TRAFFIC IMPACT STUDY

PROPOSED CHRISTIAN SPRINGS SUBDIVISION

KNOX COUNTY, TENNESSEE

PREPARED FOR:

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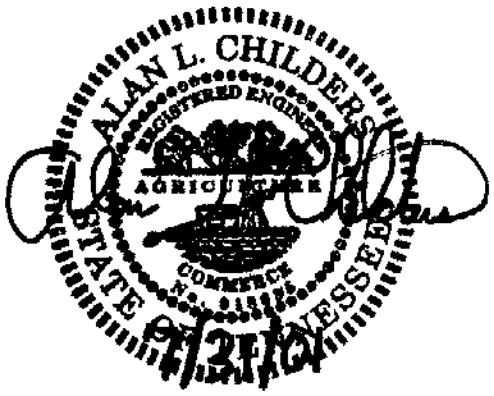
JULY 30, 2001

TRAFFIC IMPACT STUDY

PROPOSED CHRISTIAN SPRINGS SUBDIVISION

KNOX COUNTY, TENNESSEE



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MANAGEMENT SUMMARY

This report provides a summary of the traffic impact study that was performed for the Christian Springs Subdivision, which is proposed to have entrances off of Maloneyville Road and Stair Drive in northeastern Knox County. The project site is located approximately one-quarter mile east of Tazewell Pike (State Route 331) and approximately one mile south of Emory Road (State Route 131). Interstate 640 is approximately 8 miles to the south.

This study primarily focused on the evaluation of two intersections: the proposed north subdivision entrance on Maloneyville Road, and the existing intersection of Maloneyville Road and Stair Drive. The following summarizes the concerns and recommendations that are made to address these concerns:

1) Intersection Sight Distance:

   It is recommended that some small trees and brush, located primarily on the inside of a curve between the two study intersections, be removed. This will improve the sight distance for the Maloneyville Road and Stair Drive intersection. In addition, similar vegetation removal should be undertaken along a fence located just to the north of the proposed north project entrance on Maloneyville Road. A vertical curve located to the south of the north entrance on Maloneyville Road needs to be adjusted to achieve 400 feet of sight distance. These vegetation and vertical curve adjustments will substantially address the sight distance concerns that were identified at both intersections during a site field review.

2) Stair Drive Pavement Width:

   It is recommended that Stair Drive be widened from its proposed south subdivision entrance to the Maloneyville Road and Stair Drive intersection. The recommended width of this widening would be to provide a section at least 20 feet wide. Furthermore the inside radius

of Stair Drive at the intersection with Maloneyville Road should be improved with some centerline shifting to improve intersection angle.

3) Curve Advance Signing:

It is recommended that an advance curve warning sign for the curve discussed above be placed north of the horizontal curve with supplemental plates displaying the appropriate curve advisory speed.

INTRODUCTION

The subject of this traffic impact study is the proposed Christian Springs subdivision, which is to be located in northeastern Knox County, just south of the Harbison Crossroads community. The project site is located immediately east of the intersection of Maloneyville Road and Stair Drive, which is about one-quarter mile east of Tazewell Pike (State Route 331) and approximately one mile south of Emory Road (State Route 131). Interstate 640 is approximately 8 miles to the south. FIGURE 1 is a location map that identifies the project site in relation to the roadways in the vicinity of the proposed subdivision.

The concept plan for this project proposes a subdivision of 180 lots at full build-out. Two access points are proposed, one to be located on Maloneyville Road and the other on Stair Drive. FIGURE 2 provides a detailed layout of the proposed subdivision as shown on the concept plan.

The purpose of this traffic impact study is to assess the impact of the proposed Christian Springs subdivision on the roadway facilities in the project area. Specifically, this assessment includes review of traffic and geometric conditions at the intersection of Maloneyville Road and Stair Drive, and review of traffic and geometric conditions at the proposed project north entrance on Maloneyville Road. The proposed project south entrance, which is located on Stair Drive, has lighter traffic volumes and obviously clear sight distance at its proposed location; thus, a detailed assessment of this intersection is not included.

