	Good	Good	Medium	1	3	3	3	2	10	152
5	Asphalt	Yes	Good	Good	Good	Medium	3	3	3	3	2	12	235
4	Asphalt	Yes	Good	Good	Good	Medium	1	3	3	3	2	10	170
5	Asphalt	Yes	Good	Good	Good	Medium	3	3	3	3	2	12	342
4	Concrete	No	Poor	Poor	Good	Low	1	1	1	3	1	6	230
5	Asphalt	Yes	Good	Good	Good	Low	3	3	3	3	1	12	269
4	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	452
4	Asphalt	Yes	Fair	Fair	Good	High	1	2	2	3	3	8	363
6	Asphalt	Yes	Fair	Fair	Good	Medium	3	2	2	3	2	10	151
6	Asphalt	Yes	Good	Good	Good	Medium	3	3	3	3	2	12	331
4	Asphalt	No	Good	Good	Good	Medium	1	3	3	3	2	10	135
4	Asphalt	No	Poor	Fair	Good	Medium	1	1	2	3	2	7	564
3	Asphalt	No	Poor	Poor	Fair	Low	1	1	1	2	1	5	162
4	Asphalt	No	Poor	Poor	Poor	Medium	1	1	1	1	2	4	568
8	Other	No	Good	Good	Good	High	3	3	3	3	3	12	326
4	Asphalt	Yes	Fair	Fair	Good	High	1	2	2	3	3	8	160
7	Concrete	Yes	Good	Good	Good	High	3	3	3	3	3	12	73

APPENDIX B:
MILFORD SIDEWALK ASSESSMENT DATABASE

10	Concrete	Yes	Good	Good	Good	High	3	3	3	3	3	12	155
15	Concrete	Yes	Good	Good	Good	High	3	3	3	3	3	12	63
5	Concrete	Yes	Good	Good	Good	High	3	3	3	3	3	12	165
8	Concrete	Yes	Good	Good	Good	High	3	3	3	3	3	12	136
5	Asphalt	Yes	Fair	Good	Good	High	3	2	3	3	3	11	214
5	Asphalt	Yes	Fair	Good	Good	High	3	2	3	3	3	11	39
4	Asphalt	Yes	Fair	Fair	Fair	Medium	1	2	2	2	2	7	447
4	Asphalt	Yes	Fair	Good	Good	Medium	1	2	3	3	2	9	144
4	Concrete	Yes	Fair	Good	Fair	Medium	1	2	3	2	2	8	302
4	Concrete	Yes	Fair	Good	Good	Medium	1	2	3	3	2	9	315
4	Concrete	Yes	Fair	Fair	Good	Medium	1	2	2	3	3	8	179
5	Asphalt	Yes	Fair	Good	Good	High	3	2	3	3	3	11	432
10	Concrete	Yes	Good	Good	Good	High	3	3	3	3	3	12	576
5	Brick	Yes	Good	Good	Good	High	3	3	3	3	3	12	351
5	Brick	Yes	Good	Good	Good	High	3	3	3	3	3	12	103
6	Brick	Yes	Good	Good	Good	High	3	3	3	3	3	12	84
6	Brick	No	Good	Good	Good	High	3	3	3	3	3	12	112
3	Brick	Yes	Good	Good	Good	High	1	3	3	3	3	10	74
5	Asphalt	Yes	Good	Good	Good	Low	3	3	3	3	1	12	995
5	Asphalt	Yes	Good	Good	Good	Low	3	3	3	3	1	12	1160
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	1190
4	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	187
4	Asphalt	Yes	Good	Good	Good	High	1	3	3	3	3	10	394
Width	**Surface Type**	**Curb**	**Surface Cond**	**Drainage Cond**	**Obstructions**	**Importance Rank**	**Width Score**	**Surface Score**	**Drainage Score**	**Obstruct Score**	**Import Score**	**Sum Score**	**Length**
5	Asphalt	Yes	Good	Good	Good	High	3	3	3	3	3	12	1394
4	Asphalt	Yes	Fair	Fair	Good	Medium	1	2	2	3	2	8	1124
4	Asphalt	Yes	Fair	Fair	Good	Low	1	2	2	3	1	8	72
4	Asphalt	Yes	Good	Good	Good	Low	1	3	3	3	1	10	50
4	Asphalt	Yes	Fair	Fair	Good	Low	1	2	2	3	1	8	73
3	Concrete	Yes	Good	Good	Good	Low	1	3	3	3	1	10	63
4	Asphalt	Yes	Poor	Poor	Good	Medium	1	1	1	3	2	6	1354

