

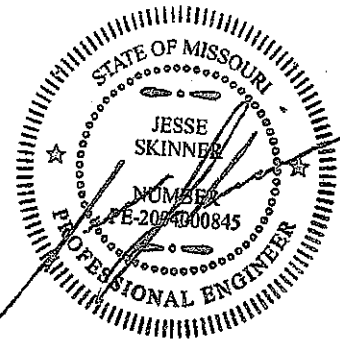
# Whispering Woods

## TRAFFIC IMPACT STUDY

January 3, 2017

Prepared For:  
Whispering Woods Land, LLC  
803 P.C.A. Road  
Warrensburg, MO 64093

Prepared By:  
Priority Engineers, Inc.  
PO Box 563  
Garden City, MO 64747



1-3-17



PRIORITY  
ENGINEERS, INC.

January 3, 2017

Mr. Rick Frye  
Whispering Woods Land, LLC  
803 P.C.A. Road  
Warrensburg, MO 64093

Re: Whispering Woods – Lee's Summit, MO

Dear Mr. Frye:

In response to your request, Priority Engineers, Inc. has completed a traffic impact study for the above referenced project. The purpose of the analysis is to determine the potential traffic impacts associated with this development on the intersections and streets surrounding this site, primarily during the AM and PM peak hours. The following report documents our analysis and recommendations.

We appreciate the opportunity to work with you on this project. Please contact us with any questions or if you require additional information.

Sincerely,

PRIORITY ENGINEERS, INC.

Jesse Skinner, P.E., PTOE  
Senior Transportation Engineer

Priority Engineers, Inc.  
PO Box 563  
Garden City, MO 64747  
816.738.4400

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## 1) INTRODUCTION

The purpose of this study is to examine the potential traffic impacts associated with the proposed Whispering Woods development located north of SW Hook Road and east of SW Pryor Road in Lee's Summit, Missouri. The development will be constructed with access onto SW Pryor Road.

The study area is shown in Figure 1. The site layout is shown in Figure 2.

## 2) EXISTING CONDITIONS

The existing site is located north and east of the northeast quadrant of the intersection of SW Hook Road and SW Pryor Road. The property is currently used for agricultural purposes and has not previously been developed.

SW Pryor Road is a two-lane roadway adjacent to this property with a posted speed limit of 45 miles per hour. SW Pryor Road is classified as a Major Arterial. SW Hook Road is a two-lane road with a posted speed limit of 35 miles per hour. SW Hook Road is classified as a minor arterial. The intersection of SW Pryor Road and SW Hook road is unsignalized with stop signs controlling all four directions. To the north of this site, SW Scherer Road intersects SW Pryor Road at a four-way stop controlled intersection. SW Scherer Road is also a two-lane major arterial with a posted speed limit of 35 miles per hour.

The proposed development site is bounded on the west by SW Pryor Road. The property adjacent to the southwestern boundary of the proposed development is owned by the Lee's Summit School District (Hawthorn Hill Elementary School). Properties to the east of Hawthorne Hill Elementary School and to the south of the proposed development are single family residential dwellings on large lots. To the east of the proposed development the property is owned by the Lee's Summit School District (Lee's Summit West High School). To the north of the proposed development site, the property is undeveloped agricultural property.

Peak Hour turning movement traffic counts for the intersections of SW Hook Road and SW Pryor Road, SW Pryor Road and the western Hawthorn Hill Elementary School drive, and SW Pryor Road and SW Scherer Road were conducted on typical weekdays in October of this year between the hours of 7:00 and 9:00 AM and from 4:00 to 6:00 PM. The peak hours were determined to be different for each intersection in the AM and from 4:45 to 5:45 in the PM. The most conservative scenario for the AM Peak Hour was created by applying the individual AM peaks hours for each intersection while balancing the traffic volumes. The complete traffic counts are shown in Appendix II. The peak hour traffic volumes and existing lane configurations are shown in Figures 3-7.

## 3) PROPOSED DEVELOPMENT

The proposed site plan is shown in Figure 2. The proposed development consists of 164 units of Single Family Detached Residences.

The proposed development will have two entrances onto SW Pryor Road. The northern entrance will be located approximately 530 feet south of the northern property limit. The southern entrance will be approximately 180 feet north of the existing west drive for Hawthorne Hill Elementary. As part of the proposed development the existing entrance will be closed and

the School will be served by a new entrance to the north. Sight distance along SW Pryor Road exceeds the minimum requirements for intersection sight distance for both entrances.

**4) TRIP GENERATION**

The vehicle trips generated by the proposed development were estimated using the Institute of Transportation Engineers' Trip Generation, 9<sup>th</sup> Edition. Land Use 210, Single Family Detached Residences, was used. The estimated AM and PM peak hour traffic volumes associated with these uses are shown in Table 1.

Land Use	Intensity	Daily	AM Peak			PM Peak		
			Total	In	Out	Total	In	Out
Single Family Detached Residences	164 Units	1655	124	31	93	164	103	61
<b>Total New Trips</b>		<b>1655</b>	<b>124</b>	<b>31</b>	<b>93</b>	<b>164</b>	<b>103</b>	<b>61</b>

**5) TRIP DISTRIBUTION**

Trips generated by the Whispering Woods development were distributed based on existing traffic flows and a general analysis of the surrounding area. The trips were distributed onto the existing street system approximately as follows:

- 32 percent to/from the north on SW Pryor Road
- 17 percent to/from the east via SW Scherer Road
- 13 percent to/from the west via SW Scherer Road
- 22 percent to/from the south on SW Pryor Road
- 11 percent to/from the east via SW Hook Road
- 5 percent to/from the west via SW Hook Road

The proposed development trips are shown in Figures 7-8.

**6) SIGNAL WARRANTS**

The Manual of Uniform Traffic Control Devised (MUTCD) peak hour signal warrants were checked for the intersections of SW Scherer Road and SW Hook Road with Pryor Road. According to Warrant 3, the Peak Hour Warrant, the intersection of SW Scherer Road and SW Pryor Road will be met during the proposed PM Peak Hour. Because SW Pryor Road has a posted speed limit of 45 miles per hour, the 70% factor was also considered for Warrant 3. When considering this factor, the intersection of SW Scherer Road and SW Pryor Road meets peak hour signal warrants during existing AM and PM Peak Hour conditions. The intersection of SW Hook Road and SW Pryor Road meets during the existing PM Peak Hour.

Table 2 below summarizes the Peak Hour Signal Warrant.

Intersection	Scenario	Major Street Volume	Minor Street Volume	Peak Hour	Peak Hour (70% Factor)
Scherer Rd	Existing AM	846	130	NO	YES
	Existing PM	987	194	NO	YES
Hook Rd	Existing AM	580	124	NO	NO
	Existing PM	692	173	NO	YES
Scherer Rd	Proposed AM	918	134	NO	YES
	Proposed PM	1058	211	YES	YES
Hook Rd	Proposed AM	623	126	NO	NO
	Proposed PM	738	184	NO	YES
Scherer Rd	Future AM	1323	196	YES	YES
	Future PM	1542	303	YES	YES
Hook Rd	Future AM	900	185	NO	YES
	Future PM	1071	266	YES	YES

The intersection of SW Scherer and SW Pryor Road currently meets peak hour signal warrants during the existing AM and PM Peak Hours based upon the 70% Factor. This intersection is also currently experiencing low levels of service in the PM Peak Hour. The intersection of SW Hook Road and SW Pryor Road also meets the existing peak hour signal warrant based upon the 70% Factor during the PM Peak Hour.

**7) LEVEL OF SERVICE AND VOLUME/CAPACITY ANALYSES**

Capacity analysis was used to quantify the impacts of the increased traffic on the intersections studied. The methodology outlined in the Highway Capacity Manual, 2000 and 2010 Editions, was used as a basis to perform the analysis for this study. Capacity analysis defines the quality of traffic operation for an intersection using a grading system called Level of Service (LOS). The LOS is defined in terms of average vehicle delay. Levels of service A through F have been established with A representing the best and F the worst.

Level of Service	Unsignalized Intersection	Signalized Intersection
A	< 10 Seconds	< 10 Seconds
B	< 15 Seconds	< 20 Seconds
C	< 25 Seconds	< 35 Seconds
D	< 35 Seconds	< 55 Seconds
E	< 50 Seconds	< 80 Seconds
F	≥ 50 Seconds	≥ 80 Seconds

The study intersections were evaluated using Synchro, an analysis package based in part on Highway Capacity Manual methods. The analysis reports are included in Appendix II.

### **Existing Conditions**

The levels of service and lane configuration for existing conditions are shown in Figures 5 and 6 in Appendix I.

The individual movements at the unsignalized intersection of SW Pryor Road and SW Scherer are a level of service C or better in the AM Peak Hour except the southbound through movement which is a level of service F. During the PM Peak Hour, the level of service at the intersection of SW Pryor and SW Scherer road degrades with through movement on both southbound and northbound SW Pryor road experiencing a level of service F.

During the AM peak hour the intersection of SW Pryor Road and SW Hook Road experiences levels of service for individual movements at a level of service C or better. During the PM peak hour the intersection of SW Pryor Road and SW Hook Road experiences levels of service for individual movements at a level of service D or better.

During the AM Peak Hour, the western entrance to Hawthorne Hills Elementary School experiences a level of service D while SW Pryor Road experiences a level of service A for both directions. During the PM peak hour, the school entrance onto SW Pryor Road experiences a level of service B while SW Pryor Road remains a level of service A for both directions.

### **Proposed Conditions**

The levels of service and lane configuration, for the ultimate buildout of the Whispering Woods development are shown in Figures 9 and 10 in Appendix I.

