KELLEY'S CORNER BUSINESS DISTRICT

Circulation Plan

prepared for

TOWN OF ACTON
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February 28, 1997

Revised
January 29, 2001 (Planning Board)

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I. BACKGROUND AND OBJECTIVES

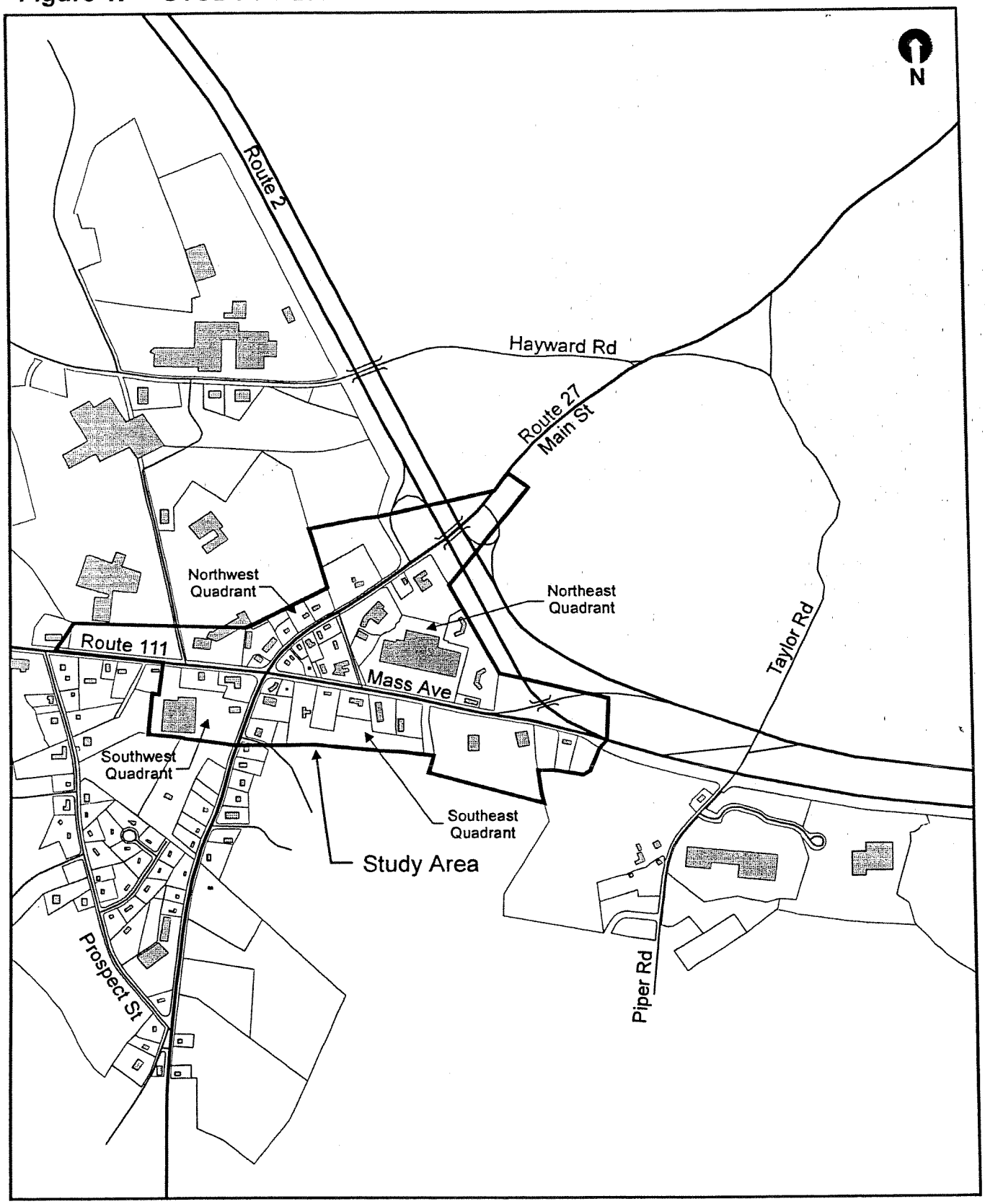
Currently, the mix and arrangement of the land uses in Kelley's Corner are typical of the pattern found at any major suburban crossroads near a highway interchange. The primary land uses are commercial, including a mix of retail and service establishments, auto-oriented businesses, professional services, restaurants, and office buildings. The two largest commercial buildings - Roche Brothers Supermarket and K-Mart - predominate. There are also single and multifamily residential uses, as well as a school and a historic building. Typical of suburban "strip" commercial development, density is quite low (0.15 FAR average for the area), with one- or two-story freestanding buildings set back from the street and surrounded by parking. The ratio of parking to developed area is quite high - 4.3 spaces per 1,000 square feet of commercial area - again, typical of a suburban commercial district. While sidewalks are provided along some of the street frontages, they are frequently interrupted by driveway curb cuts. Crosswalks are provided in several locations as well, but vehicular traffic predominates, and few pedestrians move about the area. In sum, Kelley's Corner is clearly an anonymous, auto-oriented district. While the area functions as a key commercial center for the Town of Acton, it is far from a friendly "village" in its visual appearance and overall image.

A. *Past Planning Efforts*

Designated in the Town of Acton's 1991 Master Plan as a concentrated growth center, the Kelley's Corner commercial area at the corner of Routes 27 and 111 in Acton was rezoned in 1996 as a mixed-use, compact-development center intended to provide a pedestrian-friendly environment. However, subsequent to issuance of the 1995 Specific Area Plan that proposed moderate density increases, it became desirable to look at whether even higher densities could be accommodated to meet planning goals and realize the vision of an "urban village." At the same time, concerns were raised about the traffic impacts of such a change. As a result, the Town of Acton has initiated this study of traffic and circulation at Kelley's Corner.

The study area for this Kelley's Corner Circulation Plan project is shown in **Figure 1.** The study area is essentially the same as sub-area A, as defined in the *Kelley's Corner Specific Area Plan,* but does not include the abutting sub-areas B, C, and D included in that study.

Figure 1. STUDY AREA



B. *Plan Objectives*

While the Specific Area Plan study provided a broad assessment of the implications of land use buildout in the Kelley's Corner area, this Circulation Plan study focuses on a more detailed analysis of Kelley's Corner and its immediate surroundings. The main goal of the plan is to provide a circulation plan that will accommodate projected growth while furthering the urban village character. The goals of the Kelley's Corner planning efforts are to attract business to the area and to achieve a sense of place and community pride in this business district. The Town's vision for Kelley's Corner, as expressed in the Town's zoning bylaw, is of an urban village design that emphasizes pedestrian circulation and amenities while maintaining reasonable vehicular capacities. In furtherance of these goals, specific project objectives outlined by the Town are:

- To prepare a detailed circulation plan that, when implemented, will support project goals in general and specifically will:
  - improve access to Kelley's Corner and internal circulation within Kelley's Corner for automobiles, bicycles, and pedestrians;
  - outline a practical balance between maximizing land use intensity in the Kelley's Corner business center and the traffic improvements/management steps to accommodate the land use intensity;
  - provide adequate and efficient automobile and bicycle parking to permit the maximum feasible land use intensity;
  - provide central and common/shared parking facilities;
  - allow automobile site access that will, to the largest extent possible, allow automobiles to enter and leave Kelley's Corner without passing through the Route 27/111 intersection;
  - minimize on-street automobile travel between destinations within Kelley's Corner;
  - provide adequate facilities to strongly encourage pedestrian circulation within Kelley's Corner and between its sub-areas;
  - maintain an acceptable level of service (no decrease desired) at the signalized intersection of Route 27/111;
  - manage through-traffic at acceptable levels of service while improving safety for all traffic participants and reducing vehicle-to-vehicle and vehicle-to-pedestrian conflicts;
  - discourage use of local bypasses around Kelley's Corner;

- result in the capture of through-traffic by local businesses; and
- provide guidance for future action by the Town to implement its goals for Kelley's Corner.

- To prepare a conceptual engineering design for the roadways in the Kelley's Corner core business district suitable for future TIP project submission. Primary focus of this design will be the Massachusetts Avenue and Main Street intersection. The design shall address current capacity needs and anticipated capacity needs in 20 to 30 years.

This plan includes conceptual engineering designs for the roadways as well as a detailed circulation plan based on forecasts of peak-period traffic volumes. The data and analyses upon which the plan is based are described in the following sections of this report.

II. EVALUATION OF EXISTING CONDITIONS

State Routes 27 and 111, which cross at Kelley's Corner in the center of the study area, each contain one travel lane in each direction. Within the study area, lane widths vary from 12 feet to 15 feet. There are no shoulders, and no on-street parking is provided on either roadway. Route 111 and Route 27 meet at a signalized intersection, where Route 111 widens to provide a left-turn lane and a through-right lane in each direction.

Sidewalks are provided along both sides of Route 111 west of Route 27 and along the north side of Route 111 east of Route 27. Along Route 27, sidewalks are provided on the west side of the roadway only. There is also a short section of sidewalk along the northeast corner of the Route 27/Route 111 intersection. Existing sidewalks in the study area are narrow and are generally in poor condition. There are signalized crosswalks on all four approaches of the Route 27/Route 111 intersection. In addition, unsignalized crosswalks are provided on Route 27 north and south of Route 111, and on Route 111 west of Route 27.

Local area roadways that provide connections between Routes 27 and 111 include Taylor Road, Hayward Road, Arlington Street, Prospect Street, School Street, and Piper Road. Each of these roadways provides one lane of travel in each direction. A private roadway connects Routes 27 and 111 through the northeast quadrant of the study area. The road is one lane in each direction and wide enough at each end to accommodate left and right turning lanes onto Routes 27 and 111.

A. *Existing Traffic Volumes*

A traffic count program was conducted on Saturday, September 28, and Tuesday, October 1, 1996, including three-hour turning movement counts at the Route 111/Route 27 intersection during the weekday A.M., weekday P.M., and Saturday mid-day peak periods. In addition, the intersection of the private road with Route 111 was counted in the P.M. peak

period. Weekday and Saturday 24-hour directional Automatic Traffic Recorder (ATR) counts were taken on each leg of the Route 27/Route 111 intersection.

ATR counts were taken on Prospect Street west of Route 27 and south of Route 111; Piper Road south of Route 111 and School Street east of Route 27; Taylor Road north of Route 2/111 and east of Route 27; and Hayward Road west of Route 27 and Arlington Street north of Route 111 during the week of November 4, 1996.

Weekday A.M. and weekday P.M. peak-period turning movement volumes at the intersections of Route 2 with Route 27 and with Route 111/Piper Road/Taylor Road were available from the Central Transportation Planning Staff (CTPS) for the year 1990. These counts were compared to the counts taken for this project in 1996 and to 1995 volumes for Route 2 produced by the CTPS traffic model. In all cases, the 1990 volumes were higher than the 1996 and 1995 volumes. Based on this comparison, the 1990 volumes are a conservative representation of existing conditions, and the application of a growth factor is not required. The 1990 volumes were used to represent 1996 conditions. Traffic count data and volume comparisons are included in **Appendix A.**

Turning movement volumes for the weekday A.M., weekday P.M., and Saturday mid-day peak hours are shown in **Figures 2, 3, and 4.** Weekday and Saturday total daily traffic volumes on Route 27 and Route 111 are shown in **Figure 5.** Of the three peak hours, the weekday P.M. peak hour experiences the highest total intersection volume, and the weekday A.M. peak hour the lowest. Total daily traffic on Route 27 is approximately 13–15% lower on Saturday than on weekdays, and on Route 111 Saturday volume is 4–11% lower. Peak-hour and total daily traffic volumes on Taylor Road, Hayward Road, Arlington Street, Prospect Street, School Street, and Piper Road are shown in **Figure 6.**

B. *Pedestrian and Bicycle Traffic*

Counts of pedestrian and bicycle traffic using the Route 27/Route 111 intersection crosswalks were taken during the same three peak periods. The observed volumes of pedestrians and bicycles were very low. Total counts were as follows: 13 pedestrians and 1 bicyclist in the weekday A.M. peak period, 15 pedestrians and 7 bicyclists in the weekday P.M. peak period, and 17 pedestrians and 18 bicyclists in the Saturday mid-day peak period.

C. *Origin–Destination Characteristics*

Two surveys were conducted to gain information on travel characteristics to, through, and within Kelley's Corner. A license plate survey was conducted at the boundaries of the study area to give an indication of what proportion of vehicles travel through or to and from Kelley's Corner, and how long vehicles destined for Kelley's Corner remain in the study area. In addition, a shopper questionnaire was developed and administered to Kelley's Corner patrons at a variety of establishments to determine travel characteristics within Kelley's Corner.