APPENDIX B:
MILFORD SIDEWALK ASSESSMENT DATABASE

5	Asphalt	Yes	Good	Good	Good	Low	3	3	3	3	1	12	90
3	Asphalt	Yes	Good	Good	Good	Low	1	3	3	3	1	10	66
4	Asphalt	Yes	Good	Good	Good	Low	1	3	3	3	1	10	77
4	Asphalt	Yes	Good	Good	Good	Low	1	3	3	3	1	10	124
3	Asphalt	Yes	Good	Good	Good	Low	1	3	3	3	1	10	51
3	Asphalt	Yes	Fair	Fair	Good	Low	1	2	2	3	1	8	39
5	Asphalt	Yes	Fair	Good	Good	Low	3	2	3	3	1	11	169
4	Asphalt	Yes	Good	Fair	Good	Low	1	3	2	3	1	9	267
4	Asphalt	Yes	Fair	Fair	Good	Low	1	2	2	3	1	8	403
4	Asphalt	Yes	Good	Good	Good	Low	1	3	3	3	1	10	119
5	Asphalt	Yes	Good	Good	Fair	Low	3	3	3	2	1	11	426
4	Asphalt	Yes	Fair	Good	Good	Low	1	2	3	3	1	9	268
5	Asphalt	Yes	Good	Good	Good	Medium	3	3	3	3	2	12	1005
5	Asphalt	Yes	Good	Good	Good	Low	3	3	3	3	1	12	884
3	Asphalt	No	Poor	Fair	Good	Low	1	1	2	3	1	7	731
4	Asphalt	Yes	Fair	Fair	Fair	Medium	1	2	2	2	2	7	730
5	Asphalt	Yes	Fair	Good	Good	Medium	3	2	3	3	2	11	230
4	Asphalt	Yes	Good	Good	Good	Medium	1	3	3	3	2	10	110
5	Asphalt	Yes	Good	Good	Good	Medium	3	3	3	3	2	12	1143
5	Asphalt	Yes	Fair	Fair	Good	High	3	2	2	3	3	10	875
4	Asphalt	No	Fair	Fair	Good	High	1	2	2	3	3	8	847
5	Asphalt	Yes	Good	Good	Good	Medium	3	3	3	3	2	12	595
5	Asphalt	Yes	Good	Good	Good	Medium	3	3	3	3	2	12	92
5	Asphalt	Yes	Good	Good	Good	Medium	3	3	3	3	2	12	159
4	Asphalt	Yes	Good	Good	Good	Medium	1	3	3	3	2	10	807
4	Concrete	No	Fair	Fair	Good	Low	1	2	2	3	1	8	110
												TOTAL	53559