The individual movements for the unsignalized intersection of SW Pryor Road and SW Scherer Road remains a level of service C or better in both the AM Peak Hour except the through movements on SW Pryor Road which experiences a level D and F for northbound and southbound, respectively. During the PM Peak Hour, the level of service for both directions of SW Scherer Road remains level of service C or better. The northbound movement of SW Pryor Road degrades to a level of service F and the southbound movement of this intersection remains a level of service F.

Both the proposed AM and PM peak hour movements for the intersection of SW Pryor Road and SW Hook Road have individual turning movements with a level of service C or better except the PM southbound through movement which is a level of service D.

The newly constructed entrance onto SW Pryor Road that will service both the Whispering Woods residential development and Hawthorne Hills Elementary has a level of service C or better for all movements in both the AM Peak Hour and the PM Peak Hour.

The newly constructed north entrance into the Whispering Woods residential development experiences a level of service C or better for all movements in both the AM and PM peak hours.

## **8) TURN LANES AND ACCESS MANAGEMENT**

The site has been laid out to provide for good site circulation and future connectivity. There are two local road connections to Pryor Road. Each connection will have 100' or more of throat length.

According to the City of Lee's Summit Access Management Code, both left and right turn lanes should be provided for connectors with arterial streets. In compliance with this code, turn lanes should be constructed at both entrances into the Whispering Woods Development. The City of Lee's Summit plans to improve Pryor Road in the future. An agreement between the developer and the City is needed to coordinate the improvements of the Developer and the City.

The spacing between the proposed southern entrance and SW Hook Road is approximately 1000'. The spacing between the southern entrance and the northern entrance into the development is approximately 1000'. The spacing between the northern entrance and SW Eagle Creek Drive is approximately 900'. The spacing of all intersections exceeds the Access Management Code.

The City of Lee's Summit Thoroughfare Master Plan indicates the potential for a future east/west arterial north of the Whispering Woods development and south of Scherer Road. This future arterial is not within the property limits of Whispering Woods. To the east of the Whispering Woods property lies Lee's Summit West High School. An arterial roadway located on the northern edge of the Whispering Woods property would also be located on the northern edge of the High School property. The internal roadway network within the Whispering Woods residential development allows for a connection to the north.

#### **9) UNIMPROVED ROAD POLICY**

The City of Lee's Summit Unimproved Road Policy outlines the relation to unimproved roads to proposed developments. Unimproved roads are typically those roads that are narrow in width with drainage ditches adjacent to the roadway. Traffic volumes collected on October 4, 2016 on SW Pryor Road showed a daily volume of 6745. Following the full build out of the Whispering Woods development, the total daily traffic volume is expected to be 8400 vehicles. The Unimproved Road Policy allows development up to 11000 vehicles per day when the road is brought to an interim standard with two 12-foot lanes and six-foot grass shoulders. SW Pryor Road adjacent to this project has twelve foot lanes and six-foot shoulders. Right and left turn lanes are proposed to be constructed at both entrances.

#### **10) FUTURE CONDITIONS**

A future scenario was created in order to estimate traffic volumes through study intersections in the year 2036. A 2% growth factor was applied to background traffic volumes to generate this scenario which is illustrated in Figures 11-14 in Appendix I.

If left unsignalized in the year 2036, the intersection of SW Pryor Road and SW Scherer Road would experience a level of service D for movements in both directions on SW Scherer Road and a level of service as low as F for movements in both directions on SW Pryor Road during the AM peak hour. During the PM Peak Hour, the individual movements would degrade on SW Scherer road with levels of service as low as F.

The unsignalized intersection of SW Pryor Road and SW Hook Road would be expected to function well with levels of service of C or better in the AM Peak Hour except the through movements of SW Pryor road which are levels of service F. During the PM Peak hour, the Westbound through movement on SW Hook Road would degrade to a level of service D, through movements on SW Pryor Road would experience level of service F with all other movements level of service C or better.



Based upon the signal warrants discussed in Section 6 of this report, it is anticipated that both the SW Scherer Road intersection and the SW Hook Road will be signalized in the future scenario. These intersections were modeled with traffic signals and projected 2036 traffic volumes. The results of these models are illustrated in Figures 15 and 16. Both intersections are expected to function well in the future scenario once signalized.

## 11) RECOMMENDATIONS & CONCLUSIONS

This study documents the impact of the proposed Whispering Woods Development on adjacent intersections during the AM and PM peak hours. Based on the findings of this report, the following improvements are recommended:

- Construction of a 150' northbound right-turn lane into the southern (School) entrance
- Construction of a 150' northbound right-turn lane into the North Entrance
- Construction of a 200' southbound left-turn lane into the southern (School) entrance
- Construction of a 200' southbound left-turn lane into the North Entrance
- Construct two westbound lanes at the southern entrance of the development

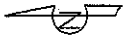
The intersection of SW Pryor Road and SW Scherer Road should be considered and monitored for signalization. The intersection meets peak hour signal warrants during the existing AM and PM Peak Hours based upon the 70% Factor discussed in section 6 of this report. Although this intersection will warrant a traffic signal without the addition of this development's traffic, Whispering Woods will increase traffic volumes at this intersection which is already experiencing declining levels of service. City staff has indicated potential planned improvements at this location, an agreement between the developer and the City is needed to coordinate details on this improvement.

The intersection of SW Pryor Road and SW Hook Road meets peak hour signal warrants during the existing PM Peak Hour based upon the 70% Factor discussed in section 6 of this report. The addition of the Whispering Woods development traffic does not change the levels of service at this intersection during either the AM or PM Peak Hours. Neither are additional peak hour signal warrants met. This intersection will continue to function reasonably well, but will likely require a traffic signal in the future as additional development occurs in the area, but is not recommended in conjunction with this development.

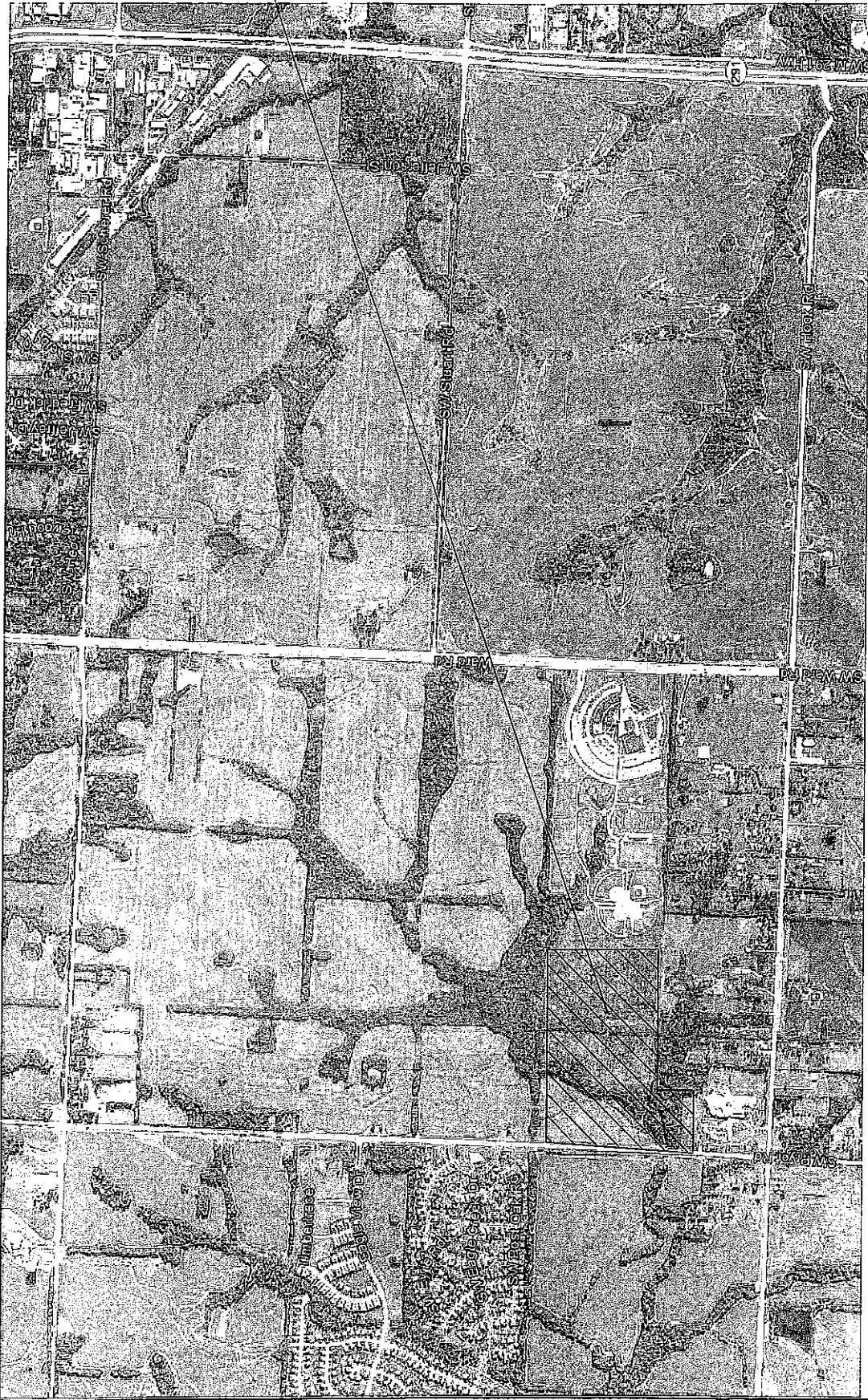

No additional improvements are necessary as a result of this development.

