APPENDICES
for the
FRA-270-30.00
INTERCHANGE JUSTIFICATION
STUDY

Columbus, Ohio

Prepared by

ms consultants, inc.
6500 Busch Boulevard
Columbus, Ohio

January 29, 1993

inter-office communicatior

to: G. L. Butzer, Deputy Director, Planning & Design date: February 11, 1993

from: J.A. Gregory, Planning and Design Engineer

subject: Collector, Distributor, Morse, Stelzer (CDMS)
Interchange Justification Study

Enclosed are three copies of the Interchange Justification Study to modify IR 270 in Franklin County by adding a new interchange and associated collector/distributor lanes. Although we have not yet completed our review due to staffing restraints and other priorities, i.e. Legislators Day, etc. we believe it can be formally submitted to the FHWA for approval. Copies of the January 29, 1992 transmittal letter are also included.

Additionally, copies are also being concurrently distributed to the following for information/review as follows:

City of Gahanna
% W. Murphy
Director of Public Service

City of Columbus (2 copies)
% G.H. Mack
Director of Public Service
% R.C. Smith
City Engineer

Franklin County
% John Circle
County Engineer

MORPC
% M. Ismail
Director of Transportation

D.K. Huhman (2 copies)
% Bureau of Location and Design

R.A. Allen
% Bureau of Environmental Services

T.M. Singleton
% Bureau of Planning

C.S. Creager
% Bureau of Design Services

T.C. Lunt
% Bureau of Programming

R.M. Blair
Chief Executive Assistant to the Director

The initial public meeting has tentatively been established for March 10, 1993 and our Newsletter will announce the completion of this study, overall time schedules, etc.

Please formally submit this study to the Federal Highway Administration - Ohio Division for their concurrence.

JAG:nh

Attachment

c: J.A. Gregory
M.C. Flynn
C. Seidle (City of Columbus)
T.J. Stitt
R.L. Arledge
J.E. Brenneman
B.D. Hanhilammi
J.E. McQuirt
R.L. Richards
R.F. Howard
G.D. Proctor
W.C. Habig (MORPC)
R. Lawler (MORPC)
D. Philips (Franklin County)
R.H. Lyndes
D.A. Mengerink
R.M. Gabriel
A.J. DiLoreto
J.T. Grow
E. Blais (FHWA)
J. Steele (FHWA)
Project File (FRA-270-30.00 PID 11715)
Project File (FRA-Stelzer Road PID 11401)
Project File (FRA/LIC-161-16.75/0.00 PID 9098)

→ Project File

ms consultants, inc.
engineers, architects, planners

Formerly:
Mosure & Syrakis Co.
Mosure & Associates, Inc.

6500 Busch Boulevard
Suite 233
Columbus, Ohio 43229-1738
614-848-6726 (848-MSCO)
FAX: 614-848-6311

Offices in
Akron
Canton
Columbus
Youngstown, OH
Beaver Falls
Pittsburgh, PA

January 29, 1993

Mr. Michael C. Flynn, PE
Deputy Director
ODOT District 6
400 East William Street
Delaware, OH 43015

Attention: Mr. James A. Gregory, PE

Re: FRA-270-30.00
PID 11715
Collector, Distributor, Morse, Stelzer
INTERCHANGE JUSTIFICATION STUDY

Gentlemen:

This letter serves to transmit eighteen copies each of the referenced Interchange Justification Study and its Appendices which are bound as a separate documents. The Interchange Justification Study has been revised to reflect appropriate agency comments received during our meeting in your offices on December 15, 1992, and as subsequently forwarded to us with your letter dated December 22, 1992. The project schedule has been expanded and reflects comments of your December letter and also Mr. Lyndes' letter dated January 13, 1993. Letters of support and commitment for the FRA-270-30.00 improvement package have been obtained from the Ohio Department of Transportation, the Mid-Ohio Regional Planning Commission, the City of Columbus and the Franklin County Engineer; these letters are presented as Chapter IV of the Interchange Justification Study. We recognize the difficulties of time schedule compression implied in your various comments; as partners for the accelerated delivery of the FRA-270-30.00 improvements, we stand ready to work with the public agencies and private entities in the mutual effort required for success.

As per your letter of December 22, we understand that ODOT will prepare the formal request to the FHWA Ohio Division for approval of the FRA-270-30.00 improvement package. We also understand that ODOT will distribute the Interchange Justification Study and its Appendices to the various local agencies associated with the improvement package.

As you are aware, considerable effort has been expended by the project partners during the past two weeks to develop a final cost estimate, cost-sharing strategy, source of funding and statement of responsibility for each functional component (environmental, engineering design, right-of-way, construction) of each of the eleven projects identified in the Interchange Justification Study. This work continues to move forward although final closure has not yet been reached. When all elements of responsibility and cost have been resolved, an expanded version of Table 5 will be prepared by our firm to document the agreement and will be forwarded to ODOT District 6 for distribution as a supplement to the Interchange Justification Study. In the interim we will appreciate your expedited distribution and review of the document forwarded herewith.

If **ms consultants** can be of further assistance with regard to the Interchange Justification Study and its distribution, please contact me. We appreciate the spirit of cooperation exhibited to date by many of the agencies; we look forward to continued positive interaction as these important projects move forward to design and construction.