Figure 2. 1996 WEEKDAY A.M. PEAK-HOUR TRAFFIC VOLUMES

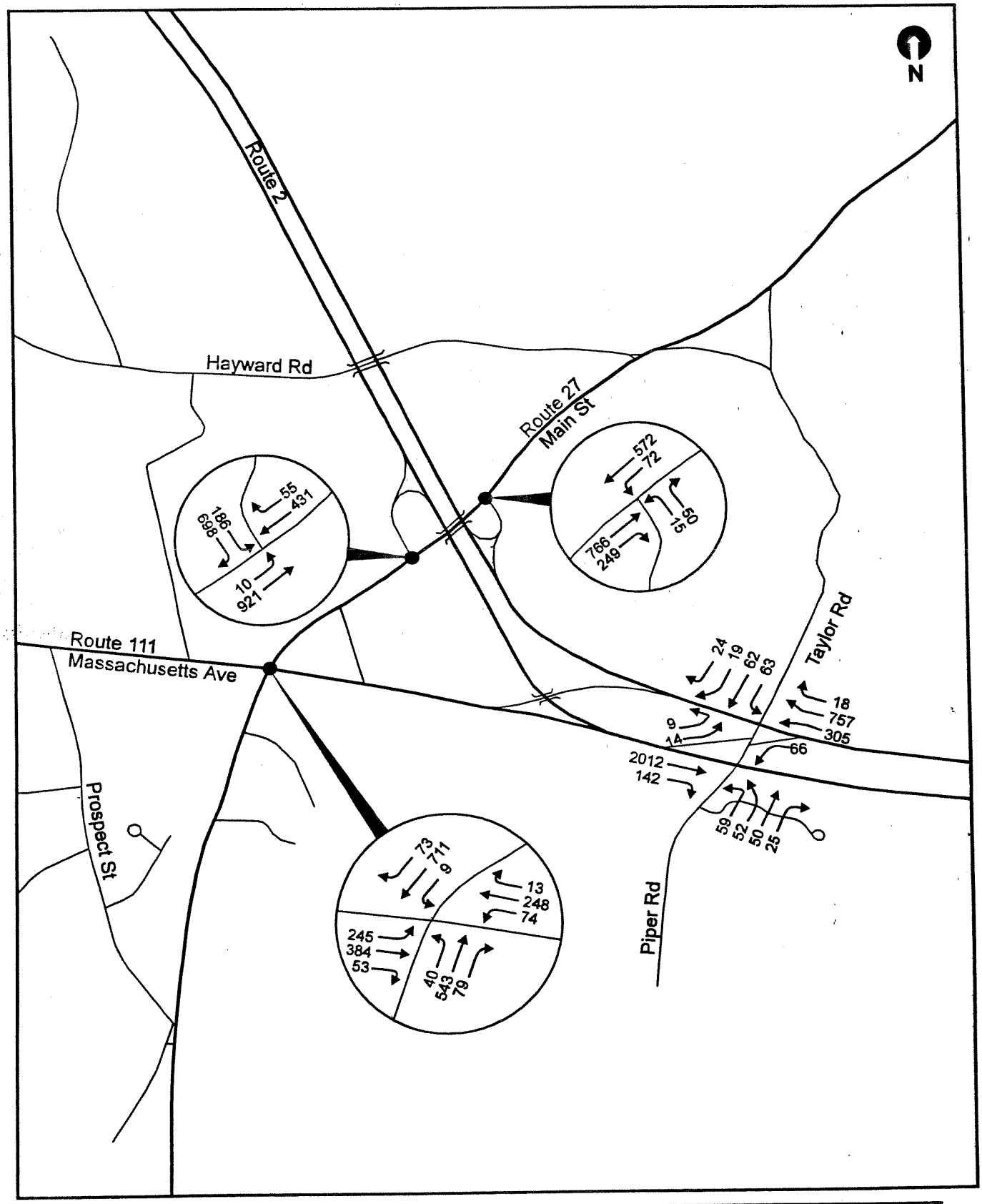


Figure 3. 1996 WEEKDAY P.M. PEAK-HOUR TRAFFIC VOLUMES

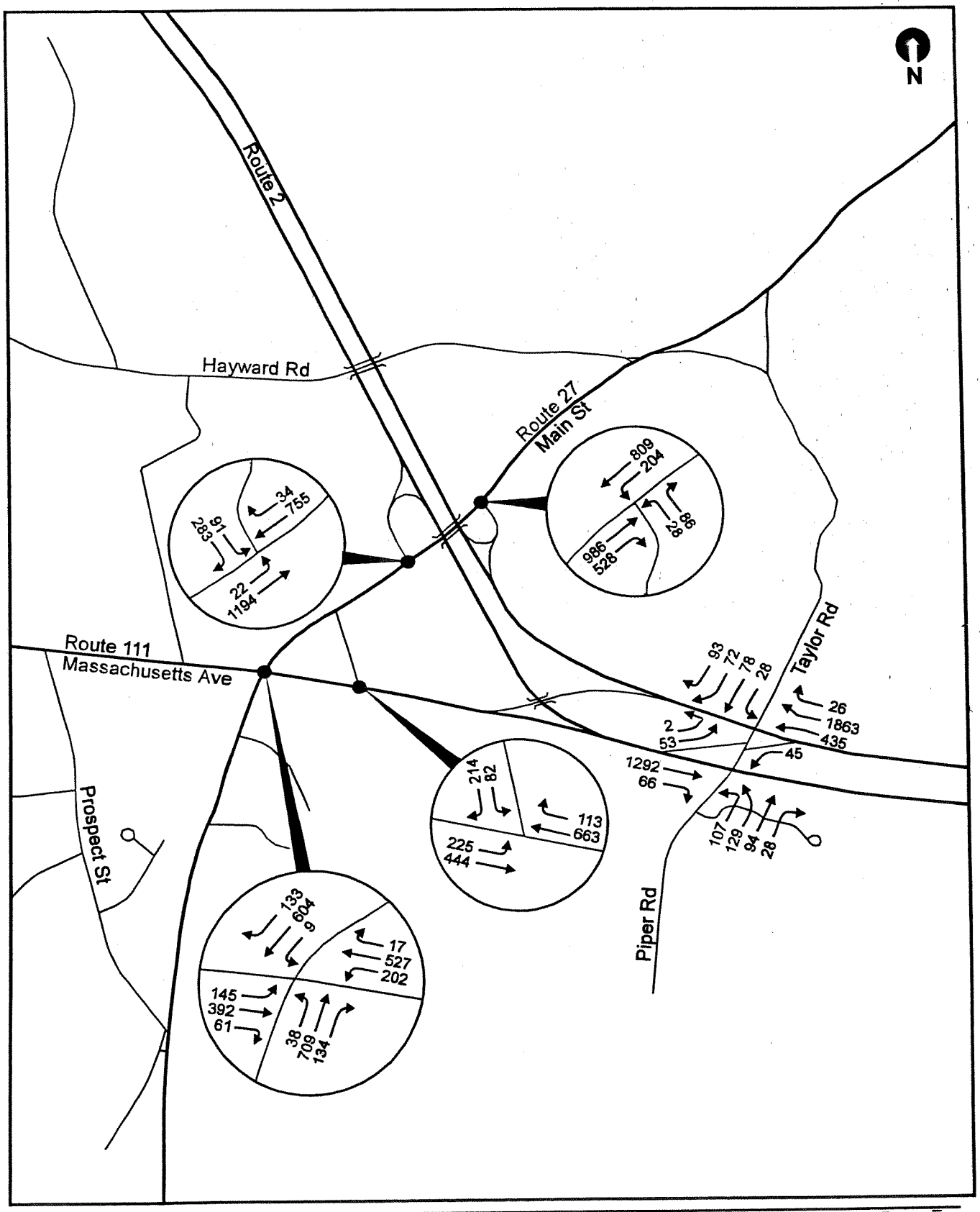


Figure 4. 1996 SATURDAY MID-DAY PEAK-HOUR TRAFFIC VOLUMES

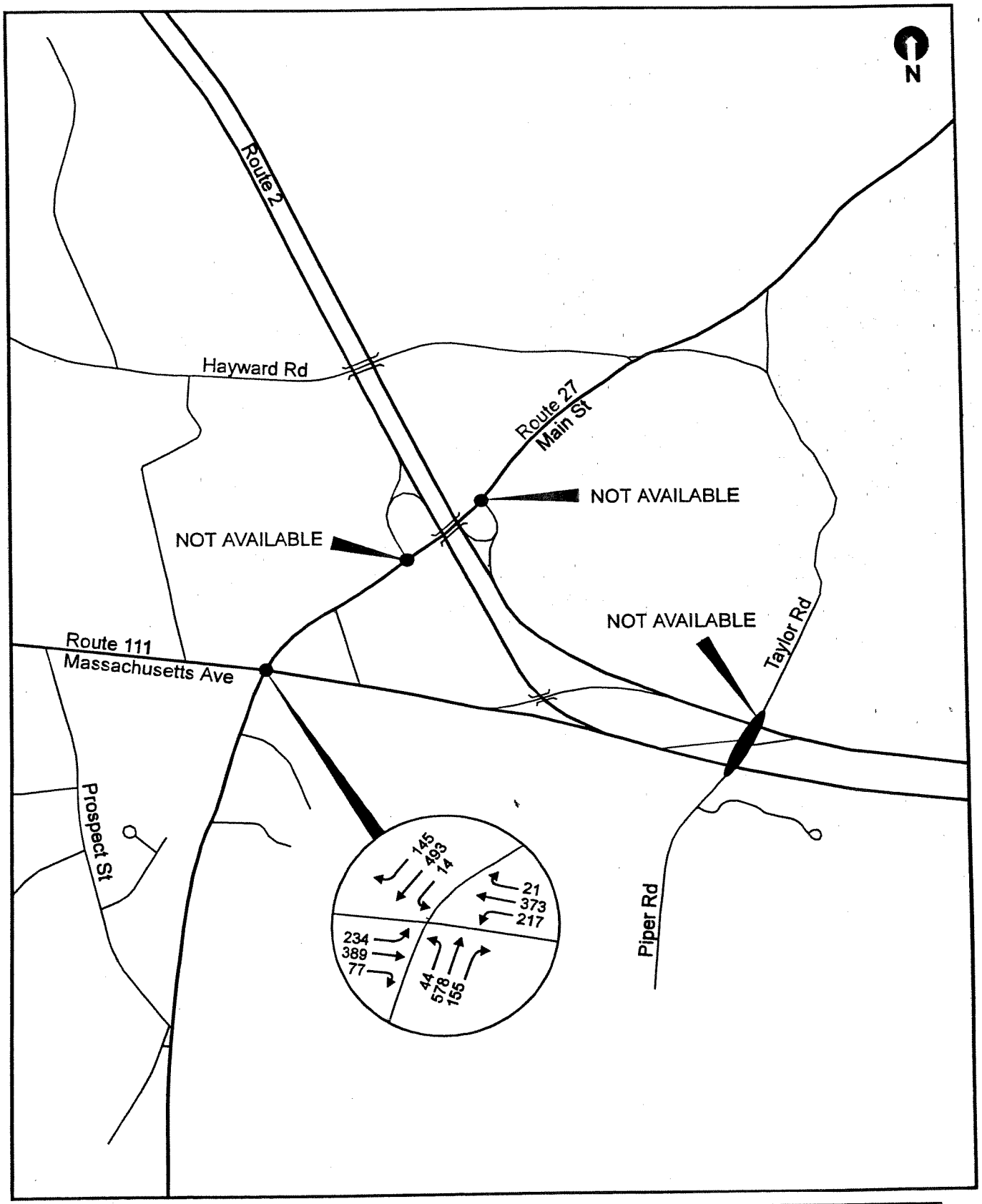


Figure 5. 1996 WEEKDAY AND SATURDAY 24-HOUR TRAFFIC VOLUMES

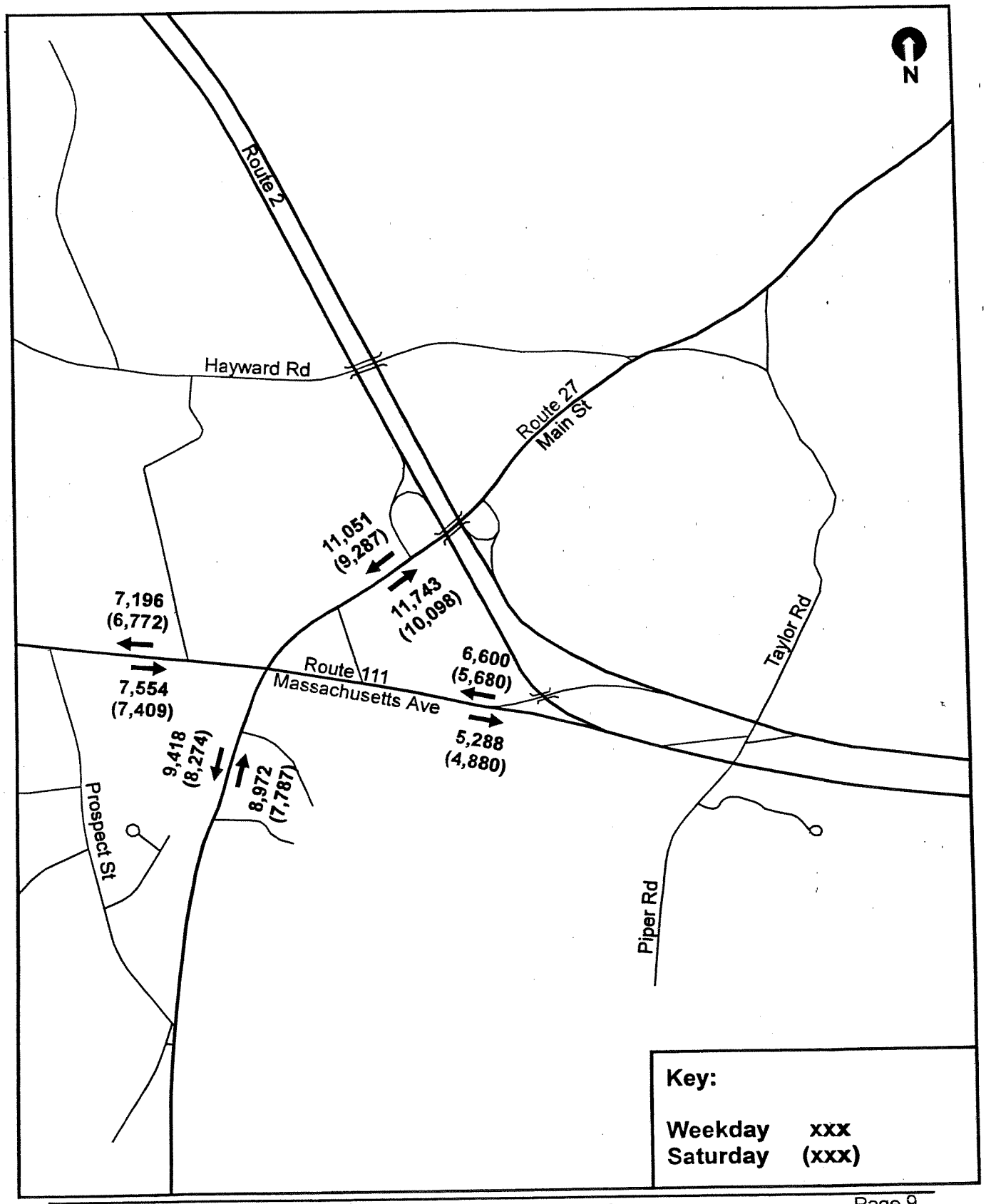
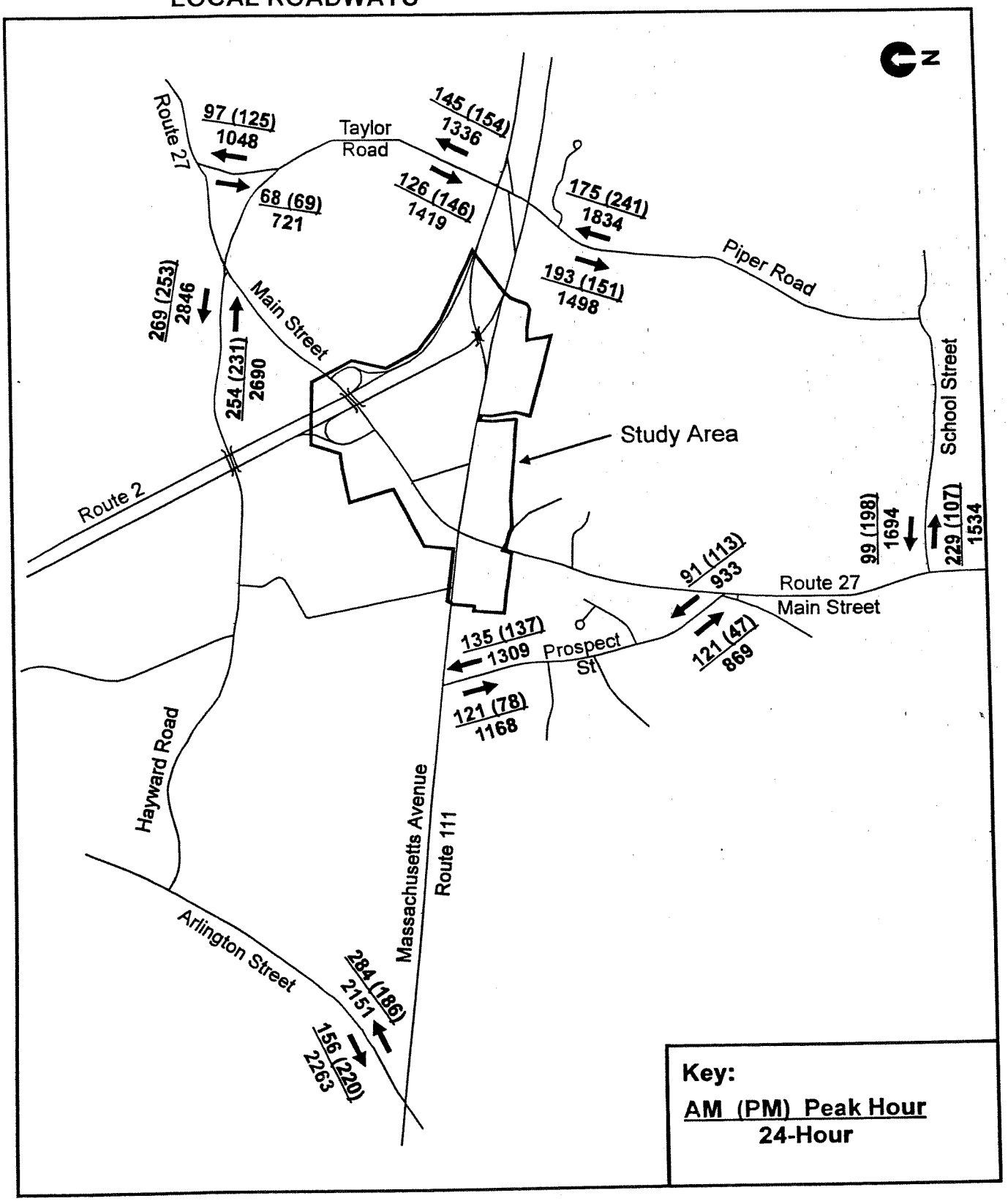


Figure 6. 1996 WEEKDAY PEAK-HOUR AND 24-HOUR VOLUMES ON LOCAL ROADWAYS



1. License Plate Survey

The license plate survey was conducted for three-hour intervals during the weekday A.M., weekday P.M., and Saturday mid-day peak periods. The weekday license plate surveys took place on Tuesday, October 1, 1996. The Saturday survey was conducted on October 12, 1996. Surveyors were placed at the four study area entry/exit points. License plates and corresponding times of observation were recorded for each direction at the entry/exit points. License plates on entering vehicles were matched to license plates on exiting vehicles, and the time elapsed between observations was calculated. Times less than five minutes were classified as through trips and times more than five minutes were classified as to/from trips (vehicles with a destination in Kelley's Corner).

A summary of results is presented below in **Table 1.** The results reflect common travel patterns. The peak period with the highest percentage of trips destined to and from Kelley's Corner is Saturday, reflecting a higher level of shopping activity and lower commuter traffic. To/from trips are lowest in the weekday A.M. peak period, reflecting the fact that many Kelley's Corner establishments are not open, but that employees and a small number of patrons are making trips. In the weekday P.M. peak period, the percentage of trips to/from Kelley's Corner is higher than in the weekday A.M. but not as prominent as the Saturday peak period. A description of the survey methodology and assumptions made in the data analysis is included in **Appendix B.**

Table 1. SUMMARY OF LICENSE PLATE SURVEY RESULTS

Peak Period	Through Trips	To/From Trips
Weekday A.M. Peak (7:00–10:00)	79%	21%
Weekday P.M. Peak (4:00–7:00)	72%	28%
Saturday Mid-day Peak (11:00 A.M.–2:00 P.M.)	64%	36%

2. Shopper Questionnaire

A personal shopper interview survey was conducted on Saturday, September 28, 1996. Altogether, 189 surveys were completed and analyzed. An approximately even number of males and females of varying ages responded. The results have been incorporated in efforts to forecast future travel within Kelley's Corner.

- The survey confirmed the initial hypothesis that almost all respondents to the survey (97%) drove to Kelley's Corner, including 1% of respondents who were dropped off. Only 1% walked, 1% biked, and 1% did not answer the question.

- Nearly three-quarters (74%) of respondents started their Kelley's Corner trips from home, with 4% coming from work, 2% from a store in another area, and 20% from other places. Of the respondents, 74% stated they were returning home as their next destination as well, indicating a high proportion of single purpose trips and a very low proportion of "pass-by trips." Pass-by trips generally can account for 25% or more of shopping center trips along busy traffic routes. In fact, 83% of the respondents said they had made a "specific trip" to Kelley's Corner, with only 17% stating that they were "passing through." The large proportion of single-purpose trips is probably due to the locally oriented nature of the businesses in the area, despite the high proportion of through traffic along Routes 27 and 111.

- Of those surveyed, 47% live in Acton, while another 33% live in towns immediately bordering Acton. Only 1% of respondents actually lived within Kelley's Corner, due to the relatively low number of residential uses in the study area itself.

- About half (49%) of the respondents made only one stop in Kelley's Corner, and 35% visited two businesses. Only 16% visited more than two businesses. Overall, an average of 1.22 trips were made per respondent.

- Of total trips to or within Kelley's Corner, the highest percentage (45%) were multiple stops within a single quadrant; in this case two-thirds of the trips were walk trips. The next highest percentage of trips (40%) was single stop trips. Only 15% were multiple stop trips made between quadrants; of these, 88% were auto trips and 12% walk trips. Thus, the contribution of traffic moving within (as opposed to through or to) Kelley's Corner on Routes 27 and 111 is actually quite low.

- Three-quarters (74%) of all the multiple stops and 54% of all stops were made within the northeast quadrant, where the supermarket (and the largest number of establishments) is located. This quadrant is the only location in which walking was the preferred mode of moving between businesses; here two-thirds of those making more than one trip walked, while only one-third drove. Very few multiple trips were made within any of the other quadrants.

- The next most popular combination of visits was between the northeast and southwest quadrants; this pair accounted for 17% of multiple trips and 10% of all trips. In this case, however, close to 100% of respondents drove between stops.

The findings of the survey had several implications for the development of the Circulation Plan:

- First, Kelley's Corner is serving a primarily local market, with 83% of the shoppers making a special-purpose trip to go there. The area, for whatever reason, is not attracting the share of regional traffic that might be expected at its busy location. Nevertheless, traffic destined specifically to Kelley's Corner accounts for only 28% of total area traffic on weekday evenings and 36% on Saturday. Given that such a high proportion of traffic on Routes 27 and 111 is through-traffic, marketing strategies might be developed to pull more of these vehicles in to shop at Kelley's Corner. To the extent that these vehicles are already traveling through the study area, they will become "pass-by" customers for shops and restaurants, spending money within the study area without adding new vehicle trips.

- Second, vehicular traffic on Routes 27 and 111 resulting from internal trips (trips that both start and end within the Kelley's Corner study area) represents a very small proportion of total traffic. Most multiple trips are made within the northeast quadrant, and two/thirds of these are made by walking. Only 15% of the total internal trips travel between quadrants. Thus, the traffic mitigation effect of pedestrian and design improvements that might convert these trips from drive to walk trips is likely to be small in terms of current traffic. In the future, however, such improvements might serve to encourage both more travel between quadrants and more walking for these trips.

- The number of multiple trips within Kelley's Corner is relatively low for a shopping center of its size—1.22 stops on average per customer. Changes in land use, density, and design could serve to add businesses within the area, to decrease walking distances between them, to improve pedestrian connections to and through parking lots, and to improve the convenience and safety of street crossings such that customers would stay in the area longer and visit more establishments. As in the point above, these changes might not serve to decrease traffic in any dramatic way. Nevertheless, they would help boost the economy of area businesses.

A copy of the questionnaire and a detailed summary of the results are included in **Appendix C.**

D. *Level of Service Analysis*

Levels of service of study area intersections were calculated using Highway Capacity Software (HCS). Queue lengths for the signalized intersections were calculated using the Massachusetts Highway Department (MHD) spreadsheet program. Level of service at an intersection is defined in terms of the average stopped delay per vehicle. Level of service

criteria, as presented in the 1994 *Highway Capacity Manual* for signalized and unsignalized intersections, are shown in **Tables 2 and 3** respectively.

Table 2. LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

Level of Service (LOS)	Stopped Delay per Vehicle (seconds)
A	≤ 5
B	>5 and ≤ 15
C	>15 and ≤ 25
D	>25 and ≤ 40
E	>40 and ≤ 60
F	> 60

Table 3. LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level of Service (LOS)	Stopped Delay per Vehicle (seconds)
A	≤ 5
B	>5 and ≤ 10
C	>10 and ≤ 20
D	>20 and ≤ 30
E	>30 and ≤ 45
F	> 45

1. Intersection Level of Service Analysis

Intersection level of service analysis was conducted for the three peak hours at the Route 27/Route 111 intersection. In addition, level of service analysis was done for the intersection of the private road with Route 111 in the weekday P.M. peak hour, and for the intersections of Route 2 with Route 27 and Route 111/ Piper Road/Taylor Road for the weekday A.M. and weekday P.M. peak hours. Results of the level of service analysis and queue length calculations are shown in **Table 4.** Level of service calculations are included in **Appendix D.**

The Route 27/Route 111 intersection operates at level of service 'C' in the weekday A.M. peak hour and at level of service 'F' in both the weekday P.M. and Saturday mid-day peak hours. A critical movement analysis was conducted to confirm the HCS level of service analysis results. The critical lane analysis also shows that the intersection is 'near capacity' in the weekday A.M. peak hour and

'over capacity' in the weekday P.M. and Saturday peak hours. In addition, the calculated queue lengths reflect what has been observed in the field.

The intersection of Piper and Taylor roads with Route 2/111 operates at level of service 'F' in both the weekday A.M. and weekday P.M. peak hours.

The intersection of the private road with Route 111 operates at level of service 'B' in the weekday P.M. peak hour, but the left turn from the private road operates at level of service 'F.' This intersection is representative of conflicts experienced by vehicles at all driveways in the study area during the weekday P.M. peak hour. Vehicles have difficulty turning onto the major roadways due the high volumes of traffic, as is typical of many suburban areas served by roadways that carry high levels of through-traffic.

Left turns to the Route 2 ramps operate at level of service 'C' or better in both weekday peak hours. Right turns from the ramps operate at level of service 'C' or better except from the eastbound ramp in the weekday A.M. peak hour, which operates at level of service 'E.' Left turns from the eastbound and westbound ramps operate at levels of service 'E' and 'C' in the weekday A.M. peak hour respectively. Left turns from both ramps operate at level of service 'F' in the weekday P.M. peak hour, due to the high volume of traffic on Route 27.

2. Roadway Segment Level of Service Analysis

Although level of service tends to be more critical at intersections, a roadway segment level of service analysis was also conducted for Route 27 and Route 111 on the four approaches to Kelley's Corner.[1] The methodology uses a base two-way capacity of 2,800 vehicles per hour on a two-lane roadway, which is then adjusted for factors such as directional split, vehicle composition, and terrain. Results of the roadway segment level of service analysis are shown in **Table 5.** Level of service analysis calculations are included in **Appendix E.**

Route 111 east of Route 27 operates at level of service 'D' in all three peak hours. West of Route 27, it operates at level of service 'D' in the weekday A.M. peak hour and level of service 'E' in the weekday P.M. and Saturday mid-day peak hours. Route 27 north of Route 111 is near capacity, and Route 27 north and south of Route 111 operates at level of service 'E' in all three peak hours. These results indicate that segment levels of service are less critical than at intersections. The segment levels themselves do not indicate much excess capacity, particularly on Route 27 north of Route 111. In addition, the results confirm the presence of fewer gaps for side street traffic to enter the traffic stream.

[1] Despite some divergence of opinion concerning the applicability of segment analysis to roadways operating at speeds as low as on Routes 27 and 111, such analysis was considered appropriate to give another indication of roadway conditions.

Table 4. 1996 INTERSECTION LEVEL OF SERVICE ANALYSIS

Intersection	Weekday A.M. Peak Hour			Weekday P.M. Peak Hour			Saturday Mid-day Peak Hour		
	Delay[1]	LOS[2]	Queue[3]	Delay	LOS	Queue	Delay	LOS	Queue
Signalized Intersections									
Route 27/Route 111									
EB Route 111	30.1	D	33	*	F	30	*	F	30
WB Route 111	15.0	B/C	14	*	F	34	*	F	35
NB Route 27	19.8	C	26	*	F	56	*	F	40
SB Route 27	12.1	B	26	19.6	C	25	15.7	C	21
Total Intersection	**19.5**	**C**		*	**F**		*	**F**	
Route 2/111/ Piper/Taylor									
EB Route 2/111	36.4	D		12.1	B				
WB Route 2	11.5	B	na	*	F	na	not available		
NB Piper Road	*	F		*	F				
SB Taylor Road	46.0	E		*	F				
Total Intersection	*	**F**		*	**F**				
Unsignalized Intersections									
Route 111/ Private road									
SB Left Turn	not available			105.8	F	4	not available		
SB Right Turn				9.8	B	2			
EB Left Turn				8.8	B	2			
Total Intersection				**7.3**	**B**				
Route 27/ Route 2 EB Ramps									
EB Left Turn	43.6	E	5	110.1	F	5	not available		
EB Right Turn	30.6	E	13	13.8	C	4			
NB Left Turn	3.5	A	0	5.4	B	0			
Total Intersection	**12.8**	**C**		**5.9**	**B**				
Route 27/ Route 2 WB Ramps									
WB Left Turn	16.8	C	1	472.1	F	3	not available		
WB Right Turn	6.5	B	1	9.4	B	1			
SB Left Turn	5.6	B	1	11.1	C	2			
Total Intersection	**0.6**	**A**		**6.2**	**B**				

* Methodology does not produce calculation of delay and LOS under these conditions.

Notes for **Table 4:**
[1] Average vehicle delay in seconds.
[2] Level of service.
[3] 95th percentile queue in vehicles.

Table 5. 1996 ROADWAY SEGMENT LEVEL OF SERVICE ANALYSIS

Roadway Segment	Two-way Volume	v/c ratio[2]	LOS
Route 111 — East of Route 27			
Weekday A.M. Peak Hour	893	.51	D
Weekday P.M. Peak Hour	1000	.54	D
Saturday Mid-day Peak Hour	908	.49	D
Route 111 — West of Route 27			
Weekday A.M. Peak Hour	1015	.57	D
Weekday P.M. Peak Hour	1294	.66	E
Saturday Mid-day Peak Hour	1313	.64	E
Route 27 — South of Route 111			
Weekday A.M. Peak Hour	1465	.71	E
Weekday P.M. Peak Hour	1677	.77	E
Saturday Mid-day Peak Hour	1444	.70	E
Route 27 — North of Route 111			
Weekday A.M. Peak Hour	1751	.79	E
Weekday P.M. Peak Hour	2022	.89	E
Saturday Mid-day Peak Hour	1932	.89	E

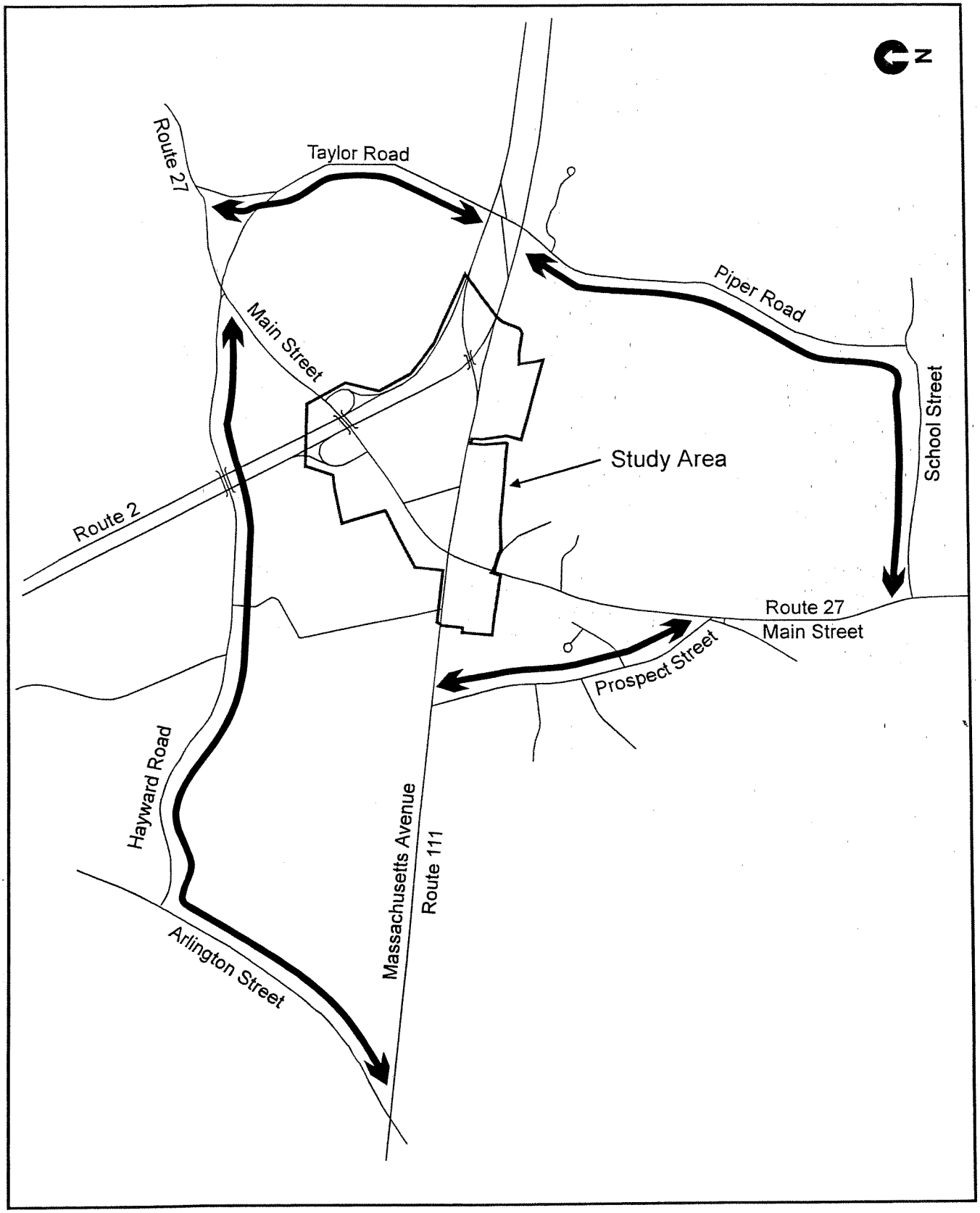
E. *Bypass Traffic*

Four primary routes may be used to avoid Kelley's Corner due to congestion at the Route 27/ Route 111 intersection. Each of these bypass routes is described below, as well as the likelihood of their use to bypass Kelley's Corner. The bypass routes are illustrated in **Figure 7.**

Prospect Street — The use of Prospect Street to travel between Route 27 and Route 111 is expected because it is an actual short-cut. The travel distance is somewhat shorter via Prospect Street (.6 mile) than via Route 27 and Route 111 (.8 mile). Some vehicles may use Prospect Street to avoid the Kelley's Corner signal, particularly when traveling northbound on Route 27 to westbound on Route 111, because the northbound left turn from Route 27 to Route 111 is difficult. However, to use Prospect Street northbound to avoid Kelley's Corner, vehicles must make two left turns: one from Route 27 to Prospect Street and one from Prospect Street to Route 111. Neither of these left turns is particularly easy, given the high volumes of traffic on Routes 111 and 27. In addition, it was observed that some vehicles cut through the K-Mart/McDonald's parking lot to avoid the northbound left turn at Kelley's Corner.