## APPENDIX I

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Future (2036) PM Peak Hour Lane Configurations & Levels of Service (with Signals)	Figure 16



*Project  
Location*

Priority  
MAIL PERMITS

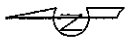
PO Box 563  
Garden City, MO 64747  
816.738.4400

No Scale

Figure 1

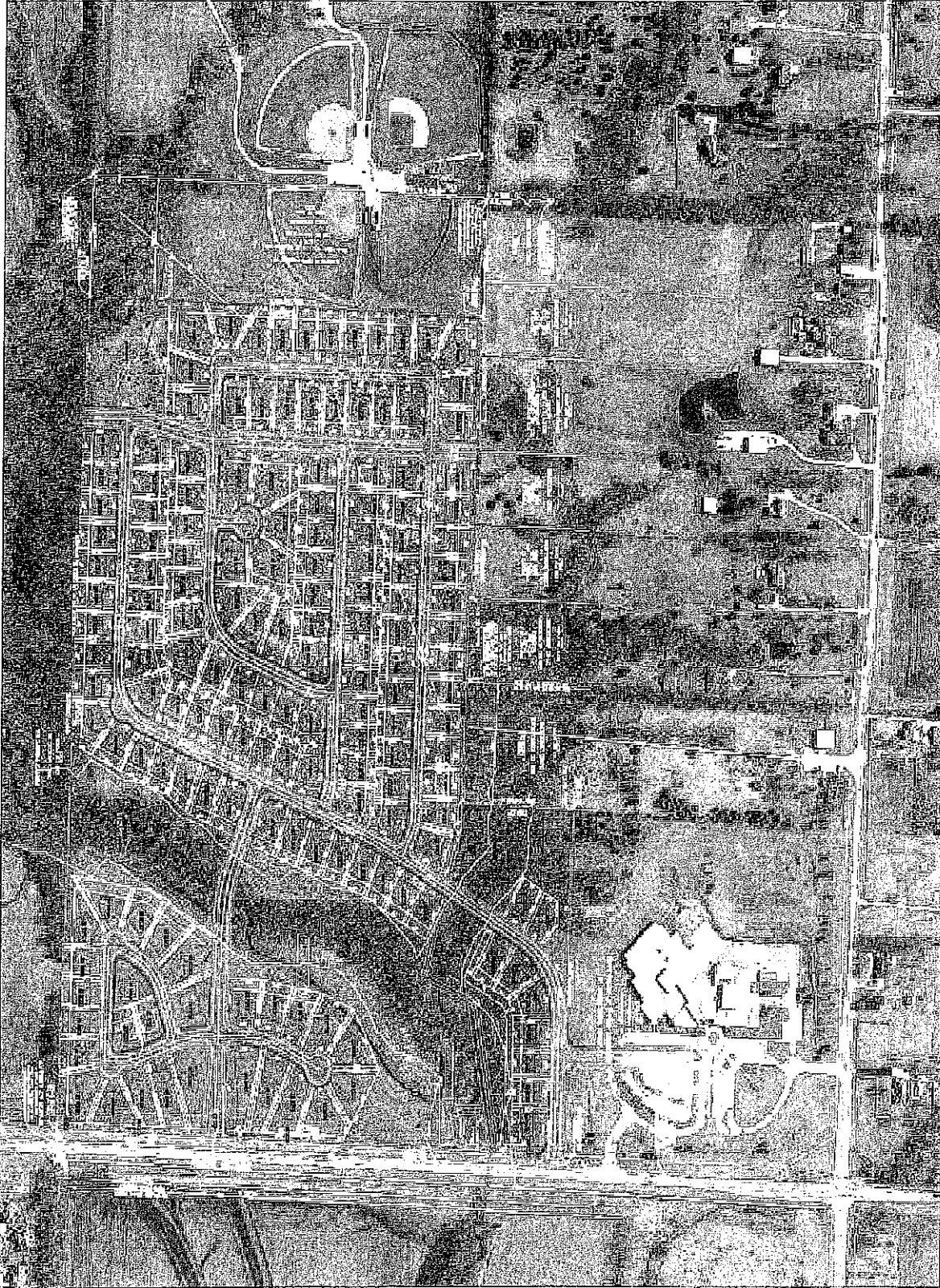
Whispering Woods  
Lee's Summit, MO

Project Location



PROLOGY  
ENGINEERING

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Garden City, MO 64747  
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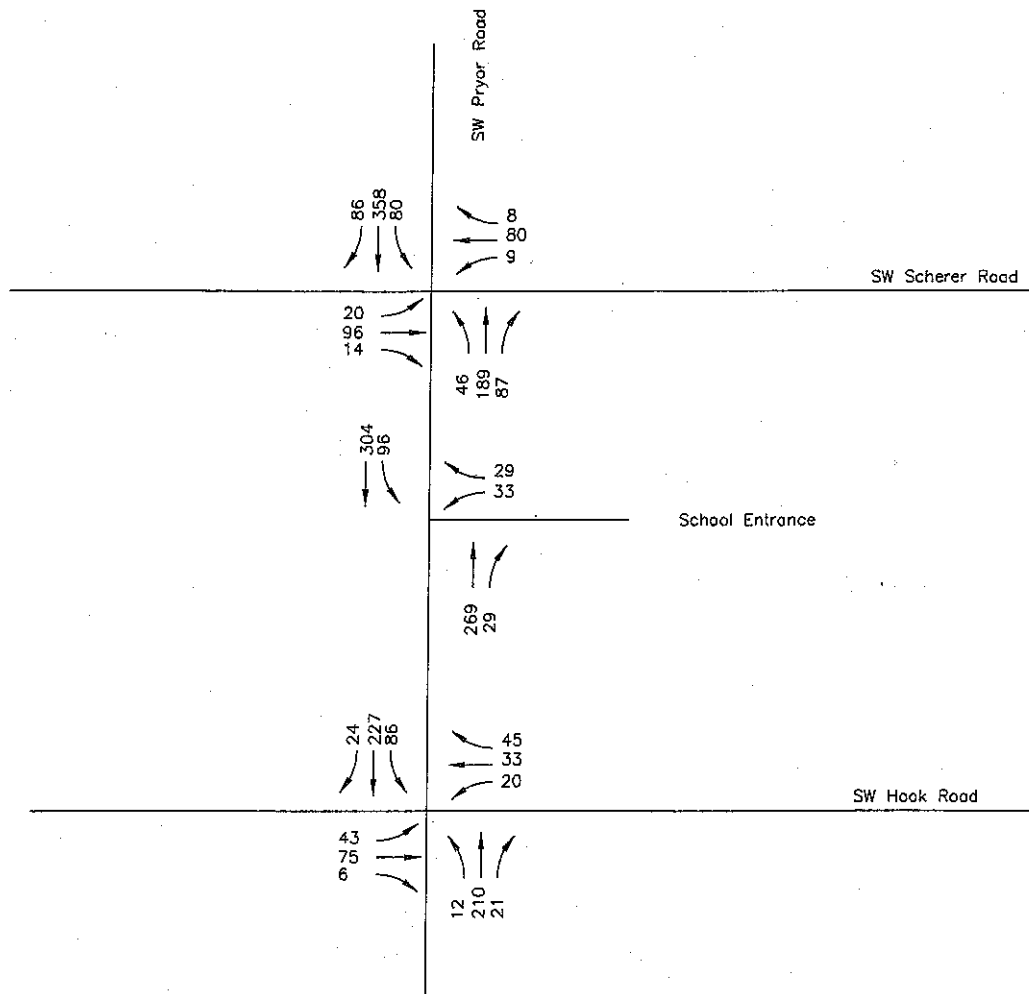