Very truly yours,

James A. Bixby

James A. Bixby, PE
Vice President

Enclosures

JAB/lb

cc: A. W. Penzek (w/enc)
G. B. Comfort (w/enc)
10-009.310 file

APPENDICES

APPENDIX A - Turning Movement Schematics

APPENDIX B - 1991 AM & PM Peak Hour Capacity Analyses

APPENDIX C - Highway Capacity Software Techniques and Modifications

APPENDIX D - Design Year Level of Service Analyses

APPENDIX E - Environmental Documents

APPENDIX F - Preliminary Plan and Profile

APPENDIX A

TURNING MOVEMENT SCHEMATICS

FRA–270–30.00

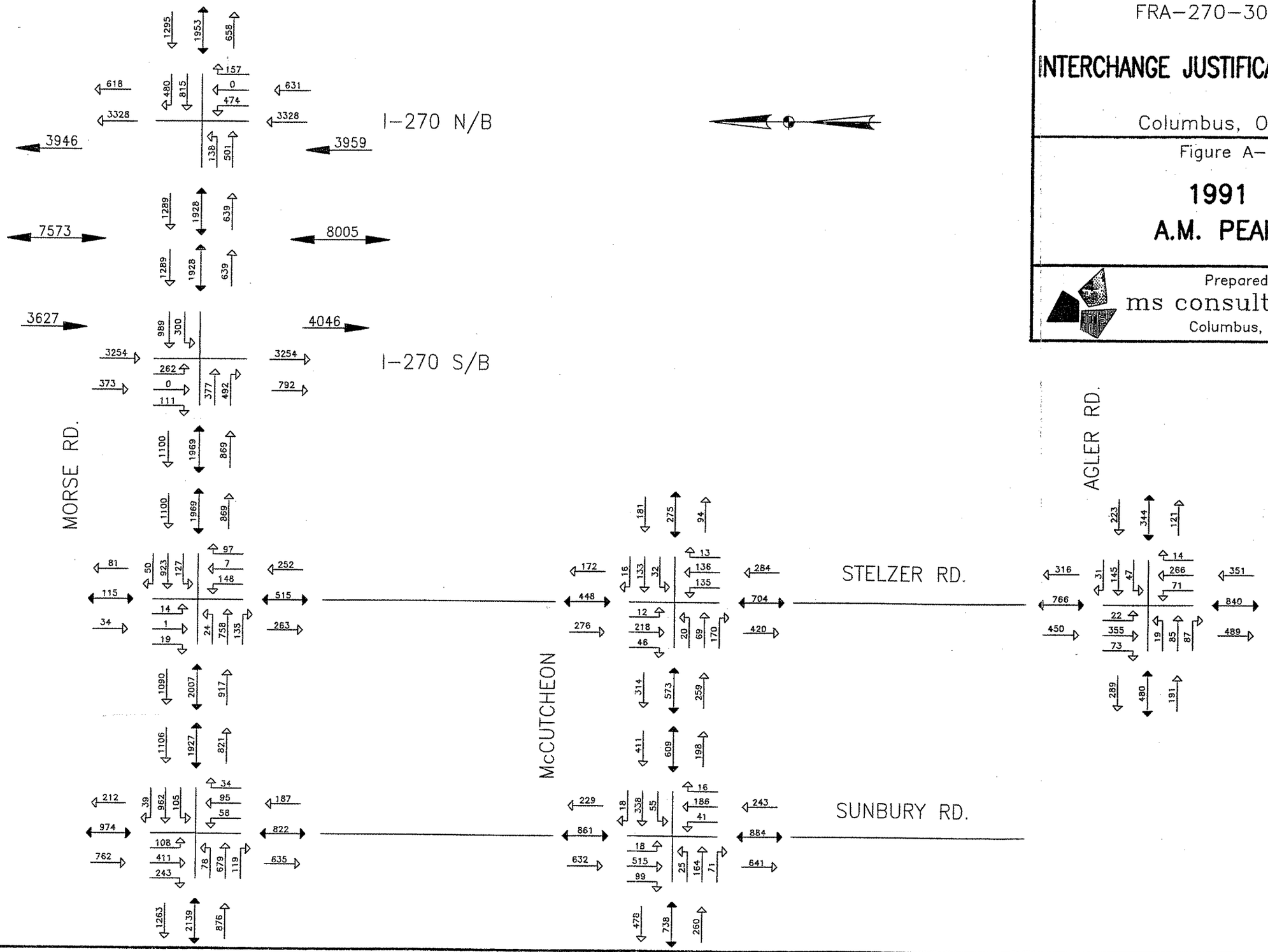
INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

Figure A–1

1991
A.M. PEAK

Prepared by
ms consultants, inc.
Columbus, Ohio



51215VB1 #8 10/13/92

FRA-270-30.00

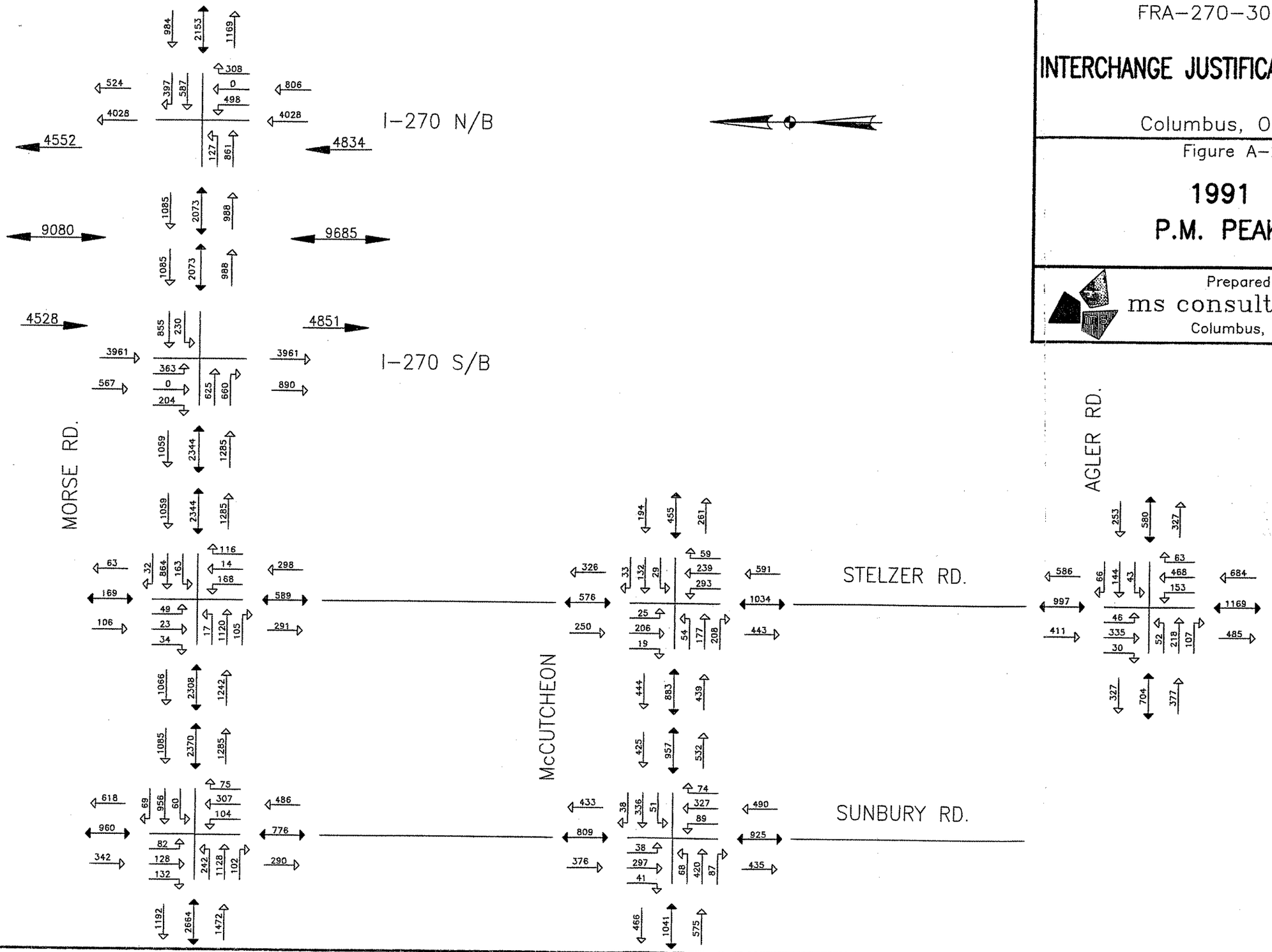
INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