[2] Volume/capacity ratio

Figure 7. KELLEY'S CORNER BYPASS ROUTES



Any use of Prospect Street to bypass Kelley's corner from eastbound Route 111 to southbound Route 27 is more likely the result of the shorter distance, rather than a desire to avoid Kelley's Corner.

Piper Road/School Street — Piper Road and School Street can be used as a bypass to Kelley's Corner by vehicles traveling between Route 2/111 and Route 27. The distance via Piper Road and School Street is slightly shorter than via Kelley's Corner (1.4 miles v. 1.7 miles). From westbound Route 2, the westbound left turn onto Piper Road has its own signal phase and may therefore be somewhat 'easier' to perform than the westbound left turn at Kelley's Corner. However, there is a relatively long wait for this light to turn green, thus lessening the attractiveness as a bypass route. In addition, the use of Piper Road/ School Street requires a second left turn to be made onto Route 27. This left turn is difficult in the peak hours due to the high volume of traffic on Route 27. In the reverse direction, bypassing Kelley's Corner by using School Street and Piper Road does not appear to be more or less difficult than traveling through Kelley's Corner. There are long queues on northbound Route 27, but there are also delays at Piper Road and Route 2.

Taylor Road — Taylor Road would not be used to bypass Kelley's Corner, since there is an exit from Route 2 to Route 27. It is possible that vehicles use Taylor Road to travel to and from Route 27 instead of using the exit from Route 2.

Hayward Road/Arlington Street — Hayward Road and Arlington Street can be used to bypass Kelley's Corner to travel between Route 27 and Route 111. This is the longest of the four potential bypass routes, and the travel distance is the same as the route via Kelley's Corner (1.8 miles). In the eastbound direction, the left turn from Route 111 to Route 27 is difficult. However, to use Arlington Street and Hayward Road, two left turns are required: one from Route 111 to Arlington Street and one from Hayward Road to Route 27. Vehicles will experience a delay to turn left from Hayward Road to Route 27.

The traffic volumes on all of the above roadways are low during the weekday A.M. and weekday P.M. peak hours (see **Figure 6),** which are the times that vehicles would be most likely to seek bypass routes around Kelley's Corner. The local roadways provide access to residential and business areas, and none of the roadways appears to have levels of traffic that would suggest that these roads are extensively used as bypass routes.

F. *Parking*

An inventory of off-street parking spaces within the study area was conducted by Town of Acton personnel. **Table 6** summarizes the number of spaces by area of Kelley's Corner. Under existing conditions, the parking supply appears to be adequate and appears to meet parking demand.

Table 6. EXISTING FLOOR AREA AND OFF-STREET PARKING

Quadrant	Non-residential Floor Area	Number of Spaces[1]	Spaces[1]/1,000 Square Feet
Southwest (K-Mart, McDonald's)	81,816	371	4.5
Northwest (Law Office, Hosmer House)	6,135	13	2.1
Northeast (Sunoco, Acton Medical, Acton Plaza)	208,434	836	4.0
Southeast (Bowladrome, Baybank to Route 2)	84,718	432	5.1
Total	**381,103**	**1,652**	**4.3**

[1] Includes non-residential parking spaces only.

The total non-residential development in Kelley's Corner under existing conditions is approximately 380,000 square feet. Based on the above parking inventory, the average parking supply for the entire study area is approximately 4.3 spaces per 1,000 square feet of development. This level is higher than the provisions required for the Kelley's Corner Business District in the zoning bylaws of 2.3 spaces/1,000 square feet for retail, 2.1 for a shopping center, and 2.8 for office use.

As a comparison to the zoning requirements for parking, Institute of Transportation Engineers (ITE) parking generation rates for office and retail are 2.6 and 3.2 respectively. The ITE rate for office is actually slightly lower than the adjusted Kelley's Corner district requirement but higher than the 50% shared parking requirement. As office parking requires all day spaces, the shared parking ratio should be carefully examined based on the proportion of office use to retail use projected for buildout conditions. The ITE rate for retail is essentially equal to the standard town of Acton requirement of 3.3 for retail, and the lower Kelley's Corner district zoning requirement reflects special conditions in the Kelley's Corner district.

III. 2010 NO-BUILD CONDITIONS

The future analysis year chosen by the project team and the Planning Committee is 2010. The future analysis year is not intended to create a time frame for future development but to provide a reasonable base upon which traffic analysis can be built, given regional forecasts currently available. CTPS is using 2010 as the base year for the Route 2 Corridor Study.

The no-build scenario assumes that there will be no significant change in the rate of development buildout or the types of land use in the Kelley's Corner area. It is assumed that growth under no-build conditions would be consistent with regional growth. It is important to recognize that this is a different scenario than buildout under existing zoning, which would reflect greater traffic growth (as was assessed in the *Kelley's Corner Specific Area Plan* study). However, it is unlikely that buildout under existing zoning will be pursued, since the goal of this study is to identify what level of development, in combination with study area improvements, can be accommodated.

Hence, the no-build scenario represents a "baseline" future condition, under which traffic volumes in the study area would change roughly in accordance with background growth.

A. *Traffic Volumes*

To represent 2010 no-build conditions, existing traffic volumes were adjusted by a growth factor derived from trends reflected in recent traffic counts as well as from available population and employment forecasts developed by the Metropolitan Area Planning Council (MAPC) and used by CTPS for its ongoing Route 2 analyses. Historic traffic count data, obtained from the CTPS studies, the Massachusetts Highway Department, and other consultant studies in the general area suggest that traffic volume growth exhibited a stable or even negative trend in the years 1990 through 1995, after a number of years of consistent growth in the 1980s. This trend appears now to be reversing again, albeit slowly.

At the same time, population and especially employment in a number of towns surrounding Acton also experienced no growth, or even a decline, between 1990 and 1995. The most recent MAPC population and employment forecasts indicate expected growth in numbers of households of less than 1% annually to year 2010 for Acton and towns to the east. Employment growth within Acton itself is similarly forecast at slightly less than 1% per year, and Concord, Lexington, Bedford, and other nearby towns show similar low projected growth rates. It should be noted that traffic volumes do not necessarily directly track localized socioeconomic growth projections, but anticipated population and employment growth does give a reasonable basis for estimating traffic growth trends in the absence of full network analyses.

To be conservative, therefore, a background growth factor of 1% per year (total adjustment 14%) was applied to the counted ADT traffic volumes to derive an estimate of year 2010 no-build traffic. A slightly smaller factor (10%) was applied to adjust weekday A.M. and P.M. peak-hour volumes to the future analysis year. The use of a slightly smaller factor for adjusting peak-hour volumes is justified, because volumes during peak hours typically grow more slowly than daily traffic volumes as a result of capacity constraints. Rather, as congestion increases at peak commuting times, these peak demand conditions tend to persist for longer periods of the day.

The resulting year 2010 no-build volumes are shown in **Figures 8 through 11.**

Figure 8. 2010 NO-BUILD WEEKDAY A.M. PEAK-HOUR TRAFFIC VOLUMES

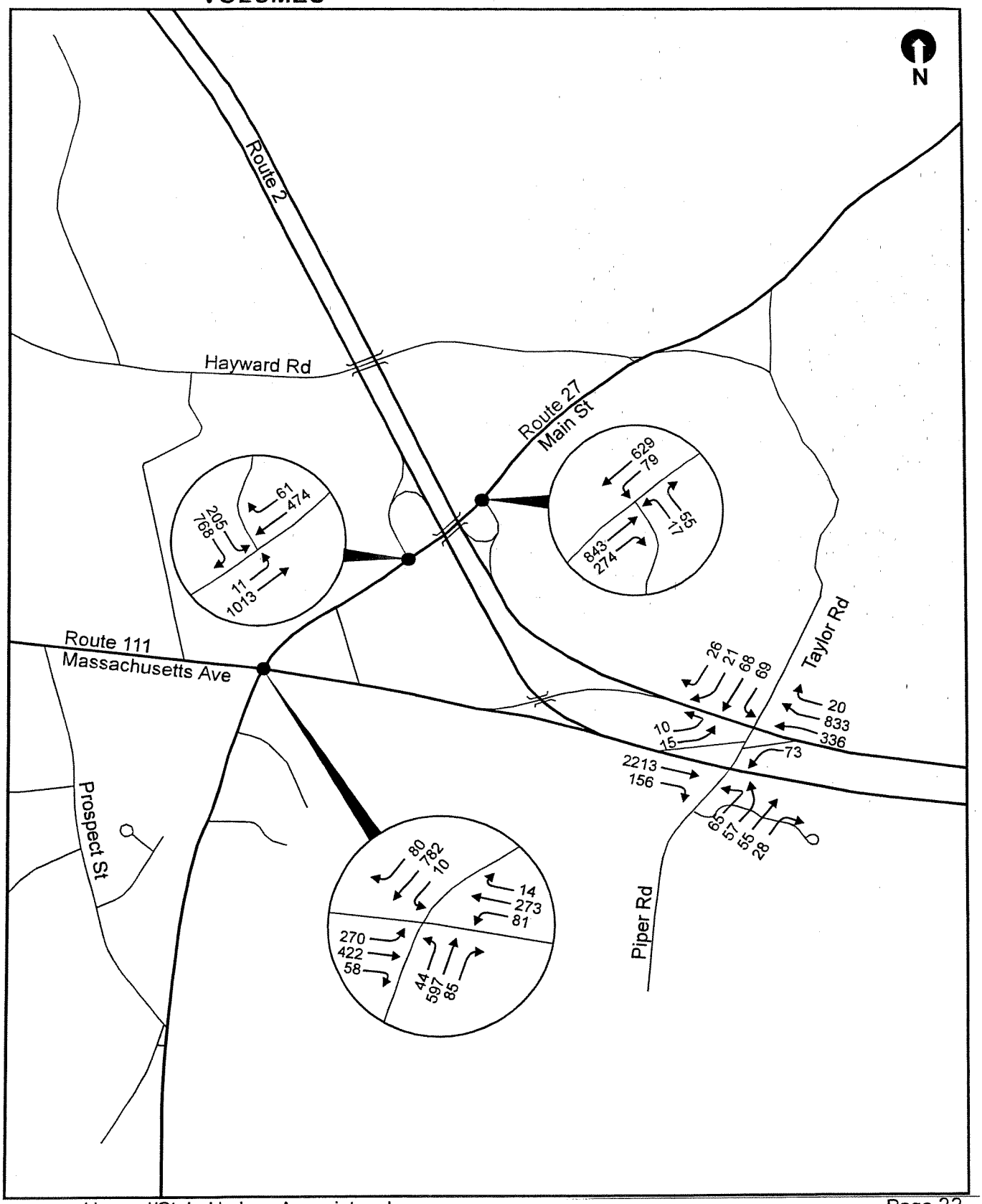


Figure 9. 2010 NO-BUILD WEEKDAY P.M. PEAK-HOUR TRAFFIC VOLUMES

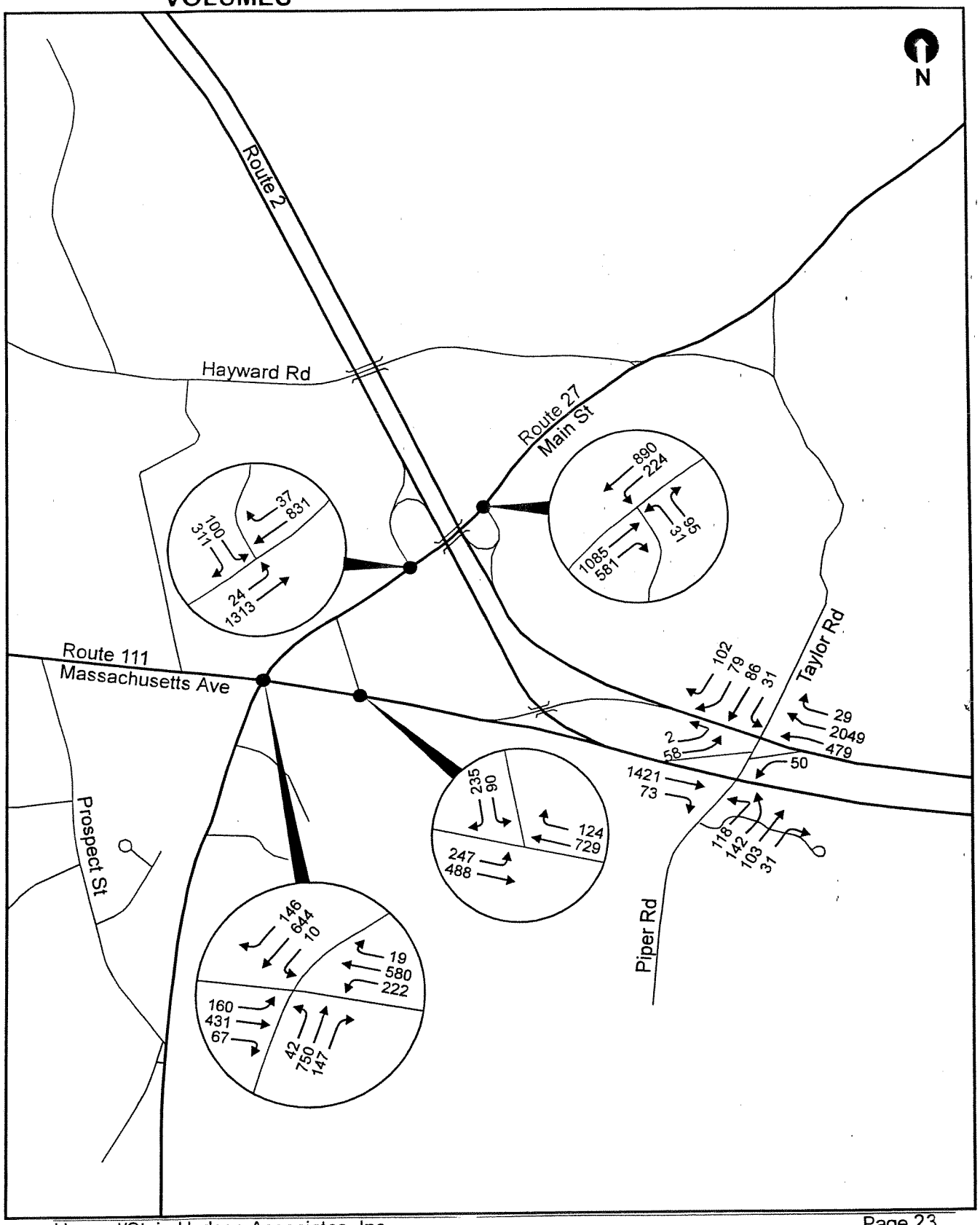


Figure 10. 2010 NO-BUILD SATURDAY MID-DAY PEAK-HOUR TRAFFIC VOLUMES

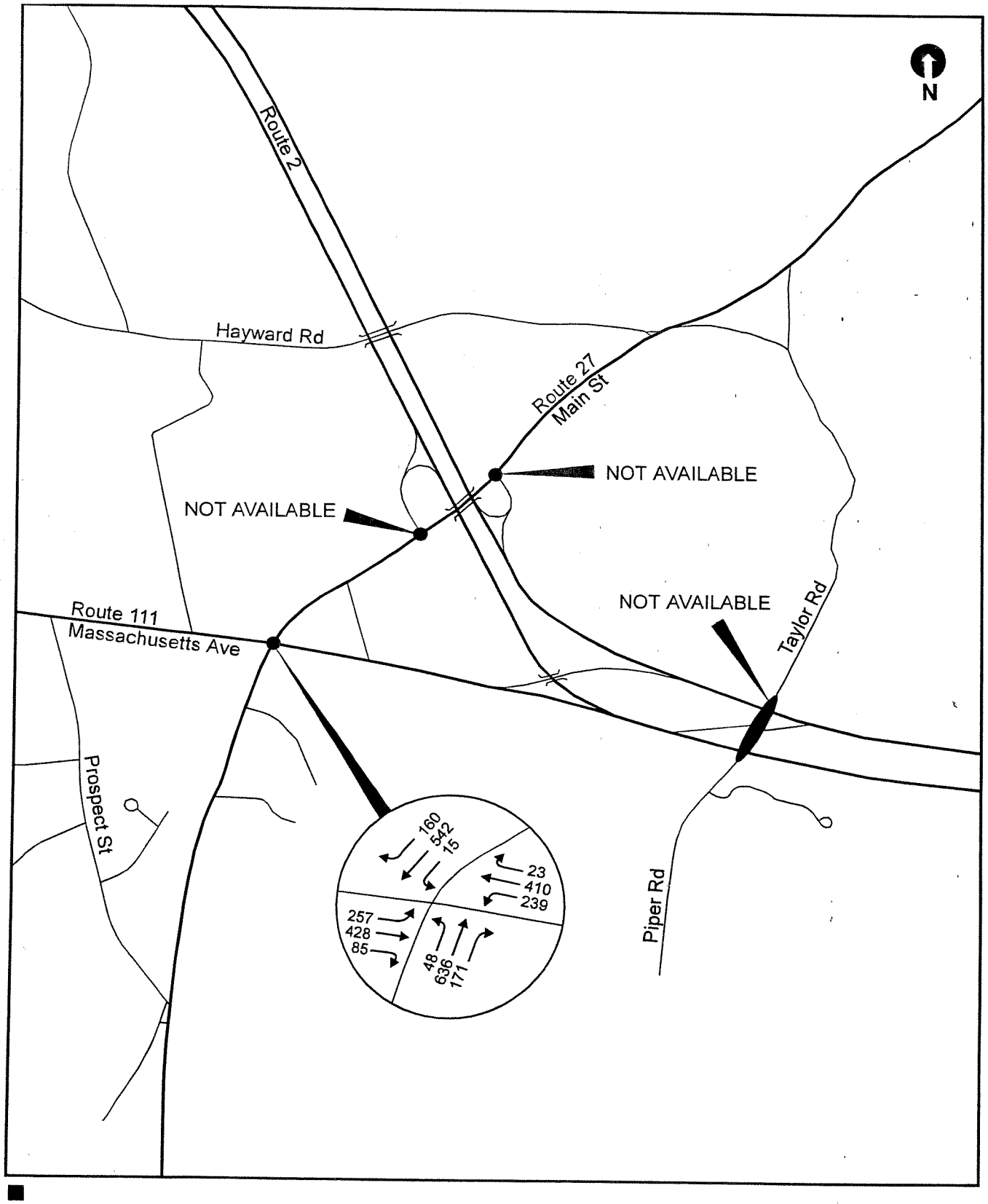
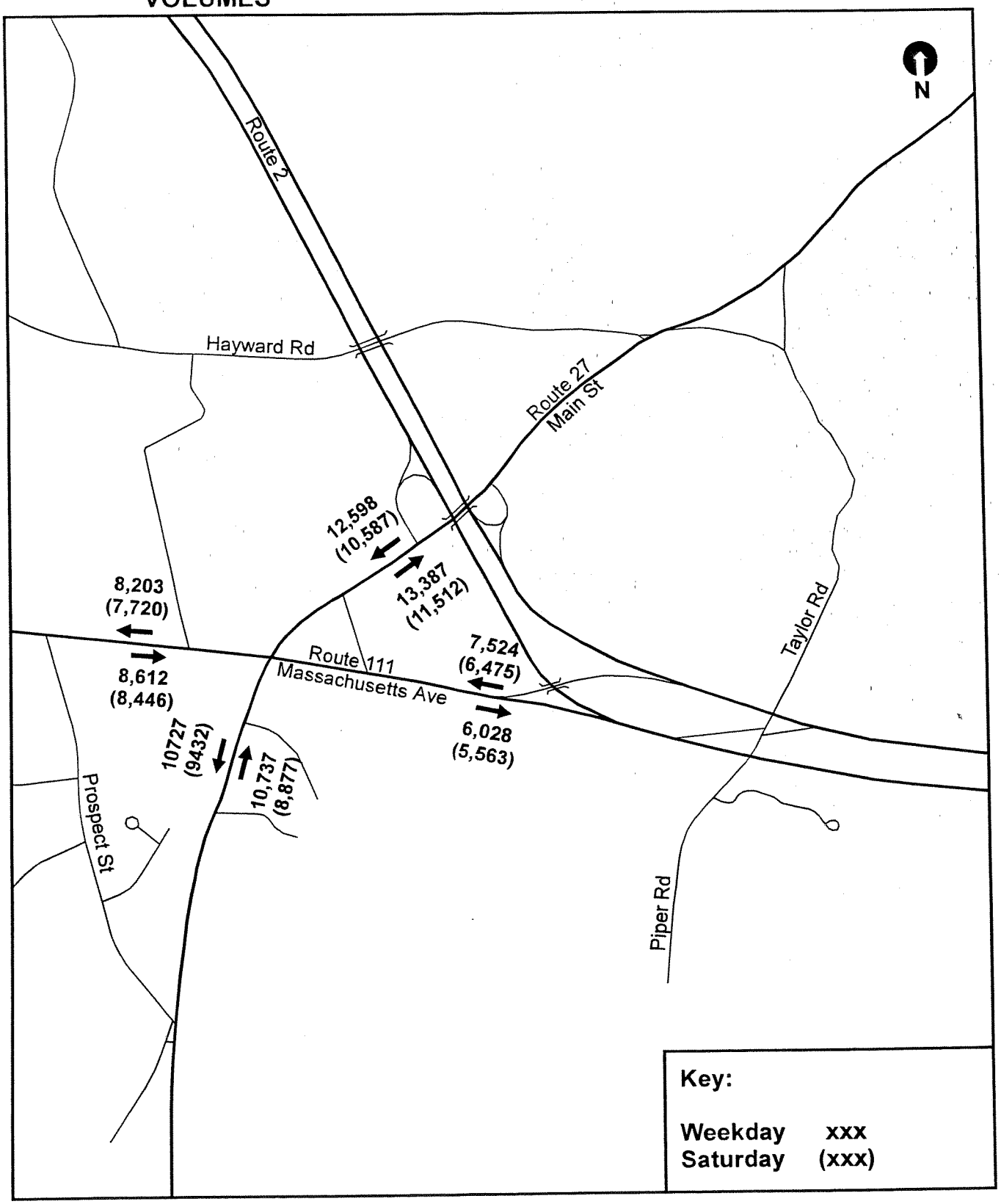


Figure 11. 2010 NO-BUILD WEEKDAY AND SATURDAY 24-HOUR TRAFFIC VOLUMES



B. *Pedestrian and Bicycle Traffic*

Under no-build conditions, no significant increase in pedestrian or bicycle traffic is expected.