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Figure 2

Whispering Woods  
Lee's Summit, MO

Site Plan



LEGEND

 Total Volume

Existing AM Peak Hour  
Traffic Volumes

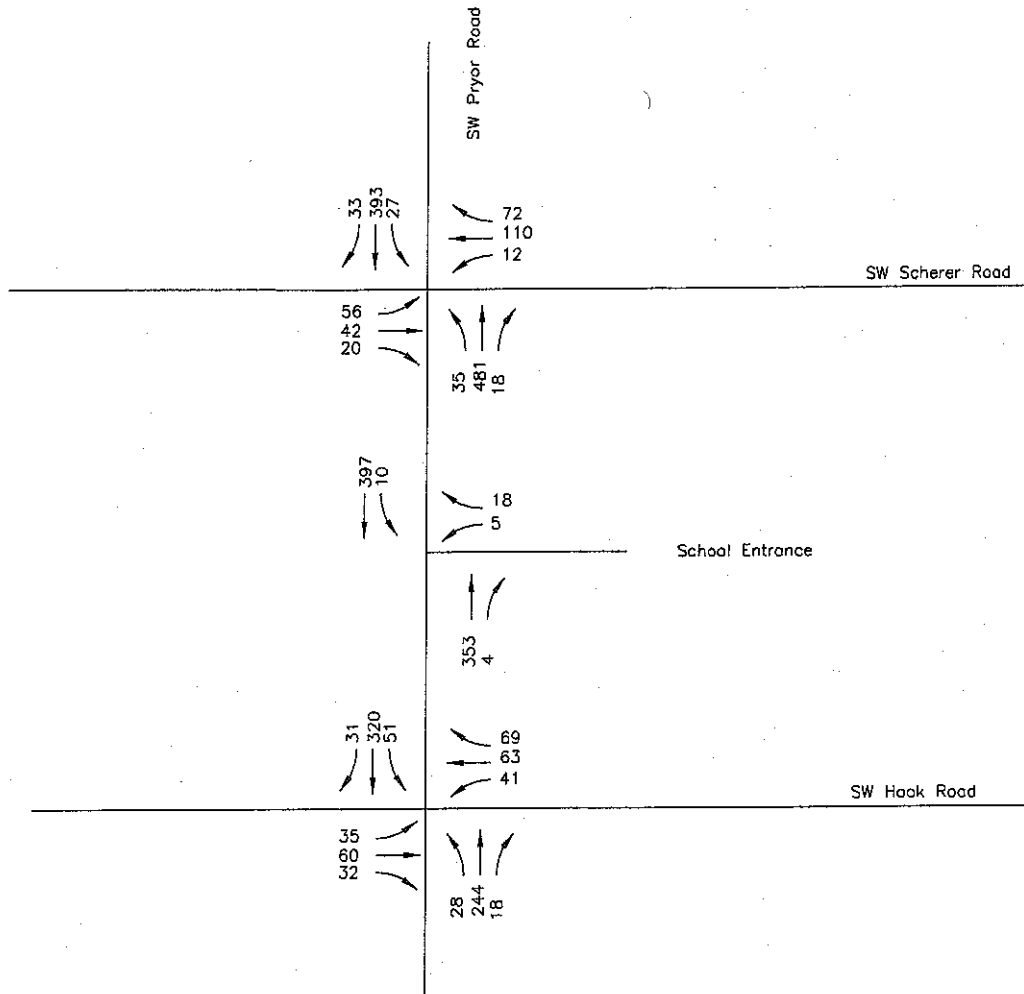
Whispering  
Woods  
Lee's Summit, MO

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Figure 3



Priority  
ENGINEERS



LEGEND



Total Volume

Existing PM Peak Hour  
Traffic Volumes

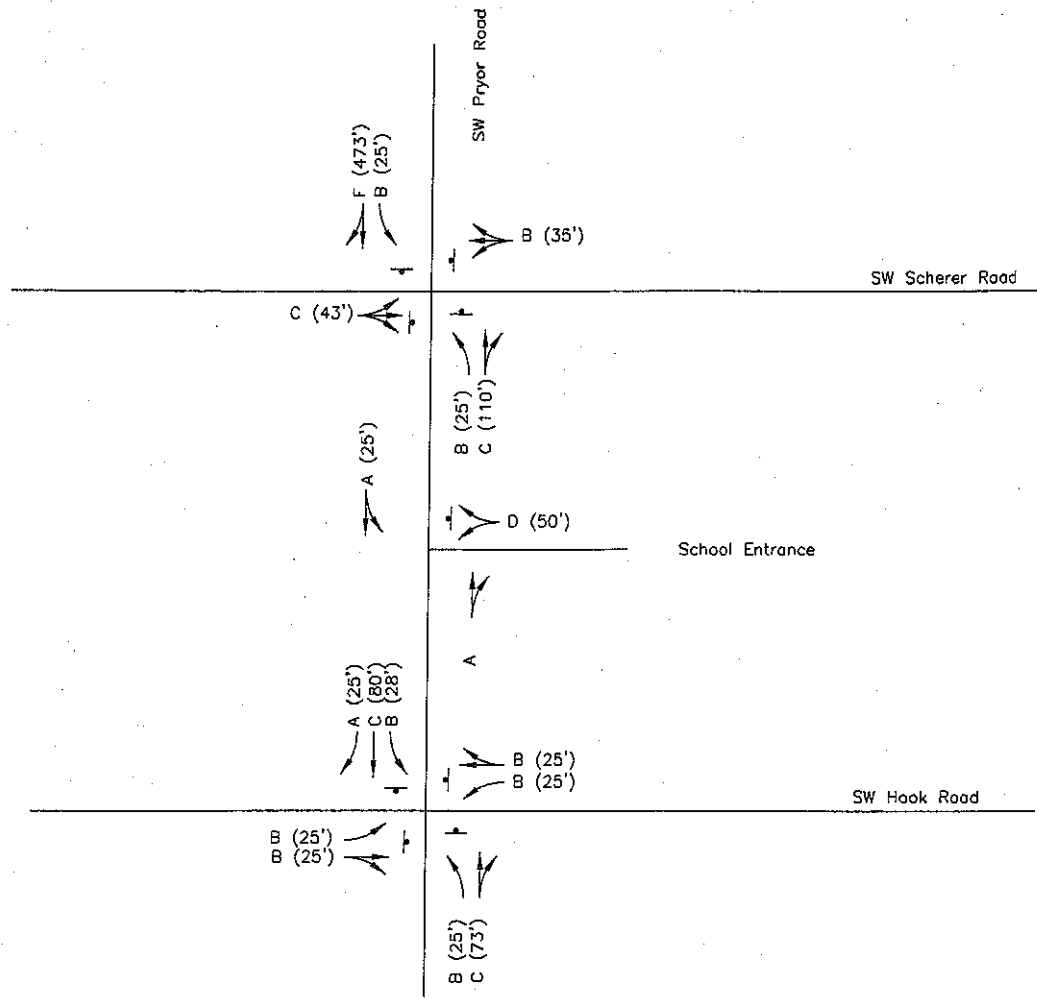
Whispering  
Woods  
Lee's Summit, MO

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

Figure 4



Proton  
ENGINEERS



LEGEND

-  HCM LOS
-  Stop Sign
-  Traffic Signal LOS

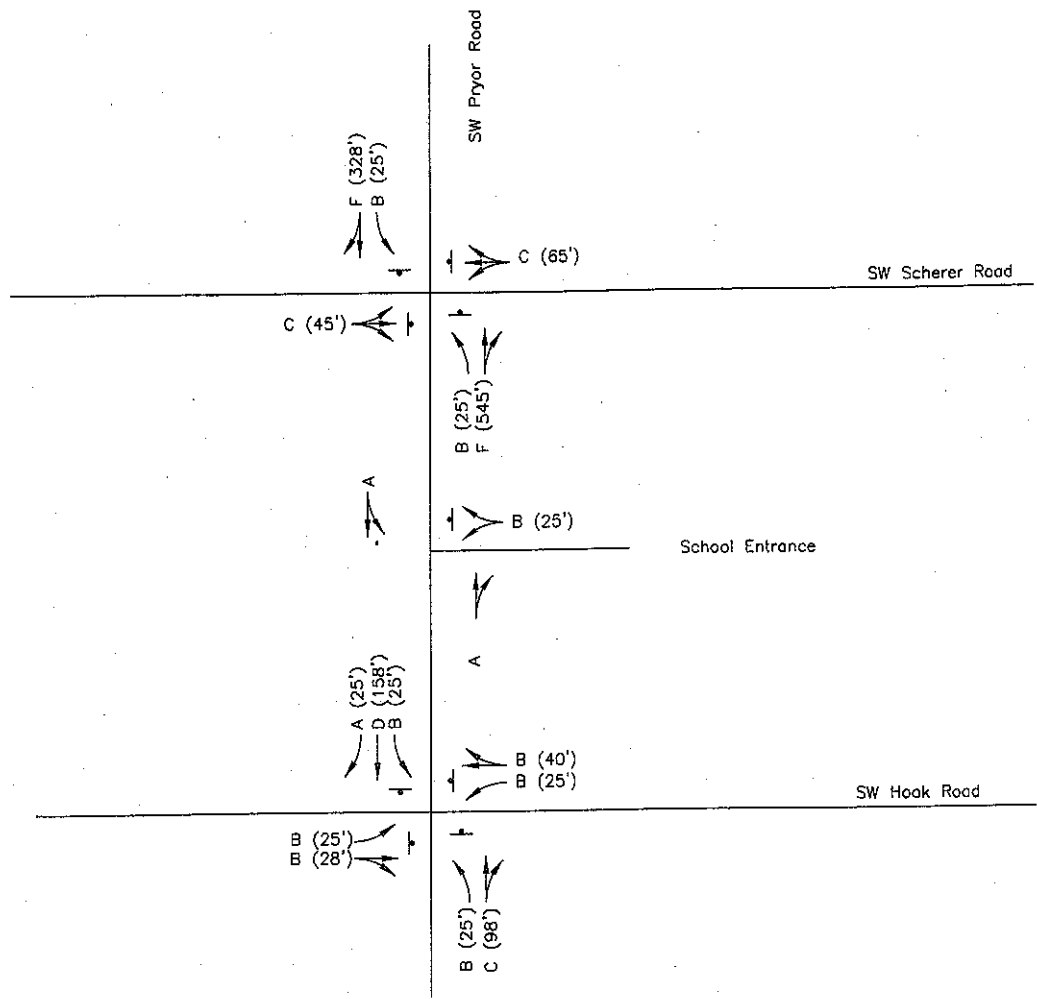
Existing AM Peak Hour  
Lane Configuration &  
Levels of Service

Whispering  
Woods  
Lee's Summit, MO

No Scale  
Figure 5



planning  
ENGINEERS



**LEGEND**

- HCM LOS (95th Percentile Queue)
- Stop Sign
- Traffic Signal LOS

Existing PM Peak Hour  
Lane Configuration &  
Levels of Service

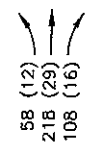
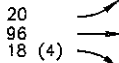
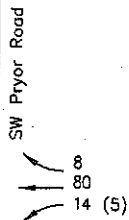
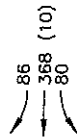
Whispering  
Woods  
Lee's Summit, MO

No. Scale  
Figure 6

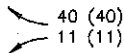
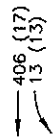


PRIORITY  
PLANNING & DESIGN, INC.