Figure A-2

1991
P.M. PEAK

Prepared by
ms consultants, inc.
Columbus, Ohio



51215VB1 #8 10/13/92

REVISED 10/29/92

N.T.S.
SCHEMATIC

FRA-270-30.00

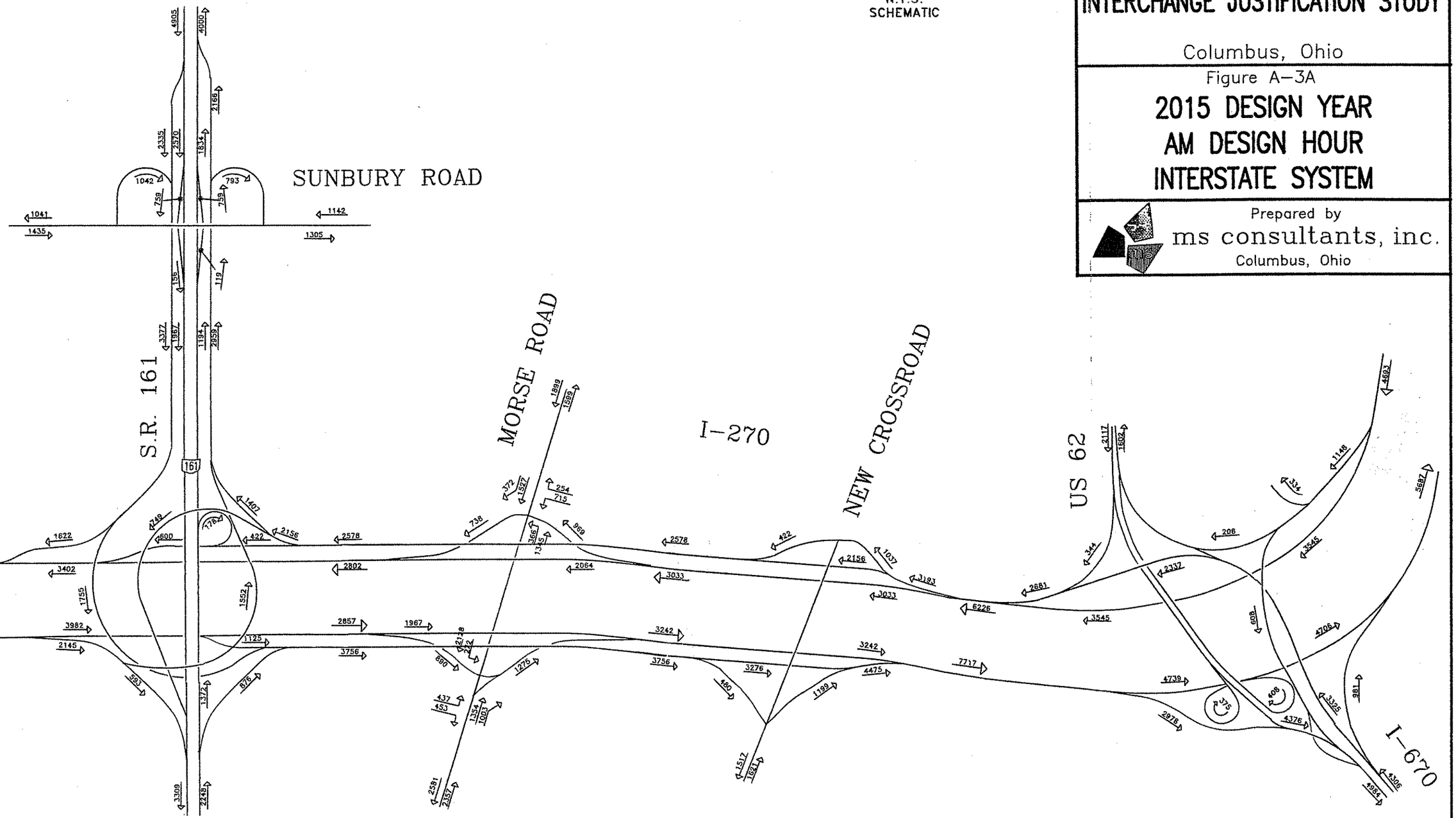
INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