C. *Level of Service Analysis*

Intersection and roadway segment level of service analyses were conducted for no-build conditions in accordance with the methodologies described for existing conditions. Results are shown in **Tables 7 and 8.** Level of service calculations are included in **Appendices F and G**. As expected, levels of service are projected to worsen with the projected increases in traffic volumes. The Route 27/111 intersection is projected to drop from level of service 'C' to level of service 'F' in the weekday A.M. peak hour. The intersection of Route 2/111/Piper Road/Taylor Road is projected to remain at level of service 'F' with increased delays.

The unsignalized intersection of the private road with Route 111 is projected to drop from level of service 'B' to level of service 'D' in the weekday P.M. peak hour, with a large increase in delay to vehicles turning left from the private road onto Route 111. At Route 27 and the eastbound Route 2 ramp, the level of service is projected to drop from 'C' to 'D' in the weekday A.M. peak hour and from 'B' to 'C' in the weekday P.M. peak hour. At the Route 2 westbound ramp, level of service is projected to remain at 'A' in the weekday A.M. peak hour but drop from B to F in the weekday P.M. peak hour. This projected drop in level of service is due to the very long delay projected for vehicles turning left from westbound Route 111 onto Route 27.

The results of the roadway segment analysis also show a projected decrease in level of service. With the exception of Route 111 east of Route 27 in the weekday A.M. and Saturday peak hours, all roadway segments are projected to operate at level of service 'E' in all peak hours. Route 27 north of Route 111 is essentially at capacity in the weekday P.M. and Saturday peak hours. Again, however, it is the levels of service and roadway operations at intersections that are more critical than the roadway segments.

Table 7. 2010 NO-BUILD INTERSECTION LEVEL OF SERVICE ANALYSIS

Intersection	Weekday A.M. Peak Hour			Weekday P.M. Peak Hour			Saturday Mid-day Peak Hour		
	Delay[1]	LOS[2]	Queue[3]	Delay	LOS	Queue	Delay	LOS	Queue
Signalized Intersections									
Route 27/Route 111									
EB Route 111	*	F	43	*	F	36	*	F	44
WB Route 111	28.3	D	19	*	F	46	*	F	46
NB Route 27	28.2	D	31	*	F	76	*	F	59
SB Route 27	15.7	C	31	26.4	D	29	20.3	C	25
Total Intersection	*	**F**		*	**F**		*	**F**	
Route 2/111/ Piper/Taylor									
EB Route 2/111	*	F		13.2	B		not available		
WB Route 2	12.2	B	na	*	F	na			
NB Piper Road	*	F		*	F				
SB Taylor Road	85.4	F		*	F				
Total Intersection	*	**F**		*	**F**				
Unsignalized Intersections									
Route 111/ Private road									
SB Left Turn	not available			377.9	F	8	not available		
SB Right Turn				12.2	C	3			
EB Left Turn				11.0	C	3			
Total Intersection				**20.7**	**D**				
Route 27/ Route 2 EB Ramps									
EB Left Turn	85.7	F	8	308.3	F	8	not available		
EB Right Turn	64.1	F	20	19.4	C	5			
NB Left Turn	3.7	A	0	5.9	B	0			
Total Intersection	**26.4**	**D**		**14.1**	**C**				
Route 27/ Route 2 WB Ramps									
WB Left Turn	20.9	D	1	*	F	*	not available		
WB Right Turn	7.1	B	1	11.1	C	1			
SB Left Turn	6.3	B	1	14.7	C	3			
Total Intersection	**0.7**	**A**		*	**F**				

* Methodology does not produce calculation of delay and LOS under these conditions.

Notes for **Table 7:**
[1] Average vehicle delay in seconds.
[2] Level of service.
[3] 95th percentile queue in vehicles.

Table 8. 2010 NO-BUILD ROADWAY SEGMENT LEVEL OF SERVICE ANALYSIS

Roadway Segment	Two-way Volume	v/c ratio[3]	LOS
Route 111 — East of Route 27			
Weekday A.M. Peak Hour	982	.57	D
Weekday P.M. Peak Hour	1100	.59	E
Saturday Mid-day Peak Hour	999	.54	D
Route 111 — West of Route 27			
Weekday A.M. Peak Hour	1116	.58	E
Weekday P.M. Peak Hour	1423	.70	E
Saturday Mid-day Peak Hour	1444	.70	E
Route 27 — South of Route 111			
Weekday A.M. Peak Hour	1612	.76	E
Weekday P.M. Peak Hour	1845	.85	E
Saturday Mid-day Peak Hour	1588	.76	E
Route 27 — North of Route 111			
Weekday A.M. Peak Hour	1926	.87	E
Weekday P.M. Peak Hour	2224	.97	E
Saturday Mid-day Peak Hour	2125	.97	E

D. *Bypass Traffic*

The extent to which bypass traffic volumes, which are relatively low today, will increase under future no-build conditions is a function of the level of congestion at the major Routes 27/111 intersection. In the weekday A.M. peak hour, the intersection level of service is predicted to deteriorate from level of service 'C' to level of service 'F'—a significant worsening of conditions. Average queuing on eastbound Route 111 would increase from 33 to 43 cars—about an additional 200 feet, and queue lengths on the other approaches would increase by about 5 cars—about an additional 100 feet.

This increase of congestion is likely to have two effects. First, the time of travel might be altered such that the peak period would become longer. Second, bypass traffic might increase. Since alternate routes do not offer significant travel time advantages, it is not likely that bypass traffic increases will be dramatic, however. In the weekday P.M. peak hour, the intersection is already operating at level of service 'F', such that average queues are already longer than in the weekday A.M. peak hour. In this case, the worst impact of no-build traffic is to add 20 cars to the northbound Route 27 queue. Again, such an increase is sufficient to influence both the time of the trip and the likelihood to use bypass

[3] Volume/capacity ratio

routes. On Saturday, midday peak hour queues also will increase significantly under no-build conditions; here, it is more likely that the timing of trips will be changed since there is more flexibility for weekend midday trips.

The conclusion is that the worse conditions become at the Route 27/111 intersection, the longer the peak hour will extend and the more likely drivers will be to bypass the area.

IV. 2010 BUILD CONDITIONS

A primary goal of the Kelley's Corner circulation plan study was to determine the maximum FAR that could be supported by area roadways with reasonable traffic improvements, while maintaining acceptable levels of service and improving the area's character through urban design and improved pedestrian and bicycle environments. Existing zoning bylaws permit FARs of up to 0.4 when special requirements are met. The original intent for this study was to test FAR scenarios of 0.6 and 0.8 for the study area. However, results of the FAR 0.6 analysis showed that significant improvements to area roadways would be required to support even this level of development, and testing a higher development density became undesirable from a traffic standpoint.

In addition to traffic considerations, there are many land use, physical and economic factors that will influence the FAR which is actually achievable in the study area. One "breakpoint" in achieving higher development densities is the shift from surface parking to structured parking. Given the expense of the construction of structured parking, a higher FAR is generally desired to make the investment in structured parking economically feasible. However, as noted above, a FAR greater than 0.6 is undesirable from a traffic standpoint; thus, structured parking is considered unrealistic for the Kelley's Corner business district.

The need to provide all study area parking in surface facilities will constrain the actual FAR that can be achieved on each parcel, even with consolidation of parcels. A discussion of this issue and a concept analysis of the actual achievable FAR for Kelley's Corner are presented in Section C of Chapter V.

In light of the above, it was considered worthwhile to develop a rough representation of a FAR 0.4 scenario. The analysis of this scenario represents what could happen under existing zoning, and in addition provides a sensitivity analysis to compare to the FAR 0.6 scenario.

A. *FAR 0.60 Buildout*

The analysis of buildout in the study area for a 0.6 FAR represents a much more aggressive buildout than was broadly assessed in the previous study. In brief, the buildout assumes full development of all parcels within the study area (essentially sub-area A from the previous study) at a FAR of 0.6. This analysis was accomplished by performing a parcel-by-parcel assessment of development potential. This "micro" level approach was necessary

not only to reflect differences between individual parcels, but also to provide a disaggregated basis for derivation of trip generation, necessary to facilitate modeling of traffic volumes and turning movements.

1. Buildout Methodology

The buildout analysis was based on information provided by the Town concerning existing parcelization and development constraints. It was assumed that all development would occur within existing parcels (i.e., that there would be no consolidation of smaller parcels into larger, more efficient configurations) and that within each parcel buildout would be constrained by the "Developable Site Area" (i.e., the total area of the site, less wetlands and flood plains). Surface parking was assumed in all cases. It is likely that many smaller parcels will eventually be consolidated in order to allow larger-scale development to occur; however, since it is not known exactly how such consolidation will occur, it was decided to base the buildout on current reality. In any case, this decision does not affect the maximum amount of development estimated, because all parcels were allowed to build out to the maximum FAR of 0.60. The basic steps were the following:

1. Compute buildout floor area.
2. Compute required parking spaces.
3. Determine building height and compute footprint.
4. Compute required open space.
5. Compute area of parking spaces.

A detailed description of the buildout methodology is provided in **Appendix H**.

2. Trip Generation

A number of assumptions and judgments were necessary to develop the buildout scenario. Most importantly, it was necessary to consider each parcel in terms of the amount of floor area allowable under this zoning and how such development could occur physically, taking into consideration site constraints and the need for supporting parking. In most cases, this results in buildings of two or three stories, and this has direct implications for the type of use.

In general, it is reasonable to assume that retail uses would occupy first (ground) floors, but that second and third floors would be more likely to become office uses. However, it was considered unlikely that at Kelley's Corner the significant second and third floor square footage under buildout would support entirely office use. More realistically, it might be expected that "small" offices, representing more service-oriented uses such as medical or insurance offices, would be supported. Further, it is likely that some retail use might be accommodated above ground floor, albeit that it is more likely to be in the form of ancillary space such as storage. It was considered that "small" offices represent more of a balance in terms of trip generation between general office and retail use, in that they exhibit neither

the high daily generation associated with retail, nor the sharp peak hour generation associated with typical offices.

It was necessary to consider the individual circumstances of each parcel, but the general assumptions for buildout land uses were as follows:

- Upper level floor space under buildout would be general office use only where the square footage exceeded about 5,000 sf.
- For 2-story buildings, the second floor would be "small" offices, except where the 5,000 sf general office threshold is triggered.
- For 3-story buildings, the second floor would be split equally between retail and "small" offices, and the third floor would be "small" offices, again except where the general office threshold is triggered.
- Where existing use is predominantly either retail or "small" office, the buildout use is more likely to expand, rather than change, that use.

The analysis shows a potential increase of about 800,000 sf over the existing 380,000 sf, along with an additional 30 residential units. The allocation by broad use category is summarized in **Table 9**, from which it can be seen that the majority of increase is allocated to office use. This confirms that there is some limitation on the potential for additional retail space, owing mainly to the physical constraints of providing such space at ground level. However, it is important to recognize that the majority of existing land use in the study area comprises retail, commercial or "small" office, and hence the proportion of office space overall is not as high as appears. While about two-thirds of additional space under buildout might be office, the proportion of office space in total would be closer to one half.

Table 9. SUMMARY OF FAR 0.6 BUILDOUT AND TRIP GENERATION ANALYSIS

Land Use Category	Additional Floor Area	Peak-hour Trip Generation		
		Weekday A.M.	Weekday P.M.	Saturday Mid-day
Retail	145,908	360	781	1,063
Small Office	100,423	270	410	365
Office	556,541	1,278	1,173	245
Sub Total	802,872	1,908	2,364	1,673
Residential	30 units	15	19	15
TOTAL	**na**	**1,923**	**2,383**	**1,688**

An analysis of trip generation was also performed based on ITE rates to derive appropriate rates for the relevant categories of land use. Rates were applied for weekday A.M., weekday P.M., and Saturday peak conditions, and were split out by inbound and outbound trips so that the resulting volumes could be input to the traffic model. Adjustments were subsequently applied to reflect the effects of pass-by trips, multi-purpose trips, and internal trips. Specific trip generation rates and trip adjustment percentages are included in **Appendix I**.

The total trip generation by broad land use category is also included in **Table 9.** This shows that the additional development under the 0.6 FAR scenario would generate some 1,900 additional vehicle trips in the weekday A.M. peak hour, 2,400 vehicle trips in the weekday P.M. peak hour, and 1,700 vehicle trips in the Saturday peak hour. Again, it should be borne in mind that these do not represent absolute increases in traffic on the roadway network, since they do not include the various adjustments incorporated in the traffic model. However, they do serve to demonstrate the relative magnitude of buildout traffic generation. The pattern clearly reflects the effects of significant office development, with the Saturday increase being less than the weekday peak increases.

It is important to recognize that the trip generation probably represents a conservative analysis, not only because of the adjustments that need to be made for pass-by, multi-purpose and internal trips, but also because of the likely characteristics of activity in a location such as Kelley's Corner which are not necessarily reflected in ITE trip rates. Significant factors in this respect include the reductions associated with mixed-use centers, and the less pronounced peaks compared to typical suburban locations, particularly for offices.

3. Traffic Volumes

Projected year 2010 traffic volumes at the Route 27/111 intersection and at the intersection of the private road with Route 111 for the P.M. peak only under the FAR 0.6 scenario are presented in **Figures 12 through 14.** To obtain year 2010 FAR 0.6 traffic volumes, the first step was to separate study area traffic into through traffic and to/from Kelley's Corner traffic. The 10% growth rate was then applied to the through-traffic only. Trips to/from Kelley's Corner were then added back to the factored through-traffic to produce base 2010 volumes.

Trips associated with additional development in Kelley's Corner were distributed and assigned to the roadway network in two components: trips to/from Kelley's Corner and trips within Kelley's Corner. The distribution of these trips was based on results from the license plate survey. These volumes were then added to the base 2010 traffic volumes to produce 2010 FAR 0.6 buildout volumes. The model distribution and assignment assumptions are included in **Appendix J.**