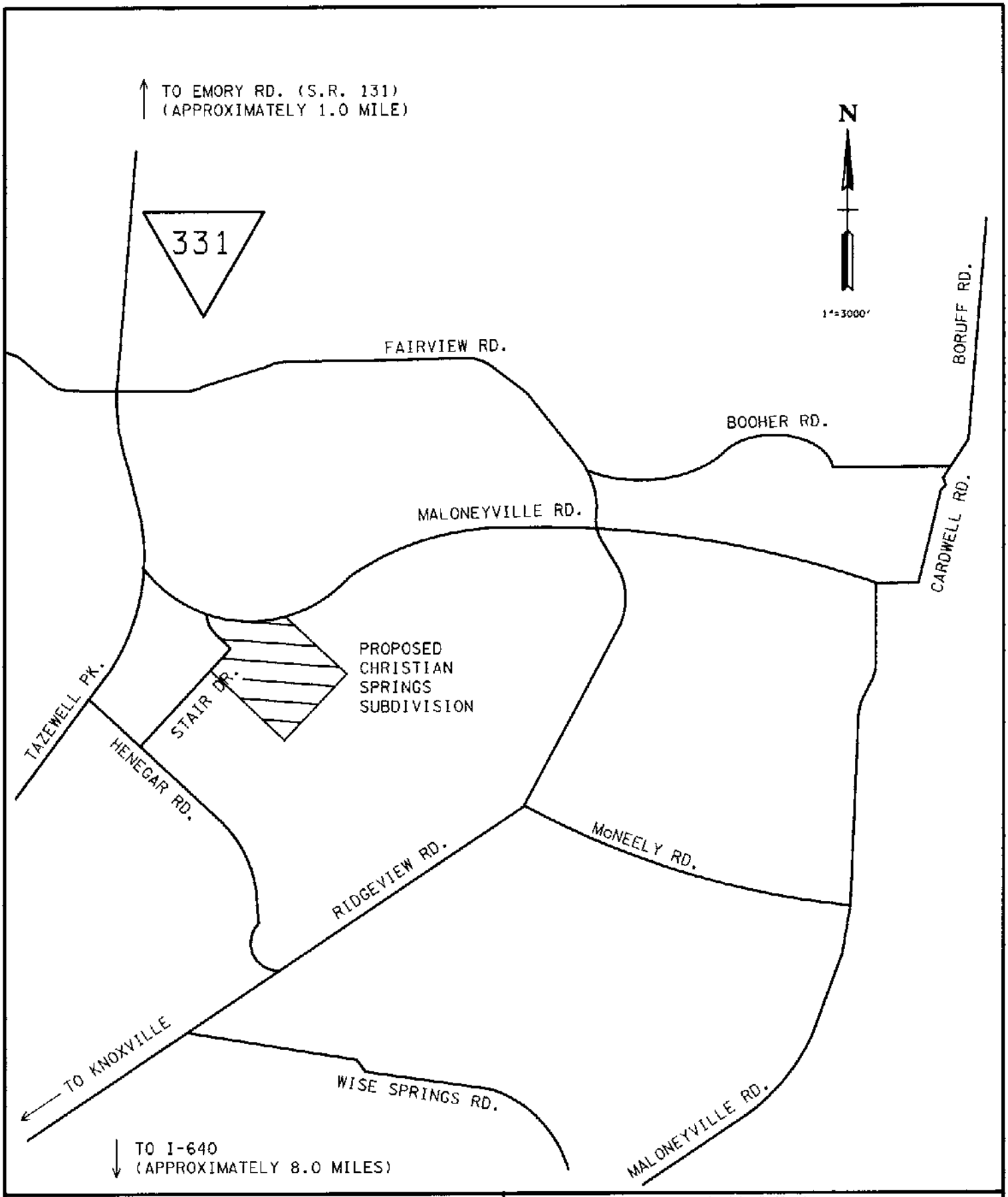

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FIGURE 1
LOCATION MAP

CHRISTIAN SPRINGS SUBDIVISION
TRAFFIC IMPACT STUDY

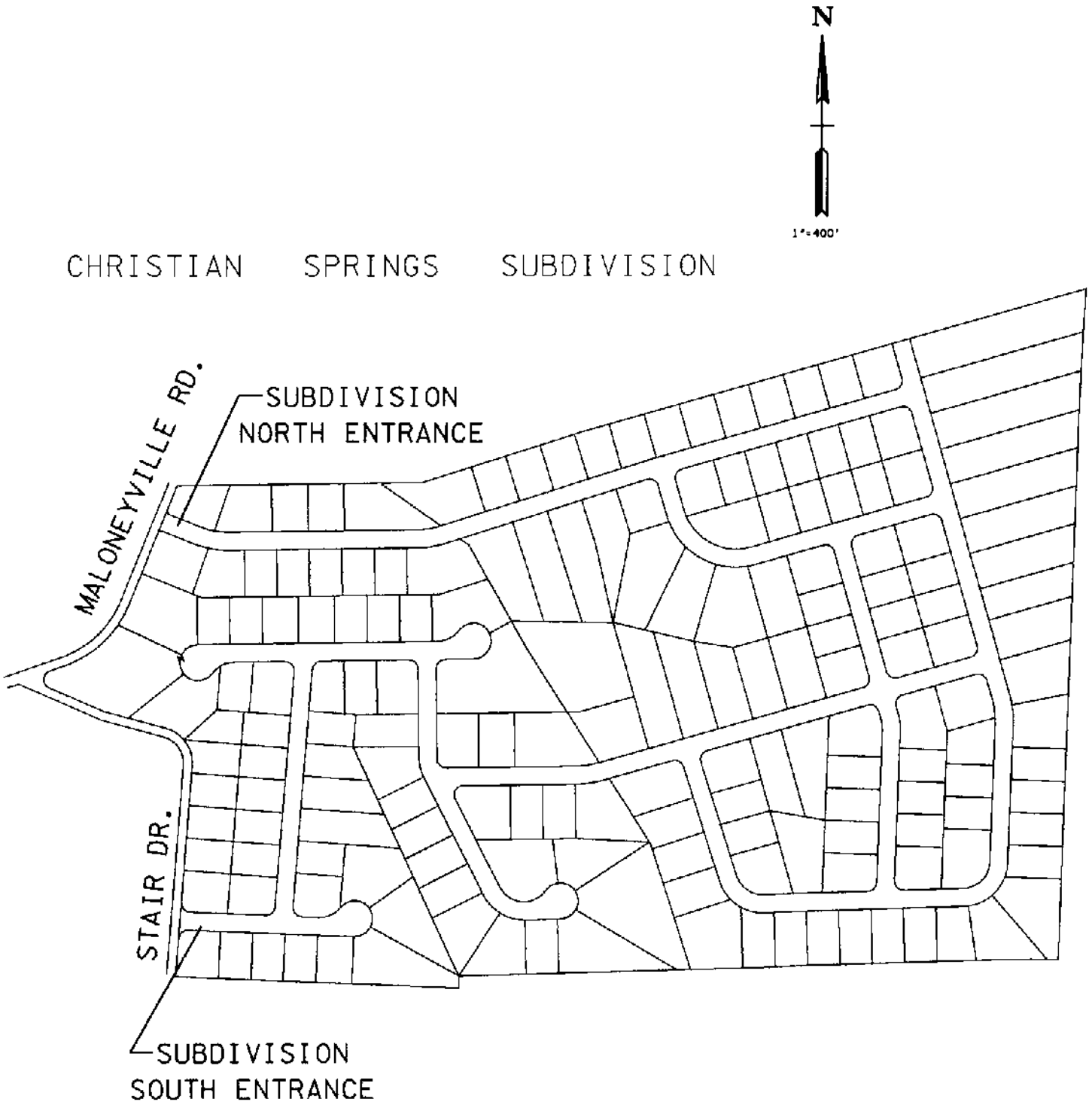

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FIGURE 2
CONCEPT SITE PLAN

CHRISTIAN SPRINGS SUBDIVISION
TRAFFIC IMPACT STUDY

Existing Roadway Conditions

Maloneyville Road, which is the road planned for the north subdivision access point, is a two-lane roadway with a pavement width of approximately 20 feet. It is a Knox County maintained facility, and is classified by the Knox County Metropolitan Planning Commission (MPC) as a collector roadway. The posted speed limit is 40 MPH and the roadway is striped with a double solid yellow centerline and white solid edge-lines to delineate the two traffic lanes, which are approximately 10 feet in width. The intersection of Maloneyville Road and Stair Drive is a "T" type intersection, with Maloneyville being the through street and Stair Drive dead ending as a STOP street from the southeast. Stair Drive is also a two-lane roadway, and has a narrow pavement, approximately 15 feet in width. No centerline or edge-line pavement markings are present on Stair Drive.

