

FINAL REPORT

PARK AVENUE

CORRIDOR STUDY

AUBURN, MAINE

PREPARED FOR:
AVCOG/ATRC
125 Manley Road
Auburn, Maine 04210

PREPARED BY:
Gorrill-Palmer Consulting Engineers, Inc.
P.O. Box 1237, 15 Shaker Road
Gray, Maine 04039
(207)657-6910
June 2007

Park Avenue Corridor Study

Auburn, Maine

Table of Contents

Acknowledgements.....i

Executive Summary.....1

1. Introduction.....6

Project Background.....6

Study Area.....7

Project Goals.....7

2. Existing Conditions.....8

Data Collection.....8

Speed Analysis.....9

Historic Growth.....9

Effect of Traffic Signal Installation for Park Avenue at Court Street.....10

2006 Adjusted Volumes.....10

Bicycle and Pedestrian Amenities.....10

2006 Volumes: Capacity and Level of Service.....11

Origin-Destination Study.....13

Collision History.....14

Design Years.....16

Future Volumes: Capacity and Level of Service.....17

Summary of Existing Conditions.....20

3. Improvement Recommendations.....21

Park Avenue at Court Street.....21

Park Avenue at Lake Street.....21

Lake Street at Gamage Avenue.....21

Park Avenue at Summer Street.....22

Park Avenue at Mount Auburn Avenue.....22

Mount Auburn Avenue at Summer Street.....22

4. Identification and Evaluation of Improvement Alternatives.....23

Traffic Calming Measures.....23

Typical Cross-Sections.....27

Determination of Construction Phasing Program.....30

Additional Discussion on Improvement Plan.....34

Other Recommendations.....38

5. Public Process.....40

6. Recommendations.....42

Report Tables

Table 2.1: Speed Data Along Park Avenue.....9
 Table 2.2: Peak Hour Pedestrian Volumes – 2006.....11
 Table 2.3: Level of Service Criteria for Signalized Intersections.....11
 Table 2.4: Level of Service Criteria for Unsignalized Intersections.....12
 Tables 2.5-2.10: LOS Results for Study Area Intersections – 2006 PM Peak Hour.....12
 Table 2.11: Results of Origin Destination Study on Park Avenue.....13
 Tables 2.12-2.23: LOS Results for Study Area Intersections – 2015/2025 Peak Hour.....17

Report Figures

Figure 2.1: Historic AADT of Park Avenue south of Summer Street.....9
 Figures 2.2-2.3: Collision Diagrams for Study Area High Crash Locations.....15

 Figures 4.1-4.6: Potential Traffic Calming Measures.....24
 Figures 4.7-4.11: Typical Cross-Sections.....28

Appendices

Appendix A.....Study Area Map, Turning Movement Diagrams
 Appendix B.....Concept Plans
 Appendix C.....Collision Data, Historic Data, Forecasting Results, Forecasting Memo
 Appendix D.....Meeting Notes, Public Correspondence, Maine DOT Policy on Traffic Calming
 Appendix E.....Capacity and Queuing Analyses, Signal Warrant Analyses
 Appendix F.....Turning Movement, ATR Counts
 (Note: Technical appendices E and F available upon request under separate cover)

Acknowledgements

The Consultants and the Committee wish to acknowledge the assistance that Patricia “Pat” Finnegan, outgoing City Manager for Auburn, has provided throughout the course of the study. Pat’s ongoing involvement with the project has contributed to the success of this report. ATRC, the Park Avenue Advisory Committee and the Consultant wish her the best in her future endeavors.

Special thanks also go to those individuals who comprised the Advisory Committee itself and those individuals who attended the public meetings. The attendees and notes from the meetings are enclosed in the Appendix of this report.

Park Avenue Advisory Committee Members

Bob Belz, Public Works Director, City of Auburn
Cathy Dodge, Park Avenue Elementary School
Cathy Veilleux, Park Avenue Elementary School
Cecil Wheeler, Park Avenue Resident
David Galbraith, Director of Planning and Permitting, City of Auburn
Dennis Emidy, Planning Department, MaineDOT
Eric Labelle, Community Services Director, City of Auburn
Gail Phoenix, Park Avenue Resident City of Auburn
Karen Scammon, Park Avenue Resident
Laurie Smith, Assistant City Manager, City of Auburn
Melissa Buzza, Park Avenue Resident
Pat Finnegan, City Manager, City of Auburn
Phil Crowell Jr., Police Chief, City of Auburn/Park Avenue Resident
Ralph Webster, MaineDOT
Robert Hayes, City Councilor, Ward 2, City of Auburn
Sid Hazelton, Assistant Public Works Director, City of Auburn
Vickie Gaylord, Principal, Park Avenue Elementary School

Executive Summary

Preface

Park Avenue from Mount Auburn Avenue west of the Mall area to Court Street serves as one of the primary north-south cross-town corridors for the City of Auburn. It is defined as a major collector by the City of Auburn and the Androscoggin Transportation Resource Center (ATRC). A two-lane roadway, this corridor provides an alternate route to Minot Avenue and Center Street, as well as a connection (via Mount Auburn Avenue) to Lewiston.

The construction and opening of the overpass to the Veteran's Memorial Bridge has resulted in increased traffic coming to and from Lewiston via various roadways adjacent to Mount Auburn Avenue, including Park Avenue. In addition, the growth of retail in the Auburn Mall area, additional residential development along Court Street, and the fall 2006 opening of a new elementary school is placing additional demands on a primarily residential roadway. Although the rate of annual growth along Park Avenue has declined from approximately seven percent per year in the early 1980's to two-and-a-half percent per year in the past three years prior to this study, this rate is still above the one to two percent growth per year typical of Lewiston-Auburn area roadways. Short of designating or constructing alternative corridors (both of which are not anticipated), some growth is expected to continue well into the future.

ATRC formed an Advisory Committee to oversee this study of the Park Avenue corridor. The transportation consulting services of Gorrill-Palmer Consulting Engineers, Inc. were retained to complete traffic forecasting, capacity analysis, and to work with the Committee on the potential conceptual plans for the corridor. The forecasting was completed for 2015 and 2025, ten and twenty-year horizons respectively, and completed utilizing information provided by ATRC, MaineDOT and the Consultant. Capacity analyses were completed for the 2006, 2015 and 2025 traffic volumes to determine the operations of the corridor.

Initial Findings

Based on the forecasting completed for the Park Avenue corridor, traffic volumes along Park Avenue are anticipated to increase by 1.9 percent per year for the next ten years, and 1.4 percent per years from 2015 to 2025. This will result in a 36 percent increase in traffic along the roadway by 2025. The traffic growth forecasts were derived from the regional TransCAD model, maintained by ATRC. A summary of the model output, including the growth assumptions built into the model, is included in Appendix C.

The recent signalization of Park Avenue at Court Street provides sufficient capacity for the current traffic volumes. However, the intersection will operate with delay and queuing based on the 2015 and in particular, the 2025 traffic volumes. In addition, roadway modifications at other portions of the corridor will be required to address capacity constraints and safety deficiencies. Provisions for other modes is of ever-increasing importance, due to additional housing in the area, the new school, and the desire for safe and designated bicycle routes.

Proposed Phases/Cross-Sections

In addition to the geometric improvements at key intersections which are discussed below, a phased improvement plan has been identified that will allow for use by multiple modes while minimizing the impacts to adjacent properties. The plan is described as follows:

Phase 1: Sidewalk Construction from Court Street to Lake Street

Phase 1 would consist of a five-foot sidewalk from its current terminus on the east side of the roadway just north of Court Street to Park Avenue Elementary School. As part of this phase, two small raised islands (one-inch concrete) would be constructed at Vista Drive. At the Park Avenue Elementary driveway, raised islands would also be constructed.

The sidewalk would continue on the east side of Park Avenue, where it would terminate at Lothrop Street just north of the school. North of the school, the main sidewalk would transition to the west side of Park Avenue. The portion of the sidewalk on the west side of the roadway will convert this portion of the roadway from an open drainage system with open ditching to a closed drainage system with catch basins and pipes. This conversion will allow for improvements to the existing drainage deficiencies at this location.

The sidewalk will be set away from the existing edge of the roadway far enough so that the widening of Park Avenue by up to three feet on each side in the future to accommodate bicyclists will not require reconstruction of the sidewalk. In addition, south of the school, the distance between the edge of the roadway and the sidewalk will be sufficient to put in a drainage swale, and as such not requiring a closed drainage system until the remainder of the roadway work is put in (Phase 3).

Alternative 1 - Placement of Sidewalk on west Side of Park Avenue (Recommended): In addition to the sidewalk proposed on the east side of Park Avenue, the potential exists for a sidewalk on the west side of Park Avenue from Vista Drive to Court Street, which would allow children living on Vista Drive to not have to cross Park Avenue twice when walking to the Middle School.

Alternative 2 - Construction of Shared Use Path from Court Street to Park Avenue Elementary (Not Recommended): Instead of the use of a sidewalk (or potentially, two sidewalks, if Alternative 1 were utilized) along Park Avenue, a shared use path could be constructed on the west side of Park Avenue south of the school. As this segment of Park Avenue has few driveways, and few homes, this option may be feasible. It would, require, however, significant additional right-of-way.

Phase 2: Right Turn Lane from Park Avenue to Mount Auburn Avenue/Summer Street Safety Work

Part of Phase 2 would consist of placing a raised island where westbound traffic currently merges from Summer Street to Mount Auburn Avenue, or immediately to the west of Farmer Whiting's driveway; all traffic headed outbound on Summer Street to Mount Auburn Avenue would be therefore routed to Park Avenue. As a result, the volume of left turns from Park Avenue to Mount Auburn Avenue would increase significantly. Therefore, as part of this phase, a right turn lane would be constructed for Park Avenue northbound destined for Mount Auburn Avenue. This would allow for left and right turns to queue independently.

Although the intersection of Park Avenue and Mount Auburn Avenue is not forecast to meet traffic signal warrants in the forecast period, it is recommended that periodic traffic counts be completed at this location to determine when a signal will be warranted.

Phase 3: Roadway Widening/Reconstruction from Court Street to Lake Street

Phase 3 would consist of widening Park Avenue from its current width south of Lake Street, which ranges from approximately 26 to 30, feet to 32 feet, allowing for two eleven-foot lanes and two five-foot bicycle lanes. In addition, the improvements are planned to result in closed drainage on the west side of the roadway, and would result in new material being utilized in the base of the roadway. The anticipated goal would be improved drainage on this section. (Four-foot lanes are a possibility if it is determined that open drainage can be used along the roadway.)

Phase 4: Roadway Widening/Reconstruction from Lake Street to Methodist Church

Phase 4 would include sidewalk reconstruction and roadway reconstruction simultaneously, as this location currently has a sidewalk on the east side. In addition, the sidewalk work would include the provision of a five-foot esplanade, primarily to provide space for utility pole location and snow storage on an urban section of roadway. The west side of Park Avenue would not have a sidewalk.

In addition to the roadway widening, this Phase would also result in a reconfiguration of the intersection of Gamage Avenue with Lake Street. The reconfiguration would bring Lake Street into Gamage Avenue at a "T", opening up some land area for reconfigure into four to five off-street parking spaces for Lake Street Variety. These spaces would be separate from the street, would not preclude the use of the existing spaces to the rear of the facility, and would allow for use of pavers/landscaping, delineating various modes and reducing traffic speeds.

It is important to note that the roadway width is of critical importance here. Although the study is primarily based on use of a five-foot shoulder, it may be possible to construct a roadway with four foot shoulders, resulting in minimal roadway widening. Shoulders of this width will require further conversations with MaineDOT. A five-foot shoulder is the typical width for use as a bicycle lane. It is the opinion of Gorrill-Palmer Consulting Engineers, Inc. that this detail would be finalized with MaineDOT during the design process. A goal of the design would be the reduced shoulder width in this section, if it can be accomplished.

Phase 5: Roadway Widening/Reconstruction from Methodist Church to Summer Street

Phase 5 would result in widening and reconstruction of Park Avenue north of the Phase 4 area, and with a similar cross-section to Phase 3 (32 feet total, less if open drainage can be utilized). Sidewalk along this portion of Park Avenue would be adjacent to the roadway to minimize construction impacts and reduce costs. One option would be to construct the roadway first, and then return later on to construct the sidewalk. Although pedestrian volumes are limited now, residential development has been taking place on this portion of the roadway, and at some time may warrant the need for pedestrian infrastructure.

Phase 6: Roadway Widening/Reconstruction of Mount Auburn Avenue/Summer Street

Phase 6 would see the completion of work at the northern end of Park Avenue begun in Phase 2. This would entail the widening of Mount Auburn Avenue east of Park Avenue to provide an exclusive left turn lane. In addition, the segment of Summer Street between Park Avenue and Mount Auburn Avenue would be reconstructed. As this would be a limited, local-access roadway, it is recommended that the roadway not be widened beyond its current width, to minimize impacts and construction costs.

Geometric Improvements Based on Recommendations

Based on the analysis, the recommended geometric improvements are as follows:

- Extension of the left turn lane from Court Street eastbound to Park Avenue (providing that this change is compatible with adjacent properties).
- Radius improvements to the intersection of Park Avenue and Lake Street. In addition, additional right-of-way should be secured, if feasible, so that a small (mini) roundabout could be installed (a long-term improvement that may be required in future years). By the year 2025, operational efficiency at this intersection will be marginal. As this happens, queuing will begin affect adjacent neighborhoods, making entering the roadway very difficult. The allocation of additional right-of-way should be considered to make future improvements possible.
- Narrowing Lake Street between Gamage Avenue and Park Avenue to allow for the development of off-street parking for Lake Street Variety and other local uses.
- Provision of separate left and right turn lanes at the Park Avenue approach to Mount Auburn Avenue.
- Provide a five-foot shoulder along much of Park Avenue to provide for bicycles and rural route mail delivery. In the portion of the roadway between Lake Street and the United Methodist Church, the potential exists for even narrower shoulders if deemed acceptable by MaineDOT.