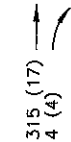
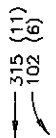




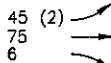
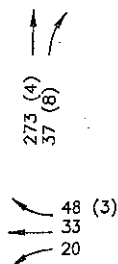
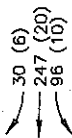
SW Scherer Road



North Entrance




School Entrance



SW Hook Road

LEGEND

 Total Volume (Proposed Development)

Existing + Proposed Development  
AM Peak Hour Traffic Volumes

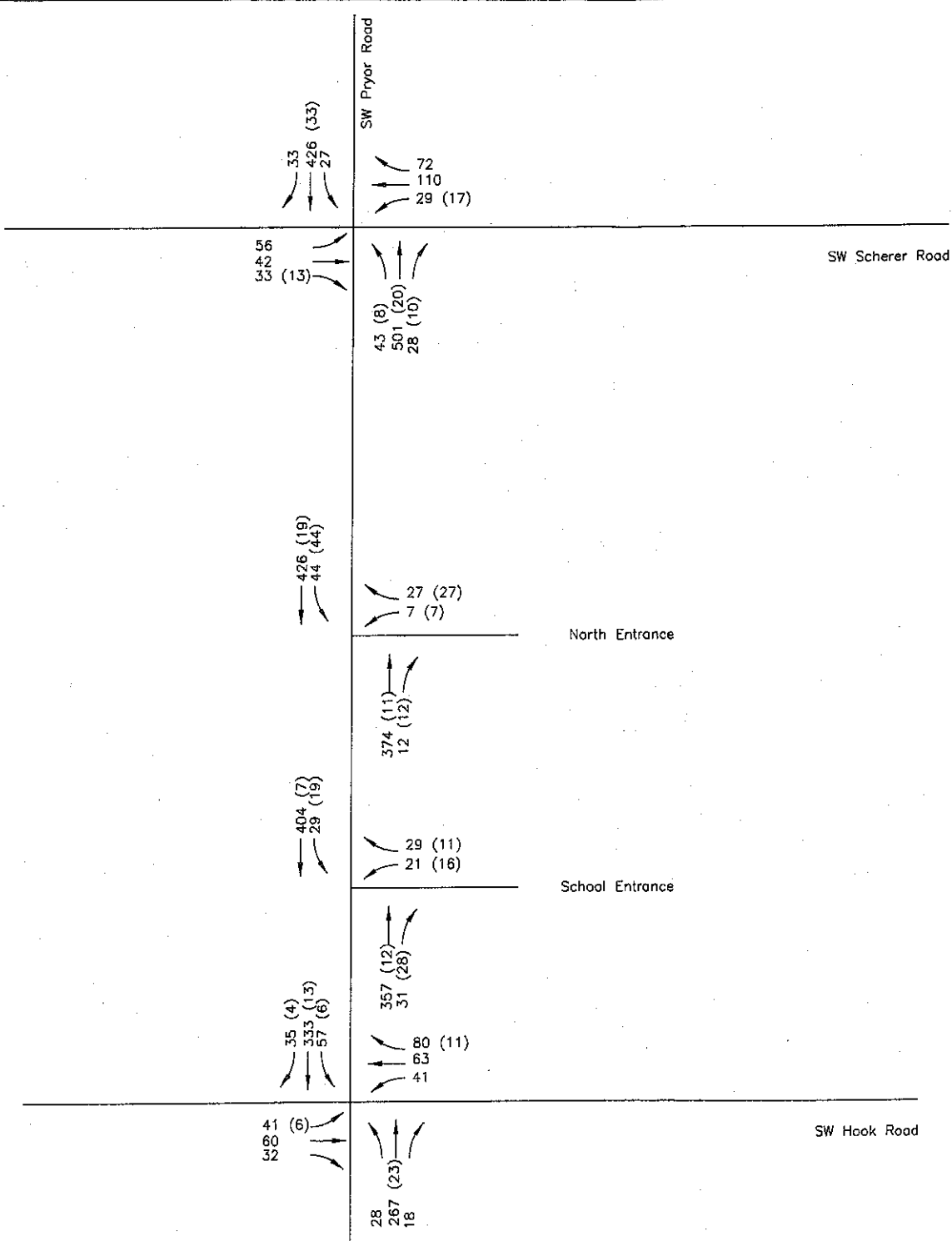
Whispering  
Woods  
Lee's Summit, MO

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Figure 7



PROTECTOR  
1100 W. 11th St.  
St. Louis, MO 63103



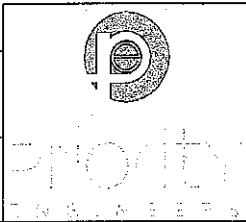
**LEGEND**

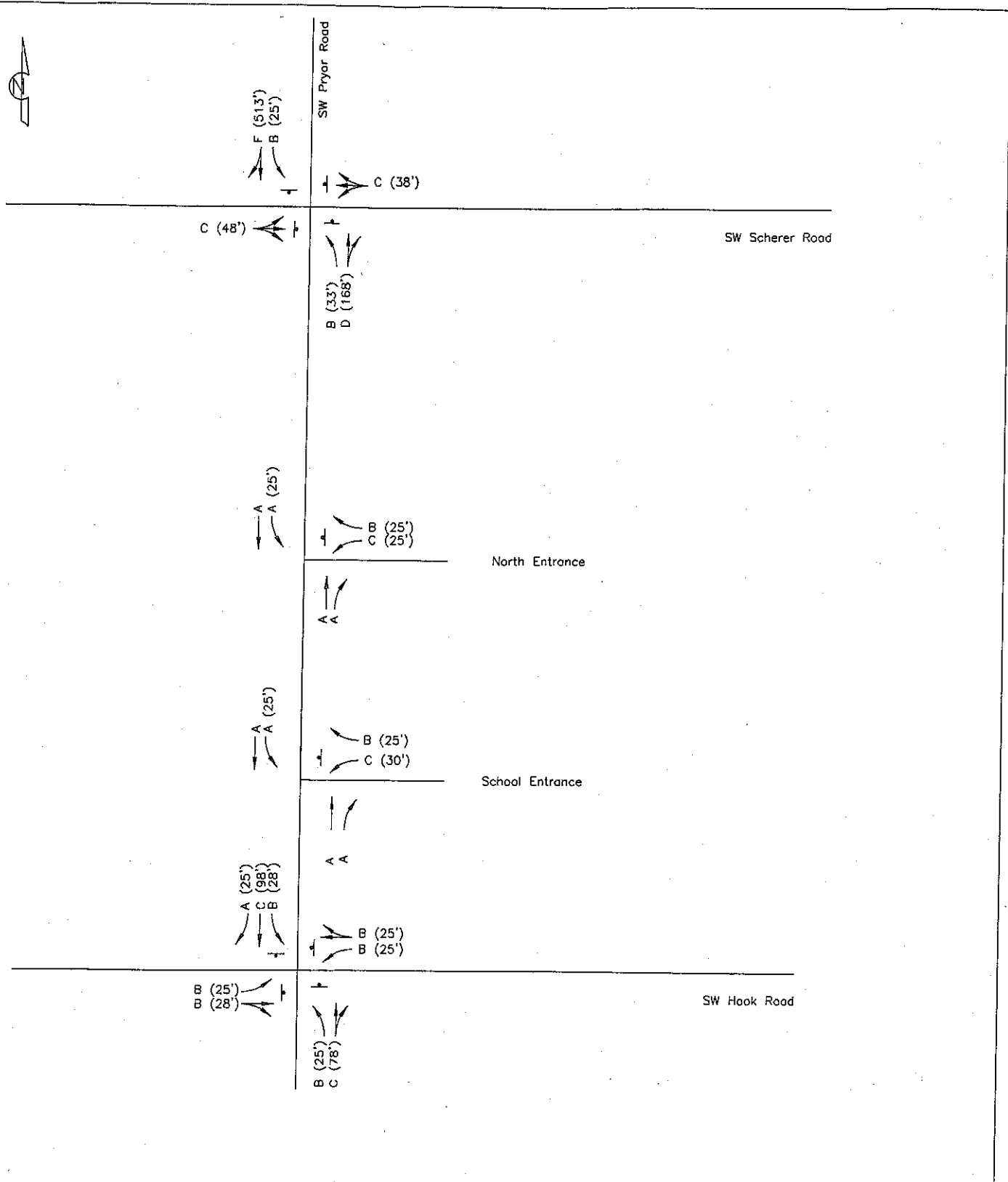
Total Volume (Proposed Development)