APPENDIX C:
SIDEWALKS NOT ADA COMPLIANT DATABASE

Street Name	From	To	Width	Surface	Drainage	Obstructions	Importance
				Cond	Cond	Cond	Rank
UNION ST	149 UNION ST	152 UNION ST	4	Good	Good	Good	High
NASHUA ST	EDGEWOOD SHOP	EDGEWOOD SHOP	4	Good	Good	Good	High
NASHUA ST	EDGEWOOD	TONELLA	4	Good	Good	Good	High
NASHUA ST	TONELLA RD	POWERS ST	4	Good	Good	Good	High
NASHUA ST	POWERS ST	WHEELER ST	4	Fair	Good	Good	High
NASHUA ST	WHEELER ST	VINE ST	4	Fair	Good	Good	High
NASHUA ST	VINE ST	MONSON PL	3	Fair	Fair	Good	High
NASHUA ST	MONSON PL	TONELLA RD	3	Good	Good	Good	High
NASHUA ST	TONELLA	RIVERSEDGE DR	4	Good	Good	Good	High
NASHUA ST	RIVERSEDGE DR	318 HOLT AGENCY	4	Fair	Good	Good	High
UNION ST	MERRILL CT	GEORGE ST	4	Good	Good	Good	High
GEORGE ST	UNION ST	GAP 9-13 GEORGE	4	Fair	Good	Good	High
GEORGE ST	15 GEORGE ST	17 GEORGE ST	4	Fair	Fair	Good	High
UNION ST	WILLOW ST	LINCOLN ST	4	Good	Good	Good	High
GROVE ST	HIGHLAND AVE	SUMMER ST	4	Fair	Fair	Good	High
AMHERST ST	GROVE ST	GETTY GAS	4	Good	Good	Good	High
MONT VERNON RD	30 MONT VERNON RD	GROVE ST	4	Good	Good	Good	High
BRIDGE ST	MONT VERNON ST	100 BRIDGE ST	4	Good	Good	Good	High
BRIDGE ST	100 BRIDGE ST	SWING BRIDGE	4	Fair	Fair	Good	High
SCHOOL ST	BRIDGE ST	MIDDLE ST	4	Fair	Fair	Good	High
OVAL			3	Good	Good	Good	High
WEST ST	86 WEST ST	HIGH SCHOOL	4	Good	Good	Good	High
WEST ST	HIGH SCHOOL	HIGH SCHOOL	4	Good	Good	Good	High
NASHUA ST	451 NASHUA ST	POWERS ST	4	Fair	Good	Fair	Medium
NASHUA ST	POWERS ST	LAUREL ST	4	Fair	Good	Good	Medium
NASHUA ST	LAUREL ST	SHEPARD ST	4	Fair	Good	Good	Medium
NASHUA ST	ST JOSEPH HOSP	452 NASUA ST	4	Fair	Fair	Good	Medium
NASHUA ST	452 NASUA ST	RIVERSIDE CEMETERY	4	Poor	Poor	Fair	Medium

APPENDIX C:
SIDEWALKS NOT ADA COMPLIANT DATABASE

HIGH ST	SOUTH ST	FRANKLIN ST	4	Fair	Fair	Good	Medium
FRANKLIN ST			4	Fair	Fair	Fair	Medium
FRANKLIN ST	NASHUA ST		4	Fair	Good	Good	Medium
HIGH ST	FRANKLIN ST	NASHUA ST	4	Fair	Fair	Good	Medium
CLINTON ST	SUNOCO GAS	FRANKLIN ST	4	Poor	Fair	Good	Medium
HIGH ST	FRANKLIN ST	NASHUA ST	4	Fair	Fair	Good	Medium
CLINTON ST	SUNOCO GAS	FRANKLIN ST	4	Poor	Fair	Good	Medium
HIGH ST	SOUTH ST	130 HIGH ST	3	Poor	Poor	Fair	Medium
SUMMER ST	25 SUMMER ST	28 SUMMER ST	4	Poor	Poor	Good	Medium
Street Name	**From**	**To**	**Width**	**Surface Cond**	**Drainage Cond**	**Obstructions Cond**	**Importance Rank**
SUMMER ST	21 SUMMER ST	BILLINGS ST	3	Fair	Fair	Good	Medium
SUMMER ST	BILLINGS ST	16 SUMMER ST	4	Good	Good	Good	Medium
SUMMER ST	14 SUMMER ST	10 SUMMER ST	3	Fair	Fair	Fair	Medium
SUMMER ST	10 SUMMER ST	GROVE ST	4	Good	Good	Good	Medium
AMHERST ST	CHESTNUT ST	PLEASANT ST	4	Good	Good	Good	Medium
AMHERST ST	PLEASANT ST	SOUHEGAN ST	4	Fair	Fair	Good	Medium
AMHERST ST	BELMONT DR	DEARBORN ST	4	Good	Good	Good	Medium
AMHERST ST	62 AMHERST ST	70 AMHERST ST	4	Good	Good	Good	Medium
SOUHEGAN ST	SWING BRIDGE	23 SOUHEGAN ST	4	Good	Good	Good	Medium
SOUHEGAN ST	33 SOUHEGAN ST	59 SOUHEGAN ST	4	Poor	Fair	Good	Medium
SOUHEGAN ST	29 SOUHEGAN ST	6 SOUHEGAN ST	4	Poor	Poor	Poor	Medium
MYRTLE ST	MONT VERNON ST	BILLINGS ST	4	Fair	Fair	Fair	Medium
MYRTLE ST	BILLINGS ST	23 MYRTLE ST	4	Fair	Good	Good	Medium
MYRTLE ST	BILLINGS ST	SPRING ST	4	Fair	Good	Fair	Medium
MYRTLE ST	SPRING ST	ADAMS ST	4	Fair	Good	Good	Medium
ADAMS ST	SHADY LN	38 ADANS ST	4	Fair	Fair	Good	Medium
KNIGHT ST	WEST ST	WELL ST	4	Fair	Fair	Good	Medium
SOUTH ST	LINCOLN ST	233 SOUTH ST	4	Poor	Poor	Good	Medium
PSOSPECT ST	26 PROSPECT ST	MARSHALL ST	4	Fair	Fair	Fair	Medium
TONELLA RD	NASHUA ST	BIRCHWOOD DR	4	Fair	Fair	Good	Low
JAMES ST	NASHUA ST	END-CONDOS	4	Fair	Fair	Good	Low