Additional Recommendations

Certainly, a significant factor in the ongoing and future growth of traffic volumes along Park Avenue is its desirability as a collector. One way to minimize future growth would be to increase desirability of alternative corridors, which are as follows:

- Reconfigure the Washington Street Rotary to provide for easier access for Minot Avenue traffic inbound.
- Improve Mount Auburn Avenue/Summer Street/Young's Corner Road from the Auburn Mall area to Hotel Road.
- Improve the Young's Corner Road/Hotel Road intersection to improve capacity.
- Investigate the potential of providing a break in the median along Union Street Bypass to allow for left turns onto Summer Street.

The retention of large trees along the corridor should be encouraged, to ensure that the sense of enclosure remains along the roadway. Loss of trees could result in a feeling of open space that can further encourage driver speeding. However, trees should not be retained or added within the clear zone, for safety purposes. At this level of conceptual design, determining the locations and numbers of trees potentially impacted by improvements is not feasible. This would be addressed in the creation of design plans, with the intention of retaining trees where possible. It is also recommended that the City work with property owners along the roadway to plant new trees so as to maintain a sense of enclosure.

With these recommendations, Park Avenue should continue to accommodate traffic flow, while providing wider shoulders to accommodate bicyclists, and improved pedestrian facilities. These improvements will help to balance the competing demands and needs for travel modes along the corridor as well as the residents along Park Avenue, all while aiding with safety.

Chapter 1

Introduction

Project Background

Auburn, with a population of approximately 23,000 people, is Maine's fifth largest city, and as a sister city to the larger neighbor city of Lewiston to the east, experiences traffic demand commensurate with being Maine's second-largest metropolitan area. In addition, the portion of the City in the vicinity of Park Avenue is at the confluence of rural and urban areas, with significant development occurring in the area, most significantly, in the vicinity of the Auburn Mall.

Mount Auburn Avenue has long been identified as an important east-west corridor by the City and also by the MaineDOT and the Androscoggin Transportation Resource Center. Additional residential development in outlying areas of Auburn, combined with the construction of the overpasses on both approaches to the Veteran's Memorial Bridge has resulted in the rapid growth of east-west traffic north of Park Avenue.

In addition, Court Street continues to be the City's other major east-west corridor. Despite having less capacity than Minot Avenue, Court Street east of Minot Avenue carries a comparable amount of traffic. As a direct cross-connector between Court Street and Mount Auburn Avenue, Park Avenue provides cross-town connectivity with a resulting growth in traffic demand. Although down to two-and-a-half percent per year from seven percent per year in the early eighties, recent traffic growth rates indicate that traffic volumes have been increasing at a greater rate than the Lewiston-Auburn area as a whole.

With the construction of new housing, additional retail in the Mall area, a new elementary school, and a relocation of one of the City's larger churches, travel demand along Park Avenue is anticipated to increase.

However, despite these pressures on the roadway, two important things should be kept in mind:

Adjacent Uses: Like many of the major roadways in Auburn, portions of Park Avenue have densely spaced residential areas that predate many of the current traffic patterns. Although much of the roadway is more rural in nature, the portion of the road near Lake Street is a closely-spaced neighborhood, with homes close to the roadway. As a result, neighbors have expressed concern about traffic volumes and speeds and petitioned the City of Auburn to examine the issue. Any design will seek to respect the needs of residents while maintaining current engineering design principles.

Drainage: The portions of Park Avenue between Park Avenue Elementary School and Lake Street as well as in the vicinity of the Methodist Church currently experience significant drainage issues, due to topography, an aging roadway design, and the limitations of open drainage in these areas. In addition to meeting needs for traffic and minimizing impacts to properties, drainage issues will have to be addressed to avoid having standing water alongside the roadway or affecting landowners' properties.

Study Area

The study area primarily focuses on Park Avenue, but also examines the issues with intersections directly adjacent to the corridor. The intersections included in the study are as follows:

- Park Avenue at Court Street
- Park Avenue at Lake Street
- Lake Street at Gamage Avenue
- Park Avenue at Summer Street
- Park Avenue at Mount Auburn Avenue
- Park Avenue at Summer Street

Project Goals

It is important to develop a set of goals to serve as a benchmark by which to evaluate the effectiveness and impact of various alternatives. The goals are as follows:

- 1.) Utilize strategies that slow vehicle speeds to increase safety and sense of place for non-motorized modes of travel.
- 2.) Provide an enhanced environment for pedestrians and bicyclists along the corridor.
- 3.) Allow for improved drainage design along the corridor, with particular concern to specific locations.
- 4.) Preserve the capacity of Park Avenue without undue impacts on adjacent land uses.
- 5.) Determine a scope of work that can be completed in a phased manner to allow for construction of portions of the roadway over a period of time.

As shown in the goals above, the balancing of competing needs is of the greatest importance along this corridor. Although state and federal funding for this road necessitates the preservation of access for through traffic (including truck traffic) along Park Avenue, residents and students should be able to feel relatively safe and secure along its length.

Chapter 2

Existing Conditions

Park Avenue provides access from the Auburn Mall area and communities to the north and east of Auburn, as well as access from the Veteran's Bridge. Park Avenue is an urban/major collector; the main purpose of a collector is to provide access to and from arterials (such as Court Street).

At the time of the beginning of the study, Park Avenue was composed exclusively of unsignalized intersections. However, as part of the improvements associated with the new elementary school on Park Avenue, a traffic signal was installed at the intersection of Park Avenue and Court Street in late summer of 2006. Park Avenue is a two-lane roadway of varying widths, with portions of the roadway having sidewalk on the east side.

Data Collection

Our office collected the following turning movement counts:

- Week of May 22, 2005, from 7:00 to 9:00 AM and again from 3:30 to 5:30 PM:
 - Park Avenue at Court Street (updated on September 12, 2006 for AM)
 - Park Avenue at Lake Street (updated on September 12, 2006 for AM)
 - Lake Street at Gamage Avenue
 - Park Avenue at Summer Street
 - Park Avenue at Mount Auburn Avenue

Based on the turning movement counts, the peak hours for the corridor are from 7:15 to 8:15 AM and from 4:30 to 5:30 PM. The raw counts are summarized on Figures 2 and 3 in the Appendix for the AM and PM peak hours, respectively.

In addition to the turning movement counts, our office collected directional ATR data, including speed data at the following locations:

- Between Court Street and Lake Street (5,700 AADT)
- Between Lake Street and Summer Street (6,200 AADT)
- Between Summer Street and Mount Auburn Avenue (6,000 AADT)

The ATR data was collected the week of April 11, 2006, updated the week of September 11, 2006 between Court Street and Lake Street to determine the effect of the new school. Based on MaineDOT seasonal adjustment information, the week of April 11 is representative of average annual traffic. As such, the AADT information referenced above is directly obtained from the raw data.

In addition, an ATR was placed on Park Avenue in early June 2006 to determine the overall peak hour (i.e. design hour) for the roadway. Based on this information, the weekday PM peak hour from 4:30 to 5:30 PM is the highest hour for the roadway. This was confirmed based on a review of the September ATR data. Given the proximity of retail, the Saturday midday peak period is also a busier-than-average time. However, the PM peak period is still approximately ten percent higher overall than the Saturday period. As the PM period contains both significant commuter and retail-related traffic, this is to be expected.

Based on the vehicle classification completed as part of the ATR data-collection effort, trucks comprise approximately three percent of the traffic, and larger trucks (multi-unit trucks such as semis) comprising one percent of the total. Based on the hourly information, the majority of trucks appear to utilize the roadway between 9:00 AM and 3:00 PM. While some reduction in trucks, particularly large trucks, was observed during the September counts, it does not appear to be a significant change.

Speed Analysis

The average and 85th percentile speed data along the three roadway segments is compiled and compared to the posted speeds in the following table:

Table 2.1: Speed Data Along Park Avenue*

Location	Posted Speed	Average Speed	85 th Percentile Speed
Between Court and School	35 mph	33/31** mph	38/35** mph
Between School and Lake	35/25 mph	35** mph	40** mph
Between Lake and Summer	25/35 mph	36 mph	40 mph
Between Summer and Mount Auburn	35 mph	25 mph	29 mph

*All ATR's placed along portions of Park Avenue posted at 35 mph.

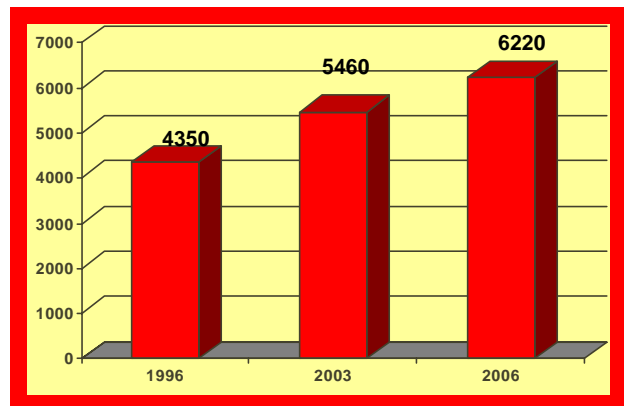
**These results based on September ATR counts.

As shown in the above table, toward the beginning and end of the corridor, vehicular speeds are generally in keeping with posted speeds. As the vehicles move away from the termini of Park Avenue, speeds increase. Although the travel speeds are not uncommon along a collector with posted speeds typically at 35 miles per hour, some isolated vehicles travel well in excess of the posted speeds, something noted as a concern by residents living along the corridor.

In addition, a site visit when students were arriving at the school indicated that vehicles passing by the school appeared to be traveling well above the school speed zone of 15 mph fronting the property. As the flashing advisory signage is quite visible along the roadway, this appears to be an enforcement issue.

Historic Growth

Historical data was obtained from the Maine Department of Transportation (Maine DOT) for the years 1996 and 2003 and was compared to the data collected as part of this study. Based on this information, it appears that the roadway volumes along Park Avenue have been increasing by



Historic AADT of Park Ave. south of Summer Street.

approximately two-and-a-half percent per year. Although the rate of annual growth along Park Avenue has declined from approximately seven percent per year in the early 1980's to about two-and-a-half percent per year in the past three years prior to the study, this growth rate is still greater than a typical roadway in the Lewiston-Auburn area, an area that increases at one to two percent per year.

Effect of Traffic Signal Installation for Park Avenue at Court Street

When the morning turning movement counts were completed at the intersection of Park Street at Court Street, the through volumes on Court Street noticeably declined from the counts in April, by approximately ten to fourteen percent. As this is a significant reduction, an updated PM turning movement count was also performed to determine if a similar reduction took place during the afternoon. The reductions turned out to be similar. A review of the operations at the signal immediately following activation showed that queuing had become significant for traffic along Park Avenue. Therefore, some of this traffic may have since diverted to other routes, such as Minot Avenue.

In addition, the traffic coming to and from Park Avenue was slightly less to and from Court Street to the west, and slightly greater to and from Court Street to the east. One possibility is that more drivers feel comfortable making a left from Park Avenue, particularly if using Western Avenue as a bypass of downtown Auburn.

2006 Adjusted Volumes

As the turning movement counts were collected in late May and early September, they are not representative of the typical design volumes utilized for analysis. In Maine, volumes are typically adjusted to the approximate 30th highest hour; i.e. a design hour where only 29 days have higher traffic volumes. Gorrill-Palmer Consulting Engineers, Inc. initially referenced the MaineDOT standard group mean factors to determine the adjustment, which was approximately five percent for both periods. Therefore, the turning movement volumes were increased by this amount and balanced to result in the 2006 adjusted and balanced volumes. Based on updated ATR information compiled in June, the seasonal fluctuation for Park Avenue appears to be even less than the MaineDOT data would suggest; as such, this results in a conservative analysis.

The raw turning movement volumes are shown on Figures 2 and 3 of Appendix A for the AM and PM peak hours, respectively. The 2006 adjusted and balanced volumes are shown on Figures 4 and 5 of Appendix A for the AM and PM peak hours, respectively.

Bicycle and Pedestrian Amenities

Our office conducted a visual survey of the corridor to collect information on bicycle and pedestrian amenities. Crosswalks exist at the intersections, although pavements markings at most locations are worn and difficult to see in low light conditions. As part of the collection of turning movement data, our office also collected data on the number of pedestrian movements at each intersection along the corridor during the peak hour. This pedestrian data is summarized below:

Table 2.2: Peak Hour Pedestrian Volumes - 2006

Intersection	Number of Pedestrians	
	AM Peak Hour	PM Peak Hour
Park Avenue at Court Street	1	4
Park Avenue at Lake Street	1	27
Lake Street at Gamage Avenue	1	20
Park Avenue at Summer Street	0	0
Park Avenue at Mount Auburn Avenue	0	2

As can be seen in the above table, pedestrians are more common in the Lake Street/Gamage Avenue area, particularly in the afternoon. This is to be expected, as residential density is at its greatest at this portion of the corridor. While additional pedestrian activity could be expected if additional pedestrian facilities were constructed, the pedestrian volumes do not appear to support a sidewalk on both sides of Park Avenue.

A review of the roadway indicates that Park Avenue does not provide bicycle-specific amenities, or striped paved shoulders. In addition, the width and condition of the roadway varies significantly depending on the section, resulting in a difficult environment for bicyclists. Lastly, lighting, while available along some portions of the roadway, is not consistent along the corridor.