Existing + Proposed Development  
PM Peak Hour Traffic Volumes




Whispering  
Woods  
Lee's Summit, MO

No Scale  
Figure 8





**LEGEND**

-  HCM LOS (95th Percentile Queue)
-  Stop Sign
-  Traffic Signal LOS

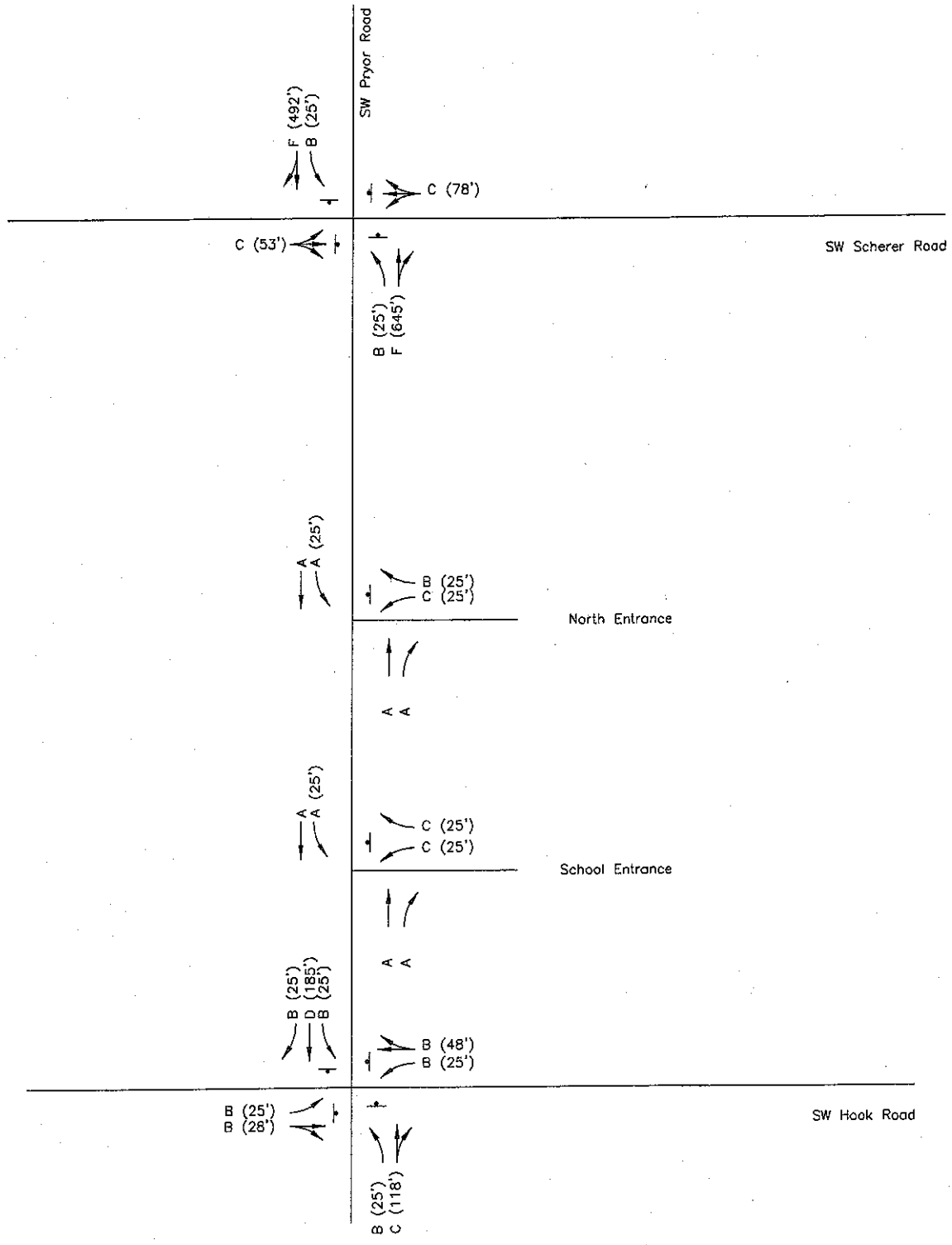
Existing + Proposed Development  
AM Peak Hour Lane Configuration  
& Levels of Service

Whispering  
Woods  
Lee's Summit, MO

No Scale  
Figure 9



2010  
11/13/10



**LEGEND**

- HCM LOS (95th Percentile Queue)
- Stop Sign
- Traffic Signal LOS

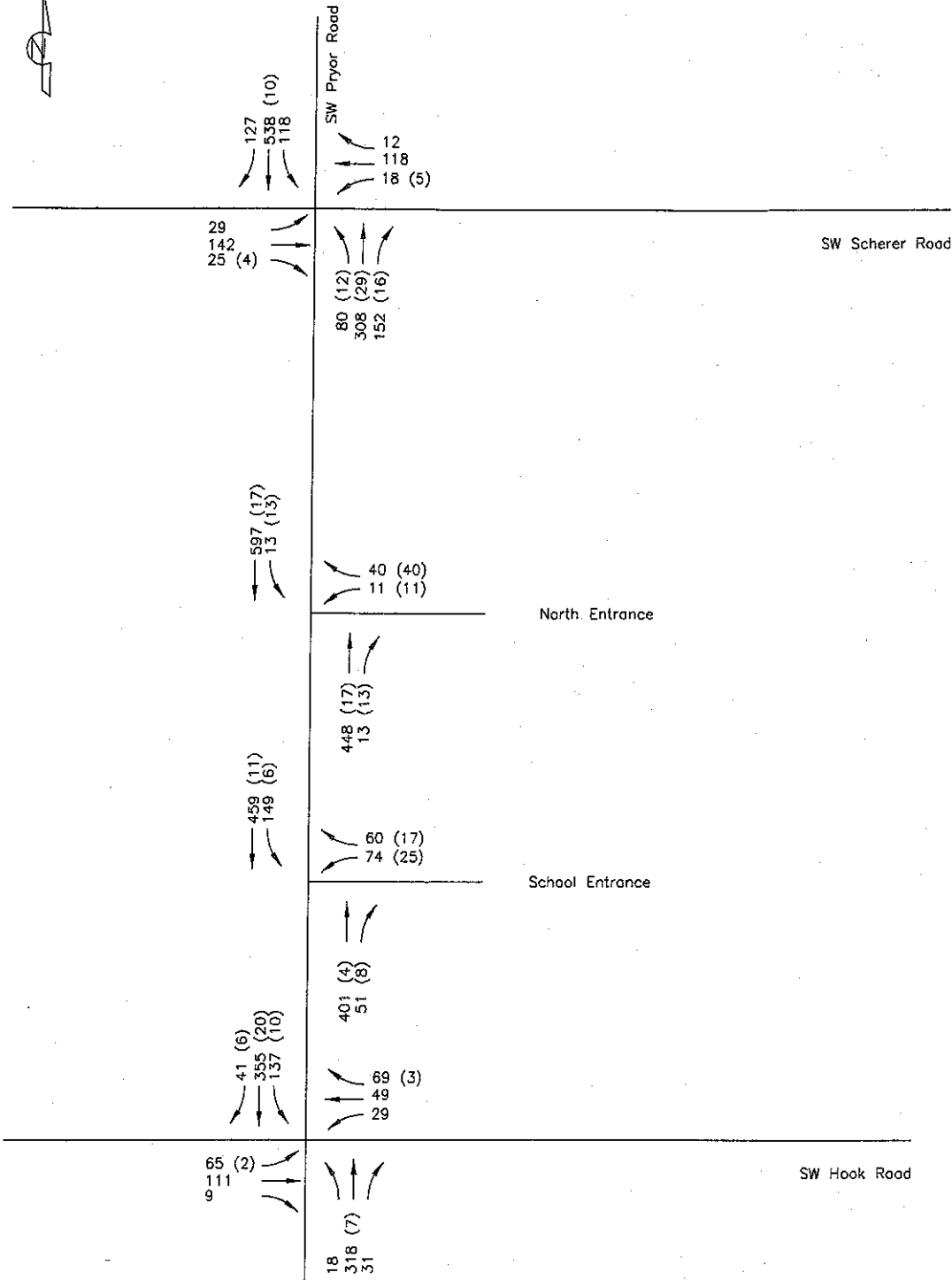
Existing + Proposed Development  
PM Peak Hour Lane Configuration  
& Levels of Service

Whispering  
Woods  
Lee's Summit, MO

No Scale  
Figure 10



priority  
ENGINEERS



LEGEND

Total Volume (Proposed Development)

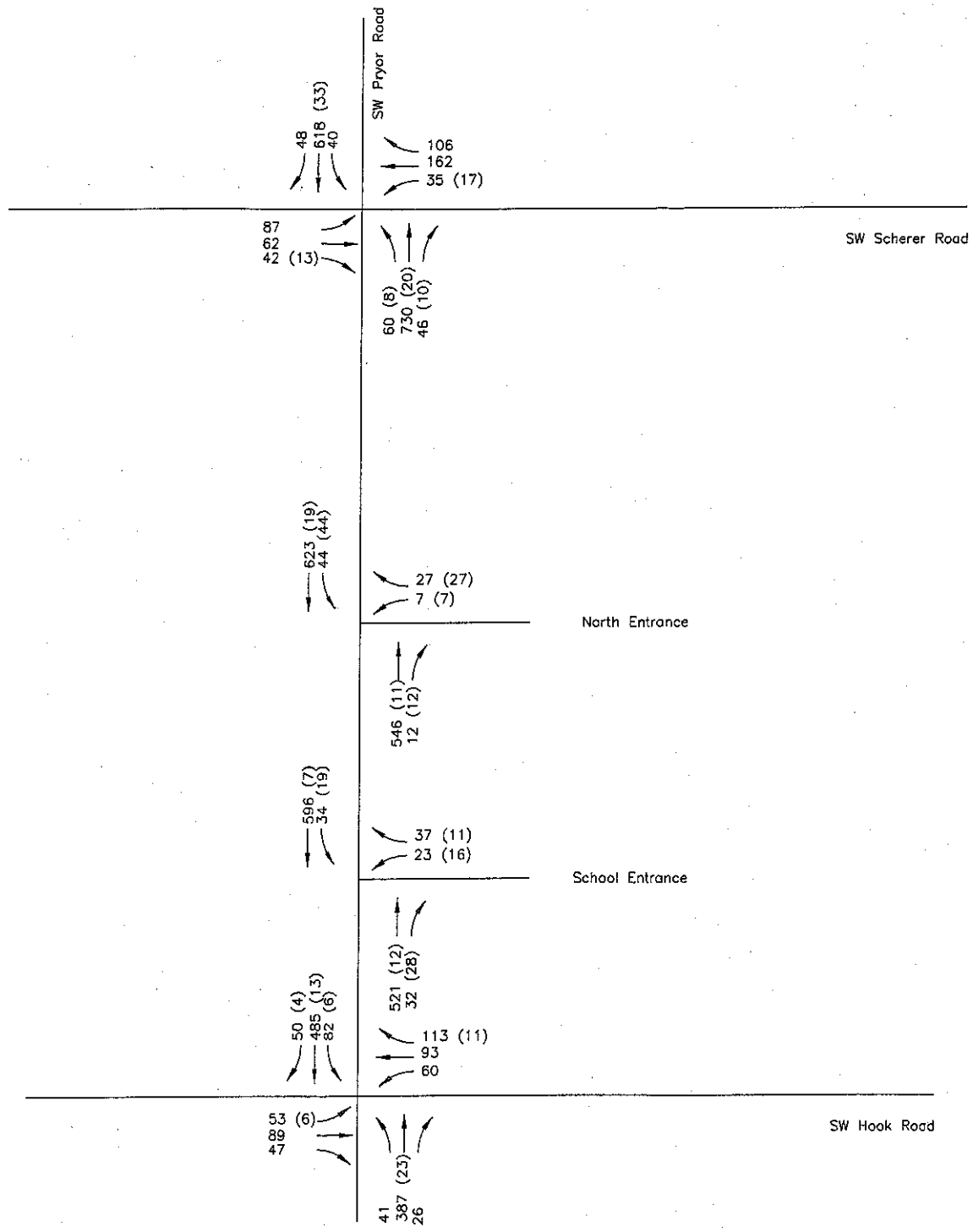
Future (2036)  
AM Peak Hour Traffic Volumes