Existing Traffic Data

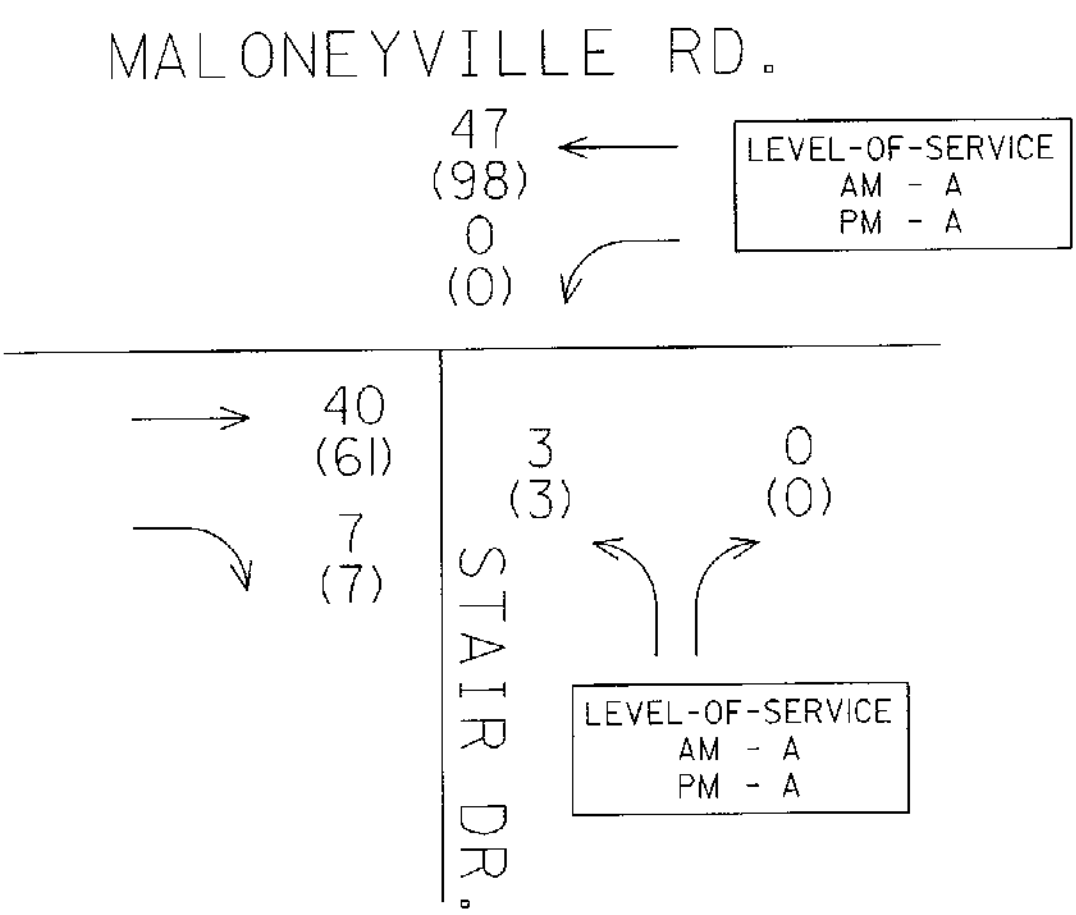
The MPC collects average daily traffic data (ADT) bi-annually on Maloneyville Road, just east of Tazewell Pike. These counts were conducted in 1998 and 2000, with the results being 1121 and 1280 vehicles per day respectively.

For purposes of this study, turning movement count data were collected for the intersection of Maloneyville Road and Stair Drive for the morning and afternoon peak periods on Monday, June 4, 2001. The peak hour traffic periods were determined to be between 7:30 and 8:30 AM and between 5:00 and 6:00 PM. The peak hour volume data were adjusted to an average weekday basis, using factors contained in "Traffic Volume Adjustment Factors to be used with traffic Signal Warrant Analysis – Volume Warrants" distributed by the Tennessee Transportation Assistance Program. The average weekday adjustment factor for a Monday in June is 0.97, and this is the value that was used for these adjustments. The resulting peak hour traffic volumes are

shown on FIGURE 3, while detailed summaries of the raw traffic count data are contained in the APPENDIX.

Existing Level-of-Service

Unsignalized intersection capacity analyses were conducted for the existing single approach STOP traffic control conditions at the Maloneyville Road and Stair Drive intersection using the volumes shown in FIGURE 3 that were derived as discussed above. These analyses employed the procedures of the Highway Capacity Manual (Transportation Research Board, 2000) as contained in the Highway Capacity Software (HCS2000), Release 4.1. The results indicated that all the relevant traffic movements currently operate at level-of-service "A" during both peak hours. These results are summarized on FIGURE 3, with detailed computer printouts located in the APPENDIX.



VOLUME
LEGEND
AM
(PM)

NOTE: VOLUMES ADJUSTED
FOR DAY OF WEEK AND MONTH

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FIGURE 3
EXISTING PEAK HOUR TRAFFIC VOLUMES
AND LEVEL-OF-SERVICE SUMMARY

CHRISTIAN SPRINGS SUBDIVISION
TRAFFIC IMPACT STUDY

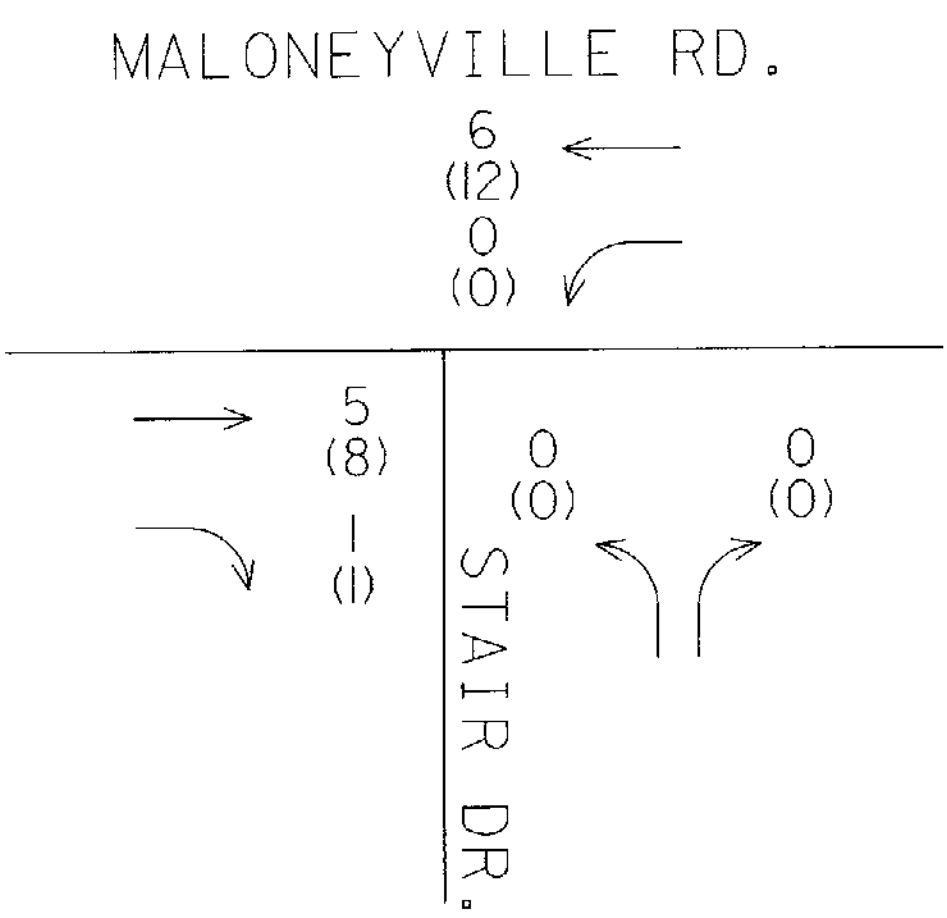
PROPOSED CONDITIONS

Background Traffic Growth

The year 2005 was established as the appropriate design/analysis year for this study. In order to determine traffic volumes resulting solely from background traffic growth, it was necessary to establish an anticipated annual growth rate for existing traffic. The Knox County Department of Engineering and Public Works was consulted on the matter, and it was determined that for the last several years, growth rates in the area surrounding the proposed subdivision have been in the two to four percent range, with the majority two percent. Therefore, for purposes of this study, a three percent annual growth rate was selected. FIGURE 4 contains the background growth traffic volumes that would result from a three percent annual growth from year 2001 to 2005, at the intersection of Maloneyville Road and Stair Drive.