APPENDIX C:
SIDEWALKS NOT ADA COMPLIANT DATABASE

GARDEN ST	UNION ST	COTTAGE ST	4	Fair	Fair	Good	Low
COTTAGE ST	GARDEN ST	10 COTTAGE ST	4	Fair	Fair	Good	Low
GROVE ST	16 GROVE ST	BILLINGS ST	4	Poor	Fair	Fair	Low
GROVE ST	BILLINGS ST	SPRING ST	3	Poor	Poor	Fair	Low
GROVE ST	SPRING ST	ADAMS ST	4	Fair	Fair	Fair	Low
HIGHLAND AVE	ADAMS ST	53 HIGHLAND ST	3	Poor	Poor	Poor	Low
HIGHLAND AVE	53 HIGHLAND ST	59 HIGHLAND ST	4	Fair	Fair	Fair	Low
HIGHLAND AVE	59 HIGHLAND ST	END	4	Poor	Poor	Good	Low
SOUHEGAN ST	AMHERST ST	6 SOUHEGAN ST	4	Fair	Fair	Good	Low
AMHERST ST	NORTH ST	95 AMHERST ST	4	Poor	Poor	Good	Low
SOUHEGAN ST	59 SOUHEGAN ST	CHESTNUT ST	3	Poor	Poor	Fair	Low
CROSBY ST	25 CROSBY ST	23 CROSBY ST	4	Fair	Fair	Good	Low
CROSBY ST	18 CROSBY ST	18 CROSBY ST	4	Good	Good	Good	Low
OLIVE ST	SHEPHARD ST	18 OLIVE ST	4	Fair	Fair	Good	Low
LAUREL ST	8 LAUREL ST	8 LAUREL ST	3	Good	Good	Good	Low
OAK ST	16 OAK ST	16 OAK ST	3	Good	Good	Good	Low
Street Name	**From**	**To**	**Width**	**Surface**	**Drainage**	**Obstructions**	**Importance**
WILLOW ST	OAK ST	11 WILLOW ST	4	Good	Good	Good	Low
OAK ST	ORANGE ST	END	4	Good	Good	Good	Low
ORANGE ST	9 ORANGE ST	9 ORANGE ST	3	Good	Good	Good	Low
OAK ST	26 OAK ST	26 OAK ST	3	Fair	Fair	Good	Low
OAK ST	38 OAK ST	46 OAK ST	4	Good	Fair	Good	Low
COTTAGE ST	33 COTTAGE ST	CHERRY ST	4	Fair	Fair	Good	Low
GLENN DR	23 GLENN DR	28 GLENN DR	4	Good	Good	Good	Low
GLENN DR	14 GLENN DR	PROSPECT ST	4	Fair	Good	Good	Low
PROSPECT ST	60 PROSPECT ST	26 PROSPECT ST	3	Poor	Fair	Good	Low