Figure 12. 2010 FAR 0.60 BUILDOUT WEEKDAY A.M. PEAK-HOUR TRAFFIC VOLUMES

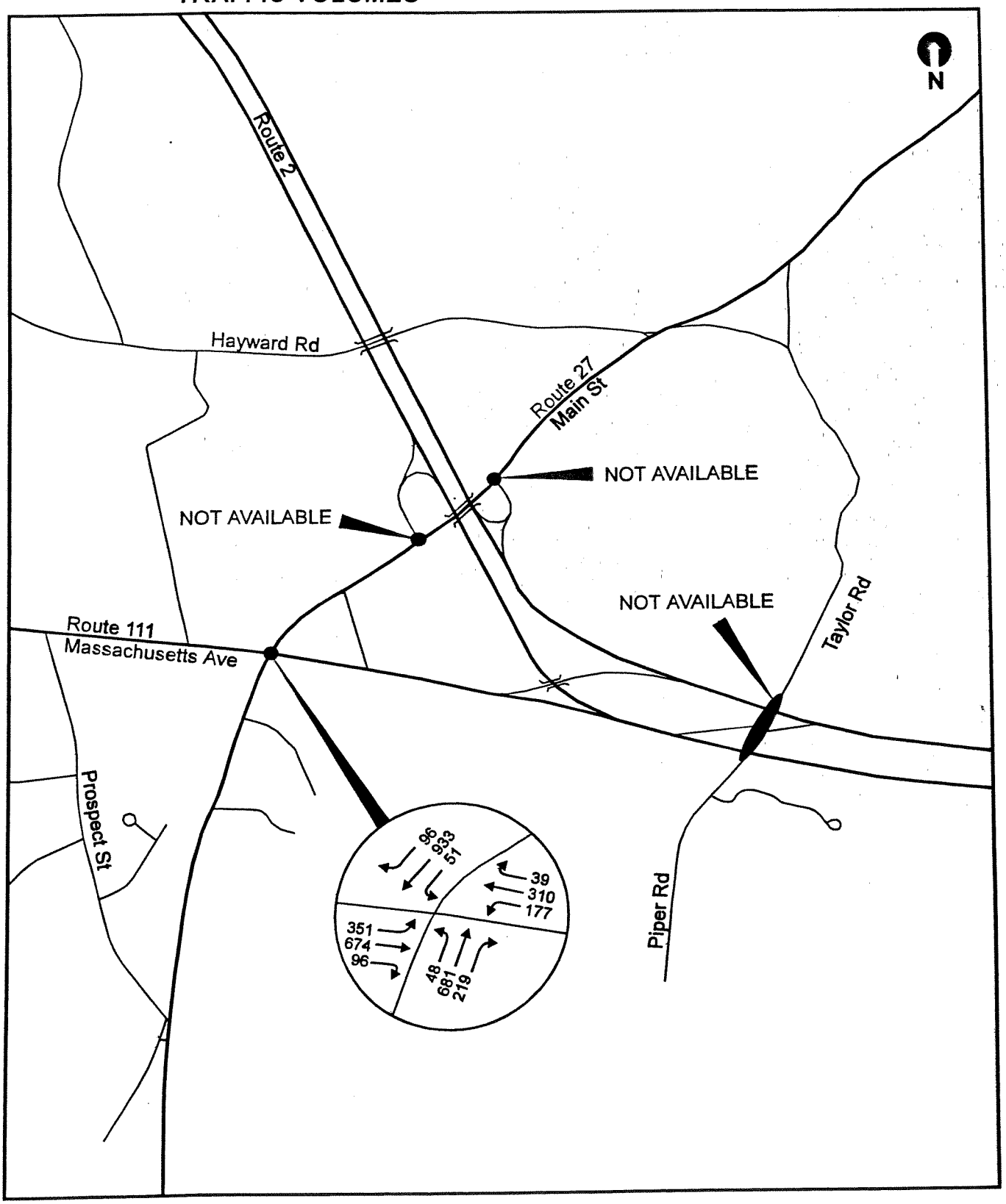


Figure 13. 2010 FAR 0.60 BUILDOUT WEEKDAY P.M. PEAK-HOUR TRAFFIC VOLUMES

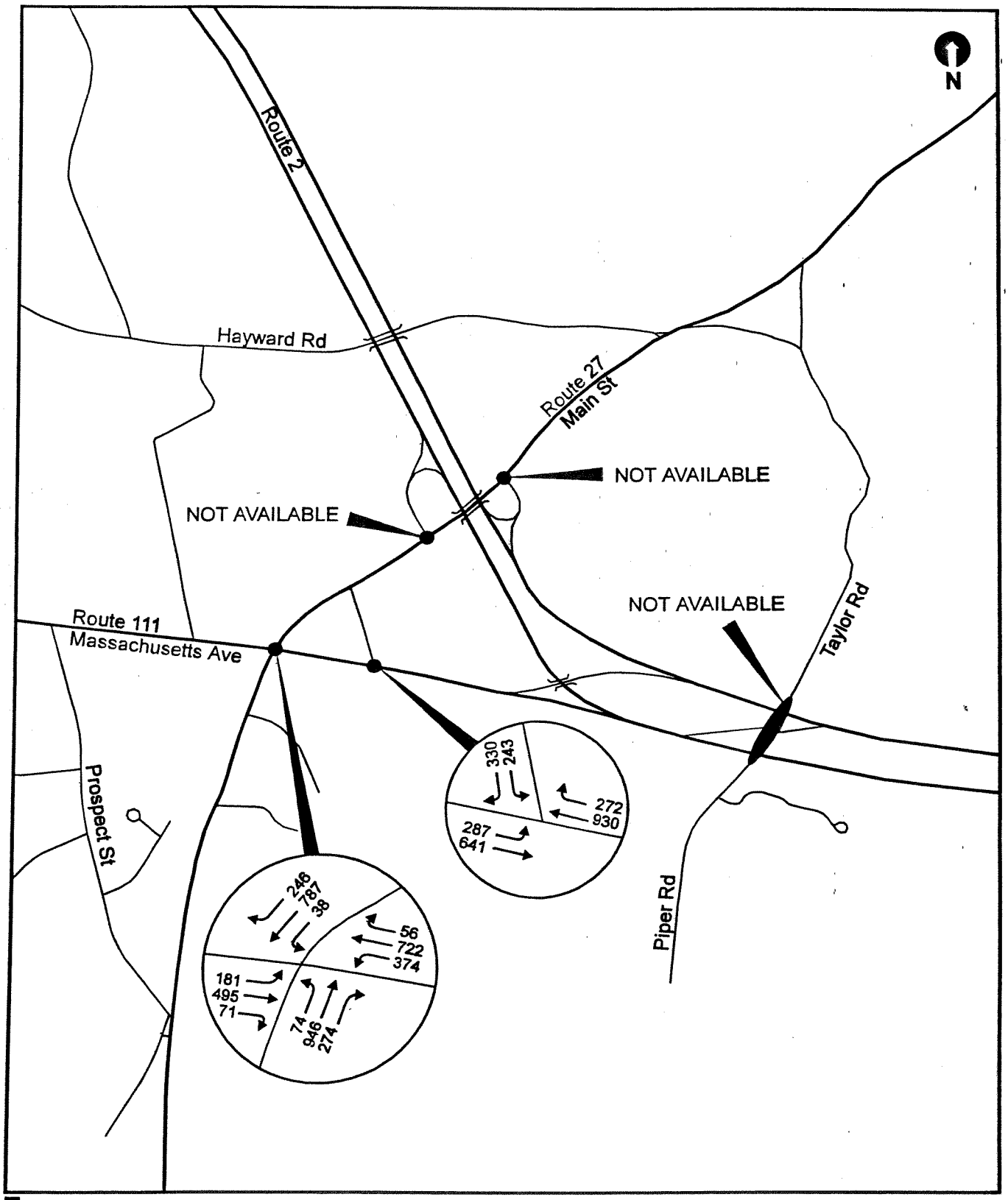
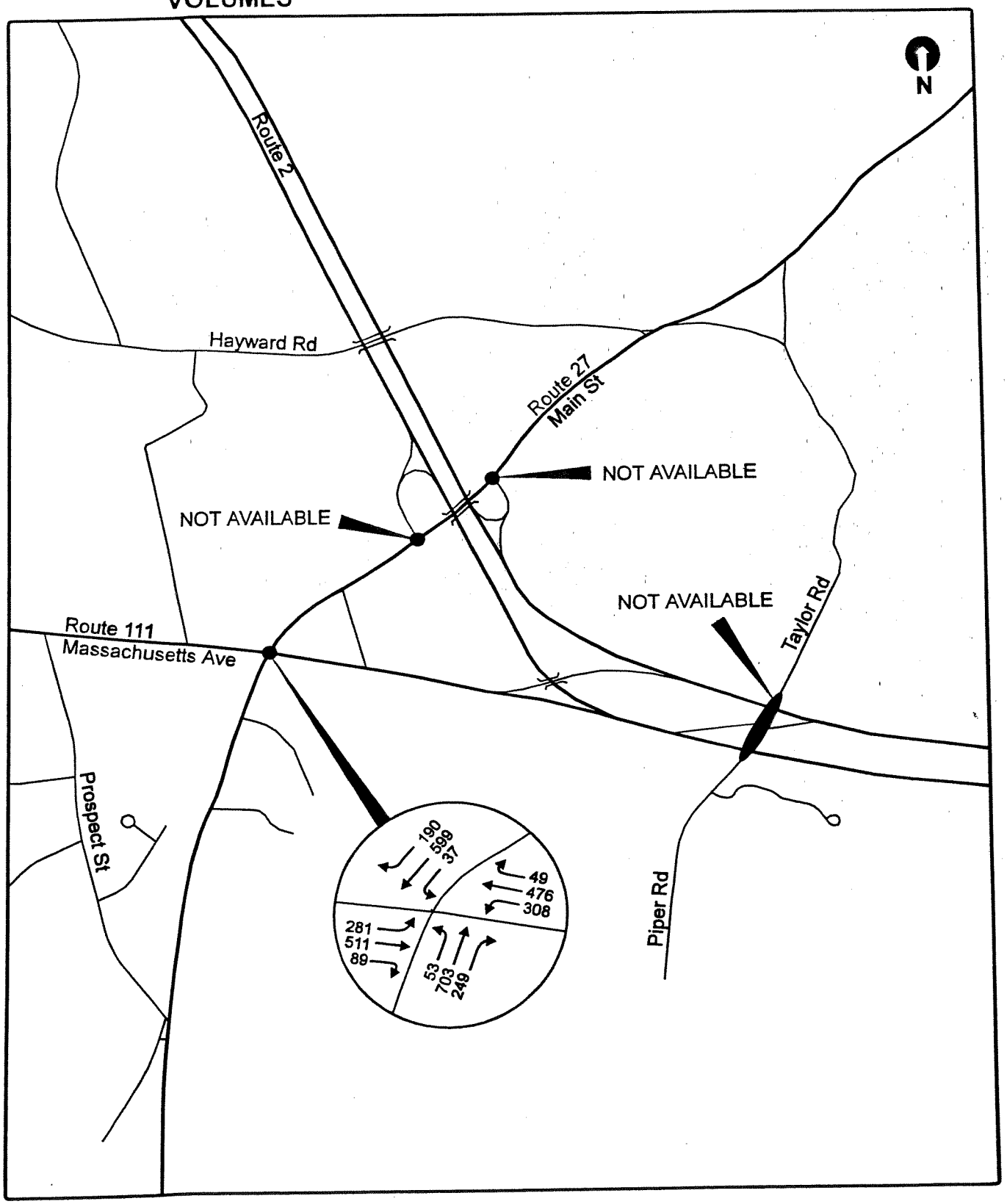


Figure 14. 2010 FAR 0.60 BUILDOUT SATURDAY MID-DAY TRAFFIC VOLUMES



4. Level of Service Analysis

Level of service analysis results for the 2010 FAR 0.6 buildout scenario without circulation plan mitigation measures are presented in **Tables 10 and 11.** Level of service calculations are included in **Appendix K**. As noted above, no-build conditions had already reached LOS 'F' in both morning and evening at the Route 27/111 intersection. For Build conditions, traffic volumes generated by the FAR 0.6 scenario are projected to exceed the capacity of the study area roadway system by a significantly greater amount, as shown in the tables. Delay and level of service at intersections cannot realistically be computed when volumes exceed capacity. The analysis program will not generate vehicle delay, but increased congestion can be measured by examining queue lengths, which increase significantly under the FAR 0.6 scenario.

At the intersection of the private road with Route 111, the delay experienced by vehicles turning left onto Route 111 cannot be calculated due to the high volume of left turns and the high major street volumes. Vehicles exiting from other driveways in the study area can also be expected to experience long delays.

Based on roadway segment analysis, Route 111 east and west of Route 27 is projected to operate at level of service 'E' in all three peak hours. Route 27 south of Route 111 is also projected to operate at level of service 'E' in all three peak hours. Route 27 north of Route 111 is projected to operate over capacity at level of service 'F' in all three peak hours.

Table 10. 2010 FAR 0.60 BUILDOUT INTERSECTION LEVEL OF SERVICE ANALYSIS WITHOUT MITIGATION

Intersection	Weekday A.M. Peak Hour			Weekday P.M. Peak Hour			Saturday Mid-day Peak Hour		
	Delay[1]	LOS[2]	Queue[3]	Delay	LOS	Queue	Delay	LOS	Queue
Signalized Intersections									
Route 27/Route 111									
EB Route 111	*	F	97	*	F	42	*	F	62
WB Route 111	*	F	41	*	F	88	*	F	66
NB Route 27	*	F	65	*	F	155	*	F	93
SB Route 27	*	F	91	*	F	89	*	F	46
Total Intersection	*	**F**		*	**F**		*	**F**	
Unsignalized Intersections									
Route 111/ Private road									
SB Left Turn	not available			*	F	*	not available		
SB Right Turn				56.3	F	10			
EB Left Turn				40.6	E	8			
Total Intersection				*	**F**				

* Methodology does not produce calculation of delay and LOS under these conditions.

Notes for **Table 10:**
[1] Average vehicle delay in seconds.
[2] Level of service.
[3] 95th percentile queue in vehicles.

Table 11. 2010 FAR 0.60 BUILDOUT ROADWAY SEGMENT LEVEL OF SERVICE ANALYSIS WITHOUT MITIGATION

Roadway Segment	Two-way Volume	v/c ratio[4]	LOS
Route 111 — East of Route 27			
Weekday A.M. Peak Hour	1319	.70	E
Weekday P.M. Peak Hour	1433	.68	E
Saturday Mid-day Peak Hour	1123	.60	E
Route 111 — West of Route 27			
Weekday A.M. Peak Hour	1615	.82	E
Weekday P.M. Peak Hour	1846	.88	E
Saturday Mid-day Peak Hour	1674	.77	E
Route 27 — South of Route 111			
Weekday A.M. Peak Hour	1889	.83	E
Weekday P.M. Peak Hour	2238	.98	E
Saturday Mid-day Peak Hour	1760	.81	E
Route 27 — North of Route 111			
Weekday A.M. Peak Hour	2545	1.14	F
Weekday P.M. Peak Hour	2837	1.26	F
Saturday Mid-day Peak Hour	2422	1.09	F

B. *FAR 0.4 Buildout Sensitivity Analysis*

1. Buildout Methodology

The buildout analysis methodology used to develop the FAR 0.4 scenario was essentially the same as was adopted for the FAR 0.6 scenario. Because the breakdown of specific land uses is directly influenced by the number of building stories, which in turn is determined by the amount of floor area in relation to physical parcel characteristics, it was again necessary to develop the buildout on a parcel-by-parcel basis. The FAR 0.4 analysis was performed using land use and trip generation assumptions and judgements that were consistent with the FAR 0.6 analysis.

The FAR 0.4 analysis shows a potential increase in floor area of about 440,000 sf over the existing 380,000 sf, along with an additional 30 residential units. The allocation by broad use category is summarized in **Table 12** from which it can be seen that the majority of increase is again allocated to office use, but to a much

[4] Volume/capacity ratio

lesser relative extent than under the FAR 0.6 scenario. This reflects the fact that buildings would be limited to 1 and 2 stories, with the effect that the amount of upper floor space (suitable for office rather than retail use) would be significantly reduced compared to the FAR 0.6 scenario. As a result, the additional retail space under FAR 0.4 is only slightly less than under FAR 0.6, whereas the additional office space under FAR 0.4 is only about half that yielded under FAR 0.6.

Table 12. SUMMARY OF FAR 0.4 BUILDOUT AND TRIP GENERATION ANALYSIS

Land Use Category	Additional Floor Area	Peak-hour Trip Generation		
		Weekday A.M.	Weekday P.M.	Saturday Mid-day
Retail	130,667	322	706	961
Small Office	47,154	127	192	171
Office	261,905	666	605	137
Sub Total	439,726	1,115	1,503	1,269
Residential	30 units	15	19	15
TOTAL	**na**	**1,130**	**1,522**	**1,284**

The total trip generation by broad land use category is also included in **Table 12**. This shows that the additional development under the 0.4 FAR scenario would generate some 1,100 additional trips in the weekday A.M. peak hour, 1,500 in the weekday P.M. peak hour, and 1,300 in the Saturday mid-day peak hour. Compared to the FAR 0.6 scenario, the difference between the weekday and Saturday peak generation is less significant, owing to the smaller increase in office development projected under the FAR 0.4 scenario. Again, it should be borne in mind that the additional trips presented in **Table 12** do not represent absolute increases in traffic on the roadway network, as they do not include the various adjustments incorporated in the traffic model.

Table 13 shows a comparison of vehicle trip generation for the FAR 0.4 and 0.6 scenarios as adjusted to reflect reductions for pass-by traffic and internal trips. This provides a more realistic comparison of the trip generation effects under each scenario than the gross trip generation by land use categories presented in **Tables 9 and 12**. As can be seen from **Table 13**, the additional trips generation under FAR 0.6 is only about 75% higher than under FAR 0.4 for the weekday peaks, and only 50% higher for the Saturday peak, despite that fact that the FAR 0.6 buildout represents about twice as much additional floor area as FAR 0.4. This reflects the different mix of office and retail use under either scenario, as previously discussed, as well as the fact that office trip generation generally does not increase linearly in relation to the scale of development.

Table 13. COMPARISON OF FAR 0.4 AND FAR 0.6 ADDITIONAL VEHICLE TRIP GENERATION				
Peak Hour	**Trip Direction**	**FAR 0.4**	**FAR 0.6**	**% Difference**
Weekday A.M. Peak Hour	To Kelley's Corner	848	1,523	80%
	From Kelley's Corner	207	316	53%
	Total Trips	**1,055**	**1,839**	**74%**
Weekday P.M. Peak Hour	To Kelley's Corner	340	523	54%
	From Kelley's Corner	777	1,417	82%
	Total Trips	**1,117**	**1,940**	**74%**
Saturday Mid-day Peak Hour	To Kelley's Corner	363	550	52%
	From Kelley's Corner	323	479	48%
	Total Trips	**686**	**1,029**	**50%**

2. Traffic Volumes

Traffic volumes for the FAR 0.4 buildout scenario were calculated using the spreadsheet model developed for the FAR 0.6 scenario. All assumptions regarding traffic characteristics and distribution for the FAR 0.6 scenario were applied to the FAR 0.4 scenario. The resulting traffic volumes are shown in **Figures 15 through 17.**

Table 14 contains a comparison of total traffic volumes at the Route 27/111 intersection with the FAR 0.4 and FAR 0.6 buildout scenarios. Again, this reflects the relative mix of land uses and their trip generating characteristics under each scenario, as discussed previously.

Table 14. TOTAL ROUTE 27/111 INTERSECTION VOLUMES						
	Scenario					
Peak Hour	**1996 Existing FAR ~ 0.15**	**2010 Buildout FAR ~ 0.4**	**% Change from Existing**	**2010 Buildout FAR ~ 0.6**	**% Change from Existing**	**Incremental Change from FAR 0.4 to 0.6**
Weekday A.M. Peak Hour	2,472	3,164	28%	3,675	49%	16%
Weekday P.M. Peak Hour	2,971	3,710	25%	4,264	44%	15%
Saturday Mid-day Peak Hour	2,740	3,278	20%	3,545	29%	8%

Figure 15. 2010 FAR 0.4 BUILDOUT WEEKDAY A.M. PEAK-HOUR TRAFFIC VOLUMES

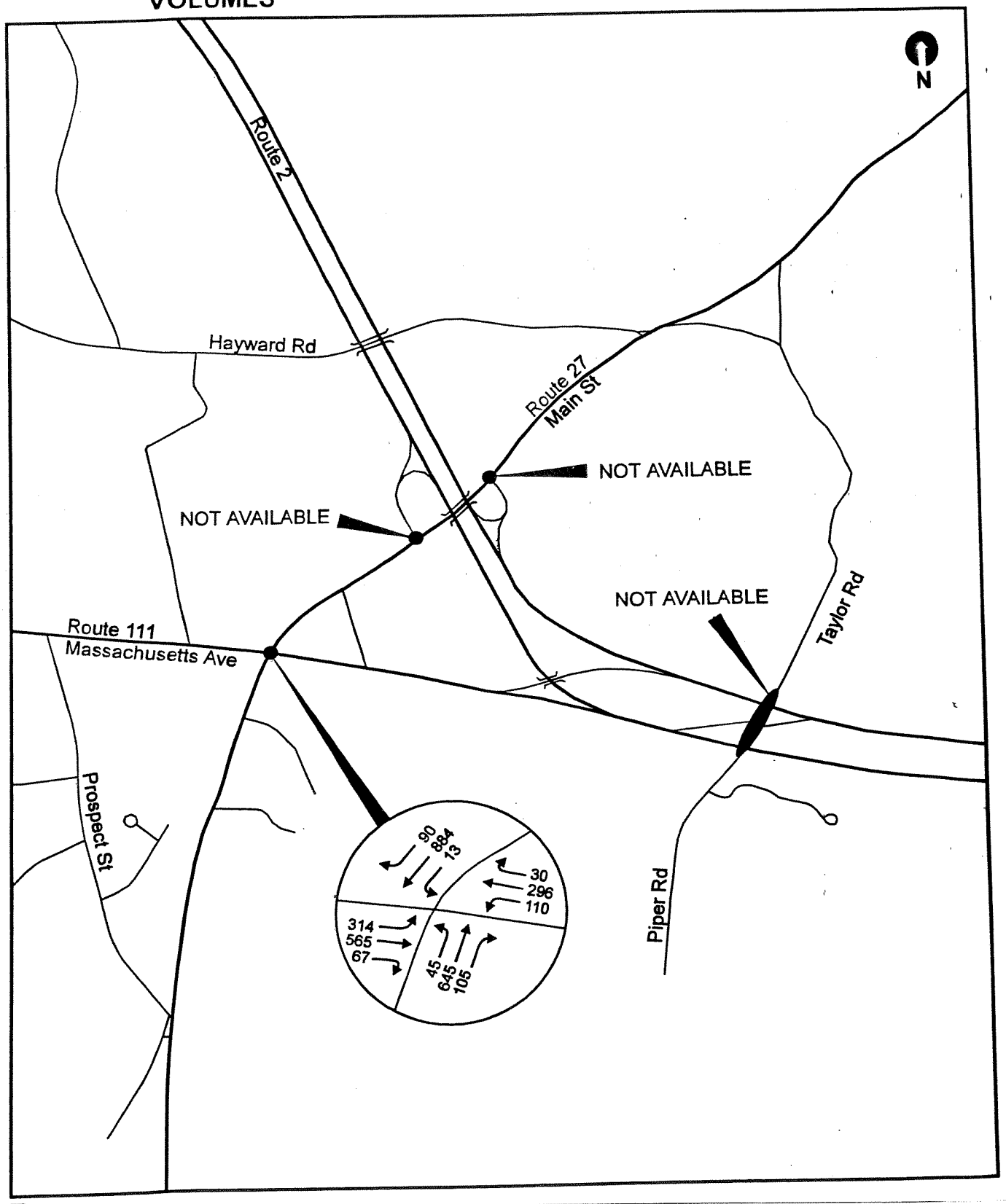


Figure 16. 2010 FAR 0.4 BUILDOUT WEEKDAY P.M. PEAK-HOUR TRAFFIC VOLUMES

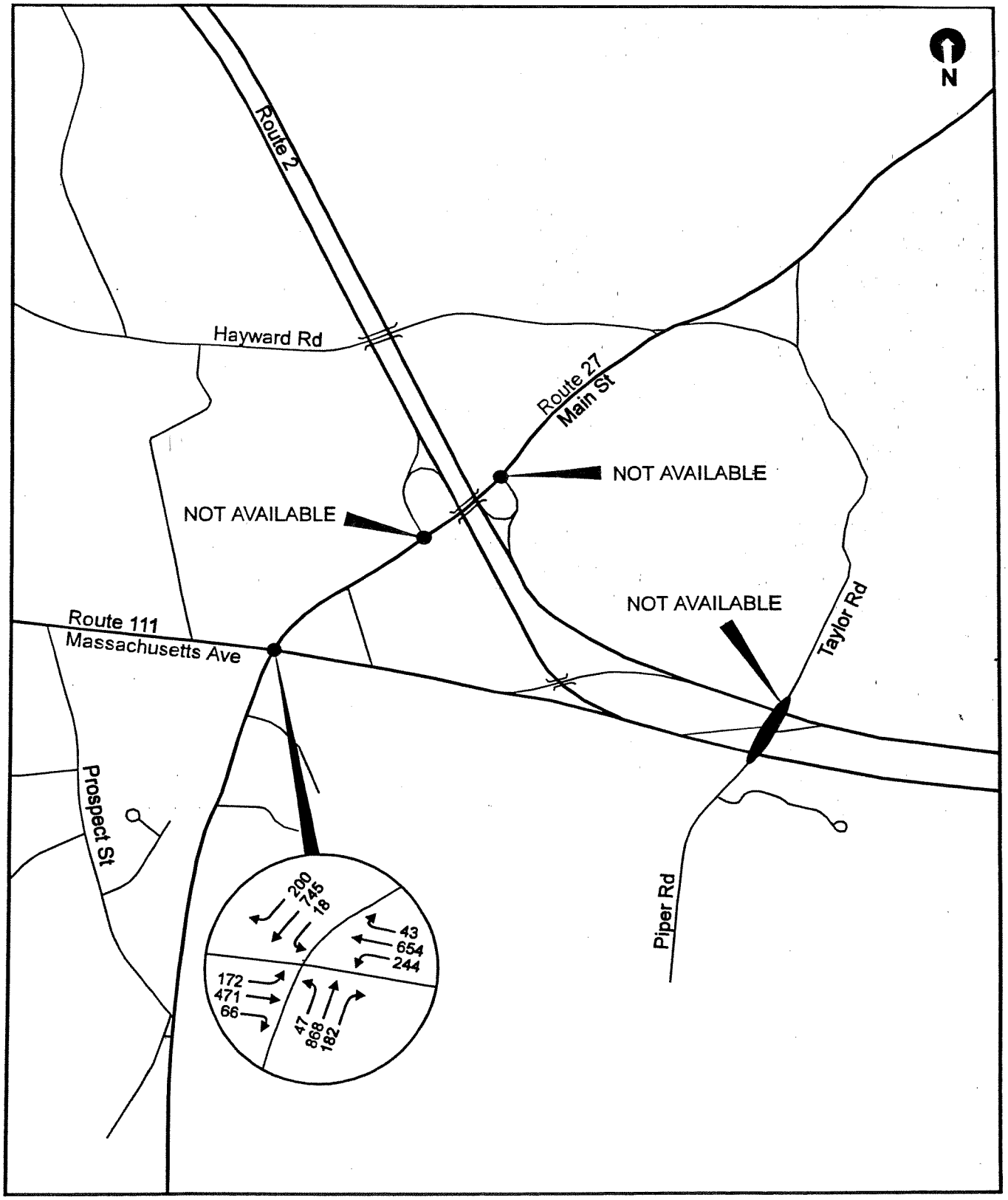
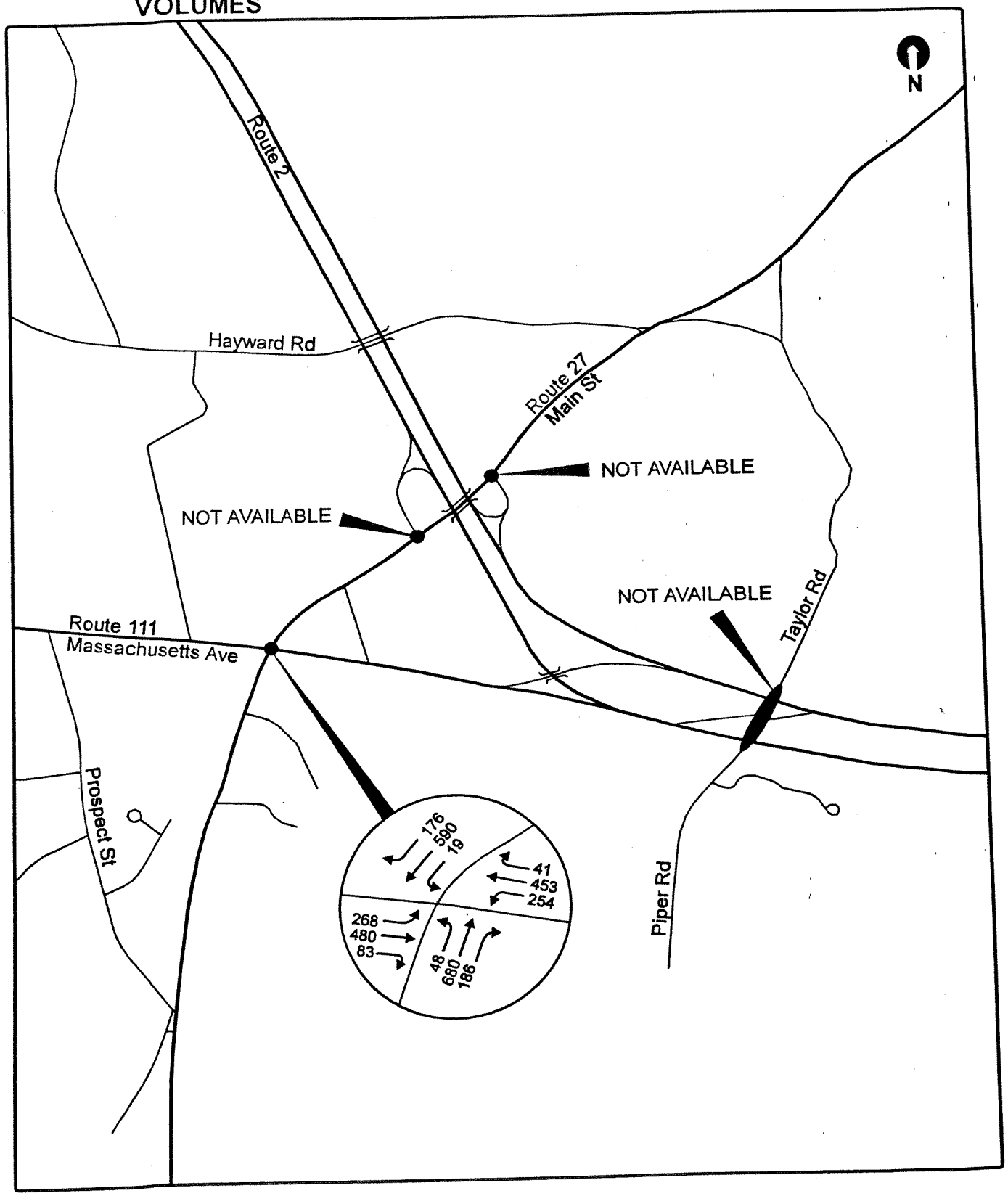


Figure 17. 2010 FAR 0.4 BUILDOUT SATURDAY MID-DAY TRAFFIC VOLUMES



3. Level of Service Analysis

Level of service analysis results for the Route 27/111 intersection under 2010 FAR 0.4 buildout conditions without circulation plan mitigation measures are presented in **Table 15.** As noted above, no-build conditions had already reached LOS 'F' in both morning and evening at the Route 27/111 intersection. Although traffic volumes generated by the FAR 0.4 scenario are lower than the FAR 0.6 volumes, they are also projected to further exceed the capacity of the study area roadway system.