2006 Volumes: Capacity and Level of Service

Our office performed an analysis of the capacity and level of service of the existing conditions (2006 adjusted volumes). All analyses were done using the Synchro/SimTraffic software. The SimTraffic results were run five times with the final results averaged. Level of service rankings are similar to the academic ranking system where an ‘A’ is very good with little control delay and an ‘F’ represents very poor conditions with long delays. A Level of Service (LOS) ‘D’ or higher is desirable for a signalized intersection. At an unsignalized intersection, if the level of service falls below a ‘D’, an evaluation should be made to determine if a traffic signal is warranted.

The following table summarizes the relationship between control delay and level of service for a signalized intersection:

Table 2.3: Level of Service (LOS) Criteria for Signalized Intersections

Level of Service (LOS)	Control Delay per Vehicle (sec)
A	Up to 10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	Greater than 80.0

The following table summarizes the relationship between control delay and level of service for an unsignalized intersection:

Table 2.4: Level of Service (LOS) Criteria for Unsignalized Intersections

Level of Service (LOS)	Control Delay per Vehicle (sec)
A	Up to 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	Greater than 50.0

The software model was used to evaluate the 2006 conditions to get a baseline of information for comparison with future growth and needs. The capacity results are shown in the following tables:

Table 2.5: LOS Results for Park Avenue at Court Street (Signalized)

Movement/Lane Group	2006 AM Peak Hour		2006 PM Peak Hour	
	Delay	LOS	Delay	LOS
Court EB LT	18	B	24	C
Court EB TH	12	B	12	B
Court WB TH/RT	18	B	24	C
Park SB LT/RT	12	B	17	B
Overall	15	B	19	B

Table 2.6: LOS Results for Park Avenue at Lake Street

Movement/Lane Group	2006 AM Peak Hour		2006 PM Peak Hour	
	Delay	LOS	Delay	LOS
Lake EB LT/TH/RT	8	A	9	A
Lake WB LT/TH/RT	6	A	8	A
Park NB LT/TH/RT	13	B	16	C
Park SB LT/TH/RT	14	B	20	C
Overall	10	B	15	C

Table 2.7: LOS Results for Lake Street at Gamage Avenue

Movement/Lane Group	2006 AM Peak Hour		2006 PM Peak Hour	
	Delay	LOS	Delay	LOS
Lake EB TH/RT	1	A	1	A
Lake WB LT/TH	1	A	2	A
Gamage NB LT/RT	4	A	5	A
Overall	2	A	2	A

Table 2.8: LOS Results for Park Avenue at Summer Street

Movement/Lane Group	2006 AM Peak Hour		2006 PM Peak Hour	
	Delay	LOS	Delay	LOS
Summer EB LT/TH/RT	7	A	8	A
Summer WB LT/TH/RT	7	A	12	B
Park NB LT/TH/RT	4	A	5	A
Park SB LT/TH/RT	1	A	1	A
Overall	3	A	3	A

Table 2.9: LOS Results for Park Avenue at Mount Auburn Avenue

Movement/Lane Group	2006 AM Peak Hour		2006 PM Peak Hour	
	Delay	LOS	Delay	LOS
Mount Auburn EB TH/RT	5	A	3	A
Mount Auburn WB LT/TH	7	A	11	B
Park NB LT/RT	15	B	11	B
Overall	8	A	9	A

Table 2.10: LOS Results for Summer Street at Mount Auburn Avenue

Movement/Lane Group	2006 AM Peak Hour		2006 PM Peak Hour	
	Delay	LOS	Delay	LOS
Mount Auburn EB TH/RT	4	A	2	A
Mount Auburn WB LT/TH	7	A	10	B
Summer NB LT/RT	14	B	6	A
Overall	5	A	7	A

The tables above indicate that, overall, the corridor is typically operating at acceptable levels of service (LOS 'C' or better). However, it should be noted that queues on Court Street with the installation of the traffic signal result in significant queuing, on occasion in excess of 400 feet. Other queuing of significance is the southbound queue at the intersection of Park Avenue and Lake Street during the PM peak hour (at times over 200 feet) as well as the westbound queue for Mount Auburn Avenue at Park Avenue (sometimes in excess of 300 feet). These results were confirmed by site observations during the course of this study. It is anticipated that as future volumes increase, these queues will also increase in length, as is discussed later in this chapter.

Origin-Destination Study

An origin-destination study was conducted along Park Avenue on May 25, 2006 from 7:00 to 8:00 AM and again from 4:00 to 5:00 PM to determine the proportion of traffic that utilizes the entire length of Park Avenue. This was accomplished by collection partial license plate information at several stations at each end of Park Avenue and comparing the data at one end to the other. The results of this study are shown in the following table:

Table 2.11: Results of Origin Destination Study on Park Avenue

Origin-Destination Results for May 25, 2006: 7:00 to 8:00 AM				
Origin	Destination	Total Origin Volume	Total Matches	% of Total
Mnt. Aub. WB to Park SB	Park SB to Court WB	154	105	68%
Mnt. Aub. WB to Park SB	Park SB to Court EB	154	4	3%
	Total Matching	154	109	71%
Court EB to Park NB	Park NB to Mnt. Aub. EB	199	104	52%
Court WB to Park NB	Park NB to Mnt. Aub. EB	34	8	24%
	Total Matching	233	112	48%
Origin-Destination Results for May 26, 2006: 4:00 to 5:00 PM				
Origin	Destination	Total Origin Volume	Total Matches	% of Total
Mnt. Aub. WB to Park SB	Park SB to Court WB	249	129	52%
Mnt. Aub. WB to Park SB	Park SB to Court EB	249	2	1%
	Total Matching	249	131	53%
Court EB to Park NB	Park NB to Mnt. Aub. EB	260	161	62%
Court WB to Park NB	Park NB to Mnt. Aub. EB	39	10	26%
	Total Matching	299	171	57%

As shown in the above table, the origin-destination information indicates that, typically, the majority of traffic along Park Avenue is through traffic. Overall traffic volumes indicate that 56 percent of all traffic on Park Avenue travels from Mount Auburn Avenue to Court Street and vice-versa. This is significant on two levels. First, it confirms this roadway's current and growing function as a local collector. Most traffic does not utilize Park Avenue as an origin or destination. Second, as the AM peak period has slightly more through traffic than the PM period (57 versus 55 percent), it indicates that while the retail in the Auburn Mall vicinity may have some impact on traffic volumes along Park Avenue, through traffic may be due to even more regional impacts, as retail activity is negligible on a weekday between 7:00 and 8:00 AM.

Additional origin-destination information was collected at the Auburn Middle School (AMS) driveway, to determine what portion of through traffic, particularly during the AM peak hour, is destined to or from the school. Based on this data, the amount of through traffic due to the school is almost nonexistent, with only a few vehicles during the AM peak hour utilizing Park Avenue as a through route.

As the through traffic does not appear to be significantly influenced by either school traffic (excluding the potential for ELHS traffic, as multiple access points precluded an origin-destination study) or retail traffic, it appears that commuter traffic plays a dominant role in the impacts to Park Avenue. As Park Avenue to Court Street and ultimately, Hotel Road provides an alternate route to the Maine Turnpike, expanded housing off of Hotel Road increases residents traveling to and from Lewiston, and increased operations near the airport and industrial park provides new jobs, this growth can be understood.

Collision History

Our office obtained the collision history for the Park Avenue study area from the Maine Department of Transportation (MaineDOT). A location is classified as a High Crash Location (HCL) if it meets both of the following criteria:

1. Eight or more crashes over a three-year period, and;
2. A Critical Rate Factor (CRF) of 1.00 or greater for the same three-year period. A CRF compares the actual crash rate of each intersection or road segment to the Statewide crash rate of similar locations. A CRF less than 1.00 indicates a lower than average crash rate.

Based on the crash data, two locations were considered High Crash Locations. Our office obtained the crash reports from the MaineDOT and compiled the collision diagrams for one location; MaineDOT prepared a diagram for the other. Each is shown on the following pages with a discussion following the respective diagram.

Summer Street at Mount Auburn Avenue

This location experienced eleven collisions from 2003-2005.

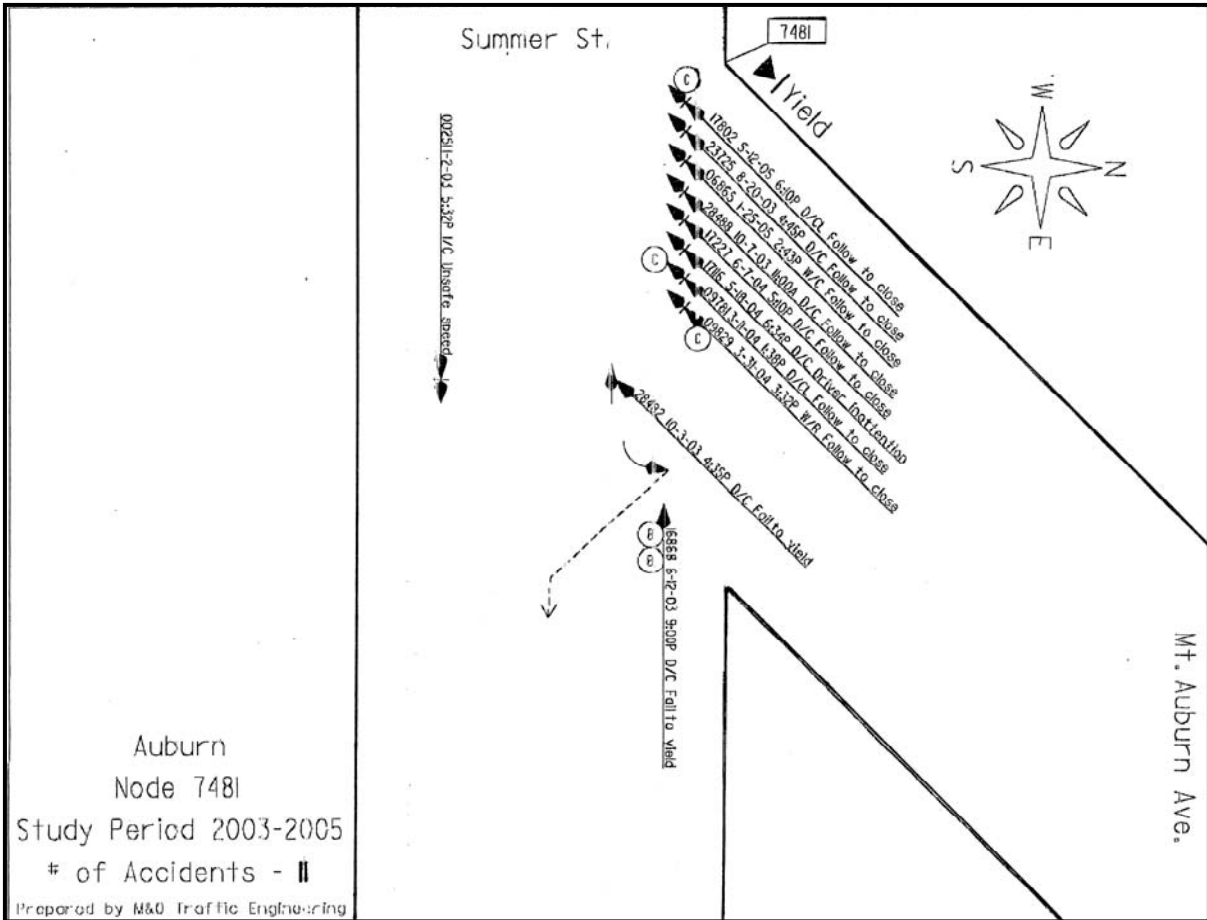


Figure 2.2: 2003-2005 Crash History for Summer Street at Mount Auburn Avenue

Based on the figure above, the majority of collisions were rear-end in nature, taking place at the westbound (outbound) movement of Mount Auburn Avenue. Although this approach has significantly more traffic than the outbound Summer Street approach, it must yield to Summer Street traffic, and the skew of the intersection, combined with a severe horizontal and vertical sight distance restriction on Summer Street west of the intersection, result in an awkward approach for this movement. Recommendations for this location will be discussed in the alternatives section of this report.

Park Avenue at Mount Auburn Avenue

This location experienced eleven collisions from 2003-2005.