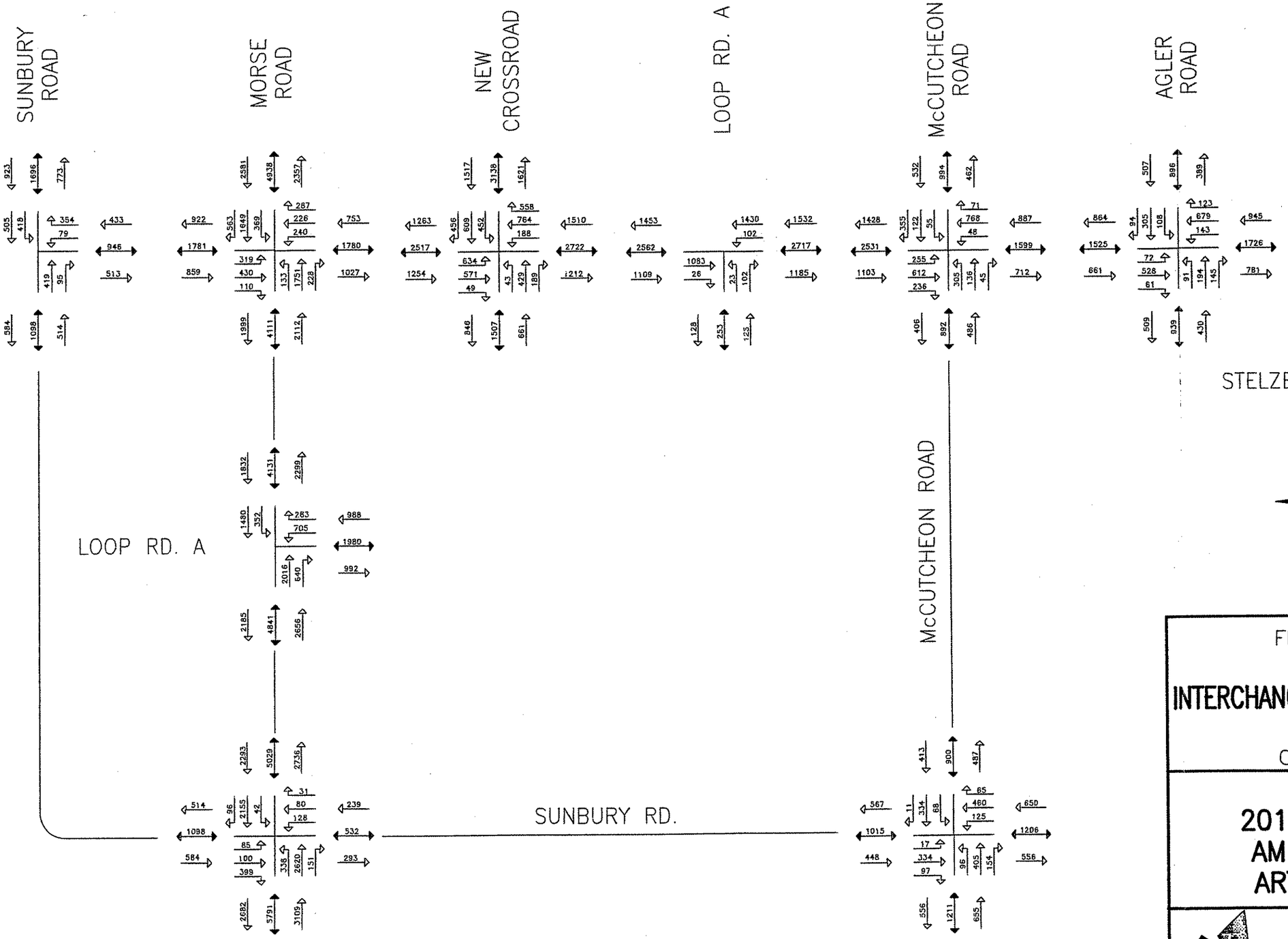
Figure A-3A

2015 DESIGN YEAR AM DESIGN HOUR INTERSTATE SYSTEM

Prepared by
ms consultants, inc.
Columbus, Ohio



10009ARE #8 10/29/92



N.T.S.
SCHEMATIC

FRA–270–30.00

INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

Figure A–3B

2015 DESIGN YEAR AM DESIGN HOUR ARTERIAL SYSTEM

Prepared by
ms consultants, inc.
Columbus, Ohio

REVISED 10/29/92

N.T.S.
SCHEMATIC

FRA-270-30.00

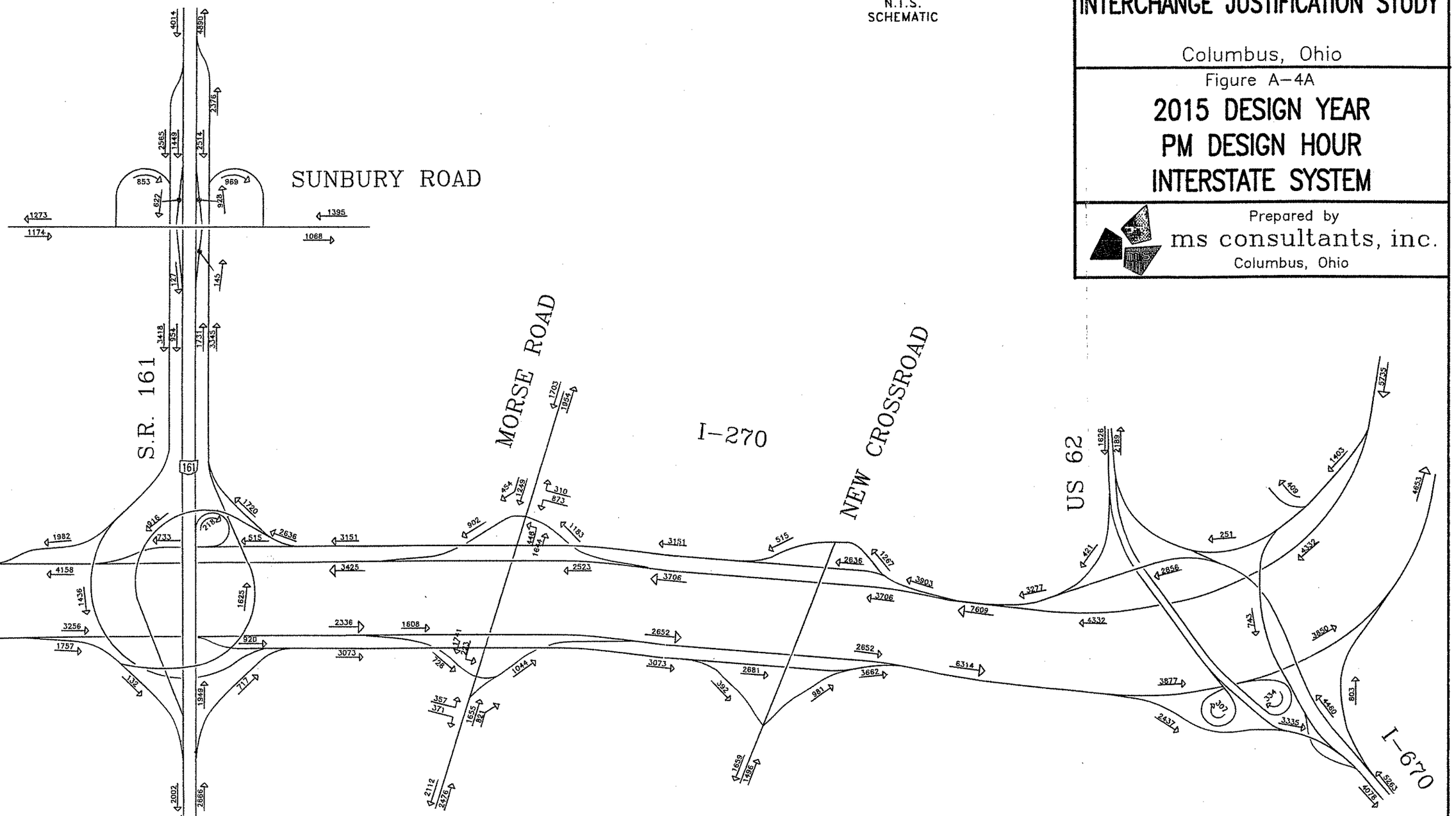
INTERCHANGE JUSTIFICATION STUDY

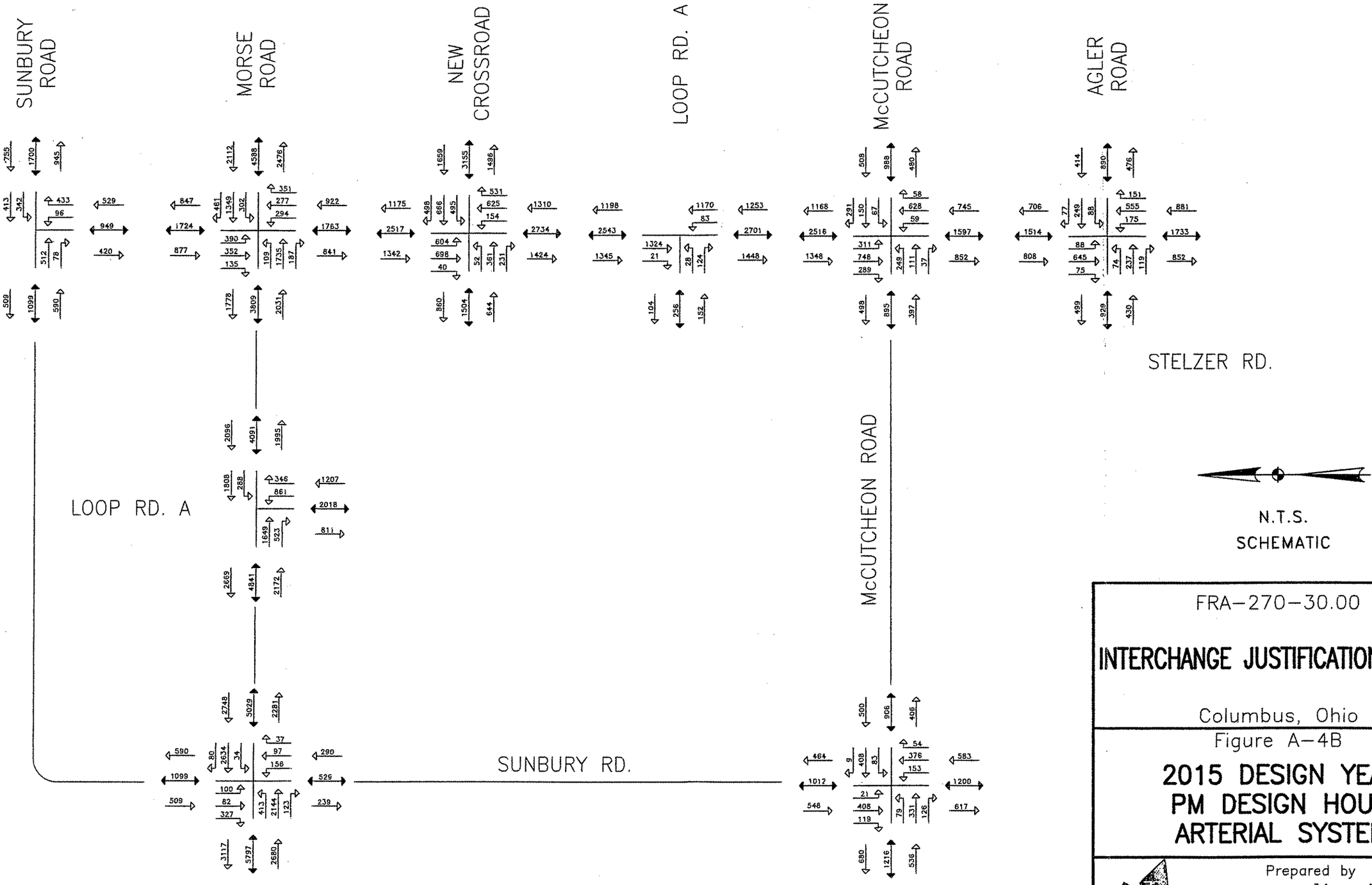
Columbus, Ohio

Figure A-4A

2015 DESIGN YEAR
PM DESIGN HOUR
INTERSTATE SYSTEM

Prepared by
ms consultants, inc.
Columbus, Ohio





N.T.S.
SCHEMATIC

FRA–270–30.00

INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

Figure A–4B

2015 DESIGN YEAR PM DESIGN HOUR ARTERIAL SYSTEM

Prepared by
ms consultants, inc.
Columbus, Ohio

10009VPR #8 10/13/92

APPENDIX B

1991 AM & PM PEAK HOUR CAPACITY ANALYSES

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 N/B SOUTH OF MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 AM PEAK
DATE OF ANALYSIS..... 4-22-91
OTHER INFORMATION.... FILE A:\51216\1991\70NBSMAM

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 4 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.97	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 3959
V/C RATIO..... .75
LEVEL OF SERVICE.... D
SPEED (mph)..... 45
DENSITY (pcpmpl)..... 33

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 S/B SOUTH OF MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 AM PEAK
DATE OF ANALYSIS..... 4-22-91
OTHER INFORMATION.... FILE A:\51216\1991\70SBSMAM

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 4 (TYPICAL - 200 #/HF)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.97	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 4046
V/C RATIO..... .77
LEVEL OF SERVICE.... D
SPEED (mph)..... 45
DENSITY (pcpmpl)..... 35

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 N/B NORTH OF MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 AM PEAK
DATE OF ANALYSIS..... 4-22-91
OTHER INFORMATION.... FILE A:\51216\1991\70NBNMAM

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 4 (TYPICAL - 200 #/MF)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	E	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.97	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 3946
V/C RATIO..... .75
LEVEL OF SERVICE.... D
SPEED (mph)..... 45
DENSITY (pcpmpl).... 33

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 S/B NORTH OF MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 AM PEAK
DATE OF ANALYSIS..... 4-22-91
OTHER INFORMATION.... FILE A:\51216\1991\70SBNMAM