Trip Generation

In order to project the expected traffic volumes to be generated by full build-out of the proposed Christian Springs subdivision, the data and procedures of *Trip Generation, Sixth Edition* (Institute of Transportation Engineers, 1997) were utilized. The generated traffic volumes were determined based on the morning and evening peak hour of adjacent street regression equations for single-family detached housing developments (Land Use Code 210, Volume 1, pages 264 and 265). As noted earlier in this report, the anticipated number of units upon full build-out is 180, which was used to determine the number of new trips generated. TABLE 1 summarizes the number and directional split of entering and exiting trips for the peak periods.



LEGEND

AM
(PM)

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FIGURE 4
PEAK HOUR TRAFFIC VOLUMES
(BACKGROUND GROWTH - YR 2005)

CHRISTIAN SPRINGS SUBDIVISION
TRAFFIC IMPACT STUDY

TABLE 1

Trip Generation Summary

	New Trips	% Entering	% Exiting	Number Entering	Number Exiting
AM Peak	136	25	75	34	102
PM Peak	184	64	36	118	66

Trip Distribution

A review of the proposed subdivision concept site plan led to the assumption that fifty percent of the generated traffic at full build-out will use each of the planned subdivision entrance intersections. FIGURE 5 provides a summary of the trip distribution patterns developed for the intersection of Maloneyville Road and Stair Drive, and the two proposed subdivision entrance intersections, under this assumption. In addition, FIGURE 6 provides the generated traffic volumes that were applied to the local roadway network in accordance with these patterns. FIGURE 7 shows the combined year 2005 volumes reflecting the existing traffic, the background traffic growth, and the newly generated traffic from the Christian Springs subdivision at full build-out. Also shown on FIGURE 7 are summaries of unsignalized intersection capacity analyses for the subdivision north entrance and the intersection of Maloneyville Road and Stair Drive.

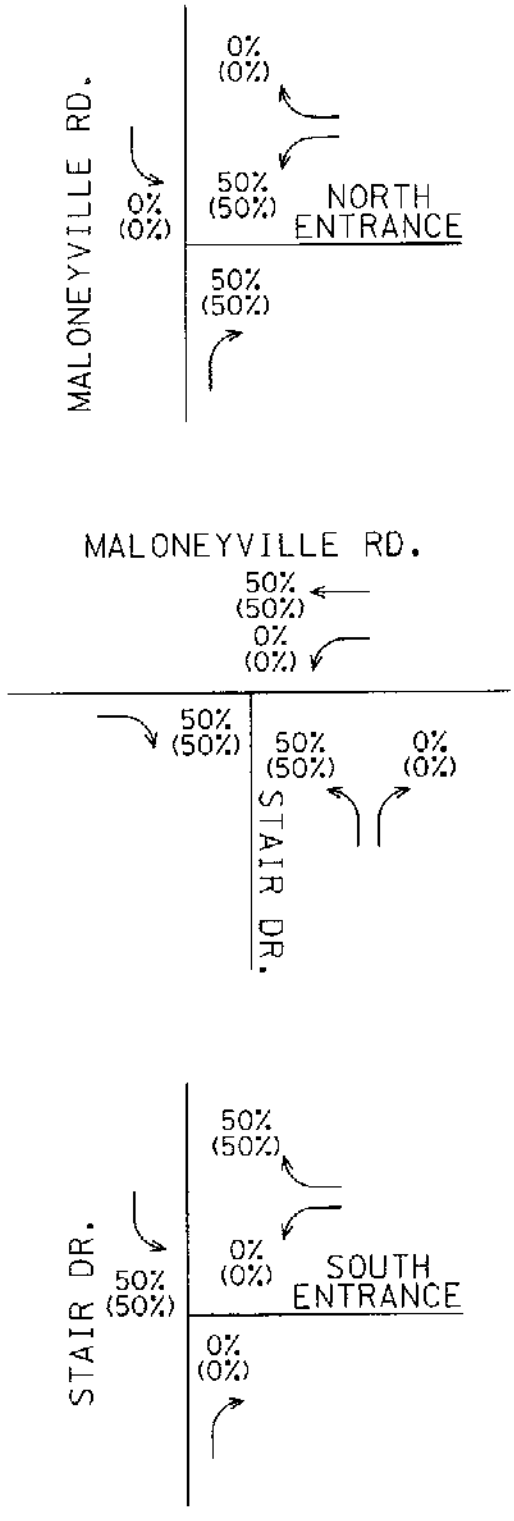

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FIGURE 5
TRIP DISTRIBUTION PATTERN