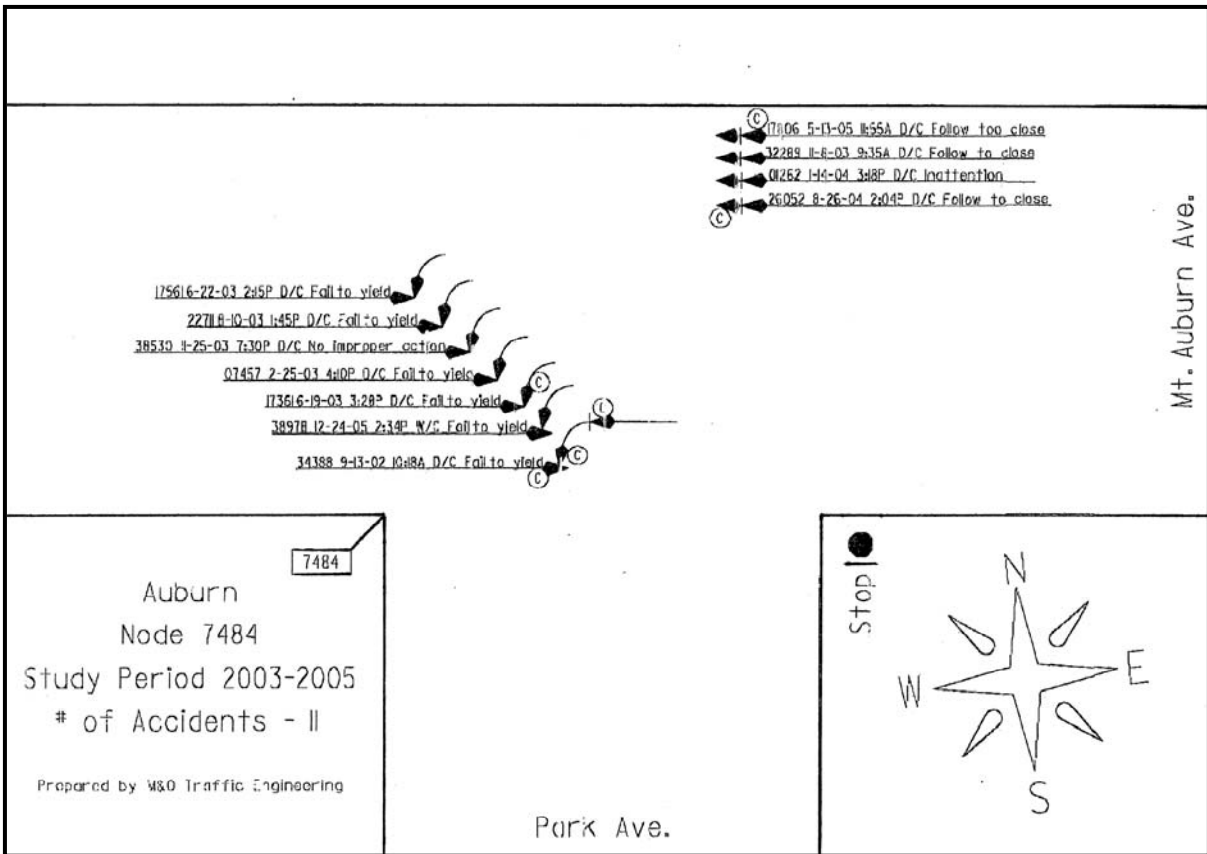


Figure 2.3: 2003-2005 Crash History for Park Avenue at Mount Auburn Avenue

Based on the above figure, every reported collision was in some way related to the westbound left turns from Mount Auburn Avenue to Park Avenue. Four of these incidents were rear-end in nature when a through vehicle heading westbound on Mount Auburn Avenue collided with a vehicle waiting to turn left. Six incidents were angle collisions that occurred when an eastbound vehicle on Mount Auburn Avenue collided with a westbound vehicle attempting to turn left.

Design Years

The forecast years for this project are 2015 and 2025. The forecasting was completed with the TransCAD-based model provided by ATRC. The forecasting is based on detailed demographic projections as well as information provided to ATRC from the projections created in associated with Auburn Master Plan. The model was first calibrated to represent current travel volumes and conditions, and the anticipated growth added for ten and twenty year forecast periods to result in the future volumes. A summary of the model output, including the growth assumptions built into the model, is included in Appendix C. Additional calibration was completed by our office utilizing historic growth information obtain for the past 25 years from MaineDOT. A memorandum discussing the growth methodology is included in Appendix C of this report.

Future Volumes: Capacity and Level of Service

Capacity analyses completed for the existing roadway network in the study area based on the forecast 2015 and 2025 volumes. The results in shown in the following tables, and include the 2006 current volumes for reference.

Table 2.12: Park Avenue at Court Street AM Peak Hour

Movement/Lane Group	2006		2015		2025	
	Delay	LOS	Delay	LOS	Delay	LOS
Court EB LT	18	B	23	C	27	C
Court EB TH	12	B	16	B	18	B
Court WB TH/RT	18	B	18	B	22	C
Park SB LT/RT	12	B	16	B	21	C
Overall	15	B	18	B	20	C

Table 2.13: Park Avenue at Court Street PM Peak Hour

Movement/Lane Group	2006		2015		2025	
	Delay	LOS	Delay	LOS	Delay	LOS
Court EB LT	24	C	31	C	51	D
Court EB TH	12	B	15	B	29	C
Court WB TH/RT	24	C	27	C	33	C
Park SB LT/RT	17	B	21	C	26	C
Overall	19	B	22	C	33	C

Table 2.14: Park Avenue at Lake Street AM Peak Hour

Movement/Lane Group	2006		2015		2025	
	Delay	LOS	Delay	LOS	Delay	LOS
Lake EB LT/TH/RT	8	A	10	B	11	B
Lake WB LT/TH/RT	6	A	7	A	7	A
Park NB LT/TH/RT	13	B	13	B	14	B
Park SB LT/TH/RT	14	B	14	B	16	B
Overall	10	B	11	B	12	B

Table 2.15: Park Avenue at Lake Street PM Peak Hour

Movement/Lane Group	2006		2015		2025	
	Delay	LOS	Delay	LOS	Delay	LOS
Lake EB LT/TH/RT	9	A	10	B	11	B
Lake WB LT/TH/RT	8	A	11	B	13	B
Park NB LT/TH/RT	16	C	19	C	26	D
Park SB LT/TH/RT	20	C	27	D	33	D
Overall	15	C	19	C	24	C

Table 2.16: Lake Street at Gamage Avenue AM Peak Hour

Movement/Lane Group	2006		2015		2025	
	Delay	LOS	Delay	LOS	Delay	LOS
Lake EB TH/RT	1	A	1	A	1	A
Lake WB LT/TH	1	A	1	A	1	A
Gamage NB LT/RT	4	A	5	A	5	A
Overall	2	A	2	A	2	A

Table 2.17: Lake Street at Gamage Avenue PM Peak Hour

Movement/Lane Group	2006		2015		2025	
	Delay	LOS	Delay	LOS	Delay	LOS
Lake EB TH/RT	1	A	1	A	1	A
Lake WB LT/TH	2	A	2	A	2	A
Gamage NB LT/RT	5	A	6	A	8	A
Overall	2	A	2	A	3	A

Table 2.18: Park Avenue at Summer Street AM Peak Hour

Movement/Lane Group	2006		2015		2025	
	Delay	LOS	Delay	LOS	Delay	LOS
Summer EB LT/TH/RT	7	A	8	A	10	B
Summer WB LT/TH/RT	7	A	8	A	49	E
Park NB LT/TH/RT	4	A	4	A	9	A
Park SB LT/TH/RT	1	A	1	A	1	A
Overall	3	A	4	A	7	A

Table 2.19: Park Avenue at Summer Street PM Peak Hour

Movement/Lane Group	2006		2015		2025	
	Delay	LOS	Delay	LOS	Delay	LOS
Summer EB LT/TH/RT	8	A	9	A	21	C
Summer WB LT/TH/RT	12	B	13	B	20	C
Park NB LT/TH/RT	5	A	5	A	10	B
Park SB LT/TH/RT	1	A	1	A	1	A
Overall	3	A	4	A	7	A

Table 2.20: Park Avenue at Mount Auburn Avenue AM Peak Hour

Movement/Lane Group	2006		2015		2025	
	Delay	LOS	Delay	LOS	Delay	LOS
Mount Auburn EB TH/RT	5	A	5	A	6	A
Mount Auburn WB LT/TH	7	A	9	A	14	A
Park NB LT/RT	15	B	26	D	53	F
Overall	8	A	11	B	19	C

Table 2.21: Park Avenue at Mount Auburn Avenue PM Peak Hour

Movement/Lane Group	2006		2015		2025	
	Delay	LOS	Delay	LOS	Delay	LOS
Mount Auburn EB TH/RT	3	A	4	A	4	A
Mount Auburn WB LT/TH	11	B	18	A	35	E
Park NB LT/RT	11	B	13	C	21	C
Overall	9	A	14	B	26	D

Table 2.22: Summer Street at Mount Auburn Avenue AM Peak Hour

Movement/Lane Group	2006		2015		2025	
	Delay	LOS	Delay	LOS	Delay	LOS
Mount Auburn EB TH/RT	4	A	5	A	6	A
Mount Auburn WB LT/TH	7	A	7	A	10	B
Summer NB LT/RT	14	B	22	C	39	E
Overall	5	A	6	A	7	A

Table 2.23: Summer Street at Mount Auburn Avenue PM Peak Hour

Movement/Lane Group	2006		2015		2025	
	Delay	LOS	Delay	LOS	Delay	LOS
Mount Auburn EB TH/RT	2	A	3	A	3	A
Mount Auburn WB LT/TH	9	A	11	B	14	B
Summer NB LT/RT	4	A	7	A	9	A
Overall	7	A	8	A	10	B

As can be seen from the above table, while all intersections operate at an acceptable level of service based on the 2015 forecast volumes, delays and queuing begin to be an issue in 2025. While the intersection of Park Avenue with Court Street operates at an acceptable level of service through 2025, queues continue to increase along Park Avenue, reaching the Middle School driveway for eastbound traffic and well past Western Avenue for westbound traffic. In addition, by 2025, the southbound queue for Park Avenue during the PM peak hour will exceed 300 feet.

Similarly to Park Avenue at Court Street, the intersection of Park Street and Lake Street will continue to operate at acceptable levels of service. However, traffic along Lake Street will queue between 250 and 300 feet, resulting in rolling queues that may increase the potential for rear-end collisions.

The intersection of Mount Auburn Avenue and Park Avenue appears to have the most significant operational deficiencies. During the AM peak hour, the northbound traffic will experience delay, resulting in queues that extend through the intersection with Summer Street to the south. This, in turn, will increase delay at the Summer Street intersection. During the PM peak hour, westbound through traffic queues significantly by 2025, potentially past Gracelawn Avenue and toward the Mount Auburn Avenue/Turner Street retail area. This is mainly due to the delay to through traffic unable to maneuver around left turning traffic.

Improvements for the deficient areas will be examined in Chapters 3 and 4 of this report.

Summary of Existing Conditions

Based on a review of the existing conditions, the following items are notable:

- Speeding, although typically within the expected range for a roadway of this type, is an issue and of concern to residents. Site visits indicate that the problem is most significant fronting the elementary school when the flashers are on.
- Although they are a small portion of the overall traffic, trucks do use Park Avenue, including large tractor-trailer vehicles. The majority of these vehicles utilize the roadway from approximately 9:00 AM to 3:00 PM.
- The majority of traffic along Park Avenue is through traffic for vehicles traversing the entire corridor. In addition, the highest percentage of through traffic was during the AM peak hour, before most retail is operationa. Based on a study of this information, it appears that this traffic is largely due to commuters, as opposed to school or retail-related traffic.
- Facilities for other modes, including sidewalks and shoulders for bicycles, are typically lacking. Although desirable, pedestrian volumes do not appear to support sidewalks on both sides of Park Avenue throughout its length.
- Vehicle queues will become significant at the intersection of Park Avenue and Court Street, but other than extension of the storage length for the eastbound left turn onto Park Avenue from Court Street, the current two-lane configuration cannot be readily modified.
- Although delay is not forecast to be excessive at the intersection of Park Avenue and Lake Street, queues will continue to increase, potentially resulting in spillback to the intersection with Gamage Avenue and creating the potential for rear-end collisions.
- The configuration and volumes of Mount Auburn Avenue at Park Avenue and Summer Street has resulted in safety deficiencies; both locations are considered High Crash Locations.

Alternatives and recommendations for accommodating future traffic are discussed in Chapter 3.

Chapter 3

Improvement Recommendations

While Chapter 4 will discuss in detail various alternatives for Park Avenue, in particular, traffic calming, this chapter discusses specific capacity-related intersection improvements that are recommended for the Park Avenue corridor to address long-term traffic growth.

Park Avenue at Court Street

The analyses indicated that eastbound left turns will begin to queue past their storage area and into the through queue, resulting in significant queuing and delay. This situation may already occur from time to time when Auburn Middle School is at its peak of operation in the morning. Therefore, it is recommended that the storage for these left turns be extended, from approximately 100 feet to 200 feet. However, a detailed investigation will need to be performed on Court Street to determine whether or not widening of the roadway can be supported, given the proximity of residential properties. This extension should be undertaken in the near future, preferably within the next five to ten years.

Although the 2025 analyses indicate that the two-lane configuration will approach capacity during the AM and PM peak hours, right-of-way and property issues preclude the widening of Court Street. In addition, traffic may utilize Minot Avenue, which is a four-lane road and the intended roadway for commuting traffic. It is recommended that the City consider the recommendations set forth in the Court Street/Minot Avenue corridor study for the Washington Street Rotary to further encourage the use of Minot Avenue by commuter traffic.

Park Avenue at Lake Street

Although delays are forecast to be acceptable through 2025, by 2025, delays will be noticeably longer than they are currently, with resulting longer queues. A signal warrant evaluation was completed based on the forecast volumes, and the volumes did not satisfy the four-hour or peak-hour warrants. As such, it is not expected that a traffic signal can be installed at this location.

However, as volumes and delays increase, some form of traffic control beyond the current all-way STOP configuration may be desirable. One potential option would be a roundabout, which provides similar or better capacity than a traffic signal. However, acceptable operations remain with the existing all-way STOP through 2025, so this would be viewed as a long-term improvement. This concept will be discussed in greater detail in Chapter 4.

Lake Street at Gamage Avenue

Future volumes and analysis indicate that this location will operate with low to medium levels of delay throughout the forecast period. However, Lake Street eastbound between Park Avenue

and Gamage Avenue is configured such that the roadway forks, leaving wide areas of pavement. The result is poor lane delineation, excessive pavement width, and higher travel speeds than desirable, particularly on a section fronting an active neighborhood convenience store. Therefore, measures to reduce the pavement width on the west leg of this intersection should be investigated, as they will have multiple benefits.

Park Avenue at Summer Street

Given the low volumes on Summer Street, this location is anticipated to operate acceptably for the foreseeable future. However, deficiencies at the Mount Auburn Avenue intersection, if left uncorrected, could impact operations at this location. Therefore, improvements to the north are key to ongoing operations at this intersection.