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 4 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.97	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 3627
V/C RATIO..... .69
LEVEL OF SERVICE.... D
SPEED (mph)..... 47
DENSITY (pcpmpl).... 29

FACILITY LOCATION.... I-270 N/B OFF @ MORSE
ANALYST.............. TML
TIME OF ANALYSIS..... 1991 AM PEAK
DATE OF ANALYSIS..... 12-11-91
OTHER INFORMATION.... FILE A:\1991\70NBOFFA

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 4 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	3959	631	618
% TRUCKS	N.A.	4	2	2
RAMP TYPE	N.A.	N.A.	OFF	ON
DISTANCE	N.A.	N.A.	N.A.	2090

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 52 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH DOWNSTREAM RAMP USING FIGURE I.5- 7

	V1	Vr	Vf
	****	****	*****
VPH	1309	631	3959
ET	1.7	1.7	1.7
Fhv	0.96	0.99	0.97
PHF	0.90	0.90	0.90
PCPH	1515	708	4535

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	4535	D
DIVERGE:	1515	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 N/B OFF @ MORSE
TIME AND DATE..... 1991 AM PEAK : 12-11-91
OTHER INFORMATION.... FILE A:\1991\70NBOFFA

FACILITY LOCATION.... I-270 N/B ON @ MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 AM PEAK
DATE OF ANALYSIS..... 12-11-91
OTHER INFORMATION.... FILE A:\1991\70NBONAM

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 4 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	631	3959	618	N.A.
% TRUCKS	2	4	2	N.A.
RAMP TYPE	OFF	N.A.	ON	N.A.
DISTANCE	2090	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 49 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH UPSTREAM RAMP USING FIGURE I.5- 6

	Vl	Vr	Vf
	****	****	*****
VPH	642	618	3328
ET	1.7	1.7	1.7
Fhv	0.93	0.99	0.97
PHF	0.90	0.90	0.90
PCPH	767	694	3812

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	4506	D
MERGE:	1461	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 N/B ON @ MORSE
TIME AND DATE..... 1991 AM PEAK ; 12-11-91
OTHER INFORMATION.... FILE A:\1991\70NBONAM

FACILITY LOCATION.... I-270 S/B OFF @ MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 AM PEAK
DATE OF ANALYSIS..... 12-11-91
OTHER INFORMATION.... FILE A:\1991\70SBOFFA

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 4 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	3627	373	792
% TRUCKS	N.A.	4	2	2
RAMP TYPE	N.A.	N.A.	OFF	ON
DISTANCE	N.A.	N.A.	N.A.	2350

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 50 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH DOWNSTREAM RAMP USING FIGURE I.5- 7

	V1	Vr	Vf
	****	****	*****
VPH	1110	373	3627
ET	1.7	1.7	1.7
Fhv	0.95	0.99	0.97
PHF	0.90	0.90	0.90
PCPH	1298	419	4155