CHRISTIAN SPRINGS SUBDIVISION
TRAFFIC IMPACT STUDY

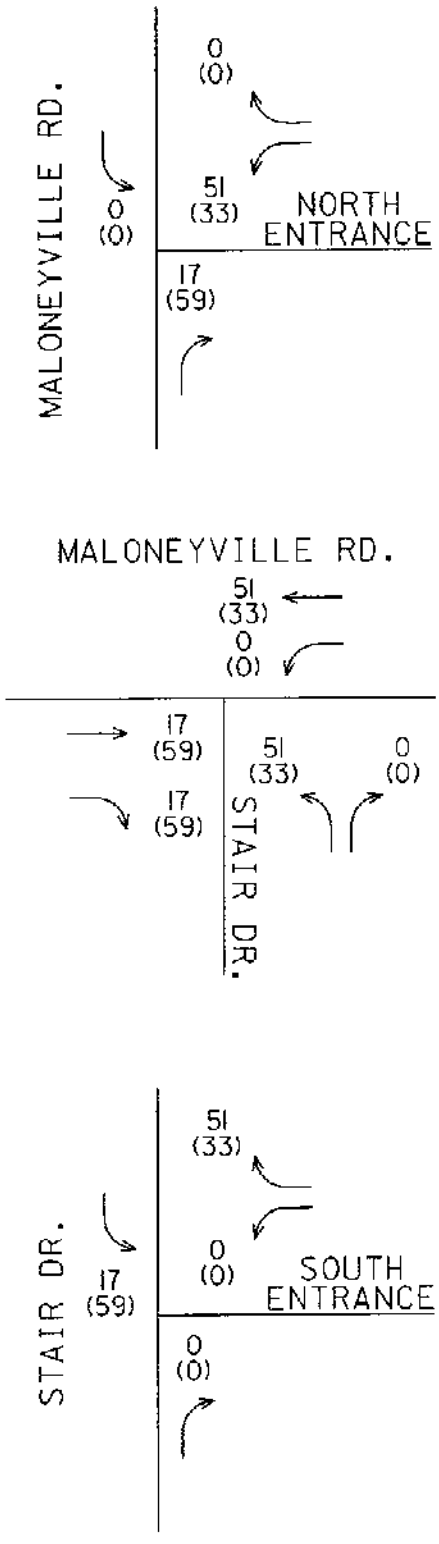

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FIGURE 6
PEAK HOUR GENERATED TRAFFIC VOLUMES

CHRISTIAN SPRINGS SUBDIVISION
TRAFFIC IMPACT STUDY

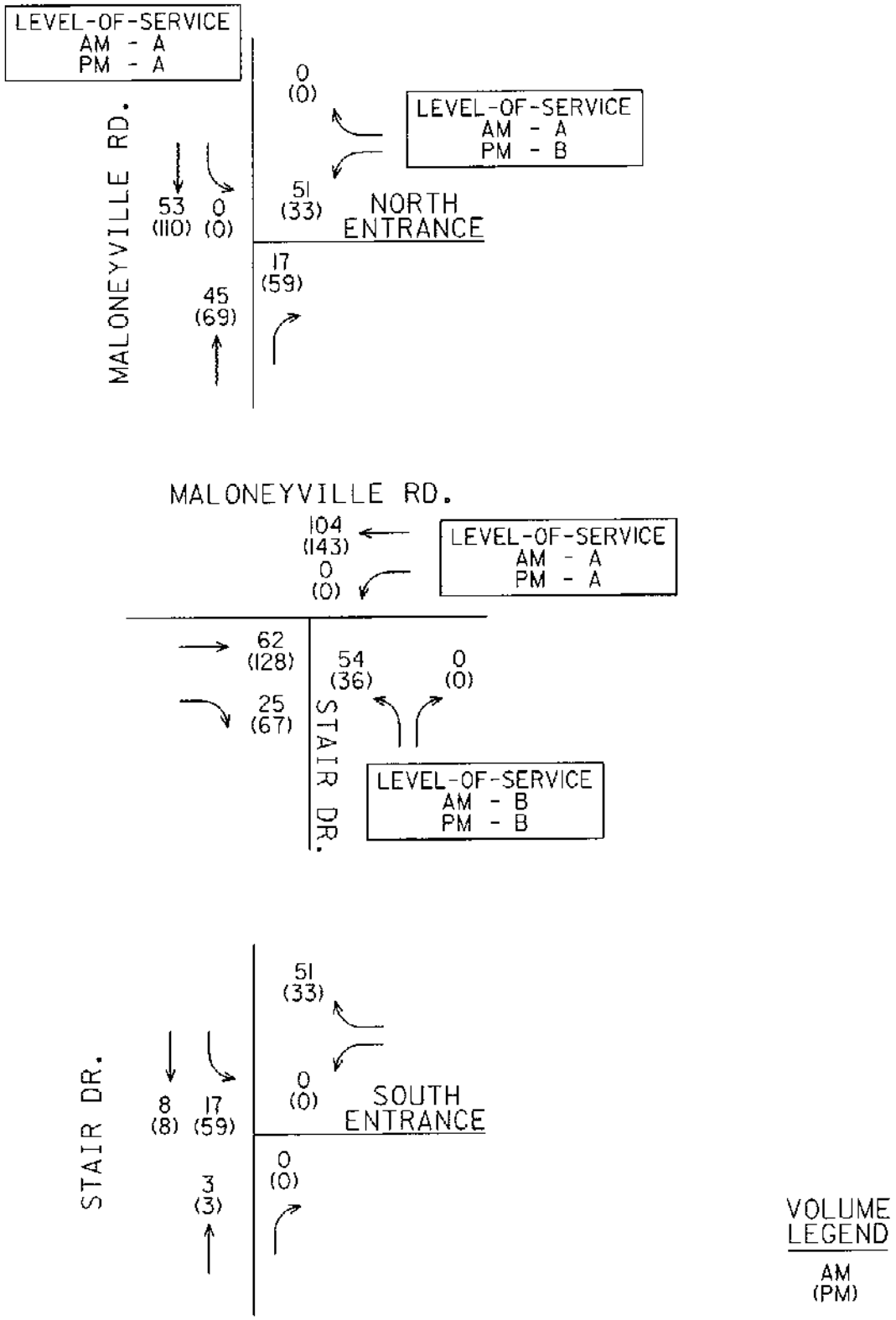

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FIGURE 7
PEAK HOUR TRAFFIC VOLUMES (COMBINED-YR 2005) AND LEVEL-OF-SERVICE SUMMARY

CHRISTIAN SPRINGS SUBDIVISION
TRAFFIC IMPACT STUDY

Proposed Level-of-Service

Unsignalized intersection capacity analyses were conducted utilizing the combined traffic volumes of FIGURE 7, at the intersection of Maloneyville Road and Stair Drive and the proposed north subdivision entrance intersection. These analyses were conducted in the same fashion as used to determine existing level-of-service. The results indicate that all the relevant traffic movements are anticipated to operate at level-of-service "A" or "B" during both peak hours. These results are summarized in FIGURE 7, with detailed computer printouts located in the APPENDIX.

Intersection Sight Distance and Other Issues

A field review was conducted to identify any sight distance problems, geometric problems or other issues of concern in the study area. The results of this review are summarized below:

1) Maloneyville Road and Stair Drive Sight Distance:

   Looking left from a STOP position on Stair Drive, the sight distance at this existing intersection is approximately 500 feet. Looking right, the sight distance is approximately 220 feet. The major problem looking right results from a horizontal curve combined with tall grass and weeds on the inside of the horizontal curve. A 30 foot right of way exists from the centerline on that side that should be adequate for trimming.

2) Subdivision North Entrance Sight Distance:

   Looking left from the future STOP position on the proposed subdivision road, the sight distance is approximately 345 feet. Looking right, the sight distance is approximately 200 feet. The major problem looking left is a vertical curve that prevents sight distance of at least 400 feet. The problem looking right is a fence line that is overgrown with vegetation. An easement already exists along the fence 16 feet on both sides that should be adequate for trimming.

3) Subdivision South Entrance Sight Distance:

The sight distance from the future STOP position on the proposed subdivision road exceeds the required 300 feet looking both left and right.

4) Stair Drive Pavement Width and Intersection Angle with Maloneyville Road:

Stair Drive, as noted previously, is approximately 15 feet wide between the proposed south subdivision entrance and the intersection of Maloneyville Road and Stair Drive. This width is deficient and should be improved. Furthermore, the intersection angle with Maloneyville Road is poor and should be improved.