Park Avenue at Mount Auburn Avenue

As discussed in the crash analysis portion of Chapter 2, this intersection is a High Crash Location. The current configuration of this intersection consists of all single-lane approaches; given the high volume of right turns from Park Avenue northbound and left turns from Mount Auburn Avenue westbound, capacity and safety problems are to be expected. Placement of appropriate turning lanes at this location will be key to future operational improvements. Therefore, a left turn lane for westbound Mount Auburn Avenue traffic destined for Park Avenue southbound is recommended, as well as separate left and right turn lane for northbound traffic on Park Avenue.

While a roundabout at this location may indeed provide better levels of service, it would also require significant property acquisition along the northern side of the intersection, to the point where it may not be feasible. It should also be noted that while the forecast volumes do not indicate that a traffic signal is warranted at this location, it is recommended that ongoing investigations of this intersection take place to determine when a traffic signal could be installed.

Mount Auburn Avenue at Summer Street

This intersection has awkward traffic controls, deficient sight distances, is in poor condition, and is a high crash location. Ideally, some modification access for traffic heading outbound from Summer Street to Mount Auburn Avenue should be completed, to reduce conflicts, avoid having the main line approach yield to the side street, and improve the condition of roads. The most effective changes would involve reducing access to Summer Street for the outbound direction of traffic, realigning the Summer Street approach, or closing off Summer Street altogether.

Additional discussion on the improvements cited is found in Chapter 4 of this report.

Chapter 4

Identification and Evaluation of Improvement Alternatives

The primary focus of this corridor study is to examine the potential for managing the forecast traffic volumes, while balancing other needs, such as residents along Park Avenue and improving drainage. While some steps can be undertaken to reduce the potential for traffic growth, Park Avenue's proximity to Mount Auburn Avenue, Court Street, and the Veteran's Bridge overpass make it a desirable route. Therefore, of greatest importance is managing vehicular speeds and accommodating other modes, such as pedestrians and bicycles, all while meeting current engineering criteria and providing safety.

Therefore, the first portion of this Chapter is dedicated to examining various traffic-calming options. When implemented appropriately, traffic calming measures can reduce vehicle speeds and can improve safety and visibility of other modes, particularly pedestrians. However, traffic calming measures can be controversial, and typically should only be implemented after careful study and a support of a supermajority of the residents and business owners along the affected roadway.

An important item of note should be mentioned. Traffic calming, as opposed to rerouting, truck prohibitions, and one-way traffic flow is investigated because Park Avenue, as a local collector, is part of the state and federal highway system, and as such, state and federal funding is subject to the preservation of existing travel patterns. To prohibit trucks, make the roadway a dead-end, or convert to one-way flow has the potential to prohibit state and federal funding as a future source of design and construction dollars. Therefore, traffic calming, as it does not expressly prohibit any type of vehicle, is the most viable way to examine reducing travel speeds along Park Avenue.

Traffic Calming Measures

The following traffic calming measures are possible methods to calm traffic on Park Avenue:

- Landscaping/Trees
- Reduced roadway width/narrower travel lanes
- Sidewalks
- Chicanes
- Chokers/Neckdowns
- Speed humps
- Raised speed tables/crosswalks/intersections
- Multi-way STOP signs
- Neighborhood Traffic Circles/Mini Roundabouts/Roundabouts

A brief description of each of these methods is given below prior to discussing their applicability to Park Avenue.

Landscaping/Trees

Landscaping can affect traffic calming by creating a sense of enclosure for drivers. Typically, as drivers enter areas that are more open, speeds increase. The placement of plantings and trees can also improve the appearance of a roadway, and visually screen traffic from properties along a roadway, in particular residential properties. If dense enough, plantings and trees can even result in some reductions in traffic noise. However, plantings can interfere with sight distances, and large trees within the clear zone of a roadway constitute a deadly fixed object. The locations and height of plantings should be carefully considered prior to implantation.

Reduced Roadway Width/Narrower Travel Lanes

In the same sense that open areas (as opposed to areas with plantings and trees) contribute to increased vehicular speeds due to the feeling of greater space, wider roadways can also contribute to this issue. Typically, the narrower a roadway, the less likely speeding is to take place. An added benefit to a narrower roadway is less asphalt, impact on adjacent properties, and additional space for features such as sidewalks and plantings.

In a similar vein to physically reducing the width of a roadway, striping an existing wide roadway with shoulder markings (also known as fog lines) can create the feeling of a narrower roadway, and lower travel speeds. This solution can be most effective when the goal is to provide paved shoulders for breakdowns and bicycle travel. For example, Park Avenue south of Summer Street is at its widest at 32 feet. This results in two 16-foot lanes. If fog lines were placed such that the travel lanes on this part of Park Avenue were eleven feet in width, two five-foot shoulders would result, sufficient width for formal bicycle lanes but with no addition to the roadway width, and therefore, minimizing construction costs.

Sidewalks

In addition to plantings and reduced lane width, the placement of sidewalks can also add to the feeling of enclosure than can reduce vehicle speeds. In addition, sidewalks provide a far superior environment for pedestrians. To further enhance the visual environment, increase pedestrian/vehicle separation, and improve aesthetics, an esplanade can be placed between the sidewalk and the roadway. This can be combined with plantings to improve on the appearance of the roadway and further enclose the roadway. However, use of an esplanade adds to the overall width of the roadway cross-section and therefore property impacts. In addition, on a roadway such as Park Avenue with many trees, the potential for cutting large trees is increased.

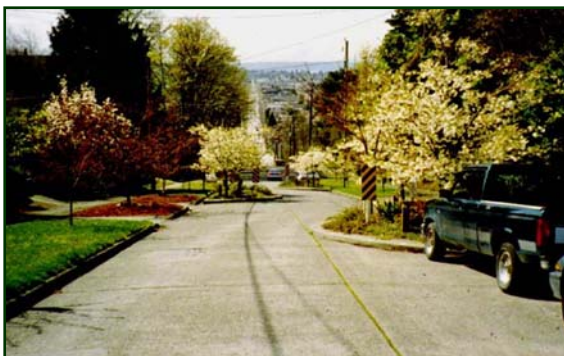


Figure 4.1 Chicanes on residential street in Portland, Oregon.

Chicanes

Chicanes are constructed along the sides of roadways typically to result in adjustments to the horizontal alignment. They are most typically used on residential streets with long, straight segments conducive to speeding. They tend to be semi-circular or trapezoidal in shape, and are built up against the existing edge of pavement.

The installation typically involves the alternation of each side of the street, resulting in drivers shifting from one side of the roadway to the other. Another benefit of chicanes is that they can be planted, which typically makes them more effective than without plantings.

Use of such treatments on a collector such as Park Avenue should be viewed with caution, as large trucks utilize this roadway, and as such the potential for a truck colliding with a chicane is a possibility.

Chokers/Neckdowns

Chokers (also known as neckdowns) result in the reduction of roadway width, typically at an intersection or a mid-block crossing of some sort. It results in extension of the curbing such that on-street parking or a paved shoulder would be temporarily eliminated to provide a narrow roadway. This measure typically reduces vehicular speeds while focusing a driver's attention on the treated area.



Figure 4.2 Choker on residential street in Portland, Oregon.

Speed Humps



Figure 4.3: Speed hump on residential street in Berkeley, California.

Speed humps are a type of vertical deflection, typically constructed of bituminous asphalt on the roadway surface. They are typically three to three-and-a-half inches at maximum height. This type of treatment is one of the most effective on vehicular speeds.

However, as they have a fairly aggressive grading, they can be difficult for snow plows and are not usually appropriate for higher-volume streets. As they are usually constructed of a bituminous material, they tend to have a low durability. Emergency departments are not

typically in favor of speed humps.

Raised Speed Tables/Crosswalks/Intersections

Like speed humps, raised tables are a form of vertical deflection. In addition, they are often four inches in height at maximum, slightly greater than that of speed humps. However, as they ramp up on each side (typically over the course of six feet), they are typically able to accommodate snow plows. In addition, raised crossings can be constructed of bricks, pavers, or concrete to add texture and durability.

A raised crosswalk is a type of raised speed table that focuses pedestrian crossings at a specific location, drawing more attention to the location than a standard mid-block crossing. A raised intersection is simply the use of speed table design for all three or four intersection approaches. Typically larger overall than a raised crosswalk, a raised intersection provides additional design opportunities with a greater potential use of designs, materials, and textures.



Figure 4.4: Raised intersection.

Multi-Way STOP Signs

Already in use along the Park Avenue corridor, a multi-way STOP treatment forces all approaches (or in some cases, all but one approach) to come to a full stop prior to moving through the intersection. Although this solution may be effective from a traffic calming standpoint, two points should be noted. One, as this treatment forces all vehicles to come to a stop, it often increases overall vehicle delay, noise, and emissions. Two, the traffic industry is now required to determine whether or not all-way STOP treatments are warranted prior to installation (as prescribed in the Manual on Uniform Traffic Control Devices). The warrants are similar to traffic signal installation and are based on traffic volumes entering the subject intersection.

Neighborhood Traffic Circles/Mini Roundabouts/Roundabouts



Figure 4.5: Neighborhood Traffic Circle/Mini-Roundabout

A modern roundabout is a small traffic circle, large enough to accommodate vehicular turning movements but too small to allow for high rates of speed within a circle, unlike rotaries. Roundabouts typically are composed of “splitter islands” on each approach, which deflect traffic into the intersection and force vehicles to reduce traffic speeds. In the center of the roundabout is a center island, typically comprised of a raised apron for truck tracking movements and a central island that prevents vehicles from driving directly through the intersection.

Larger roundabouts, like those under construction in the Auburn Mall area, can accommodate large truck movements, may have multiple approach lanes, and be 150 feet or more in diameter. In a residential setting, roundabouts may be smaller. A neighborhood traffic circle, or a mini roundabout, is a reduced-scale roundabout designed to keep in mind the smaller scale of a residential street. They range from a standard intersection design with modified striping and a painted center island to small splitter islands, trucks aprons, and raised center islands. The painted island treatment is not normally used in the United States, due to concerns that the intersection will not be utilized in its intended manner, potentially adding to the crash problem.



Figure 4.6: Modern Roundabout.

A roundabout treatment, properly applied, has significant capacity and a low frequency of crashes. However, in the case of Park Avenue, any roundabout treatment would need to minimize impacts to adjacent properties, keeping the circulation size small. However, Park Avenue, Lake Street, and Gamage Avenue are all state/federal aid roadways. As such, any intersection treatment will also need to accommodate truck movements.

Use of Methods

Based on conversations with MaineDOT, the designation, traffic volumes, and regional importance of Park Avenue make more aggressive methods of traffic calming inappropriate. However, a narrower roadway with vertical granite curbing, plantings near the roadway, and the judicious placement of center islands are all realistic measures that may be appropriate for this corridor.

Typical Cross-Sections

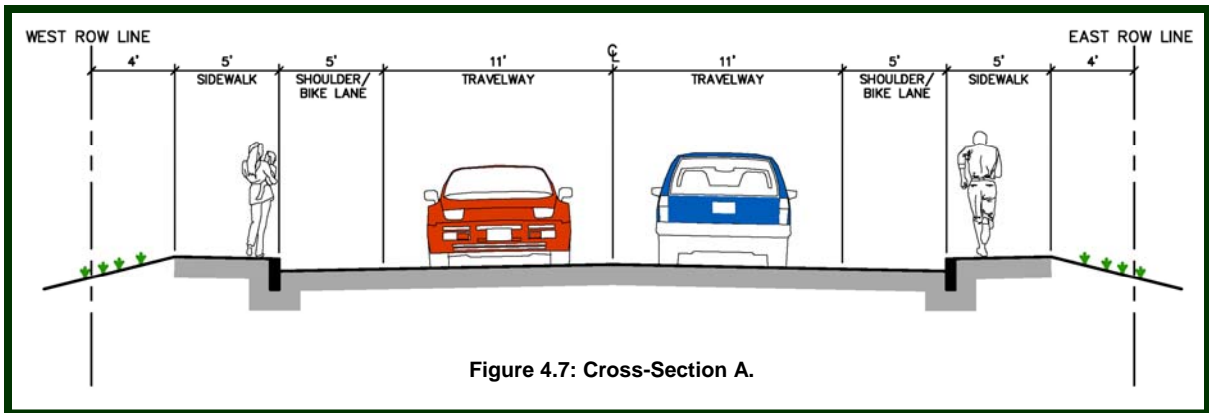
Following an on-site evaluation of the corridor and a review of available mapping, it was determined that the typical width of the right-of-way is approximately fifty feet. While adequate by local residential street standards, this width results in limitations for potential widening and various roadway improvements. Also, pavement width along the corridor varies, typically ranging between thirty and thirty-six feet.

Due to the constraints, as well as the desire to accommodate multiple modes of traffic, it was determined that sidewalk on at least one side of the roadway would be desirable. In addition, paved shoulders would separate pedestrians from cars and allow for bicyclists to travel the roadway in greater safety.