Although traffic volumes were not developed for the study area driveways, traffic generated by the increase in development density combined with projected background growth will result in a decrease in level of service from no-build conditions. Vehicles turning left onto Route 111 from the private road are projected to experience level of service 'F' under no-build conditions, and will experience longer delays under FAR 0.4 buildout conditions. In addition, vehicles exiting from other driveways in the study area can be expected to experience long delays.

Table 15. 2010 FAR 0.4 BUILDOUT INTERSECTION LEVEL OF SERVICE ANALYSIS WITHOUT MITIGATION

	Weekday A.M. Peak Hour			Weekday P.M. Peak Hour			Saturday Mid-day Peak Hour		
Intersection	**Delay[1]**	**LOS[2]**	**Queue[3]**	**Delay**	**LOS**	**Queue**	**Delay**	**LOS**	**Queue**
Signalized Intersections									
Route 27/Route 111									
EB Route 111	*	F	63	*	F	39	*	F	58
WB Route 111	*	F	23	*	F	58	*	F	54
NB Route 27	*	F	33	*	F	114	*	F	74
SB Route 27	*	F	65	*	F	67	34.7	D	39
Total Intersection	*	**F**		*	**F**		*	**F**	

* Methodology does not produce calculation of delay and LOS under these conditions.

Notes for **Table 15:**
[1] Average vehicle delay in seconds.
[2] Level of service.
[3] 95th percentile queue in vehicles.

V. CIRCULATION PLAN

The proposed circulation plan has been developed on the basis of both land use and transportation objectives, characteristics, and assumptions in order to accomplish the project objectives "to achieve a sense of place and community pride in this business district." This section includes the basis for plan development, the circulation elements of the plan, conceptual engineering designs for the key Route 27/111 intersection and the other study area roadway intersections with Routes 27 and 111, and the overall design concept.

A. *Basis for Plan Development*

The plan presented here represents physically the integration of four sets of information, as described below.

1. Project Objectives

The original project objectives as described above are the cornerstone of plan development — a new arrangement of regional and local roadways and a reconfiguration and intensification of land uses, combined with design amenities and travel demand management measures in order to accommodate increased development in a livable "village" environment. The goal is a balance between maintenance of "reasonable" traffic flow and improvement of pedestrian safety and amenities within the context of increased commercial activity.

2. Land Use Assumptions

The growth and land use assumptions dictated the amount of development to be accommodated in the 2010 Build scenario. A full FAR 0.6 buildout, calculated on the basis of surface parking to meet all parking requirements, was selected, although many factors may deter the achievement of this FAR for the entire study area. Increased floor space density encourages walking instead of driving by offering more activities within a shorter radius. The effects are enhanced when parking is provided in structures; in this case, the conclusion that parking will most likely be limited to surface lots will tend to lessen the overall effect of increased density on converting drive to walk trips. Decisions regarding the specific level and phasing of recommended improvements will depend on the timing and nature of actual proposals for redevelopment of specific parcels.

3. Study Area Traffic Characteristics

Detailed analyses of study area traffic characteristics provided the basis for analyzing actual capacity and safety problems, determining opportunities for specific improvements, estimating their effectiveness, and assigning priorities. Rather than a business district formed along one major roadway with multiple minor side streets, the Kelley's Corner business district is formed at a busy crossroads of two major roadways, with essentially no side streets. Analyses of existing conditions showed that the Route 27/Route 111 intersection serves a large proportion of through-traffic not destined for Kelley's Corner. In particular, the northbound and southbound Route 27 through-movements are composed of 84% to 95% traffic with no destination in

Kelley's Corner. Eastbound and westbound Route 111 through-movements are 76% to 91% traffic with no destination in Kelley's Corner.

Many of the through-trips in the critical P.M. peak hour are vehicles turning left from westbound Route 111 to southbound Route 27. This movement accounts for 32% of the total westbound Route 111 P.M. peak hour approach volume. Thus, the best opportunity for reducing traffic volumes at the Route 27/111 intersection is to provide the same type of access and connection to and within the southeast quadrant. However, this type of connection could only be expected to reduce total peak-hour intersection volumes by approximately 4%.

Based on trip distribution data collected in the license plate survey, it is estimated that only 50% of vehicles destined to or from Kelley's Corner actually pass through the Route 27/111 intersection. This percentage is due to the access and connections currently provided by the private road in the northeast quadrant, the parking lot connection in the southwest quadrant, and the fact that many trips are single purpose—i.e., to and from the same driveway and approach direction.

Table 16 shows the percentage of the total traffic at the Route 27/Route 111 intersection that is destined to or from Kelley's Corner in each peak hour for existing and buildout conditions. The increase in the percent of traffic to and from Kelley's Corner is more significant in the weekday A.M. and weekday P.M. peak hours due to the increased office development in the buildout scenarios. The percentages shown in the table reinforce the fact that through-traffic is a major issue to deal with at this intersection and in the study area.

Table 16. PROPORTION OF ROUTE 27/ ROUTE 111 INTERSECTION TRAFFIC TO OR FROM KELLEY'S CORNER

Peak Hour	Percentage of Traffic to/from Kelley's Corner		
	1996 Existing	2010 Build FAR 0.4	2010 Build FAR 0.6
Weekday A.M. Peak Hour	11%	24%	34%
Weekday P.M. Peak Hour	19%	28%	38%
Saturday Mid-day Peak Hour	20%	27%	32%

4. Planning Principles

Finally, basic circulation planning, transportation demand management, urban design principles, residential neighborhood protection objectives, and established land use/transportation relationships were used in developing the circulation plan, as follows:

- In terms of overall ***circulation,*** the plan seeks to establish a hierarchy of streets within the study area as the defining characteristic of the desired "urban village", as opposed to the current poorly defined patchwork of parking lots that clearly transmits the image of suburban strip development. This hierarchy includes the overall regional roadways (including Routes 27 and 111), a new system of what are called "secondary streets" (including the private road as well as newly created connections) and "shopping streets" to provide internal circulation, and a network of defined pedestrian walkways and bicycles routes. Since the amount of land that must be devoted to vehicular circulation and surface parking is significant, organization of this space into a more defined system is a major element for defining building locations and a long-range development pattern. Another effect of the clearer definition of streets is the gradual elimination of the many curb cuts along Routes 27 and 111. In the plan, access to parking is provided from the "secondary streets" rather than the main roads.

- In terms of ***transportation demand management,*** the plan incorporates the reduced parking ratios adopted by the Town for the Kelley's Corner district. As this reduced rate is applied to new development, the ratio of parking to square feet will gradually be reduced from today's typical suburban levels (4.3 spaces/1,000 square feet). The plan increases density as one means for encouraging multiple internal walking trips, as discussed above. Land use mix is also encouraged as a means of reducing auto travel. Under current conditions, the number of home-based trips within Kelley's Corner is very low. To the extent that new housing is introduced, the likelihood of walk and bicycle travel increases both for work and non-work purposes. Research has shown that people who live in "mixed-use blocks" with non-residential uses within 300 feet of their homes have a 10–15% higher probability of commuting by walk/bike modes and a 3–4% lower probability of commuting by car than people who live in purely residential areas (holding income and density constant). Residents of mixed-use areas also own fewer cars and commute shorter distances than those of purely residential areas.

  For commercial uses, land use mix also enables lower parking requirements, since patrons can combine trips without moving their cars, enabling shared parking. Entertainment uses such as cinemas can easily share parking due to different peak demand times. Residential uses within walking distance reduce employee parking demand. Combined office and retail uses provide a "captive market" of employees that also reduces auto trips and parking demand, with the extent of the reduction dependent on the relative amount of space devoted to each type of use.

- ***Urban design principles*** were also used in plan development as a means of encouraging non-auto travel. Pedestrian and bicycle trips between quadrants of the study area are extremely low today, indicating a high potential for increased

non-auto travel. Desired features include provision of sidewalks and pedestrian amenities that can reduce internal auto trips by 2% and encourage new trips to be made by non-auto modes. Reduction of curb cuts across sidewalks and provision of clearly marked crosswalks and pedestrian signal phases improve safety and decrease travel times for walkers. Orientation of buildings toward sidewalks and increased numbers of store entrances can also increase walk trips. Obviously, provision of bike racks will help increase bike use. Provision of shorter blocks within a given activity center increases pedestrian trips. Underground or structured parking, if feasible, can go even further toward increased densities and reduced walking distances. Weather protection for pedestrians, in the form of awnings or canopies, is also desirable.

- ***Residential Neighborhood Protection Objectives*** chiefly apply to the housing development abutting the southeast quadrant. In spite of the close proximity, the approximately forty single family homes off Beverly and Kelly Roads are relatively isolated from the Kelley's Corner Business District and vehicular traffic on the local street in this neighborhood is almost exclusively to and from houses within it. The plan maintains adequate separation of this neighborhood through the maintenance of vegetative buffers and possible grade changes to the business properties in the southeast quadrant. In addition, any future system and layouts of new streets in the Kelley's Corner Business District, together with appropriate traffic rules and orders, should be arranged to maintain the principally local character of traffic in this neighborhood.

B. *Circulation Plan Elements*

Based on the principles outlined above, specific circulation plan elements were developed and integrated with the buildings and open spaces into a concept plan. Following the hierarchy of streets established as the basis for plan development, improvements and new elements were developed for the following categories of streets: regional roadways, secondary streets, shopping streets and pedestrian/bicycle ways.

Demand management and land use/design measures have also been incorporated into the plan. Unfortunately, because internal vehicular traffic has been shown by the surveys to represent such a low proportion of total traffic, land use density and mix, urban design, and demand management measures of themselves will not reduce current or future traffic volumes in a way significant enough to improve conditions on Routes 27 and 111 (although, as discussed above, they can affect mode choice for new trips).

The analysis of existing, no-build, and build traffic operations in Kelley's Corner has shown that physical improvements at the Route 27/111 intersection and at other key locations are necessary to accommodate even no-build traffic at the desired "reasonable" levels in order to reduce the likelihood of bypass trips and peak spreading. As discussed above, the circulation plan elements are based on the FAR 0.6 buildout scenario. The final set of necessary improvements will depend on the actual level of development achieved. Chapter VI includes a discussion on potential phasing of improvements as new development occurs.

The challenge for this plan is to develop a way to accommodate the necessary physical capacity improvements for the main roads while still creating and enhancing a pedestrian friendly village environment for the study area as a whole.

1. Regional Roadways

As the major regional roadways, Routes 27 and 111 were closely analyzed in terms of potential intersection as well as roadway segment improvements. A wide variety of measures were examined and analyzed, including:

- lane additions;
- changes in signal timing and phasing;
- widening of Routes 27 and 111 to four-lane cross-sections;
- creation of new bypass roadways around Kelley's Corner;
- conversion of roadway directions to create one-way circulation patterns; and
- grade separation of the Route 27/111 intersection.

Application of the first three types of improvements listed above determined the improvements necessary to reduce congestion to an acceptable level without major changes to circulation patterns or construction of new roadways. The last three types of improvements would make significant changes to the Kelley's Corner roadway system, and would require full-scale permitting processes and major capital investments. Even with a major improvement of this type, analysis showed that the constraints of the study area preclude a major reduction in volumes at the critical Route 27/111 intersection.

The conclusion drawn from these analyses is that the increases in traffic volumes at a development density of FAR 0.6, combined with projected regional growth, will require that Routes 27 and 111 be widened to four-lane cross-sections at their intersection, along Route 27 and 111 to their intersections with the private road (connecting Rt. 27 and Rt. 111 east of the Rt.27/111 intersection), and to some point beyond the private road. The proposed Route 27 and Route 111 four-lane cross-sections extend to approximately 250 feet east of the private road. It may become desirable to extend the Route 27 four-lane cross-section to the intersection with the Route 2 ramps. In addition, it may become desirable to extend the four-lane cross-sections west along Route 111 to the school access road and south along Route 27 to the southern quadrant access points. The ultimate limits of the Route 27 and 111 four-lane cross-sections will depend on the level of development and background growth that occur. If four-lane cross-sections are required at the intersections of access points with Routes 27 or 111 due to increased volumes to and from the quadrants, the four-lane cross-sections should extend from the Route 27/111 intersection to these access points.

Widening to a four-lane cross-section on each approach was considered the maximum acceptable expansion; the levels of service resulting from this would be acceptable in all three peak hours. Any further widening of the Route 27/Route 111 intersection would require major land takings and would further divide the Kelley's Corner area into four separate quadrants. Widening to a four-lane cross-section can be accommodated within the existing rights-of-way, except on Route 27 as outlined in the Town of Acton 1991 Master Plan, assuming that sidewalks will be provided by land owners within the setbacks on each parcel. If sidewalks are included in the right-of-way, an additional 16' would be required along both sides of Route 27 and 111 to accommodate the proposed 8' buffer and 8' sidewalk along these roadways.

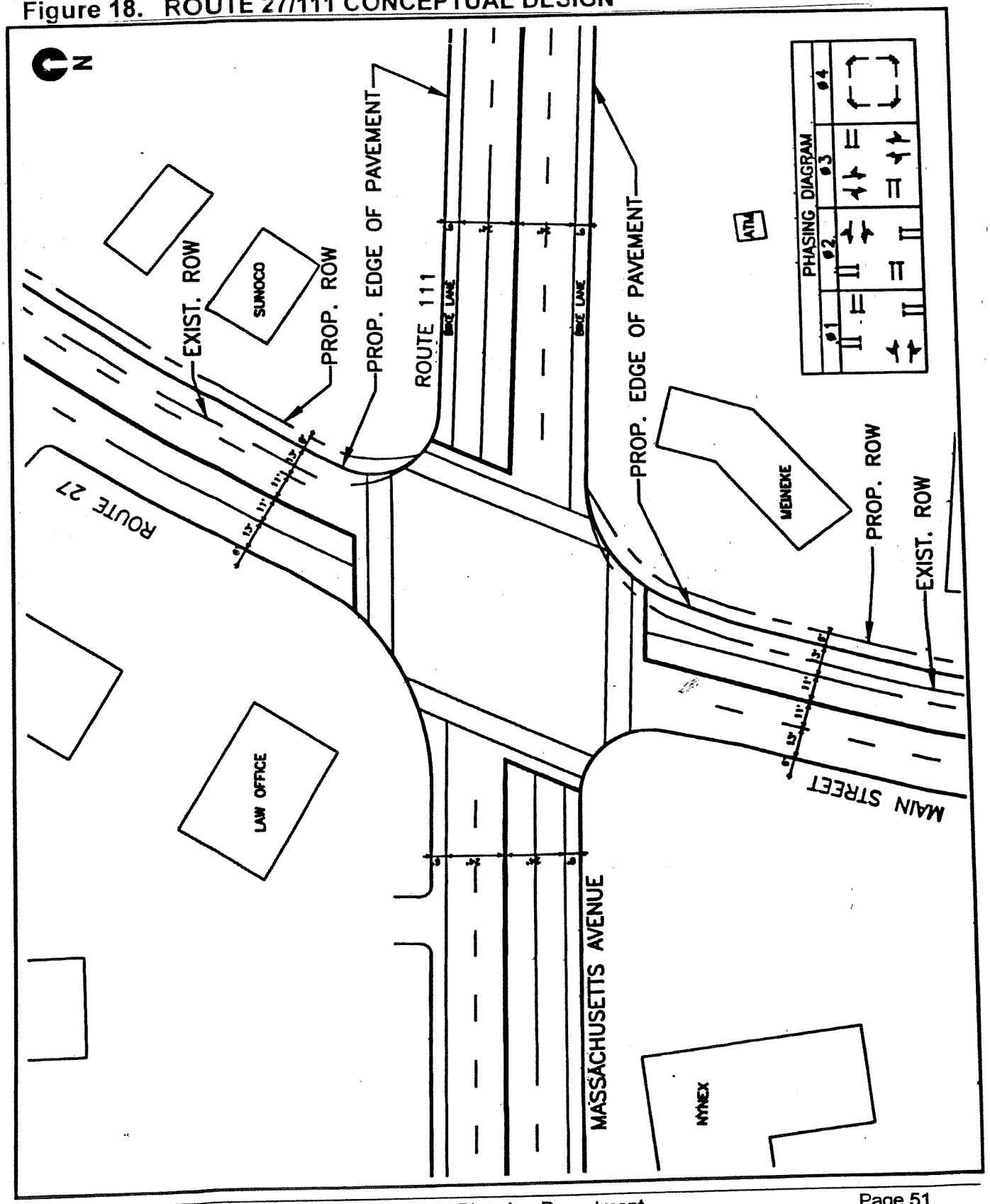
The resulting intersection would be composed of two general purpose travel lanes on each approach. With increased growth and development, through movements at the intersection dominate, and left turn lanes become inefficient. In order to accommodate the large numbers of vehicles turning left from Route 111 to Route 27 safely, separate signal phases for these approaches are recommended.

Improvements to facilitate pedestrian crossings were also examined. The construction of islands at the intersection corners to shorten pedestrian crosswalk distances was examined, but accommodation of turning movements for large trucks prevents the construction of islands large enough to meet minimum size requirements. To the extent possible, roadway edges and crosswalks were placed to minimize crossing distances. Although the roadway will be widened at the intersection, future pedestrian crosswalk distances will not be significantly longer than those under existing conditions. Exact crosswalk and ramp placement will need to be determined in final design of this intersection to reflect the latest Massachusetts Architectural Access Board (MAAB) and ADA guidelines. The exclusive pedestrian phase at the intersection should be maintained.

In addition to improvements for vehicular traffic, Route 111 has been identified in the MAPC Regional Bicycle and Pedestrian Plan as a major east-west route and has been listed as a high-priority on-road project. Since Route 111 has been identified as an on-road project, bicycle lanes have been located adjacent to traffic lanes on Route 111. The Federal Highway Administration publication titled *Selecting Roadway Design Treatments to Accommodate Bicycles* was used to determine that 6-foot bike lanes should be provided along Route 111, based on Route 111 roadway characteristics. The 6-foot bike lanes would accommodate "basic" and "children" bike riders (Group B/C bicyclists) assuming an "urban" cross-section (with curb and gutter) and no on-street parking. The precise layout of bicycle lanes should be determined during design of the future Route 111 improvements.

A conceptual plan of proposed Route 27/111 roadway improvements is shown in **Figure 18**. Under FAR 0.6 buildout conditions, the proposed improvements will result in projected levels of service of 'F' in the weekday A.M. peak hour, 'F' in the weekday P.M. peak hour and 'D' in the Saturday mid-day peak hour. With northbound and southbound left turns from Route 27 to Route 111 prohibited, levels of service would improve to 'D' and 'E' in the weekday A.M. and P.M. peak hours, respectively. These analysis results assume that the pedestrian phase is actuated every other signal cycle, or approximately 20 times an hour. Level of service calculations are included in **Appendix K**.

Figure 18. ROUTE 27/111 CONCEPTUAL DESIGN



Typical cross-sections of Route 111 and Route 27 are shown in **Figure 19.** Each roadway would contain two 12' travel lanes in each direction. Travel lane widths are shown as 12' to meet standard highway design requirements. The reduction of the lane widths to 11' should be pursued during design of the roadways. Route 27 would have 1' shoulders, with minimum 6' width sidewalks on each side of the roadway. Route 111 would have a 6' bicycle lane in each direction, and would also have 8' sidewalks along both sides of the roadway. Ideally, the sidewalks should be separated from the roadway by an 8' grass strip. In addition to the visual and safety benefits of this, the strip would also provide area for snow storage, or for future potential transit or handicapped parking bays.

2. Secondary Streets and Shopping Streets

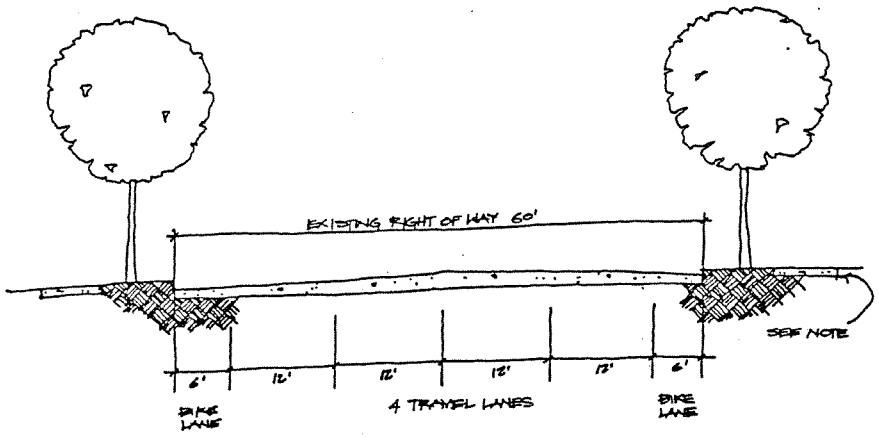
As discussed above, the creation of new bypass/access roadways cannot be expected to provide significant volume reductions at the Route 27/111 intersection. However, a system of new "secondary streets" and "shopping streets" has been developed to help define development parcels and improve the quality of circulation in Kelley's Corner, as well as to provide additional relief to the intersection. The secondary streets are intended for use as both access to the quadrant land uses, and alternative routes through Kelley's Corner. The goals in the development of the secondary streets are as follows:

- provide an access point to each quadrant from Route 27 and Route 111 as close to the study area boundaries as possible;
- align access points across Route 27 and Route 111 where future signalization is expected;
- connect access points through quadrants to provide access to quadrants and alternate travel routes; and
- restore the notion of shopping streets with vehicular and pedestrian traffic along them. The secondary streets provide access to the parking lots as well as internal circulation.

The new secondary streets would be composed of one 11' travel lane with a 1' shoulder in each direction, and 8' sidewalks on one or both sides of the street. A typical section of a new secondary street is shown in **Figure 19.** A description of opportunities to create these streets within each quadrant follows.