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	4155	C
DIVERGE:	1298	C

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 S/B OFF @ MORSE
TIME AND DATE..... 1991 AM PEAK ; 12-11-91
OTHER INFORMATION.... FILE A:\1991\70SBOFFA

FACILITY LOCATION.... I-270 S/B ON @ MORSE
ANALYST.............. TML
TIME OF ANALYSIS..... 1991 AM PEAK
DATE OF ANALYSIS..... 12-11-91
OTHER INFORMATION.... FILE A:\1991\70SBONAM

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 4 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	373	3627	792	N.A.
% TRUCKS	2	4	2	N.A.
RAMP TYPE	OFF	N.A.	ON	N.A.
DISTANCE	2350	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 49 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH UPSTREAM RAMP USING FIGURE I.5- 6

	V1	Vr	Vf
	****	****	*****
VPH	646	792	3254
ET	1.7	1.7	1.7
Fhv	0.93	0.99	0.97
PHF	0.90	0.90	0.90
PCPH	772	889	3727

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	4616	D
MERGE:	1661	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 S/B ON @ MORSE
TIME AND DATE..... 1991 AM PEAK ; 12-11-91
OTHER INFORMATION.... FILE A:\1991\70SBONAM

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE RD. (N-S) I-270 SB RAMPS
Analyst: LYDEN File Name: M70SB91A.SIG
Area Type: Other 10-10-92 1991 AM
Comment: FILE A:\51215\M70SB91A

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes		2		1	2						>	<
Volumes		377		300	989					262		111
Lane Width		12.0		11.0	12.3						15.0	
RTOR Vols			0			0						0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left					NB Left			
Thru	*				Thru			
Right					Right			
Peds					Peds			
WB Left	*				SB Left	*		
Thru	*				Thru			
Right					Right	*		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	42P				Green	43A		
Yellow/A-R	5				Yellow/A-R	5		
Lost Time	3.0				Lost Time	3.0		

Cycle Length: 95 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	3564	1651	0.27	0.46	11.9	B	11.9	B
WB	L	955	442	0.75	0.46	20.9	C	17.3	C
	T	3596	1666	0.69	0.46	16.2	C		
SB	LR	1370	649	0.64	0.47	15.8	C	15.8	C

Intersection Delay = 16.0 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE RD. (N-S) I-270 NB RAMPS
Analyst: LYDEN File Name: M70NB91A.HC9
Area Type: Other 10-10-92 1991 AM
Comment: FILE A:\51215\M70NB91A

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2			2		1		1			
Volumes	138	501			815		474		157			
Lane Width	12.0	12.0			12.0		12.0		12.0			
RTOR Vols			0			0			0			

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left	*		
Thru	*				Thru			
Right					Right	*		
Peds					Peds			
WB Left					SB Left			
Thru	*				Thru			
Right					Right			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	48P				Green	37A		
Yellow/A-R	5				Yellow/A-R	5		
Lost Time	3.0				Lost Time	3.0		

Cycle Length: 95 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	484	255	0.60	0.53	14.6	B	10.7	B
	T	3564	1876	0.31	0.53	9.7	B		
WB	T	3564	1876	0.51	0.53	11.2	B	11.2	B
NB	L	1515	622	0.85	0.41	26.7	D	23.6	C
	R	1515	622	0.28	0.41	14.2	B		

Intersection Delay = 14.7 (sec/veh) Intersection LOS = B

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE RD. (N-S) SUNBURY RD.
Analyst: LYDEN File Name: MSUN91A.HC9
Area Type: Other 10-10-92 1991 AM
Comment: FILE A:\51215\MSUN91A

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	<	1	2	<	1	1	<	1	1	1
Volumes	78	679	119	105	962	39	58	95	34	108	411	243
Lane Width	12.0	12.5		13.5	13.0		11.0	11.5		10.5	10.5	13.5
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*	*			NB Left	*		
Thru		*			Thru	*		
Right		*			Right	*		
Peds					Peds			
WB Left	*	*			SB Left	*		
Thru		*			Thru	*		
Right		*			Right	*		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green		8A	35P		Green	38A		
Yellow/A-R		4	5		Yellow/A-R	5		
Lost Time		3.0	3.0		Lost Time	3.0		

Cycle Length: 95 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	160	0.37	0.52	11.1	B	18.5	C
	TR	3536	1377	0.68	0.39	19.2	C		
WB	L	1795	170	0.44	0.52	12.1	B	21.4	C
	TR	3685	1435	0.81	0.39	22.3	C		
NB	L	217	91	0.70	0.42	30.9	D	18.7	C
	TR	1687	710	0.20	0.42	13.2	B		
SB	L	1221	514	0.23	0.42	13.5	B	16.2	C
	T	1710	720	0.63	0.42	17.8	C		
	R	1606	676	0.40	0.42	14.8	B		

Intersection Delay = 19.0 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE RD. (N-S) STELZER RD.
Analyst: LYDEN File Name: MSTZ91A.HC9
Area Type: Other 10-10-92 1991 AM
Comment: FILE A:\51215\MSTZ91A

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2 <		1	2 <		> 1		1	> 1 <		
Volumes	24	758	135	127	923	50	148	7	97	14	1	19
Lane Width	13.0	12.5		11.0	12.8			12.0	12.0		10.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4		5	6	7	8
EB Left	*				NB Left	*			
Thru	*				Thru	*			
Right	*				Right	*			
Peds					Peds				
WB Left	*				SB Left	*			
Thru	*				Thru	*			
Right	*				Right	*			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	53P				Green	32A			
Yellow/A-R	5				Yellow/A-R	5			
Lost Time	3.0				Lost Time	3.0			

Cycle Length: 95 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	356	206	0.13	0.58	6.9	B	9.2	B
	TR	3536	2047	0.51	0.58	9.3	B		
WB	L	409	237	0.60	0.58	12.7	B	9.9	B
	TR	3622	2097	0.54	0.58	9.6	B		
NB	LT	1549	554	0.31	0.36	16.9	C	16.5	C
	R	1515	542	0.20	0.36	16.1	C		
SB	LTR	873	312	0.12	0.36	15.6	C	15.6	C

Intersection Delay = 10.4 (sec/veh) Intersection LOS = B

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) McCUTCHEON RD. (N-S) STELZER RD.
Analyst: LYDEN File Name: SMCC91A.HC9
Area Type: Other 10-10-92 1991 AM
Comment: FILE A:\51215\SMCC91A

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes		> 1	<		> 1	<		> 1	<		> 1	<
Volumes	20	69	170	32	133	16	135	136	13	12	218	46
Lane Width		10.0			10.0			11.0			11.5	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left *			
Thru	*				Thru *			
Right	*				Right *			
Peds					Peds			
WB Left	*				SB Left *			
Thru	*				Thru *			
Right	*				Right *			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	20A				Green 30A			
Yellow/A-R	5				Yellow/A-R 5			
Lost Time	3.0				Lost Time 3.0			