Based on initial public input and the roadway width constraints, four potential cross-sections were determined, which are discussed as follows:

Cross-Section A

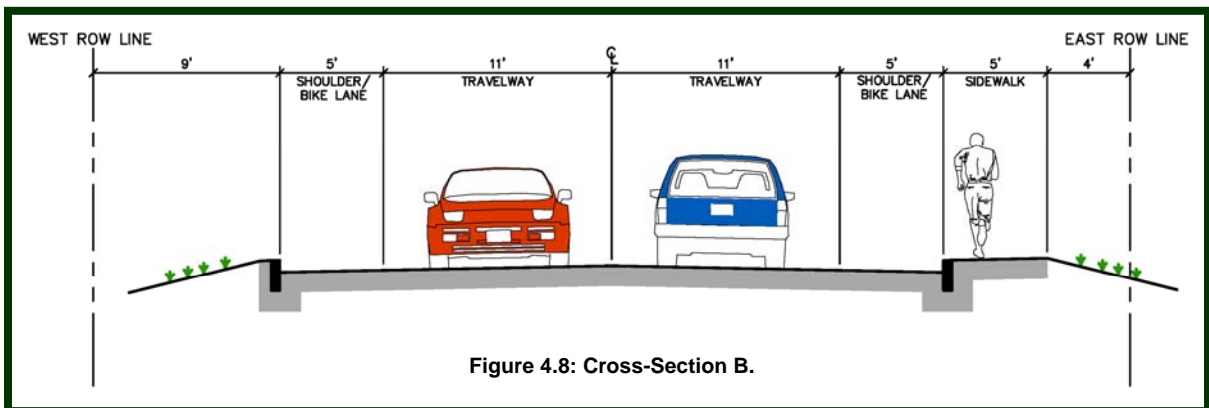
Cross-Section A would consist of two eleven-foot lanes, two five-foot shoulders, and a five-foot sidewalk on each side of the roadway, for a total width of 42 feet. A concept of this cross-section is shown on the following page:



While this concept provides for pedestrian facilities on both sides of the roadway, there is little separation between modes of travel. In addition, at 42 feet in width, some-right-of-way and significant grading easements may well be required. Also, sidewalk on both sides of the roadway results in needing closed drainage on both sides of Park Avenue along its full length, which could significantly add to construction costs.

Cross-Section B

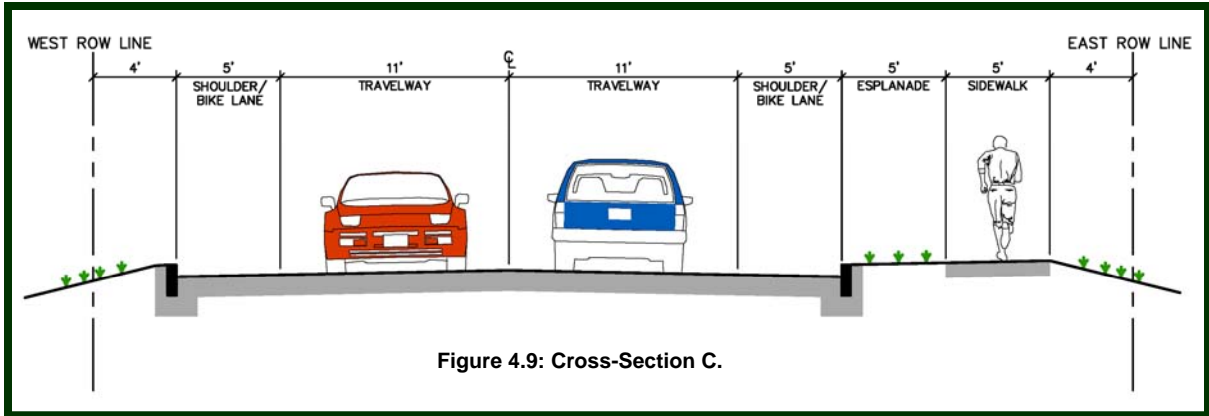
Cross-Section B would consist of two eleven-foot lanes, two five-foot shoulders, and a five-foot sidewalk on one side of the roadway, for a total width of 37 feet. A concept of this cross-section is shown below:



This cross-section has less in the way of pedestrian facilities than Cross-Section A. At 37 feet in width, while some-right-of-way and grading easements may be required, impacts would be less than Cross-Section B. However, sidewalk on one side of the roadway may allow for open drainage in some portions of Park Avenue, reducing construction costs.

Cross-Section C

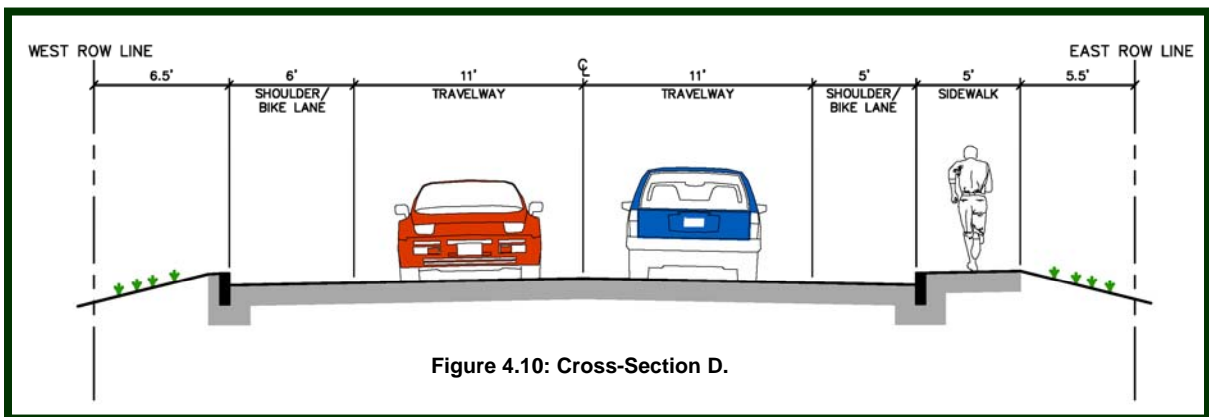
Cross-Section C would consist of two eleven-foot lanes, two five-foot shoulders, and a five-foot sidewalk on one side of the roadway separated by a five-foot esplanade, for a total width of 43 feet. A concept of this cross-section is shown on the following page:



This cross-section has a similar level of pedestrian provisions as Cross-Section B. Unlike cross-sections A or B, the provision of an esplanade separates pedestrians from vehicular traffic. The width of 42 feet results in potential impacts similar to those for Cross-Section A. The use of an esplanade does provide advantages in terms of snow storage and drainage. Like Cross-Section B, sidewalk on one side of the roadway may allow for open drainage in some portions of Park Avenue, reducing construction costs.

Cross-Section D

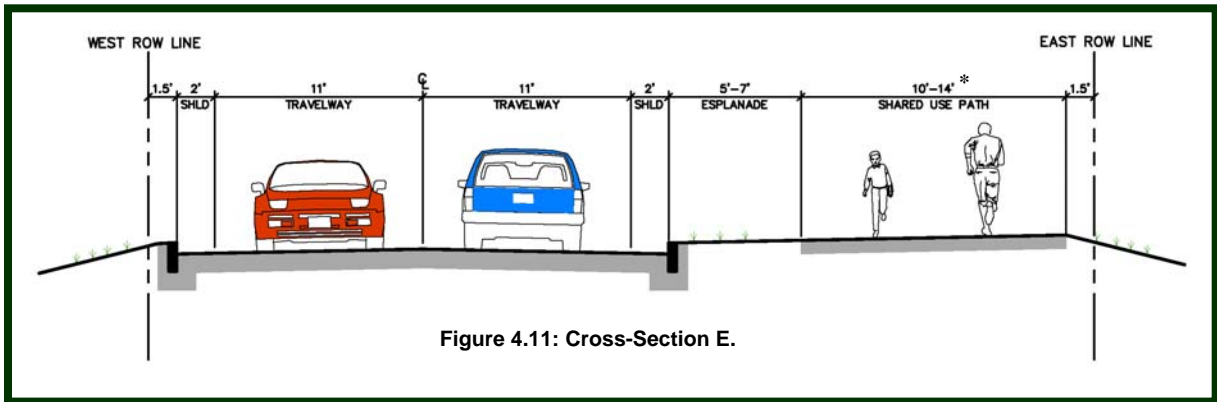
Cross-Section D would consist of two eleven-foot lanes, one five-foot shoulder, one six-foot shoulder, and a five-foot sidewalk on one side of the roadway, for a total width of 38 feet. The additional width of one of the shoulders is to have potential for multiple uses. A concept of this cross-section is shown below:



The intent of this cross-section is to serve as a compromise between the increased pedestrian access from Cross-Section A and the reduced right-of-way impacts of Cross-Section B. Like Cross-Sections B and C, sidewalk on one side of the roadway may allow for open drainage in some portions of Park Avenue, reducing construction costs.

Cross-Section E

Cross-Section E represents a departure from the other cross-sections in that it would consist of a roadway of reduced width and compensate by having a shared-use path adjacent to the road. The overall cross-section is anticipated to be 41 feet wide and is shown on the following page:



*Narrower widths may be allowable, but would require additional conversations with MaineDOT/FHWA.

Use of this cross-section would provide a narrow road, still requires additional width for a shared use path. It should be noted that if the separation of the path is less than seven feet from the edge of the road, a raised barrier at least 42 inches in height would be required.

In addition, AASHTO typically does not recommend use of shared use paths *in place of* on-road facilities, but as a complements. Also, due to the potential of the barrier to impact visibility for motorists, it should only be investigated in places where there are few driveways.

Preferred Cross-Section(s)

A review of the constraints along Park Avenue from the mapping information as well as site visits indicated that differing sections of the corridor had variable constraints. As a result, the overall improvement plan consists of varied cross sections.

Determination of Construction Phasing Plan

An initial opinion of probable construction costs for Park Avenue indicated that completion of all the improvements would not be within the realm of feasibility for construction. Therefore, it was decided that an “all or nothing” plan would be supplanted with a phased approach. Utilizing a phased approach, portions of the improvements could be completed when funding became available.

It is important to note that the phasing discussion that follows is indicative of a preferred plan, which has been designated to provide maximize consistency and minimize impacts. However, also discussed are potential alternative measure, where feasible, that may also prove relevant during the course of determining design plans.

The concepts shown on the diagrams typically consist of two eleven-foot travel lanes and two five-foot shoulders/bicycle lanes. In areas where it is determined that open drainage and non-curbed sections can be utilized, the potential for constructing four-foot shoulders exists.

Phase 1: Sidewalk Construction from Court Street to Lake Street

Of primary concern at this time, based on meetings with the public and the Advisory Committee is provision of pedestrian opportunities to and from Park Avenue Elementary School. As the students along Park Avenue who attend the school live south of Lake Street, this segment of roadway is of primary importance.

Therefore, Phase 1 would consist of a five-foot sidewalk from its current terminus on the east side of the roadway just north of Court Street to Park Avenue Elementary School. As part of this phase, two small raised islands (one-inch concrete) would be constructed at Vista Drive. They would allow students (and other pedestrians) to cross the roadway at a visible and protected location. The islands would be located and sized such that turning movements to and from Vista Drive would not be affected.

At the school driveway, raised islands would also be constructed, although they would be greater in size and in height. As with Vista Drive, these islands would provide protection for crossing students. In addition, actuated signage would be installed to alert drivers to pedestrian crossings. Ideally, a crossing guard would be responsible for the crossing of students and the use of the pedestrian crossing button.

The sidewalk would continue on the east side of Park Avenue, where it would terminate at Lothrop Street just north of the school. North of the school the main sidewalk would transition to the west side of Park Avenue. This would be necessary to avoid impacting a stream on the east side of the roadway, and to best serve this portion of the roadway, as most of the homes north of the school between Lothrop Street and Lake Street are on the west side of Park Avenue.

The portion of the sidewalk on the west side of the roadway will convert this portion of the roadway from an open drainage system with open ditching to a closed drainage system with catch basins and pipes. This conversion will allow for improvements to the existing drainage deficiencies at this location.

An important component to this phase is its relationship to future phases, i.e. the reconstruction of Park Avenue. The sidewalk will be set away from the existing edge of the roadway far enough so that the widening of Park Avenue will not require reconstruction of the sidewalk. In addition, south of the school, the distance between the edge of the roadway and the sidewalk will be sufficient to put in a drainage swale, and as such not requiring a closed drainage system until the remainder of the roadway work is put in (Phase 3).

Alternative 1: Placement of Sidewalk on west Side of Park Avenue

In addition to the sidewalk proposed on the east side of Park Avenue, desire was expressed on the part of those attending the public meeting that additional investigation be completed into the potential for a sidewalk on the west side of Park Avenue from Vista Drive to Court Street. Although a short section of sidewalk, it would allow children living on Vista Drive to avoid crossing Park Avenue twice when walking to the Middle School. This option would require either additional right-of-way if constructed on the top of the embankment along Park Avenue, or require a retaining wall if the hillside were cut into to provide the sidewalk.

Alternative 2: Construction of Shared Use Path from Court Street to Park Avenue Elementary

Instead of the use of a sidewalk (or potentially, two sidewalks, if Alternative 1 were utilized) along Park Avenue, Eric Labelle, Director of Public Services suggested the potential of a shared use path on Park Avenue south of the school. As this segment of Park Avenue has few driveways, and few homes, this option may be feasible. It would, require, however, significant additional right-of-way. Although the intent would be to move bicyclists away from the roadway, a shoulder may still be required to accommodate rural mail delivery, at least on the north side of the roadway.

The concepts for Phase 1 can be found on Figures 1 through 3 of the Conceptual Roadway Improvements Plan.

Phase 2: Right Turn Lane from Park Avenue to Mount Auburn Avenue/Summer Street Safety Work

As the safety review determined, the study area for this project has two High Crash Locations. One of these locations is the intersection of Summer Street and Mount Auburn Avenue. The current design, with Mount Auburn Avenue traffic yielding to Summer Street traffic, results in rear-end collisions, and the poor sight distances due to significant horizontal and vertical curvature immediately west of the intersection make for additional safety concerns.

Therefore, part of Phase 2 would consist of placing a raised island where westbound traffic currently merges from Summer Street to Mount Auburn Avenue, or immediately to the west of Farmer Whiting's driveway. Traffic entering Farmer Whiting's would not be affected, and as most traffic exiting this site heads back to intown Auburn (or Lewiston), the majority of exiting traffic would not be affected.

As all traffic headed outbound on Summer Street to Mount Auburn Avenue would be therefore routed to Park Avenue. As a result, the volume of left turns from Park Avenue to Mount Auburn Avenue would increase significantly. Therefore, as part of this phase, a right turn lane would be constructed for Park Avenue northbound destined for Mount Auburn Avenue. This would allow for left and right turns to queue independently.