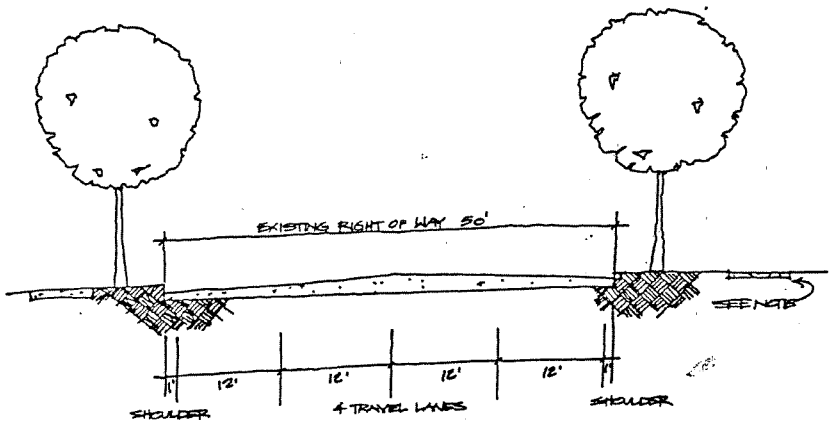
- ***Northwest Quadrant***—The northwest quadrant is the most constrained of the four quadrants, due to the adjacent school complex and the Hosmer House historical parcel. This is also the smallest quadrant, with the smallest component of commercial square footage. There is no potential for a new secondary street to serve bypass traffic in this quadrant, as it is not desirable to encourage traffic

Figure 19. ROUTE 27, 111 AND SECONDARY STREET TYPICAL SECTIONS



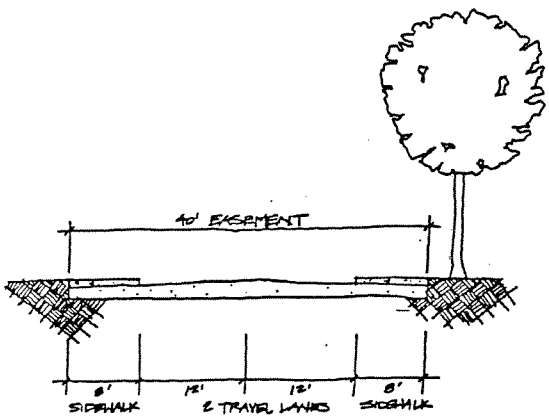
ROUTE 111

NOTE: MINIMUM 6' SIDEWALK TO BE PROVIDED WITHIN INDIVIDUAL PARCEL SETBACKS. LOCATION OF SIDEWALK & LANDSCAPING VARIES.



ROUTE 27

NOTE: MINIMUM 6' SIDEWALK TO BE PROVIDED WITHIN INDIVIDUAL PARCEL SETBACKS. LOCATION OF SIDEWALK & LANDSCAPING VARIES.



SECONDARY STREET

through the school complex. A secondary street to provide local access to the school complex could be considered. This street would require an easement along the edge of the Hosmer House parcel and/or the adjacent residential parcel aligned across from the private road. Access to the residential parcels in the northwest quadrant could be provided from a driveway off the secondary street. This type of access to the northwest quadrant parcels would allow some curb cut consolidation.

- ***Southwest Quadrant***—This quadrant has the most potential for redevelopment due to the size and topography of the K-Mart parcel. Here, the secondary street layout becomes more of a site planning issue, as access points to Route 27 and Route 111 as well as the connection between these points would most likely be within the K-Mart parcel. Ideal curb cut locations for secondary streets from this quadrant intersecting with Route 27 and Route 111 would be as far from the Route 27/111 intersection as possible while remaining generally within the confines of the business district, and align opposite to village or secondary streets in adjacent quadrants. In addition, the potential developer of this parcel should be required to provide access to the remaining two parcels in the quadrant so that the existing curb cuts on these parcels can eventually be eliminated. Besides a peripheral secondary street, shopping streets would be provided in front of commercial buildings, with pedestrian ways provided through the parking lot as well.

- ***Southeast Quadrant***—A secondary street along the periphery of this quadrant is the highest priority, as it provides a new connection and has some potential to reduce the major P.M. peak westbound Route 111 left turn volume at the Route 27/111 intersection. The street would begin at or near the current intersection of Beverly Road with Route 27, taking all necessary measures to prevent cut-through traffic through the Beverly and Kelly Roads neighborhood. The street would then run near the south edge of the quadrant in order to leave as much developable land as possible. It would be aligned within the Acton Dental parcel to leave a buffer zone to the adjacent residences. A connection to Route 111 would be made through the Petro-Plus parcel to form a 4-way intersection with the existing private road in the northeast quadrant. The roadway would continue "behind" the Goodyear and Children's Center parcels, cross the conservation land easement and wetlands, and again turn north to connect with Route 111, near the existing access to the 380 Massachusetts Avenue parcel. Access to the 380 Massachusetts Avenue parcel would connect to the new access roadway, rather than directly to Route 111.

  In addition, a local shopping street would be created along the internal edge of the buildings. Pedestrian ways would connect the peripheral secondary street and the shopping street.

  The development of new secondary streets through and within this quadrant will be challenging, due to the number of parcels affected by the roadway, the topography of the quadrant and the potential impact on the wetlands and conservation land easement located toward the east end of the quadrant. It is possible, however, that the design might take advantage of the topography to provide an enhanced separation of the Beverly Road residences and the Kelley's

Corner business district. Creation of this street will probably require subdivision of the Acton Dental parcel, and possibly acquisition of the long strip along the south side of the quadrant by the Town.

- ***Northeast Quadrant***—In this quadrant, the private road is already serving, at least in part, as a secondary street. This use needs to be formalized through Town acquisition of the road. Creation of additional new streets in this quadrant is constrained by its lower redevelopment potential, as well as topography issues. The quadrant is basically split into three sections by the private road and changes in elevation. A triangle of parcels is formed west of the private road between Route 27 and Route 111. East of the private road, the quadrant is split into northern and southern sections by a significant change in elevation that runs through the center of the quadrant.

  Parcels in the southern section of the quadrant are currently accessed via the private road or by a driveway just west of the Route 111 exit from Route 2. The driveway access to the easternmost parcel (Yankee Condominiums & real estate office) is unsafe due its close proximity to the exit from Route 2 to Route 111. Ideally, a new secondary street would be located at the southeast corner of the Acton Plaza parcel, providing access to both the residential parcel and the Acton Plaza parcel. This would serve to eliminate the existing unsafe driveway, and would provide more direct access to and from the Acton Plaza parcel for vehicles traveling to the study area from the east. In the long term, the street would continue through the quadrant to provide a connection to the Acton Medical parcel. This new street should be aligned with the secondary street proposed for the southeast quadrant. The private road would continue to provide access to this section of the quadrant.

  The northern section of the quadrant is primarily composed of the Acton Medical and Dunkin' Donuts plaza parcels. When the Acton Medical parcel is redeveloped, the driveway would ideally be realigned with the Route 2 ramp at the point where left turns are made to and from the ramps. Due to the topography of the parcel, realignment of the driveway would require significant grading changes. The realignment of this driveway becomes most desirable if the Route 2 ramp intersection is signalized. Also, due to topography, this access will essentially serve only the Acton Medical parcel. The existing connection to the lower elevation parcels should be improved and should meet the secondary street in the southern section of the quadrant. Access to the Dunkin' Donuts parcel area should continue to be provided from the private road.

  The triangle of land formed by Route 27, Route 111, and the private road has many curb cuts on all three roadways. The goal is to consolidate these access points, and to provide access from the private road via shopping streets instead. As parcels are redeveloped, only one or two access points should be provided from the private road to shared parking for all of the parcels in the triangle.

3. Secondary Street Intersections with Regional Roads

Under the FAR 0.60 scenario, the operations of the intersections of the secondary streets with Routes 27 and 111 become critical. The combination of increased traffic volumes to and from the driveways and increased through traffic volumes causes the intersections of both existing driveways and the new secondary streets with Route 27 and Route 111 to operate at levels of service 'F', with a deterioration in outbound approach level of service in particular. In fact, level of service analysis for build conditions without mitigation for the intersection of the private road with Route 111 for the P.M. peak hour shows no capacity available for vehicles turning left out of the private road.

The solution is that turning lanes will have to be added to Routes 27 and 111 at major access points. These points will also need to be signalized at such a time that traffic volumes cause signal warrants to be met. If signals are added, their operation will have to be integrated as part of a coordinated system including the new signals and the signal at the Route 27/111 intersection. If traffic signals are warranted at any other secondary street intersections with Route 27 or 111, these signals would also have to be part of the coordinated system. In addition, new signals should include concurrent pedestrian phases where possible and exclusive pedestrian phases where necessary. Typical proposed improvements for the secondary street intersections with Route 27 and Route 111 are shown in **Figures 20 and 21.** At a planning level of analysis, these intersections are projected to operate at acceptable levels of service with the proposed improvements.

4. Shopping Street/Secondary Street Intersections

Shopping street intersections with secondary streets should be treated in accordance with current Town of Acton site planning guidelines for driveways. The actual layout and geometry will be dependent on parking lot circulation. Signing to the various shopping areas at these locations should be consistent among the various quadrants in order to accentuate the impression of a unified village center.

5. Pedestrian and Bicycle Paths

Finally, pedestrian and bicycle paths within each quadrant should be provided to further organize the local circulation systems. Although these facilities will not carry motor vehicles, they can still be designed and located to create the image of a closely spaced grid of secondary streets.

Figure 20. ROUTE 27/PRIVATE ROAD CONCEPTUAL DESIGN

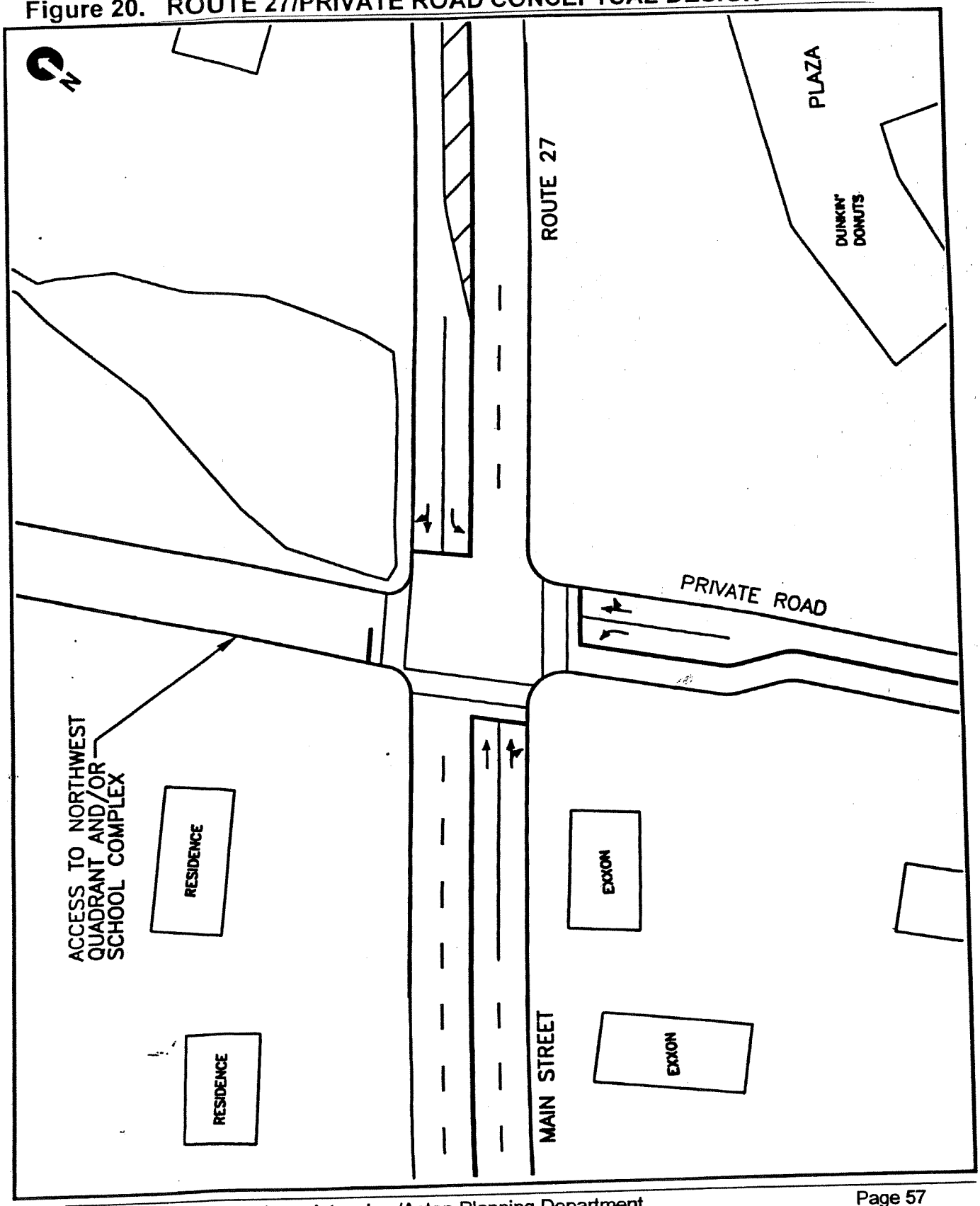
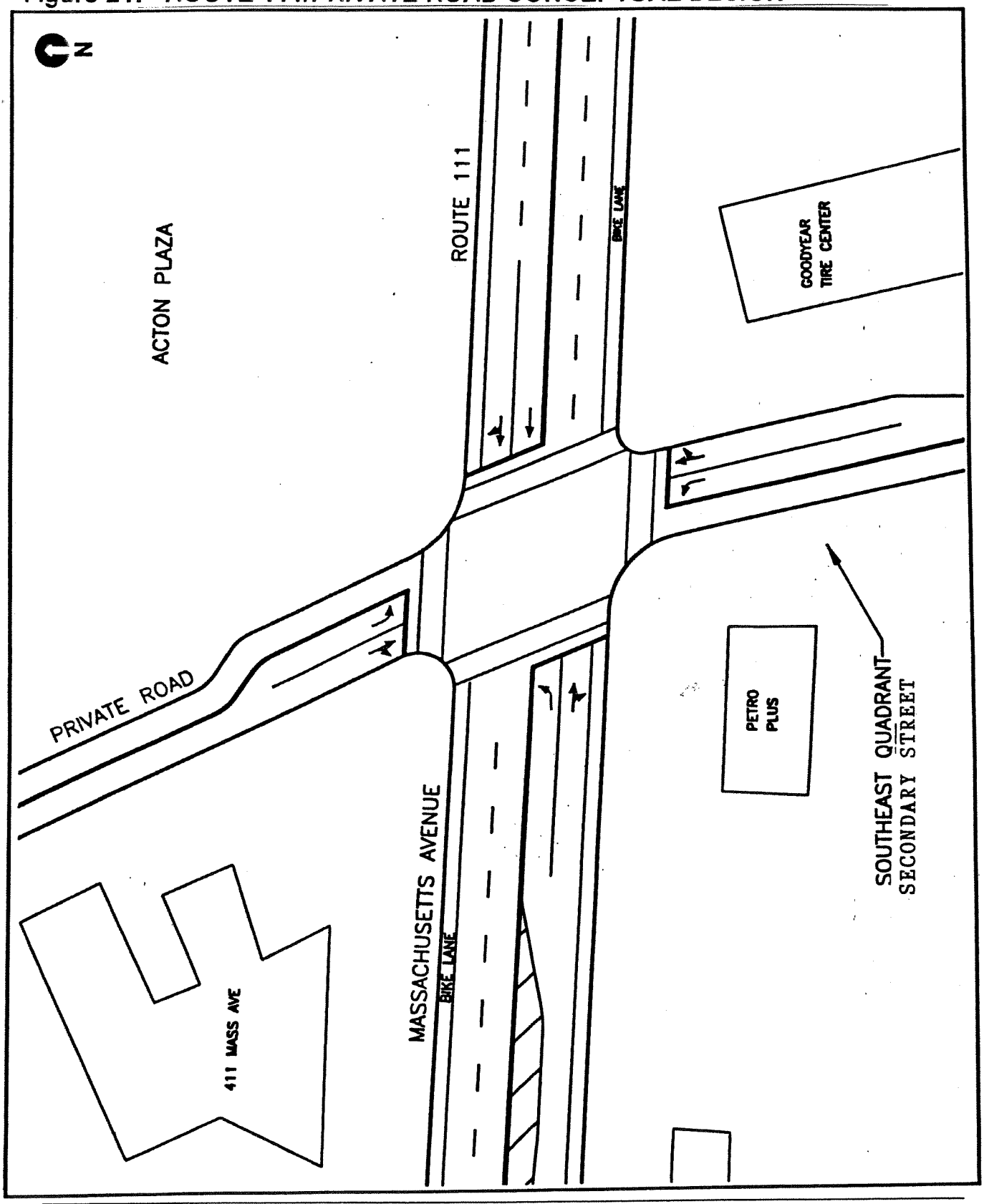


Figure 21. ROUTE 111/PRIVATE ROAD CONCEPTUAL DESIGN



In warm weather, vendor kiosks or food stands could be situated at nodes located along these walkways to encourage walking and longer stays in the area. Where possible, actual 6-feet minimum sidewalks should be provided to separate parking bays, which should be located perpendicular, rather than parallel, to buildings. If possible, landscaping can also be provided along the walkways. Sidewalks fronting the commercial storefronts should be continuous and slightly wider to encourage travel between stores. All walkways should be treated in a consistent way in terms of lighting, street furniture, pavement, canopies or awnings, etc. to help unify the public spaces in the various quadrants. Pedestrian connections from the nearby housing areas to the commercial areas should also be formalized with unified sidewalk treatments.

Similarly, clear bicycle routes should be identified to and within each parking area both from Routes 27 and 111, nearby housing, and the school. Secure bicycle parking facilities should be provided close to storefronts. The specific placement of pedestrian and bicycle ways will depend largely on the type of site re-development. The Urban Village Concept Plan presented in the following section shows a schematic representation of the placement of pedestrian and bicycle ways.

C. *Urban Village Conceptual Design*

1. Objectives for Urban Village Development

Primary goals for Kelley's Corner's future growth and development call for "attracting additional business to the area" and "achieving a sense of place and community pride." Urban Village zoning regulations and design guidelines will provide a framework for increased density and variety of land uses and guide the area toward more of an urban village or "Main Street" character as new development replaces older structures. By coordinating development and circulation changes on a quadrant by quadrant basis, greater continuity of streetscape can be achieved. Reorganization of streets and incorporation of landscaped arcades and plazas can begin to transform the currently dispersed and separated activities into an attractive mixed-use center for Acton. The focus of activity will continue to be at the corner of Routes 111 and 27. Diagonal landscaped plazas in the northeast and southwest quadrants at the traditional crossroads will connect to the shopping and office arcades in the center of the quadrants. The buildings remain oriented to Routes 111 and 27 as formal facades with pedestrian access at ground level. Auto and additional pedestrian access will be available from the interior of the blocks or quadrants. In contrast to the current pattern of multiple entrances, parking, and curb cuts that requires driving between individual businesses, the new pattern of shared parking, bikeways, and attractive outdoor pedestrian sidewalks will require less driving, encourage more walking, and provide a village street type of experience.

With these design guidelines, increased density of development is likely to occur through the assembly of multiple lots within each quadrant to allow shared parking as well as continuity of buildings, plazas, and walkways. It is anticipated that the actual buildout of the sites will result in significant variety and individual character but can still incorporate setbacks and landscaping to create an attractive new context and a more

unified whole. Particularly, buildings will be placed on the existing arterials and parking and walkways will be turned towards the quieter new secondary streets that surround the center—in contrast to mini-malls that typically orient the parking toward the main arterials.

2. Assumptions and Methodology

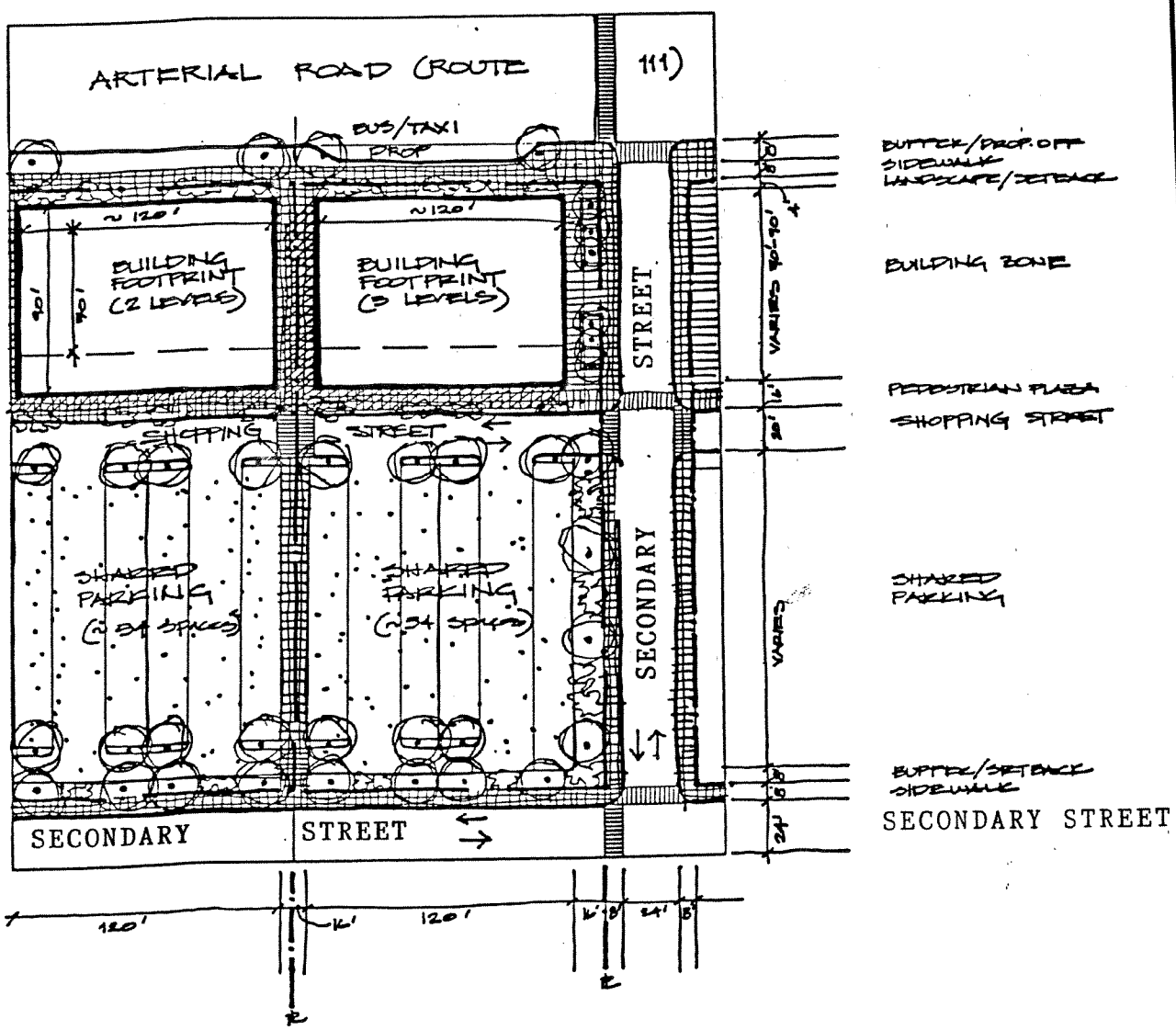
New development or re-development can follow a typical multiple lot site prototype model, with potential application for Kelley's Corner quadrants based on several key assumptions and constraints. **Figure 22** shows the site prototype plan assuming the combined use of two or more typical lot sizes.