5) Turn Lane Evaluation:

Evaluations of the need for left-turn storage and deceleration lanes at the study intersections were considered, but not conducted. This is because a quick review of the projected Year 2005 combined traffic volumes indicated that the projected left turn volumes are well below the threshold values used in Knox County's *Access Control and Driveway Design Policy* (Knox County Department of Engineering and Public Works, March 1998), and other similar methods used to justify separate left turn lanes.

RECOMMENDATIONS

This traffic impact study of the proposed Christian Springs subdivision has resulted in the identification of two significant traffic related concerns. The following summarizes the recommendations that are made to address these concerns:

1) Intersection Sight Distance:

   It is recommended that some small trees and brush, located primarily on the inside of a curve between the two study intersections, be removed. A 30-foot right of way exists on the inside of the horizontal curve that should be adequate for the brush removal. In addition, similar vegetation removal should be undertaken along a fence located just to the north of the proposed north project entrance on Maloneyville Road. An easement exists 16 feet from the center of the fence as referenced in deed # 199907230006620 that should be adequate to trim the brush to achieve 400+ feet of sight distance. A vertical curve located to the south of the north entrance on Maloneyville Road needs to be adjusted to achieve 400 feet of sight distance. These vegetation removals and this vertical curve adjustment will substantially address the sight distance concerns that were identified at both intersections during a site field review.

2) Stair Drive Pavement Width:

   It is recommended that Stair Drive be widened from its proposed south subdivision entrance to the Maloneyville Road and Stair Drive intersection. The recommended width of this widening would be to provide a section at least 20 feet wide. In addition, the inside radius of Stair Drive at the intersection with Maloneyville Road should be improved with some centerline shifting to improve intersection angle. This widening and radius improvement is recommended over a more extensive realignment of Stair Drive, as it improves the intersection angle without shifting the intersection into the horizontal curve, which is not

recommended practice. Furthermore, a major shifting of Stair Drive would disturb an underground spring that is located adjacent to this intersection.

3) Curve Advance Signing:

It is recommended that an advance curve warning sign for the curve discussed above is placed north of the horizontal curve with supplemental plates displaying the appropriate curve advisory speed.

APPENDIX

Peak Hour Turning Movement Count Summary
Maloneyville and Stair

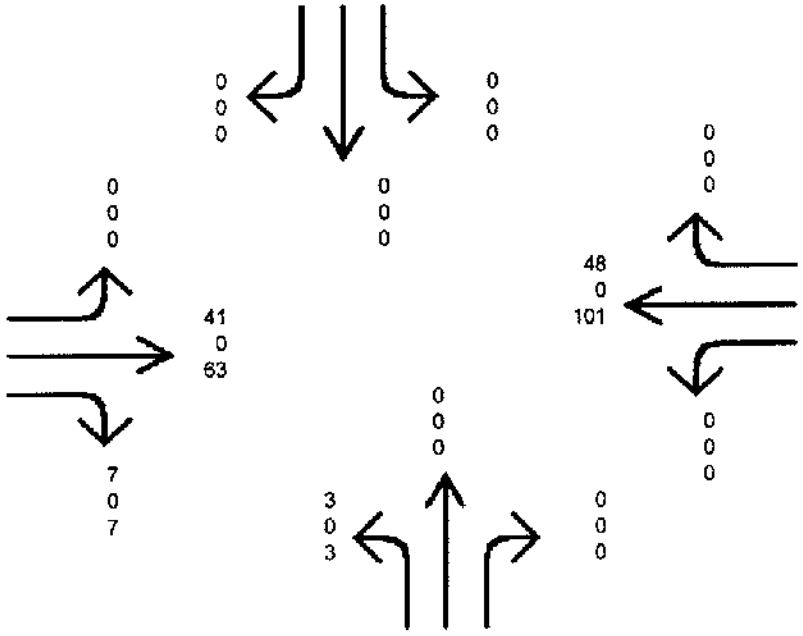
6/4/01

									0				0				
AM	From North				From East				From South				From West				
	R	T	L	P	R	T	L	P	R	T	L	P	R	T	L	P	Total
7:30	0	0	0	0	0	12	0	0	0	0	1	0	1	10	0	0	24
7:45	0	0	0	0	0	15	0	0	0	0	1	0	3	9	0	0	28
8:00	0	0	0	0	0	9	0	0	0	0	0	0	2	13	0	0	24
8:15	0	0	0	0	0	12	0	0	0	0	1	0	1	9	0	0	23
Totals	0	0	0	0	0	48	0	0	0	0	3	0	7	41	0	0	99

	0				0				0				0				
MD	From North				From East				From South				From West				
	R	T	L	P	R	T	L	P	R	T	L	P	R	T	L	P	Total
																	0
0:15																	0
0:30																	0
0:45																	0
Totals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0				0				0				0				
PM	From North				From East				From South				From West				
	R	T	L	P	R	T	L	P	R	T	L	P	R	T	L	P	Total
5:00	0	0	0	0	0	29	0	0	0	0	1	0	0	17	0	0	47
5:15	0	0	0	0	0	23	0	0	0	0	1	0	4	15	0	0	43
5:30	0	0	0	0	0	26	0	0	0	0	1	0	3	13	0	0	43
5:45	0	0	0	0	0	23	0	0	0	0	0	0	0	18	0	0	41
Totals	0	0	0	0	0	101	0	0	0	0	3	0	7	63	0	0	174

				Peak hour Factor
AM Peak	*7:30*	*to*	*8:30*	0.884
MD Peak	*0:00*	*to*	*1:00*	
PM Peak	*5:00*	*to*	*6:00*	0.925



Cannon & Cannon, Inc.
Traffic Count

File Name : Maloneyville & Stair
Site Code : 00000000
Start Date : 06/04/2001
Page No : 1