Although the intersection of Park Avenue and Mount Auburn Avenue is not forecast to meet traffic signal warrants in the forecast period, it is recommended that periodic traffic counts be completed at this location to determine when a signal will be warranted.

The concepts for Phase 2 can be found on Figures 8 and 9 of the Conceptual Roadway Improvements Plan.

Phase 3: Roadway Widening/Reconstruction from Court Street to Lake Street

Phase 3 would consist of widening Park Avenue from its current width south of Lake Street, which ranges from approximately 26 to 30, feet to 32 feet, allowing for two eleven-foot lanes and two five-foot bicycle lanes.

Where possible (particularly upland from the portion adjacent to the stream), the widening will attempt to avoid shifting utility poles, placing them within an esplanade to minimize impacts to local utilities.

It should be noted that drainage between Lothrop Street and Lake Street has been consistently raised as a concern during the meetings as part of this study. This area has open drainage ditches on both sides of the roadway, and a stream (possibly seasonal) on the east side of the road. The improvements are planned to go to closed drainage on the west side of the roadway, and would result in new material being utilized in the base of the roadway. The anticipated goal would be improved drainage on this section.

The concepts for Phase 3 can be found on Figures 1 through 3 of the Conceptual Roadway Improvements Plan.

Phase 4: Roadway Widening/Reconstruction from Lake Street to Methodist Church

Phase 4 would be similar to Phase 3 in that Park Avenue would have two travel lanes and two shoulders with a combination of widening/reconstruction, and overlay work. Unlike Phase 3, this portion of Park Avenue would include sidewalk reconstruction on the east side at the same time, as this location currently has sidewalk. In addition, the sidewalk work would include the provision of a five-foot esplanade, primarily to provide space for utility pole location and snow storage on an urban section of roadway. The west side of Park Avenue would not have a sidewalk.

In addition to the roadway widening, this Phase would also result in a reconfiguration of the intersection of Gamage Avenue with Lake Street. Currently, Gamage and Lake split in a fork configuration for eastbound (inbound) traffic. This results in significant pavement area, higher vehicle speeds, and little parking space for Lake Street Variety. As a result, vehicles coming to and from this store often park illegally along Park Avenue immediately south of its intersection with Lake Street.

The reconfiguration would bring Lake Street into Gamage Avenue at a "T", opening up some land area for reconfigure into four to five off-street parking spaces for Lake Street Variety. These spaces would be separate from the street, would not preclude the use of the existing spaces to the rear of the facility, and would allow for use of pavers/landscaping, delineating various modes and reducing traffic speeds.

Due to the fact that the placement of on-street parking would require eight feet of additional roadway for each side of the road, it is not recommended in this area. However, some parking may be available in the vicinity of Lake Street Variety, as discussed above. The aerial and GIS mapping from the City also indicates that a paper street exists immediately south of the Methodist Church. If off street parking were desired, that property as well as potentially some on the south end of the church property could be utilized.

It is important to note that the roadway width is of critical importance here. Although the concept plan shows a roadway with five-foot shoulders (and thus illustrating a conservative level of impact), it may be possible to construct a roadway with four-foot shoulders. Shoulders of

this width will require further conversations with MaineDOT. A five-foot shoulder is the typical width for use as a bicycle lane. It is the opinion of Gorrill-Palmer Consulting Engineers Inc. that this detail would be finalized with MaineDOT during the design process. A goal of the design would be the reduced shoulder width in this section, if it can be accomplished.

The concepts for Phase 4 can be found on Figures 4 and 5 of the Conceptual Roadway Improvements Plan.

Phase 5: Roadway Widening/Reconstruction from Methodist Church to Summer Street

Phase 5 would result in widening and reconstruction of Park Avenue north of the Phase 4 area, and with a similar cross-section. It should be noted that immediately north of the Methodist Church and immediately south of Summer Street that Park Avenue is currently curbed at 32 feet wide. Therefore, widening would be for the purposes of placing a sidewalk. Sidewalk along this portion of Park Avenue would be adjacent to the roadway to minimize construction impacts and reduce costs. This location does not serve any children walking to school, and its lower population density suggests that pedestrian volumes will be lower.

One option would be to construct the roadway first, and then return later on to construct the sidewalk. Although pedestrian volumes are limited now, residential development has been taking place on this portion of the roadway, and at some time may warrant the need for pedestrian infrastructure.

The concepts for Phase 5 can be found on Figures 4 through 8 of the Conceptual Roadway Improvements Plan.

Phase 6: Roadway Widening/Reconstruction of Mount Auburn Avenue/Summer Street

Phase 6 would see the completion of work at the northern end of Park Avenue begun in Phase 2. This would entail the widening of Mount Auburn Avenue east of Park Avenue to provide an exclusive left turn lane. This is anticipated to reduce the current conflict with through traffic and have a beneficial effect the crash rate.

In addition, the segment of Summer Street between Park Avenue and Mount Auburn Avenue would be reconstructed. As this would be a limited, local-access roadway, it is recommended that the roadway not be widened beyond its current width, to minimize impacts and construction costs.

The concepts for Phase 6 can be found on Figures 8 and 9 of the Conceptual Roadway Improvements Plan.

Additional Discussion on Improvement Plan

Several other items of note should be kept in mind as part of the improvement plan:

Right-of-Way Impacts

Although the roadway cross-sections, including sidewalk, are all less than 50 feet, various site constraints, and MaineDOT construction requirements will result in the need for some right-of-way acquisition. Along the southern portion of the roadway (i.e. south of the Methodist Church), where a more urban setting prevails, the concept plans anticipate providing an additional five feet from the back of the sidewalks.

North of the Methodist Church, where the roadway is more rural, MaineDOT setbacks typically require right-of-way to be ten feet from the edge of a sidewalk or ten feet from the edge of the roadway to a utility pole. In addition, five feet is typically required for clearance from the utility pole to the edge of the right-of-way. Therefore, in this area, it is anticipated that right-of-way will be set back ten feet from the edge of the sidewalk section (east side) and fifteen feet from the edge of the roadway section (west side).

Another recommendation would be to secure sufficient right-of-way at the intersection of Park Avenue and Lake Street to provide space for a mini-roundabout in the future. While the forecast volumes indicate level service of 'D' or better for the forecast period, it appears that within 25 years or so a different approach will be required as opposed to the current all-way STOP control. Given the constraints of this location, its residential nature, and the particular composition of main street/side street traffic volumes, it does not appear that a traffic signal would be an effective form of traffic control at this location. Therefore, acquisition of sufficient right-of-way in the near term will keep this option available for longer term improvement plans.

Tree Impacts

In addition to widening for the roadway, and, more significantly, sidewalks (as well as the potential for esplanades), MaineDOT typically requires the provision of clear zones. This is a distance from the edge of the travelway (i.e. travel lane) to the closest fixed object adjacent to the road. This distance is a factor of the slope up or down to the roadway, design speeds, and daily traffic volumes.

Based on a review of the MaineDOT design guidelines, it is anticipated that the clear zone would be on the order of fifteen feet. It is expected that this would not apply to the most urban portion of Park Avenue, which is posted at 25 miles per hour and has homes and other structures in close proximity to the roadway. As for the other portions of the roadway, this would result in additional clearing ten feet from the edge of the roadway on non-sidewalk portions of Park Avenue, five feet for portions where sidewalk is placed against the roadway, and no additional clearing required for portions where esplanade and sidewalk are constructed. However, this distance may be affected by need for additional grading or other construction work.

As a result, it is anticipated that the primary impacts to trees will be on the east side of the roadway between Vista Drive and Park Avenue Elementary School, and the east side of the roadway between the Methodist Church and Summer Street. Some trees already are closer to the roadway than MaineDOT recommends. At this level of conceptual design, determining the locations and numbers of trees impacted by improvements is not feasible. This would be addressed in the creation of the design plans.

It is a further recommendation, however, that the City work with local landowners to assist with tree or shrub planting along Park Avenue, outside of the clear zone and such that sight distances are not affected. This will help to establish a new buffer along the roadway, and maintain a sense of enclosure to the driver.

Traffic Calming

The inherent design of the roadway has been conceived in an attempt to minimize traffic speeds. This is accomplished by the striping of eleven foot lanes, use of vertical granite curb, and placement of islands at Vista Drive and Park Avenue Elementary School.

As discussed in the previous section, it is recommended that the City work with local landowners to assist with tree or shrub planting along Park Avenue, outside of the clear zone and such that sight distances are not affected. This will help to establish a new buffer along the roadway, and maintain a sense of enclosure to the driver. This, in turn, would help to mitigate speeds.

Based on conversations with MaineDOT, there are concerns with the use of more aggressive treatments, such as raised intersections or chicanes. These treatments are typically prohibited on arterials, and are not recommended on collectors. However, if MaineDOT provided consent, treatments such as raised intersections could be provided with minimal impacts to the proposed roadway design, provided that they do not affect the drainage design.

On-Street Parking

As discussed earlier in this report, the potential for on-street parking was considered, as it was mentioned at public meetings as well as at Advisory Committee meetings, mainly between Lake Street and the Methodist Church. However, as this roadway is a collector, it is anticipated that the design required for the roadway where on-street parking is allowed would be to have an additional eight feet for the parking beyond the striped shoulder, providing that the shoulder was striped as a bicycle lane. Ideally, the bicycle lane would be widened to six feet to account for potential conflicts when a car door was opened, resulting in an additional nine feet of widening. This only appears to be feasible at 407 Park Avenue, and between 344-356 Park Avenue. However, placement of off-street parking at these locations would require acquisition of right-of-way along the east side of the roadway, not currently proposed as part of this plan, and would result in right-of-way adjacent to the home at 407 Park Avenue. Therefore, unless the property owners specifically are interested in having on-street parking fronting their properties, this is not recommended. It should also be noted that at a standard 22 feet per on-street parking space, this would result in approximately eight spaces.

Another option for future exploration may be working with the Methodist Church and property that appears to be under City control (i.e. a paper street) immediately south of the church property. This area could potentially provide some off-street parking, although significant drainage work may be required to accommodate existing runoff issues at this location.

Preliminary Opinion of Probable Construction Cost

Opinions of cost were prepared based on MaineDOT unit prices, a twenty percent contingency, professional and construction engineering costs of 25 percent, and right-of-way acquisition costs of \$100,000 per acre. It should be noted that these costs do not include legal fees, utility relocations, or wetland or other environmental impacts. The costs are as follows:

- Phase 1: \$ 769,000
- Phase 2: \$ 683,000
- Phase 3: \$ 2,108,000
- Phase 4: \$ 1,425,000
- Phase 5: \$ 2,847,000
- Phase 6: \$ 2,717,000
- Total: \$ 10,538,000

As can be seen by the above totals, the initial Phases are the lowest in cost. Future phases, which involve roadway reconstruction, widening, and typically, sidewalks (other than Phase 3) require more funding to complete.

Use of Granite Curbing

It is recommended that granite curbing be utilized for the roadway work on Park Avenue. Volumes on the roadway are such that durability is desired in the design. In addition, a review of the bituminous curbing along Park Avenue Elementary School's frontage indicates that some damage has already occurred in the year since it was constructed. The cost differential takes the overall project cost from approximately \$10,000,000 for overall improvements to \$10,500,000, and the overall longevity of granite results in less in the way of long-term maintenance costs on the roadway.

Funding Sources

Typically, funding is available through several sources, which are as follows:

State/Federal Funding

Most roadway funding is available via state or federal dollars, and often comes through the budget set aside for ATRC. However, these funds are limited, and do not typically allow for major projects to be completed at once. Hence, the phased approach recommended as part of the improvement plan. In addition, federal and state funds also provide some Safe Routes to School funding, and this is an item that can also be explored with particular regard to Phase 1.

City Funds

The City of Auburn also has funding for roadway work, which is typically more limited than the state or federal funding. However, as much of this money has been used for sewer separation project, it is anticipated that this funding source will be extremely limited.

TIF Districts

Auburn has recently undertaken the creation of various Tax Increment Financing (TIF) districts, particularly in the Auburn Mall area, to allow for local money to be made available for various infrastructure improvements. Recently, the City discussed the potential of using TIF district funds from the Mall area for sidewalk improvements on the southern portion of Park Avenue, which was denied by the state.

However, the northern portion of Park Avenue is just to the west of the Auburn Mall area. Phases 2 and 6 would accommodate Mall-area generated traffic. It is recommended that the City investigate the potential for use of TIF districts for the northern end of Park Avenue.

Impact Fees

Impact fees are a monetary payment made by a project Applicant whenever traffic is expected to travel through an impact fee zone, or an area set forth by a municipality for improvements. The municipality would determine the total future trips for an area, as well as the costs for improvements to accommodate these trips. By dividing the total anticipate improvement cost by the number of additional future trips, an impact fee (cost/trip) can be determined.

This approach has been used in several Maine municipalities, including Scarborough and Brunswick. It has the advantage of spreading costs equally among traffic generators, and therefore avoids putting full cost of improvements on the backer of any one single project. However, it is important to note that small-scale developments (such as single-family homes) are subject to impact fees, and may be of concern to these proponents. It is recommended that the City consider this type of approach along Park Avenue.

Other Recommendations

During the course of completing the study, potential long-term items to explore were determined and are discussed in brief below:

Improvements to Minot Avenue at Washington Street

Although Minot Avenue was designed to be the primary carrier of traffic to and from western Auburn/Minot, Court Street currently receives more traffic. A study was completed for ATRC providing potential improvements to the Washington Street rotary by construction of a signalized intersection at Washington Street, Western Avenue, and Minot Avenue. Regardless of the potential improvements, any measures that would keep traffic on Minot Avenue and off of Court Street have the potential to reduce traffic on Park Avenue.