Whispering  
Woods  
Lee's Summit, MO

No Scale  
Figure 11



PRYOR  
ENGINEERING



**LEGEND**

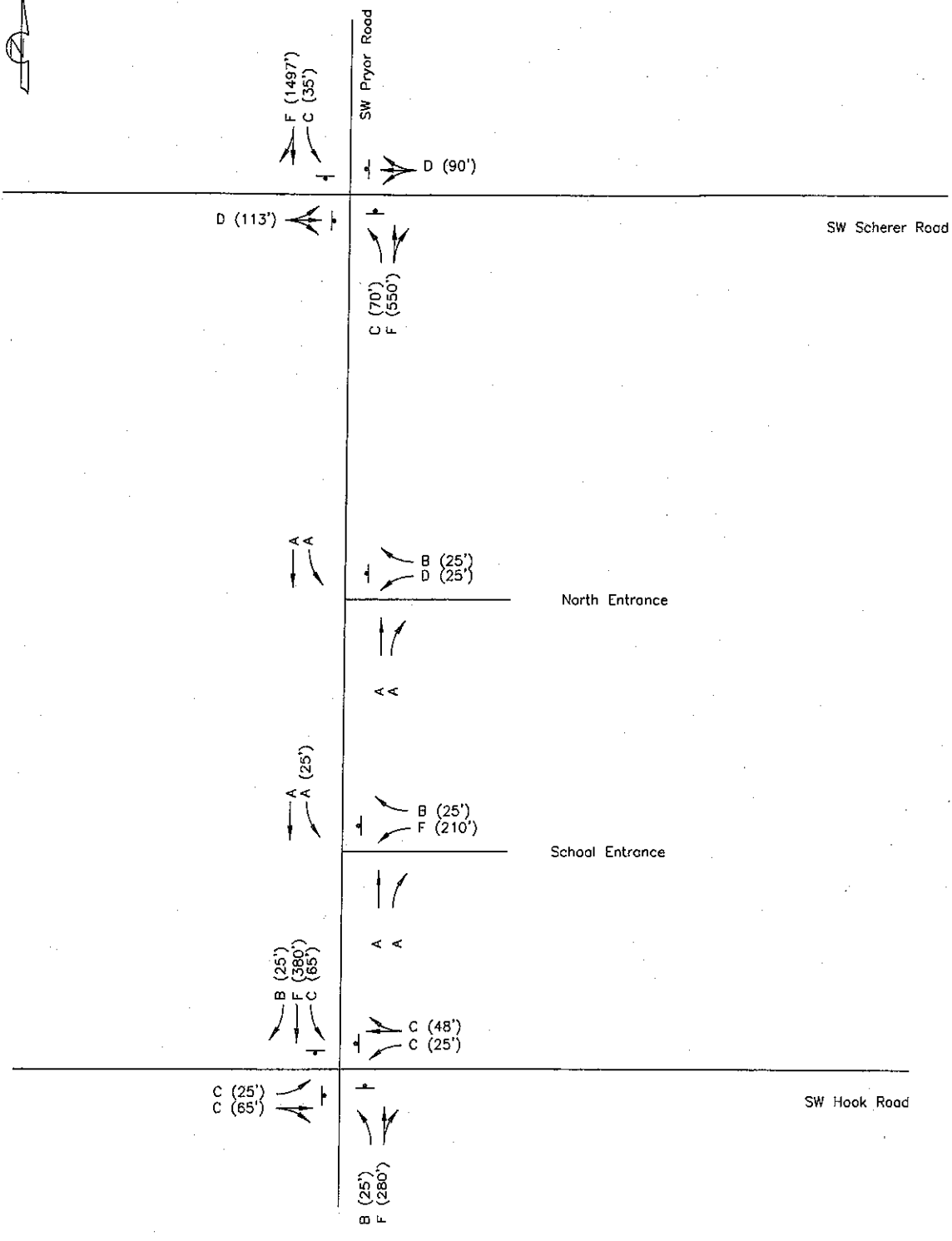
Total Volume (Proposed Development)

Future (2036)  
PM Peak Hour Traffic Volumes

Whispering  
Woods  
Lee's Summit, MO

No Scale  
Figure 12



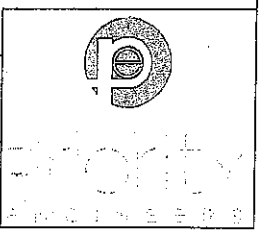


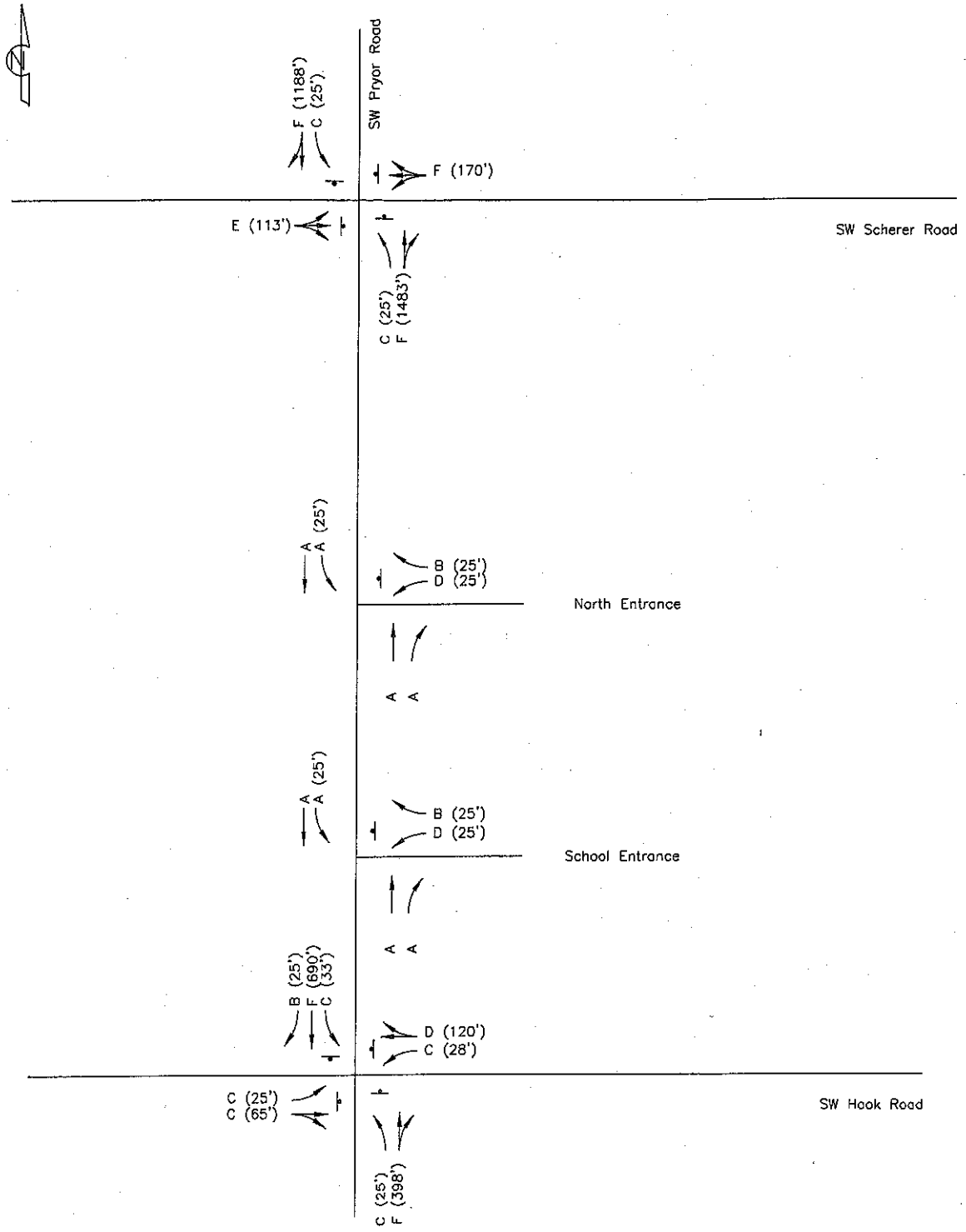
- LEGEND**
- HCM LOS (95th Percentile Queue)
  - Stop Sign
  - Traffic Signal LOS