Groups Printed- Unshifted

	STAIR From North				MALONEYVILLE From East				STAIR From South				MALONEYVILLE From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 AM	0	0	0	0	0	12	0	0	0	0	0	0	0	10	0	0	22
07:15 AM	0	0	0	0	0	5	0	0	0	0	1	0	1	10	0	0	17
07:30 AM	0	0	0	0	0	12	0	0	0	0	1	0	1	10	0	0	24
07:45 AM	0	0	0	0	0	15	0	0	0	0	1	0	3	9	0	0	28
Total	0	0	0	0	0	44	0	0	0	0	3	0	5	39	0	0	91
08:00 AM	0	0	0	0	0	9	0	0	0	0	0	0	2	13	0	0	24
08:15 AM	0	0	0	0	0	12	0	0	0	0	1	0	1	9	0	0	23
08:30 AM	0	0	0	0	0	6	0	0	0	0	1	0	1	5	0	0	13
08:45 AM	0	0	0	0	0	7	0	0	0	0	1	0	0	12	0	0	20
Total	0	0	0	0	0	34	0	0	0	0	3	0	4	39	0	0	80
04:00 PM	0	0	0	0	0	23	0	0	0	0	0	0	1	12	0	0	36
04:15 PM	0	0	0	0	0	14	0	0	0	0	1	0	0	15	0	0	30
04:30 PM	0	0	0	0	0	19	0	0	0	0	0	0	2	12	0	0	33
04:45 PM	0	0	0	0	0	17	0	0	0	0	3	0	1	9	0	0	30
Total	0	0	0	0	0	73	0	0	0	0	4	0	4	48	0	0	129
05:00 PM	0	0	0	0	0	29	0	0	0	0	1	0	0	17	0	0	47
05:15 PM	0	0	0	0	0	23	0	0	0	0	1	0	4	15	0	0	43
05:30 PM	0	0	0	0	0	26	0	0	0	0	1	0	3	13	0	0	43
05:45 PM	0	0	0	0	0	23	0	0	0	0	0	0	0	18	0	0	41
Total	0	0	0	0	0	101	0	0	0	0	3	0	7	63	0	0	174
Grand Total	0	0	0	0	0	252	0	0	0	0	13	0	20	189	0	0	474
Apprch %	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	9.6	90.4	0.0	0.0	
Total %	0.0	0.0	0.0	0.0	0.0	53.2	0.0	0.0	0.0	0.0	2.7	0.0	4.2	39.9	0.0	0.0	

HCS2000: Unsignalized Intersections Release 4.1

TWO-WAY STOP CONTROL SUMMARY

Analyst: CHRIS KIRBY

Agency/Co.: CANNON & CANNON, INC.

Date Performed: 06/08/2001

Analysis Time Period: 7:30-8:30(AM)

Intersection: MALO./STAIR

Jurisdiction: KNOX COUNTY

Analysis Year: 2001

Project ID: CHRISTIAN SPRINGS SUBDIVISION IMPACT STUDY

East/West Street: MALONEYVILLE RD

North/South Street: STAIR DR

Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		40	7	0	47	
Peak-Hour Factor, PHF		0.77	0.58	1.00	0.78	

Hourly Flow Rate, HFR		51	12	0	59			
Percent Heavy Vehicles		--	--	0	--	--		
Median Type	Undivided							
RT Channelized?								
Lanes		1	0	0	1			
Configuration		TR		LT				
Upstream Signal?		No			No			

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	3	0	0			
Peak Hour Factor, PHF	1.00	1.00	1.00			
Hourly Flow Rate, HFR	3	0	0			
Percent Heavy Vehicles	0	0	0			
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No				
Storage						
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LTR				
v (vph)		0		3				
C(m) (vph)		1553		885				
v/c		0.00		0.00				
95% queue length		0.00		0.01				
Control Delay		7.3		9.1				
LOS		A		A				
Approach Delay				9.1				
Approach LOS				A				

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		40	7	0	47	
Peak-Hour Factor, PHF		0.77	0.58	1.00	0.78	
Peak-15 Minute Volume		13	3	0	15	
Hourly Flow Rate, HFR		51	12	0	59	
Percent Heavy Vehicles		--	--	0	--	--
Median Type	Undivided					
RT Channelized?						
Lanes		1	0	0	1	

Configuration			TR		LT	
Upstream Signal?			No		No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	3	0	0			
Peak Hour Factor, PHF	1.00	1.00	1.00			
Peak-15 Minute Volume		0	0			
Hourly Flow Rate, HFR	3	0	0			
Percent Heavy Vehicles	0	0	0			
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No				
Storage						
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LTR				

$\overline{v}$ (vph)	0	3
C(m) (vph)	1553	885
v/c	0.00	0.00
95% queue length	0.00	0.01
Control Delay	7.3	9.1
LOS	A	A
Approach Delay		9.1
Approach LOS		A

HCS2000: Unsignalized Intersections Release 4.1

TWO-WAY STOP CONTROL SUMMARY

Analyst: CHRIS KIRBY

Agency/Co.: CANNON & CANNON, INC.

Date Performed: 06/08/2001

Analysis Time Period: 5:00-6:00(PM)

Intersection: MALO./STAIR

Jurisdiction: KNOX COUNTY

Analysis Year: 2001

Project ID: CHRISTIAN SPRINGS SUBDIVISION IMPACT STUDY

East/West Street: MALONEYVILLE RD

North/South Street: STAIR DR

Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		61	7	0	98	
Peak-Hour Factor, PHF		0.85	0.44	1.00	0.84	

Hourly Flow Rate, HFR			72	16	0	115		
Percent Heavy Vehicles			--	--	0	--	--	
Median Type	Undivided							
RT Channelized?								
Lanes			1	0	0	1		
Configuration				TR		LT		
Upstream Signal?				No			No	

Minor Street:	Approach	Northbound			Southbound		
	Movement	7	8	9	10	11	12
		L	T	R	L	T	R
Volume		3	0	0			
Peak Hour Factor, PHF		1.00	1.00	1.00			
Hourly Flow Rate, HFR		3	0	0			
Percent Heavy Vehicles		0	0	0			
Percent Grade (%)			0			0	
Median Storage							
Flared Approach:	Exists?		No				
	Storage						
RT Channelized?							
Lanes		0	1	0			
Configuration			LTR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LTR				
v (vph)		0		3				
C(m) (vph)		1520		798				
v/c		0.00		0.00				
95% queue length		0.00		0.01				
Control Delay		7.4		9.5				
LOS		A		A				
Approach Delay				9.5				
Approach LOS				A				

Vehicle Volumes and Adjustments

Major Street Movements	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		61	7	0	98	
Peak-Hour Factor, PHF		0.85	0.44	1.00	0.84	
Peak-15 Minute Volume		18	4	0	29	
Hourly Flow Rate, HFR		72	16	0	115	
Percent Heavy Vehicles		--	--	0	--	--
Median Type	Undivided					
RT Channelized?						

Lanes	1	0		0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street Movements	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	3	0	0			
Peak Hour Factor, PHF	1.00	1.00	1.00			
Peak-15 Minute Volume	1	0	0			
Hourly Flow Rate, HFR	3	0	0			
Percent Heavy Vehicles	0	0	0			
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No				
Storage						
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LTR				

v (vph)	0	3
C(m) (vph)	1520	798
v/c	0.00	0.00
95% queue length	0.00	0.01
Control Delay	7.4	9.5
LOS	A	A
Approach Delay		9.5
Approach LOS		A

HCS2000: Unsignalized Intersections Release 4.1

TWO-WAY STOP CONTROL SUMMARY

Analyst: CHRIS KIRBY

Agency/Co.: CANNON & CANNON, INC.