Increased Pedestrian Connectivity to Park Avenue School/Sidewalks

Currently, the only pedestrian access to Park Avenue School is via Orchard Street. However, a direct connection could easily be established via Davis Street. In addition, based on the mapping, it appears that a pathway could be constructed relatively easily from the end of Fern Street to Park Avenue. This would potentially alleviate the need for many students in and around Fern Street to walk to the school without having to walk to Court Street than back to Park Avenue.

Increased Use of Summer Street

Summer Street is designated as a collector roadway. Currently, it has very little traffic. One impediment to its use is the fact that left turns cannot be made onto it from Union Street Bypass. However, if an opening in the median were constructed, similar to the treatment at Office Max/Rite Aid nearby, vehicles would not need to circulate up to Court Street or Turner Street to go from Minot Avenue/Union Street Bypass to head out of town. This change might have some impact on Park Avenue volumes as well. Additionally, if more traffic were to use Summer Street headed to Mount Auburn Avenue, the need for a traffic signal at the intersection of Park Avenue and Mount Auburn Avenue may be reached sooner.

Improvements to Outer Summer Street/Young's Corner Road

One issue cited in the course of discussion of increased use of Park Avenue has been the condition of outer Summer Street and Young's Corner Road. The opinion has been held by many (including our office) that the poor condition of these roads may contribute to increased diversion to Park Avenue. Summer Street and Young's Corner Road intown of Hotel Road are not up to current design standards, with, narrow widths, sharp horizontal and vertical curvature, and poor sight distances. While this report *does not recommend* diversion of traffic to Hotel Road, proper condition of all of these roads would allow the natural traffic patterns to assert themselves.

Chapter 5

Public Process

The Park Avenue Advisory Committee met on several occasions to discuss the project and provide recommendations as to its progress. In addition, three public meetings were held to obtain input from the Park Avenue neighborhood. The meetings are summarized in brief below:

May 16, 2006: Background and Project Schedule (Advisory Committee)

Gorrill-Palmer Consulting Engineers, Inc. presented the background of the study, as well as the findings from the data collection, including the origin-destination study. Discussed at the meeting was the need to update some of the data collection when Park Avenue Elementary School opened in the fall.

June 21, 2006: Existing Conditions Analysis

Gorrill-Palmer Consulting Engineers, Inc. presented the existing conditions analysis, including a discussion on traffic volumes, vehicular speeds, and a discussion on origin-destination information. Much of the discussion related to existing concerns of traffic behavior.

October 16, 2006: Forecasting and Potential Improvement Plans (Advisory Committee)

GPCEI presented future traffic operations, recommendations for traffic improvements, and discussed future changes to the roadway, such as traffic calming methods and roadway cross-sections.

October 16, 2006: Forecasting and Potential Improvement Plans

GPCEI presented future traffic operations, recommendations for traffic improvements, and discussed future changes to the roadway, such as traffic calming methods and roadway cross-sections to the public.

March 22, 2007: Presentation of Concept and Phasing Plans (Advisory Committee)

The concept plans were presented to the Advisory Committee. In addition, the phasing plan as well as funding options were discussed.

March 22, 2007: Presentation of Concept and Phasing Plans

The concept plans were presented to the public. In addition, the phasing plan as well as funding options were discussed. Boards illustrating the conceptual improvements were available for viewing, and one-on-one discussions were conducted with members of the public.

***May 4, 2007: Follow Up and Final Discussion Prior to Issuance of Report
(Advisory Committee)***

The Advisory Committee met to discuss final items, such as funding and roadway widths. Members of ATRC and Gorrill-Palmer were in attendance to obtain final input prior to the preparation of the report.

Detailed minutes from all meetings are included in the Appendix of the report.

Chapter 6

Recommendations

As the preceding chapters indicate, a combination of cross-sections and geometric improvements will be required to address roadway impacts, pedestrian and bicycle needs, safety concerns, drainage issues and vehicular mobility along Park Avenue. Certainly, the future improvements to the corridor are limited by various constraints. Adjacent residential uses in certain areas and limited right-of-way make widening costly, so minimizing expansion of the current roadway width is preferable. Additionally, the accessibility of the corridor by pedestrians and bicyclists should be enhanced, particularly in the vicinity of Park Avenue Elementary School. However, as residential and institutional growth continues along the roadway, it is anticipated that needs for multiple modes will continue to increase all along the corridor.

Following meetings with the public, the City, and MaineDOT, as well as site visits and reviews of available mapping, a series of potential improvements were identified. In addition, traffic volumes were forecast to the year 2025 to determine what type of geometric improvements may be required to maintain mobility as well. Key in the decision-making process was the need to minimize impacts to adjacent properties, particularly the residences immediately to the north of Park Avenue. Lastly, provisions for non-motorized modes of travel were also of importance, given Park Avenue's key connection from the densely residential areas in and around Court Street to the Auburn Mall area and its many shopping opportunities, offices, and restaurants.

Initial Findings

Based on the forecasting completed for the Park Avenue corridor, traffic volumes along Park Avenue are anticipated to increase by 1.9 percent per year for the next ten years, and 1.4 percent per years from 2015 to 2025. This will result in a 36 percent increase in traffic along the roadway by 2025.

The recent signalization of Park Avenue at Court Street provides sufficient capacity for the current traffic volumes. However, the intersection will operate with delay and queuing based on the 2015 and in particular, the 2025 traffic volumes. In addition, roadway modifications at other portions of the corridor will be required to address capacity constraints and safety deficiencies. Provisions for other modes is of ever-increasing importance, due to additional housing in the area, the new school, and the desire for safe and designated bicycle routes.

Proposed Phases/Cross-Sections

In addition to the geometric improvements at key intersections which are discussed below, a phased improvement plan has been identified that will allow for use by multiple modes while minimizing the impacts to adjacent properties. The plan is described as follows:

Phase 1: Sidewalk Construction from Court Street to Lake Street

Phase 1 would consist of a five-foot sidewalk from its current terminus on the east side of the roadway just north of Court Street to Park Avenue Elementary School. As part of this phase,

two small raised islands (one-inch concrete) would be constructed at Vista Drive. At the Park Avenue Elementary driveway, raised islands would also be constructed.

The sidewalk would continue on the east side of Park Avenue, where it would terminate at Lothrop Street just north of the school. North of the school, the main sidewalk would transition to the west side of Park Avenue. The portion of the sidewalk on the west side of the roadway will convert this portion of the roadway from an open drainage system with open ditching to a closed drainage system with catch basins and pipes. This conversion will allow for improvements to the existing drainage deficiencies at this location.

The sidewalk will be set away from the existing edge of the roadway far enough so that the widening of Park Avenue by up to three feet on each side in the future to accommodate bicyclists will not require reconstruction of the sidewalk. In addition, south of the school, the distance between the edge of the roadway and the sidewalk will be sufficient to put in a drainage swale, and as such not requiring a closed drainage system until the remainder of the roadway work is put in (Phase 3).

Alternative 1 - Placement of Sidewalk on west Side of Park Avenue (Recommended): In addition to the sidewalk proposed on the east side of Park Avenue, the potential exists for a sidewalk on the west side of Park Avenue from Vista Drive to Court Street, which would allow children living on Vista Drive to not have to cross Park Avenue twice when walking to the Middle School.

Alternative 2 - Construction of Shared Use Path from Court Street to Park Avenue Elementary (Not Recommended): Instead of the use of a sidewalk (or potentially, two sidewalks, if Alternative 1 were utilized) along Park Avenue, a shared use path could be constructed on the west side of Park Avenue south of the school. As this segment of Park Avenue has few driveways, and few homes, this option may be feasible. It would, require, however, significant additional right-of-way.

Phase 2: Right Turn Lane from Park Avenue to Mount Auburn Avenue/Summer Street Safety Work

Part of Phase 2 would consist of placing a raised island where westbound traffic currently merges from Summer Street to Mount Auburn Avenue, or immediately to the west of Farmer Whiting's driveway; all traffic headed outbound on Summer Street to Mount Auburn Avenue would be therefore routed to Park Avenue. As a result, the volume of left turns from Park Avenue to Mount Auburn Avenue would increase significantly. Therefore, as part of this phase, a right turn lane would be constructed for Park Avenue northbound destined for Mount Auburn Avenue. This would allow for left and right turns to queue independently.

Although the intersection of Park Avenue and Mount Auburn Avenue is not forecast to meet traffic signal warrants in the forecast period, it is recommended that periodic traffic counts be completed at this location to determine when a signal will be warranted.

Phase 3: Roadway Widening/Reconstruction from Court Street to Lake Street

Phase 3 would consist of widening Park Avenue from its current width south of Lake Street, which ranges from approximately 26 to 30, feet to 32 feet, allowing for two eleven-foot lanes and two five-foot bicycle lanes. In addition, the improvements are planned to result in closed drainage on the west side of the roadway, and would result in new material being utilized in the

base of the roadway. The anticipated goal would be improved drainage on this section. (Four-foot lanes are a possibility if it is determined that open drainage can be used along the roadway.)

Phase 4: Roadway Widening/Reconstruction from Lake Street to Methodist Church

Phase 4 would include sidewalk reconstruction and roadway reconstruction simultaneously, as this location currently has sidewalk on the east side. In addition, the sidewalk work would include the provision of a five-foot esplanade, primarily to provide space for utility pole location and snow storage on an urban section of roadway. The west side of Park Avenue would not have a sidewalk.

In addition to the roadway widening, this Phase would also result in a reconfiguration of the intersection of Gamage Avenue with Lake Street. The reconfiguration would bring Lake Street into Gamage Avenue at a 'T', opening up some land area for reconfigure into four to five off-street parking spaces for Lake Street Variety. These spaces would be separate from the street, would not preclude the use of the existing spaces to the rear of the facility, and would allow for use of pavers/landscaping, delineating various modes and reducing traffic speeds.

It is important to note that the roadway width is of critical importance here. Although the study is primarily based on use of a five-foot shoulder, it may be possible to construct a roadway with four foot shoulders, resulting in minimal roadway widening. Shoulders of this width will require further conversations with MaineDOT. A five-foot shoulder is the typical width for use as a bicycle lane. It is the opinion of Gorrill-Palmer Consulting Engineers, Inc. that this detail would be finalized with MaineDOT during the design process. A goal of the design would be the reduced shoulder width in this section, if it can be accomplished.

Phase 5: Roadway Widening/Reconstruction from Methodist Church to Summer Street

Phase 5 would result in widening and reconstruction of Park Avenue north of the Phase 4 area, and with a similar cross-section to Phase 3 (32 feet total, less if open drainage can be utilized). Sidewalk along this portion of Park Avenue would be adjacent to the roadway to minimize construction impacts and reduce costs. One option would be to construct the roadway first, and then return later on to construct the sidewalk. Although pedestrian volumes are limited now, residential development has been taking place on this portion of the roadway, and at some time may warrant the need for pedestrian infrastructure.

Phase 6: Roadway Widening/Reconstruction of Mount Auburn Avenue/Summer Street

Phase 6 would see the completion of work at the northern end of Park Avenue begun in Phase 2. This would entail the widening of Mount Auburn Avenue east of Park Avenue to provide an exclusive left turn lane. In addition, the segment of Summer Street between Park Avenue and Mount Auburn Avenue would be reconstructed. As this would be a limited, local-access roadway, it is recommended that the roadway not be widened beyond its current width, to minimize impacts and construction costs.

Geometric Improvements Based on Recommendations

Based on the analysis, the recommended geometric improvements are as follows:

- Extension of the left turn lane from Court Street eastbound to Park Avenue (providing that this change is compatible with adjacent properties).
- Radius improvements to the intersection of Park Avenue and Lake Street. In addition, additional right-of-way should be secured, if feasible so that a small (mini) roundabout could be installed (a long-term improvement that may be required in future years). By the year 2025, operational efficiency at this intersection will be marginal. As this happens, queuing will begin affect adjacent neighborhoods, making entering the roadway very difficult. The allocation of additional right-of-way should be considered to make future improvements possible.
- Narrowing Lake Street between Gamage Avenue and Park Avenue to allow for the development of off-street parking for Lake Street Variety and other local uses.
- Provision of separate left and right turn lanes at the Park Avenue approach to Mount Auburn Avenue.
- Provide a five-foot shoulder along much of Park Avenue to provide for bicycles and rural route mail delivery. In the portion of the roadway between Lake Street and the United Methodist Church, the potential exists for even narrower shoulders if deemed acceptable by MaineDOT.

Additional Recommendations

Certainly, a significant factor in the ongoing and future growth of traffic volumes along Park Avenue is its desirability as a collector. One way to minimize future growth would be to increase desirability of alternative corridors, which are as follows:

- Reconfigure the Washington Street Rotary to provide for easier access for Minot Avenue traffic inbound.
- Improve Mount Auburn Avenue/Summer Street/Young's Corner Road from the Auburn Mall area to Hotel Road.
- Improve the Young's Corner Road/Hotel Road intersection to improve capacity.
- Investigate the potential of providing a break in the median along Union Street Bypass to allow for left turns onto Summer Street.

The retention of large trees along the corridor should be encouraged, to ensure that the sense of enclosure remains along the roadway. Loss of trees could result in a feeling of open space that can further encourage driver speeding. However, trees should not be retained or added in the clear zone. It is also recommended that the City work with property owners along the roadway to plant new trees so as to maintain a sense of enclosure.

With these recommendations, Park Avenue should continue to accommodate traffic flow, while providing wider shoulders to accommodate bicyclists, and improved pedestrian facilities. These improvements will help to balance the competing demands and needs for travel modes along the corridor as well as the residents along Park Avenue, all while aiding with safety.