Future (2036)  
 AM Peak Hour Lane Configuration  
 & Levels of Service

Whispering  
 Woods  
 Lee's Summit, MO

No Scale  
 Figure 13





LEGEND

- HCM LOS (95th Percentile Queue)
- ⊥ Stop Sign
- Ⓐ Traffic Signal LOS

Future (2036)  
PM Peak Hour Lane Configuration  
& Levels of Service

Whispering  
Woods  
Lee's Summit, MO

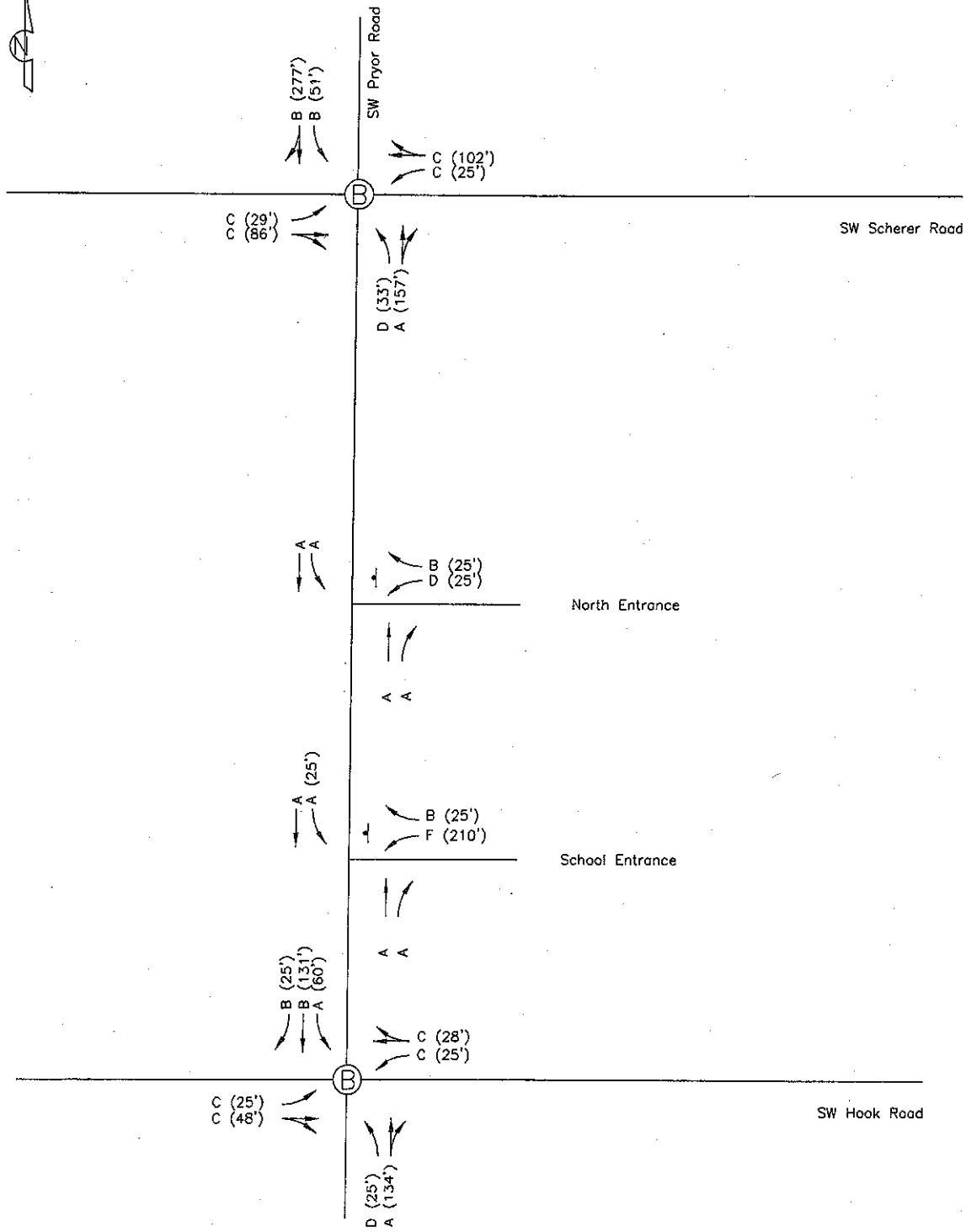
No. Scale

Figure 14



Priority  
ENGINEERS





Future (2036) with Signals  
 AM Peak Hour Lane Configuration  
 & Levels of Service

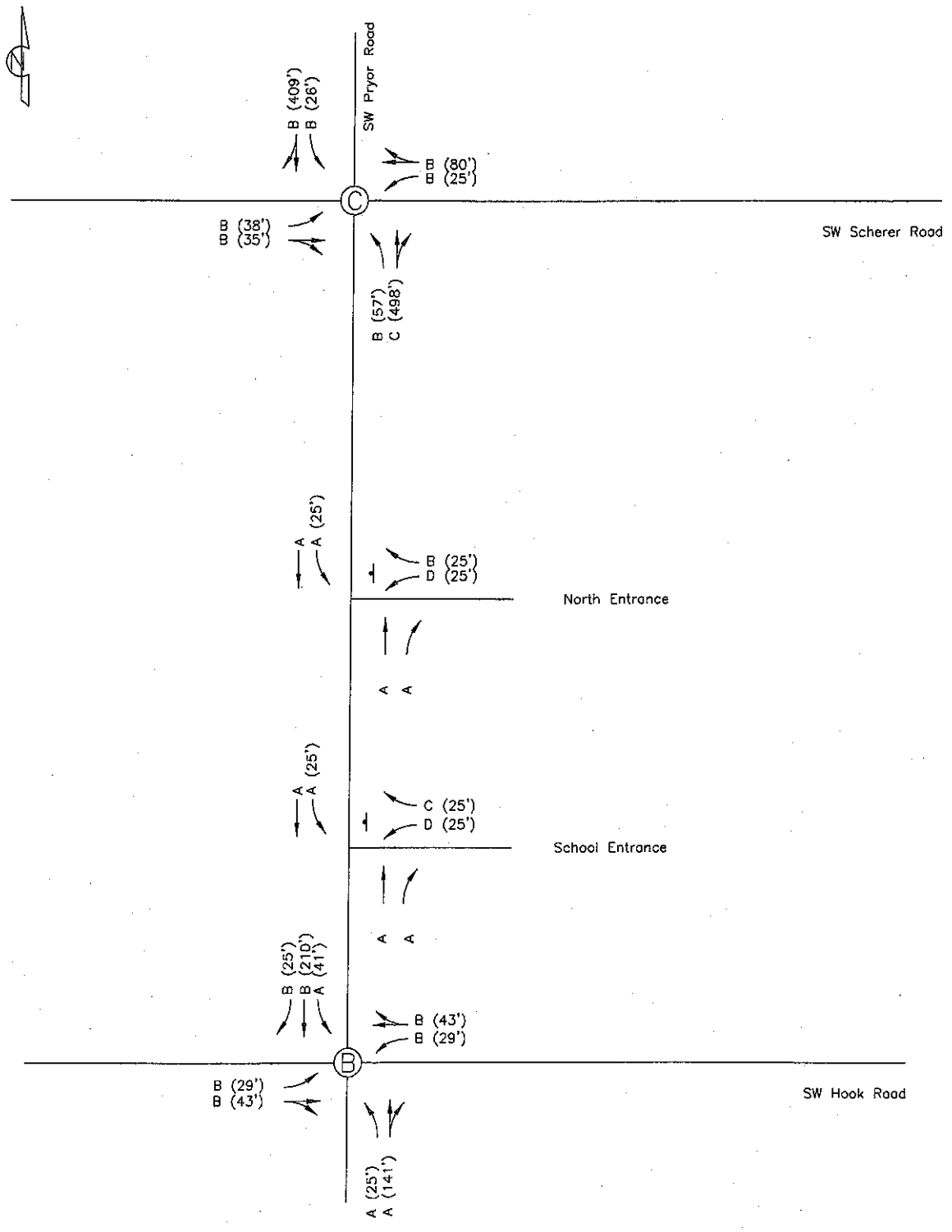
Whispering  
 Woods  
 Lee's Summit, MO

No Scale

Figure 15



Frontier  
 ENGINEERS



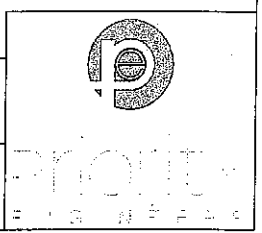
**LEGEND**

- HCM LOS (95th Percentile Queue)
- Stop Sign
- Traffic Signal LOS

Future (2036) with Signals  
 PM Peak Hour Lane Configuration  
 & Levels of Service

Whispering  
 Woods  
 Lee's Summit, MO

No Scale  
 Figure 16



## APPENDIX II

### Peak Hour Traffic Counts

#### Synchro Reports

Existing AM Peak Hour	Pages 1-4
Existing PM Peak Hour	Pages 5-8
Proposed AM Peak Hour	Pages 9-13
Proposed PM Peak Hour	Pages 14-18
Future (2036) AM Peak Hour	Pages 19-23
Future (2036) PM Peak Hour	Pages 24-28
Future (2036) AM Peak Hour (with signals)	Pages 29-34
Future (2036) PM Peak Hour (with signals)	Pages 35-40