Cycle Length: 60 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	LTR	1344	493	0.58	0.37	11.0	B	11.0	B
WB	LTR	1376	505	0.40	0.37	9.4	B	9.4	B
NB	LTR	1215	648	0.49	0.53	6.1	B	6.1	B
SB	LTR	1539	821	0.37	0.53	5.4	B	5.4	B

Intersection Delay = 7.8 (sec/veh) Intersection LOS = B

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) AGLER RD. (N-S) STELZER RD.
Analyst: LYDEN File Name: SAGL91A.HC9
Area Type: Other 10-10-92 1991 AM
Comment: FILE A:\51215\SAGL91A

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	<	1	1	<	1	1	1	1	1	<
Volumes	19	85	87	47	145	31	71	266	14	22	355	73
Lane Width	12.0	12.0		11.5	12.0		12.0	12.0	12.0	10.5	11.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*	*			NB Left	*	*	
Thru		*			Thru		*	
Right		*			Right		*	
Peds					Peds			
WB Left	*	*			SB Left	*	*	
Thru		*			Thru		*	
Right		*			Right		*	
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	8A	20A			Green	8A	26A	
Yellow/A-R	4	5			Yellow/A-R	4	5	
Lost Time	3.0	3.0			Lost Time	3.0	3.0	

Cycle Length: 80 secs Phase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	190	0.05	0.43	10.3	B	15.2	C
	TR	1646	453	0.42	0.28	15.7	C		
WB	L	1668	188	0.12	0.43	10.6	B	14.5	B
	TR	1737	478	0.41	0.28	15.6	C		
NB	L	1693	190	0.26	0.50	8.9	B	12.5	B
	T	1782	624	0.47	0.35	13.5	B		
	R	1515	530	0.03	0.35	11.0	B		
SB	L	1608	181	0.06	0.50	7.8	B	19.4	C
	TR	1684	589	0.81	0.35	20.0	C		

Intersection Delay = 15.8 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MCCUTCHEON ROAD (N-S) SUNBURY ROAD
Analyst: LYDEN File Name: MCSUN91A.HC9
Area Type: Other 10-10-92 1991 AM
Comment: FILE A:\51215\MCSUN91A

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	<	1	1	<	1	1	<	1	1	1
Volumes	25	164	71	55	338	18	41	186	16	18	515	99
Lane Width	12.5	12.0		10.5	9.5		10.0	12.0		10.0	10.0	10.5
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left	*		
Thru	*				Thru	*		
Right	*				Right	*		
Peds					Peds			
WB Left	*				SB Left	*		
Thru	*				Thru	*		
Right	*				Right	*		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	25A				Green	25A		
Yellow/A-R	5				Yellow/A-R	5		
Lost Time	3.0				Lost Time	3.0		

Cycle Length: 60 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	929	418	0.07	0.45	7.1	B	7.0	B
	TR	1702	766	0.34	0.45	7.0	B		
WB	L	1100	495	0.12	0.45	7.3	B	8.2	B
	TR	1618	728	0.54	0.45	8.3	B		
NB	L	414	186	0.25	0.45	7.9	B	7.0	B
	TR	1761	792	0.28	0.45	6.8	B		
SB	L	1138	512	0.04	0.45	7.0	B	10.8	B
	T	1657	746	0.77	0.45	11.8	B		
	R	1439	648	0.17	0.45	6.4	B		

Intersection Delay = 8.9 (sec/veh) Intersection LOS = B

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 N/B SOUTH OF MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 PM PEAK
DATE OF ANALYSIS..... 4-22-91
OTHER INFORMATION.... FILE A:\51216\1991\7ONBSMPM

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 3 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.98	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 4834
V/C RATIO..... .91
LEVEL OF SERVICE.... E
SPEED (mph)..... 38
DENSITY (pcpmpl).... 49

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 S/B SOUTH OF MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 PM PEAK
DATE OF ANALYSIS..... 4-22-91
OTHER INFORMATION.... FILE A:\51216\1991\70SBSMPM

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 3 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.98	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 4851
V/C RATIO..... .92
LEVEL OF SERVICE.... E
SPEED (mph)..... 38
DENSITY (pcpmpl)..... 50

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 N/B NORTH OF MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 PM PEAK
DATE OF ANALYSIS..... 4-22-91
OTHER INFORMATION.... FILE A:\51216\1991\7ONBNMPM

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 3 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.98	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 4552
V/C RATIO..... .86
LEVEL OF SERVICE.... E
SPEED (mph)..... 41
DENSITY (pcpmpl).... 43

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 S/B NORTH OF MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 PM PEAK
DATE OF ANALYSIS..... 4-22-91
OTHER INFORMATION.... FILE A:\51216\1991\70SBNMPM

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 3 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	E	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.98	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 4528
V/C RATIO..... .86
LEVEL OF SERVICE.... E
SPEED (mph)..... 41
DENSITY (pcpmpl).... 43

FACILITY LOCATION.... I-270 N/B OFF @ MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 PM PEAK
DATE OF ANALYSIS..... 12-11-91
OTHER INFORMATION.... FILE A:\1991\70NBOFFP

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 3 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	4834	806	524
% TRUCKS	N.A.	3	2	0
RAMP TYPE	N.A.	N.A.	OFF	ON
DISTANCE	N.A.	N.A.	N.A.	2090

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 61 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH DOWNSTREAM RAMP USING FIGURE I.5- 7

	V1	Vr	Vf
	****	****	*****
VPH	1594	806	4834
ET	1.7	1.7	1.7
Fhv	0.96	0.99	0.98
PHF	0.90	0.90	0.90
PCPH	1845	905	5481

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	5481	E
DIVERGE:	1845	E

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 N/B OFF @ MORSE
TIME AND DATE..... 1991 PM PEAK ; 12-11-91
OTHER INFORMATION.... FILE A:\1991\70NBOFFP

FACILITY LOCATION.... I-270 N/B ON @ MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 PM PEAK
DATE OF ANALYSIS..... 12-11-91
OTHER INFORMATION.... FILE A:\1991\70NBONPM

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 3 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	806	4834	524	N.A.
% TRUCKS	0	3	2	N.A.
RAMP TYPE	OFF	N.A.	ON	N.A.
DISTANCE	2090	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 52 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH UPSTREAM RAMP USING FIGURE I.5- 6

	V1	Vr	Vf
	****	****	*****
VPH	798	524	4028
ET	1.7	1.7	1.7
Fhv	0.95	0.99	0.98
PHF	0.90	0.90	0.90
PCPH	933	588	4567

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	5155	E
MERGE:	1521	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 N/B ON @ MORSE
TIME AND DATE..... 1991 PM PEAK ; 12-11-91
OTHER INFORMATION.... FILE A:\1991\70NBONPM

FACILITY LOCATION.... I-270 S/B OFF @ MORSE
ANALYST.............. TML
TIME OF ANALYSIS..... 1991 PM PEAK
DATE OF ANALYSIS..... 12-11-91
OTHER INFORMATION.... FILE A:\1991\70SBOFFP

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 3 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	4528	567	890
% TRUCKS	N.A.	3	2	2
RAMP TYPE	N.A.	N.A.	OFF	ON
DISTANCE	N.A.	N.A.	N.A.	2350