Date Performed: 06/08/2001

Analysis Time Period: 7:30-8:30(AM)

Intersection: MALO./STAIR

Jurisdiction: KNOX COUNTY

Analysis Year: 2005

Project ID: CHRISTIAN SPRINGS SUBDIVISION IMPACT STUDY

East/West Street: MALONEYVILLE RD

North/South Street: STAIR DR

Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		62	25	0	104	
Peak-Hour Factor, PHF		0.77	0.58	1.00	0.78	

Hourly Flow Rate, HFR			80		42		0		132		
Percent Heavy Vehicles			--		--		0		--		--
Median Type	Undivided										
RT Channelized?											
Lanes			1	0			0	1			
Configuration				TR				LT			
Upstream Signal?			No						No		

Minor Street:	Approach	Northbound			Southbound		
	Movement	7	8	9	10	11	12
		L	T	R	L	T	R
Volume		54	0	0			
Peak Hour Factor, PHF		0.75	1.00	1.00			
Hourly Flow Rate, HFR		72	0	0			
Percent Heavy Vehicles		0	0	0			
Percent Grade (%)			0			0	
Median Storage							
Flared Approach:	Exists?		No				
	Storage						
RT Channelized?							
Lanes		0	1	0			
Configuration			LTR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LTR				
v (vph)		0		72				
C(m) (vph)		1478		760				
v/c		0.00		0.09				
95% queue length		0.00		0.31				
Control Delay		7.4		10.2				
LOS		A		B				
Approach Delay				10.2				
Approach LOS				B				

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LTR				
v (vph)		0		72				
C(m) (vph)		1478		760				
v/c		0.00		0.09				
95% queue length		0.00		0.31				
Control Delay		7.4		10.2				
LOS		A		B				
Approach Delay				10.2				

HCS2000: Unsignalized Intersections Release 4.1

TWO-WAY STOP CONTROL SUMMARY

Analyst: CHRIS KIRBY

Agency/Co.: CANNON & CANNON, INC.

Date Performed: 06/08/2001

Analysis Time Period: 5:00-6:00(PM)

Intersection: MALO./STAIR

Jurisdiction: KNOX COUNTY

Analysis Year: 2005

Project ID: CHRISTIAN SPRINGS SUBDIVISION IMPACT STUDY

East/West Street: MALONEYVILLE RD

North/South Street: STAIR DR

Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		128	67	0	143	
Peak-Hour Factor, PHF		0.85	0.44	1.00	0.84	

Hourly Flow Rate, HFR		151	153		0	169		
Percent Heavy Vehicles		--	--		0	--	--	
Median Type	Undivided							
RT Channelized?								
Lanes		1	0			0	1	
Configuration			TR				LT	
Upstream Signal?		No					No	

Minor Street:	Approach	Northbound			Southbound		
	Movement	7	8	9	10	11	12
		L	T	R	L	T	R
Volume		36	0	0			
Peak Hour Factor, PHF		1.00	1.00	1.00			
Hourly Flow Rate, HFR		36	0	0			
Percent Heavy Vehicles		0	0	0			
Percent Grade (%)			0			0	
Median Storage							
Flared Approach:	Exists?		No				
	Storage						
RT Channelized?							
Lanes		0	1	0			
Configuration			LTR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LTR				
v (vph)		0		36				
C(m) (vph)		1268		612				
v/c		0.00		0.06				
95% queue length		0.00		0.19				
Control Delay		7.8		11.2				
LOS		A		B				
Approach Delay				11.2				
Approach LOS				B				

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LTR				
v (vph)		0		36				
C(m) (vph)		1268		612				
v/c		0.00		0.06				
95% queue length		0.00		0.19				
Control Delay		7.8		11.2				
LOS		A		B				
Approach Delay				11.2				

HCS2000: Unsignalized Intersections Release 4.1

TWO-WAY STOP CONTROL SUMMARY

Analyst: CHRIS KIRBY

Agency/Co.: CANNON & CANNON, INC.

Date Performed: 06/08/2001

Analysis Time Period: 7:30-8:30(AM)

Intersection: MALO./~~STAIR~~ N. ENTRANCE

Jurisdiction: KNOX COUNTY

Analysis Year: 2005

Project ID: CHRISTIAN SPRINGS SUBDIVISION IMPACT STUDY

East/West Street: NORTH ENTRANCE

North/South Street: MALONEYVILLE RD

Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		62	17	53	0	
Peak-Hour Factor, PHF		1.00	1.00	1.00	1.00	

Hourly Flow Rate, HFR		62	17	53	0	
Percent Heavy Vehicles		--	--	0	--	--
Median Type	Undivided					
RT Channelized?						
Lanes		1 0		0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	51	0	0			
Peak Hour Factor, PHF	1.00	1.00	1.00			
Hourly Flow Rate, HFR	51	0	0			
Percent Heavy Vehicles	0	0	0			
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No				
Storage						
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LTR				
v (vph)		53		51				
C(m) (vph)		1532		790				
v/c		0.03		0.06				
95% queue length		0.11		0.21				
Control Delay		7.4		9.9				
LOS		A		A				
Approach Delay				9.9				
Approach LOS				A				

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LTR				
v (vph)		53		51				
C(m) (vph)		1532		790				
v/c		0.03		0.06				
95% queue length		0.11		0.21				
Control Delay		7.4		9.9				
LOS		A		A				
Approach Delay				9.9				

HCS2000: Unsignalized Intersections Release 4.1

TWO-WAY STOP CONTROL SUMMARY

Analyst: CHRIS KIRBY

Agency/Co.: CANNON & CANNON, INC.

Date Performed: 06/08/2001

Analysis Time Period: 5:00-6:00(PM)

Intersection: MALO./N. ENTRANCE

Jurisdiction: KNOX COUNTY

Analysis Year: 2005

Project ID: CHRISTIAN SPRINGS SUBDIVISION IMPACT STUDY

East/West Street: NORTH ENTRANCE

North/South Street: MALONEYVILLE RD

Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		128	59	0	110	
Peak-Hour Factor, PHF		1.00	1.00	1.00	1.00	

Hourly Flow Rate, HFR		128	59	0		110		
Percent Heavy Vehicles		--	--	0		--	--	
Median Type	Undivided							
RT Channelized?								
Lanes		1	0		0	1		
Configuration			TR			LT		
Upstream Signal?		No				No		

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	33	0	0			
Peak Hour Factor, PHF	1.00	1.00	1.00			
Hourly Flow Rate, HFR	33	0	0			
Percent Heavy Vehicles	0	0	0			
Percent Grade (%)		0			0	
Median Storage						
Flared Approach: Exists?		No				
Storage						
RT Channelized?						
Lanes	0	1	0			
Configuration		LTR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LTR				
v (vph)		0		33				
C(m) (vph)		1399		726				
v/c		0.00		0.05				
95% queue length		0.00		0.14				
Control Delay		7.6		10.2				
LOS		A		B				
Approach Delay				10.2				
Approach LOS				B				

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LTR				
v (vph)		0		33				
C(m) (vph)		1399		726				
v/c		0.00		0.05				
95% queue length		0.00		0.14				
Control Delay		7.6		10.2				
LOS		A		B				
Approach Delay				10.2				