In the prototype, the two lots shown are taken from the southeast quadrant and assume the completion of the secondary street system. By consolidating the building footprints into a row along Route 27, combining the parking and providing retail curbside access on the side facing the new secondary street, an attractive and efficient shared parking area can be provided. The buildings would typically be two to three levels, with retail on the ground level and office space above, achieving a balance between areas of use and required parking. The parking ratio assumes both the shared parking and the Kelley's Corner reductions from the current zoning. The average optimized FAR for these sites would be about 0.5 when all of the privately owned lot areas are included. This would validate an allowable FAR of 0.6 for the retail/office areas. The higher amount might be achievable with a different mix of uses and fewer perimeter streets.

Overall, assumptions in applying the prototype development plan to the full site included the following:

- Shared parking and allowable reductions. No structured parking.
- Structures varying from 1 to 4 levels, and 70 to 90 feet in depth.
- Typical land use mix for standard buildings: ground level retail with ancillary retail, small office or general office above, as described in the buildout discussion in Chapter IV, Section A.
- Special land-uses at street corners such as drive-in banks, food, auto services, laundries, etc.
- Potential entertainment center (multiplex cinema, bowling, exercise center, etc.) in the center of the northeast quadrant.
- Open space distributed throughout the three quadrants, with a central focus at the crossroads.
- Landscaped buffer zones around buildings and parking.
- Pedestrian walk ways and bikeways along all arterials and secondary streets.
- Consolidation of lots for maximum FAR buildout.
- Redevelopment by multi-lot quadrant parcels rather than by individual lots.

Figure 22. URBAN VILLAGE SITE PROTOTYPE



- Requirements for multi-lot developers to build buffers, walks, and adjacent secondary streets.
- Regrading of areas with topographical constraints where possible to create larger parcels for development and shared parking.
- Loading and servicing could be provided at the sides rather than the front or back of buildings.

3. Conceptual Design Description by Quadrant

Urban Village zoning regulations and design guidelines could in the longer term result in a reconfiguration of Kelley's Corner under an increased allowable FAR. The various quadrants will be treated differently in response to their respective dimensions, topographies, and current lot configurations.

The following is a conceptual outline by quadrant on how Kelley's Corner could be reconfigured. The actual buildout of Kelley's Corner is likely to be quite different over time, since the assembly of multiple lots may be quite random depending on ownership and ongoing profitability of existing businesses. The larger sites in the southwest and northeast quadrants may be redeveloped more easily than those of the southeast or at the corner triangle of the northeast quadrant.

- ***Southwest Quadrant***—The K-Mart site and the other lots in this quadrant would be converted into a U-shaped retail and office complex along Routes 27 and 111 with parking in the center and new secondary streets around the south and west perimeter to formalize the short cut now taken through the parking lots. The new secondary street entrance from Route 111 would be combined with a re-routing of the access road to the school complex in order to create a single intersection. An open plaza would be provided at the crossroads of Routes 27 and 111. Because of the limited number of lots, this quadrant could be more easily assembled and might be the first to be redeveloped.
- ***Southeast Quadrant***—New secondary streets would need to be built along the south and east perimeter with a connection to the existing private street between Route 27 and 111 in the northeast quadrant. Some regrading of the knoll may be necessary to allow redevelopment of these parcels. The "L"-shaped property of Acton Dental might need to be subdivided to create more readily developed sub-parcels and the new east-west secondary street. An overall "L" -shaped retail/office complex along Routes 27 and 111 would be served by shared parking in the rear. Vehicular access will be provided from the secondary street on the south side. An open space buffer to the adjacent residential area in the south will be maintained along the Kelley's Corner perimeter.
- ***Northeast Quadrant***—The largest and most complex of the three, this quadrant would be divided into three parcels; a corner triangle between Routes 27 and 111, and the existing private street connecting the two, a north parcel on Route 27 and a south parcel on Route 111. The division between the north and south parcel would follow approximately the line of grade change that leads from the existing private road towards the north east edge of the quadrant. The existing private road would be upgraded to match other secondary streets, and a second perimeter street on the east side would be added. The triangle would consist of lower height retail and service businesses because of limited parking capacity. An open plaza

will be provided at the crossroads of Routes 27 and 111 diagonally opposite from a similar plaza in the corner of the southwest quadrant. The north parcel could be expanded with a variety of new and existing uses in 2- to 3-level structures lined up along Route 27 with shared parking in the rear. The south parcel would have the highest density potential with 3- to 4-level structures lined up along Route 111 and an entertainment complex in the rear with shared parking in between. Several drive-in services could be included along the existing private road in the smaller structures. Regrading of the area between the north and south parcels would improve development capacity.

- ***Northwest Quadrant***—As stated above, there is little opportunity for new commercial development or street construction in this quadrant due to the school complex and the historical Hosmer House. Rather, intensification of the residential uses already present from single to multi-family units, as recommended in the *Specific Area Plan* and adopted in the 1995 Zoning Bylaws, introduces more residential use to Kelley's Corner. This will reinforce the village concept by adding a 24-hour population and pedestrians. Appropriate markets for the housing might be singles, young couples and "empty nester" senior citizens, all of whom would tend to own fewer cars and to see the benefits of living in a denser mixed use area close to shopping, services and entertainment.

4. Development Implications

To encourage the reconfiguration as outlined above several incentives will be needed for new development.

- ***Allowable FAR***—Increasing the allowable FAR to 0.6 would provide considerable incentive for increased density from the current estimated average of less than 0.2. However, additional incentives for multiple site development might be considered through a design review process (similar to a "planned unit development" or PUD procedure) which would allow for combined open space, modified setback requirements and other benefits from multi-lot approaches.
- ***Parcel assembly***—In some quadrants, the responsibility for provision of secondary street and walkway right-of-ways may fall more heavily on a few property owners, such as the "L"- shaped lot in the southeast quadrant. The Town may need to assist in the acquisition of key parcels for portions of the circulation plan, if the lot assembly cannot proceed otherwise. Determination of how to calculate Floor Area Ratio development rights for sub-divided properties providing circulation and/or open space may also need to be addressed by the Town zoning board.

5. Zoning Amendments

The development concept outlined herein represents a more intensive use of land than is permitted by Acton's existing zoning regulations: buildings are sited closer to the street, landscaped buffers are narrower, and parking lots have less internal landscaping. Therefore, in addition to the floor area ratio increase underlying the concept plan, a number of changes to the Town's zoning regulations would be needed in order to allow the outlined type and scale of development.

- ***Front Yard (Section 5 – Table of Standard Dimensional Regulations)***—The front yard requirement of 30 feet should be reduced to reflect the site prototype plan and allow for more flexibility in site development. Consideration should also be given to differentiating the requirements for major and internal streets, such as one of the following approaches:

  - define "arterial road" and "secondary street," and set separate front yard requirements for each;

  - set one standard specifically for Main Street and Massachusetts Avenue, and a different standard for all other streets;

  - set one standard for streets over 40 feet in width, and a different standard for smaller streets (note: the prototype plan shows a total width, including sidewalks, of 40 feet for the secondary street).

  See Sec. 5.2.4 for application of front yard requirements to corner lots. (It is assumed that the "shopping street" adjoining the buildings in the prototype plan, essentially a continuous travel lane within adjoining off-street parking areas, will be privately-owned and therefore not require a setback.)

- ***Kelley's Corner Design Standards for FAR Exceeding 0.20 (Section 5.6.3)***

  - **Sidewalk (5.6.3.1)**—The existing regulations call for a 10-foot sidewalk along the lots' street frontage, with a landscaped buffer also 10 feet in width. Both may be partially or entirely within the street layout. In the site prototype plan both the sidewalk and the landscaped buffer are reduced to 8 feet in width, with the buffer eliminated at certain locations for bus/taxi loading areas. No buffer between the sidewalk and roadway is proposed along the secondary street. Consideration should be given to reducing the width requirements for sidewalks and buffer strips, and to establishing separate regulations for frontages along different types of streets.

  - **Building Design (5.6.3.4)**: The requirement that 60 percent of a lot's frontage be occupied by buildings within 40 feet of the street line is not met for the secondary streets shown in the Urban Village Concept Plan and Site Prototype Plan, and should be modified to apply to arterial streets only (or specifically to Main Street and Massachusetts Avenue).

- ***Parking Lot Design Requirements (Section 6.7)***—Several aspects of these requirements may need to be revised to reflect the site prototype plan.

  - **Cells (6.7.1)**—The bylaw requires that parking lots be broken up into cells of no more than 40 spaces, separated from each other by at least 30 feet of landscaped area. These requirements may need to be adjusted.

  - **Setbacks (6.7.2)**—The bylaw requires that parking areas be set back at least 30 feet from all front lot lines. This requirement may need to be reduced.

This is another area where distinguishing between arterial roads and secondary streets is needed.

- **Perimeter landscaping (6.7.6)**—The existing requirement for perimeter landscaping (within the setback from the street line) is 10 feet. This may need to be reduced to the 8 feet shown on the prototype plan to allow for more flexibility in site design.
- **Interior landscaping (6.7.7)**—The bylaw requires that at least 10 percent of the interior area of a parking lot cell with more than 25 spaces be planted as landscaped island areas, exclusive of perimeter landscaping. This requirement may need to be reduced in order to provide the parking required at higher FARs.

- Existing provisions at Sections 5.6.1, 5.6.2.2 and 10.4.3.4(g) establish a basis for incorporating street reservations in the site plan review process. However, more specific language referring to the Circulation Plan should be incorporated.

6. Concept Design Findings

Several interesting conclusions may be drawn from a review of the Kelley's Corner proper and the development concept discussion:

- ***Maximum achievable FAR***—The shape, topography, and dimensions of the potential parcels in the three quadrants appear to set some limits on the type and density of development which can be supported. The lot depths are generally too shallow for effective use of structured parking and higher building heights. Sites in other areas along Route 2 are likely to be larger and less costly and therefore would be preferable for these types of developments. Grade parking therefore seems more likely than structured, which in turn limits the amount of building possible. With shared parking and retail/office uses, the maximum achievable density for the total Kelley's Corner business district appears to be approximately 0.5. This is probably the case regardless of the allowable Floor Area Ratio, which reinforces adoption of a 0.6 maximum or at most 0.8.
- ***Land uses***—The current mixture and types of retail, service, and office uses is likely to continue for some time. An office park or shopping mall is more likely to seek less costly and larger consolidated parcels within the region.
- ***Development impact on traffic and circulation growth***—The conceptual design and development outline was intended to separate through traffic from local business traffic, to reduce traffic through the central intersection and to encourage non-auto trips by creating a new hierarchy of streets in which new retail/office/service clusters are accessed from new secondary streets, internal shopping streets, and pedestrian ways rather than from the regional arterial roads. The conflict of local and through traffic is thereby minimized. The existing proliferation of curb cuts from Routes 111 and 27 can gradually be eliminated and local traffic diverted to the new streets. This in turn will allow for the anticipated growth of arterial traffic, while offering an attractive and efficient alternative for local business access and enhancing the village character.

VI. PHASING/COSTS/FUNDING

A. *Phasing and Cost Estimates*

The following sections contain discussion on the potential phasing of implementing the proposed circulation plan elements, as well as generalized cost estimates for each type of improvement. Again, it should be noted that the phasing of improvements will be dependent on the types of re-development that occur, and the sequence in which parcels and quadrants are re-developed. Some of the improvements listed in the following sections are also applicable to existing conditions.

1. Route 27/111 Intersection

The first improvement to consider for this intersection is the addition of an exclusive left turn phase for the Route 111 left turns. The geometry for this type of signal phasing exists today, but the improvement would require signal equipment and timing modifications. This signal timing change would improve both safety and level of service at the intersection. The cost of this improvement, assuming that the existing signal controller can be maintained, would be approximately $13,000, including design. If the controller has to be replaced, the total cost would be approximately $30,000.

Another option to improve existing and short-term operations at the intersection is to provide left turn lanes on the Route 27 approaches. The existing roadway is wide enough to accommodate this change in geometry—only changes in lane markings would be required. The Route 27 left turn volumes are too low to justify a separate signal phase, but the provision of a separate lane will improve the intersection by moving left-turning vehicles out of the way of through and right turning vehicles. The cost of this improvement would be approximately $2,000 to $3,000.[5]

Implementation of the above two improvements would result in existing levels of service of 'C', 'D' and 'C' in the weekday A.M., weekday P.M. and Saturday mid-day peak hours respectively. Under 2010 no-build conditions (assuming minimal additional development in the Kelley's Corner district), the intersection is projected to operate at levels of service 'D', 'F', and 'D' in the three peak hours.

As more re-development occurs, the next step to improve the intersection would be to implement the widening of Route 27 to a four-lane cross-section, as included in the Town of Acton 1991 Master Plan.

Finally, as higher development levels are achieved throughout the study area, the Route 111 approaches would be widened to four-lane cross-sections, with corresponding changes to signal equipment, phasing, and timing. The cost of the new signal equipment for this improvement would be approximately $50,000. The cost of the geometric changes is included in the estimate for the widening of Route 111 to a four-lane cross-section, as the assumption is that the two improvements would be done at the same time.

Levels of service at the Route 27/111 intersection will vary depending on the types and sequence of re-development. Traffic impact studies can be used to confirm that the

[5] Before the revision date of this document, a new signal timer has been installed and an exclusive left turn phase for Rt. 111 has been provided. Also, there are now left turn lanes on Rt. 27.

above is the most effective phasing of improvements and to project levels of service as re-development occurs.

2. Secondary Street Intersections with Routes 27 and 111

A short-term improvement for the intersections of the private road with Routes 27 and 111 would be to provide left turn lanes for vehicles turning from Route 27 or 111 onto the private road. This will remove the existing condition of through vehicles being blocked by left turning vehicles, which in some instances results in through moving vehicles driving off the road to go around the left-turning vehicles. This improvement will not, however, improve conditions for vehicles turning from the private road onto Route 27 or 111.

In order to improve operating conditions for vehicles exiting from the private road, the intersections would have to be signalized. As re-development occurs, these intersections as well as other major study area access points, should be monitored to determine the time at which traffic signals are warranted. The locations that are most likely to warrant traffic signals are the intersections of the private road with Route 27 and Route 111.

Depending on the re-development, traffic signals could potentially be warranted at the following secondary street intersections: Route 27 south of Route 111 (Near Beverly Road); Route 111 west of Route 27 (at the school access drive), Route 27 at the Route 2 ramps; and Route 111 west of the Route 2 ramps (at the 380 Mass Ave/Acton Plaza street).

Signalization of a 3-leg intersection has an estimated cost of $30,000. A four-leg intersection would cost approximately $50,000 to signalize. The cost of a coordinated signal system for the two private road intersections and the Route 27/111 intersection is estimated at approximately $190,000, including new signal equipment at all three intersections and the interconnection of the signals. Additional signals at other secondary street intersections with Routes 27 or 111 would cost approximately $70,000 each, including a new signal and interconnection to the signal system.

3. Widening of Routes 27 and 111

Phasing of the roadway widening will depend on the phasing of improvements to the intersections along Routes 27 and 111. A cost per linear foot was developed for each roadway. Widening of Route 111 is estimated to cost approximately $220 per linear foot and Route 27 widening would cost $185 per linear foot. Widening Route 27 from Route 111 to 250' past the private road, and Route 111 from Route 27 to 250' past the private road would cost approximately $1 million, including design.

The above cost estimate does not include sidewalks, as it is assumed that the construction of sidewalks will be the responsibility of developers. The cost of sidewalk construction will obviously vary with parcel size, but can be estimated to cost approximately $10 per linear foot. This estimate does not include the cost of curbing, as the sidewalk will be separated from the roadway by a green strip. The cost of roadway curbing is included in the above cost estimate for Routes 27 and 111.

4. Secondary Streets

The phasing of the secondary streets has been discussed in previous sections. The cost of construction of the secondary streets is estimated at approximately $120 per linear foot. This estimate reflects the cross-section presented in **Figure 19** above, with sidewalks on both sides of the street.

Cost estimate assumptions and details for the above estimates are included in **Appendix L.**

5. Curb Cut Consolidations

There are some opportunities for reducing the number of curb cuts in the study area in the short-term. Opportunities for each quadrant are discussed below.

- ***Northwest Quadrant***—In the short-term, eliminating one of the three curb cuts that serve the law office and the Redstone Condos could be considered. Future residential developments on the R2 zoned parcels, as well as the commercial parcel if possible, should be required to share a driveway.
- ***Southwest Quadrant***—The curb cuts for Nynex and Baker Whitney do not currently pose a circulation problem because traffic generated by existing land uses is so low. In the event of a redevelopment of either of these parcels, curb cuts should be eliminated and access should be provided via the K-Mart parcel.
- ***Northeast Quadrant***—Access to the Acton Plaza parcel could be improved with a new access point at the east edge of the parcel. This access point could also potentially serve the Yankee Condo parcel and allow the elimination of the existing unsafe driveway in the short-term.

  There are no simple short-term opportunities for curb cut consolidations along the northern edge of this quadrant, or along the triangle of parcels west of the private road.
- ***Southeast Quadrant***—In the short-term, the access drive to the 380 Mass Ave parcel could be realigned to meet Route 111 at a 90-degree angle and converted to two-way operation. This improvement could be done in conjunction with the new access point to the northeast quadrant.

  Throughout the rest of the quadrant, short-term curb cut consolidations would depend on the cooperation among adjacent landowners. As development occurs, adjacent landowners could be required to share a curb cut until the secondary street through the quadrant is complete, at which point access from Route 27 or 111 would be eliminated.

B. *Funding*

Creation of the new street system to serve reconfigured development parcels and achieve the Kelley's Corner design goals as well as improvement of the regional roadways to accommodate traffic growth will require a commitment by the Town to fund basic infrastructure design and construction.

As noted in the Acton Master Plan, any improvements along Route 27 and 111 are eligible for federal aid highway funding (up to 90% federal reimbursement), provided via the Intermodal

Surface Transportation Efficiency Act (ISTEA), now its successor program TEA 21. Route 27 is classified as Federal Aid Primary/Urban facility under local jurisdiction and Route 111 is classified as a Federal Aid Urban facility under state jurisdiction. These funds are granted through the Massachusetts Highway Department's Chapter 90, Statewide Road and Bridge Program, PWED, and Chapter 81 programs.

Construction projects can also compete with many other projects across the state to receive specific funding allocations through the Transportation Improvement Program. The Route 27/111 intersection and roadway improvements would be an appropriate candidate for funding under this program. The project would need to be designed to MHD standards and be pedestrian/bicycle/handicapped accessible.

Funds from the Town and from private developers (by means of impact fees or other mitigation agreements) can be used as matching funds for the above grants. Private funding of design plans is an effective means to advance projects toward approval and construction.

For creation of the secondary and shopping streets, pedestrian ways and bicycle routes, other sources programs can be tapped. These include:

- (TEA 21) Enhancement funds as well as state Transportation Bond funds can be used for the bicycle lanes along Routes 27 and 111 as well as bicycle connections within the quadrants.
- PWED funds can be used for parking improvements or joint parking facilities, sidewalk widenings, and bicycle accommodations on the streets.
- (TEA 21) Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds could be used for bikeway improvements, signage, kiosks, and pedestrian improvements pursued in the interests of "traffic calming" and demand management within the quadrants.
- The Federal Transit Administration's Livable Communities Initiative could be a source of funds for sidewalk improvements if integrated with bus service or park and ride facilities at some future point.
- Town funds and developer contributions could be allocated for improvements that are not eligible for federal or state funding.

Private sector funding from developers and the business community can be used for on-site improvements and matching funds. Clearly private support from property owners, developers, and businesses is vital to securing any type of public agency funding to achieve the village design concept. The Massachusetts Department of Housing and Community Development offers funds for peer-to-peer technical assistance, which might support the Kelley's Corner Planning Committee in increasing private sector support for improvement projects.

VII. GLOSSARY OF TERMS

ADA (Americans with Disabilities Act)—Federal legislation prohibiting discrimination on the basis of disability, requiring accessible transportation services.

Arterial—A class of street or highway serving major through traffic, usually on a continuous route.

Automatic Traffic Recorder (ATR) counts—A count of vehicles passing a selected point taken by a traffic counting machine.

Bike lane—A portion of a roadway which has been designated by striping, signing, and pavement marking for the exclusive use of bicycles.

Build or no-build—Refers to conditions in a future year with or without the changes that may result from the present study.

Buildout—A theoretical representation of maximum potential development in the study area.

Bypass—A roadway or route that provides a connection between points that diverts traffic from another roadway or route.

Capacity—A measure of the ability of the street to accommodate traffic.

Critical movement analysis—An analysis methodology that provides a general evaluation of the capacity of signalized intersections, based on hourly traffic volumes and lane usage at the intersection.

Crosswalk—The marked crossing area for pedestrians crossing the street at an intersection or designated mid-block location.

CTPS (Central Transportation Planning Staff)—The inter-agency staff responsible for a large part of the technical and community liaison transportation planning work in the Boston region.

Floor Area Ratio (FAR)—The ratio of total building floor area to the total parcel area.

Grade separation—A crossing of two roadways at different vertical locations resulting in unhindered vehicle flow.

ISTEA (Intermodal Surface Transportation Efficiency Act of 1991)—Federal legislation that restructures and authorizes increased funding levels for transit and highway programs and mandates a necessary role for MPO's in ISTEA planning and funding decisions, requiring comprehensive regional transportation plans to the year 2015.

ITE (Institute of Transportation Engineers)—Professional organization for traffic and transportation engineers that produces many transportation engineering resources, including the Trip Generation Manual and Parking Generation Manual.

Land use—The purpose for which land or the structures on the land are being utilized. For example: commercial, residential, retail.

Level of service—A qualitative measure describing operational conditions within a traffic stream; generally described in terms of average delay to vehicles at intersections, or speed and travel time on roadway segments.

Local road—Roads whose principal function is to provide direct access to abutting land.

MAPC (Metropolitan Area Planning Council)—The agency responsible for comprehensive planning for the Boston metropolitan area, covering 101 communities.

Mode—A particular means of transportation (e.g. rail, automotive, bicycle, walking).

MPO (Metropolitan Planning Organization)—Specified by Federal legislation as the organization responsible for comprehensive transportation planning and programming for urbanized areas.

Parking Generation Manual—Reference produced by ITE, which provides data and formulas to determine the number of parking spaces required by specific land uses.

Pass-by—A term used to describe a vehicle that is diverted from its primary trip to a secondary, unplanned destination along the route of the primary trip.

Peak hour—The peak hour is the 60-minute period during an average weekday morning, weekday evening, or weekend day when the greatest number of vehicles travels past a specific point or through a specific intersection.

Quadrant—Refers to each area of land at the corners of the Route 27 and Route 111 intersection.

Queue—The number of vehicles that accumulate at an approach to a signalized intersection or at an unsignalized intersection approach waiting to enter or cross an opposing traffic stream.

ROW (right-of-way)—Priority paths for the construction and operation of modes of transportation.

TEA 21 – ISTEA's 1998 successor program

TIP (Transportation Improvement Program)—A program of transportation projects to be funded under federal programs for a three-year period developed by each MPO.

Trip Generation Manual—Reference produced by ITE, which provides data and formulas to determine the number of trips to and from specific land uses.

Turning movement counts—A count of vehicles passing through an intersection by each possible path through the intersection.

v/c ratio—The ratio of the volume of traffic served or projected to be served by a roadway or intersection to the capacity of the roadway or intersection.