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 57 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH DOWNSTREAM RAMP USING FIGURE I.5- 7

	V1	Vr	Vf
	****	****	*****
VPH	1410	567	4528
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.98
PHF	0.90	0.90	0.90
PCPH	1615	636	5134

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	5134	E
DIVERGE:	1615	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 S/B OFF @ MORSE
TIME AND DATE..... 1991 PM PEAK ; 12-11-91
OTHER INFORMATION.... FILE A:\1991\70SBOFFP

FACILITY LOCATION.... I-270 S/B ON @ MORSE
ANALYST..... TML
TIME OF ANALYSIS..... 1991 PM PEAK
DATE OF ANALYSIS..... 12-11-91
OTHER INFORMATION.... FILE A:\1991\70SBONPM

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 3 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	567	4528	890	N.A.
% TRUCKS	2	3	2	N.A.
RAMP TYPE	OFF	N.A.	ON	N.A.
DISTANCE	2350	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 52 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH UPSTREAM RAMP USING FIGURE I.5- 6

	V1	Vr	Vf
	****	****	*****
VPH	802	890	3961
ET	1.7	1.7	1.7
Fhv	0.95	0.99	0.98
PHF	0.90	0.90	0.90
PCPH	938	999	4491

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	5490	E
MERGE:	1937	E

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 S/B ON @ MORSE
TIME AND DATE..... 1991 PM PEAK ; 12-11-91
OTHER INFORMATION.... FILE A:\1991\70SBONPM

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE RD. (N-S) I-270 SB RAMPS
Analyst: LYDEN File Name: M70SB91P.HC9
Area Type: Other 10-10-92 1991 PM
Comment: FILE A:\51215\M70SB91P

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes		2		1	2						>	<
Volumes		625		230	855					363		204
Lane Width		12.0		11.0	12.3						15.0	
RTOR Vols			0			0						0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left					NB Left			
Thru	*				Thru			
Right					Right			
Peds					Peds			
WB Left	*				SB Left	*		
Thru	*				Thru			
Right					Right	*		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	60P				Green	45A		
Yellow/A-R	5				Yellow/A-R	5		
Lost Time	3.0				Lost Time	3.0		

Cycle Length: 115 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	3564	1921	0.38	0.54	11.7	B	11.7	B
WB	L	651	351	0.73	0.54	20.4	C	14.5	B
	T	3596	1939	0.51	0.54	13.0	B		
SB	LR	1372	561	1.12	0.41	102.7	F	102.7	F

Intersection Delay = 35.0 (sec/veh) Intersection LOS = D

HCM: SIGNALIZED INTERSECTION SUMMARY
MS Consultants

Streets: (E-W) MORSE RD. (N-S) I-270 NB RAMPS
Analyst: LYDEN File Name: M70NB91P.HC9
Area Type: Other 10-10-92 1991 PM
Comment: FILE A:\51215\M70NB91P

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2			2		1		1			
Volumes	127	861			587		498		308			
Lane Width	12.0	12.0			12.0		12.0		12.0			
RTOR Vols			0			0			0			

Signal Operations

Phase combination	1	2	3	4		5	6	7	8
EB Left	*				NB Left	*			
Thru	*				Thru				
Right					Right	*			
Peds					Peds				
WB Left					SB Left				
Thru	*				Thru				
Right					Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	65P				Green	40A			
Yellow/A-R	5				Yellow/A-R	5			
Lost Time	3.0				Lost Time	3.0			

Cycle Length: 115 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	730	425	0.33	0.58	9.6	B	10.6	B
	T	3564	2076	0.48	0.58	10.7	B		
WB	T	3564	2076	0.33	0.58	9.5	B	9.5	B
NB	L	1515	553	1.00	0.37	57.0	E	44.5	E
	R	1515	553	0.62	0.37	24.2	C		

Intersection Delay = 21.4 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE RD. (N-S) SUNBURY RD.
Analyst: LYDEN File Name: MSUN91P.HC9
Area Type: Other 10-10-92 1991 PM
Comment: FILE A:\51215\MSUN91P

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	<	1	2	<	1	1	<	1	1	1
Volumes	242	1128	102	60	956	69	104	307	75	82	128	132
Lane Width	12.0	12.5		13.5	13.0		11.0	11.5		10.5	10.5	13.5
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*	*			NB Left *			
Thru		*			Thru *			
Right		*			Right *			
Peds					Peds			
WB Left	*	*			SB Left *			
Thru		*			Thru *			
Right		*			Right *			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	16A	48P			Green 37A			
Yellow/A-R	4	5			Yellow/A-R 5			
Lost Time	3.0	3.0			Lost Time 3.0			

Cycle Length: 115 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	250	0.86	0.61	30.9	D	30.4	D
	TR	3574	1554	0.92	0.43	30.3	D		
WB	L	1795	265	0.20	0.61	7.7	B	21.4	C
	TR	3669	1595	0.75	0.43	22.1	C		
NB	L	847	287	0.40	0.34	22.6	C	27.4	D
	TR	1703	578	0.73	0.34	28.8	D		
SB	L	546	185	0.49	0.34	24.6	C	21.8	C
	T	1710	580	0.24	0.34	20.9	C		
	R	1606	545	0.27	0.34	21.1	C		

Intersection Delay = 26.2 (sec/veh) Intersection LOS = D

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE RD. (N-S) STELZER RD.
Analyst: LYDEN File Name: MSTZ91P.HC9
Area Type: Other 10-10-92 1991 PM
Comment: FILE A:\51215\MSTZ91P

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	<	1	2	<	>	1	1	>	1	<
Volumes	17	1120	105	163	864	32	168	14	116	49	23	34
Lane Width	13.0	12.5		11.0	12.8			12.0	12.0		10.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left *			
Thru	*				Thru *			
Right	*				Right *			
Peds					Peds			
WB Left	*				SB Left *			
Thru	*				Thru *			
Right	*				Right *			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	78P				Green 27A			
Yellow/A-R	5				Yellow/A-R 5			
Lost Time	3.0				Lost Time 3.0			

Cycle Length: 115 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	435	303	0.06	0.70	4.2	A	7.0	B
	TR	3569	2483	0.58	0.70	7.0	B		
WB	L	114	79	2.28	0.70	*	*	*	*
	TR	3628	2524	0.41	0.70	5.8	B		
NB	LT	1400	353	0.58	0.25	30.3	D	29.0	D
	R	1515	382	0.34	0.25	26.9	D		
SB	LTR	433	109	1.08	0.25	131.9	F	131.9	F

Intersection Delay = * (sec/veh) Intersection LOS = *

* Delay and LOS not meaningful when any v/c is greater than 1.2

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) McCUTCHEON RD. (N-S) STELZER RD.
Analyst: LYDEN File Name: SMCC91P.HC9
Area Type: Other 10-10-92 1991 PM
Comment: FILE A:\51215\SMCC91P

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes		> 1	<		> 1	<		> 1	<		> 1	<
Volumes	54	177	208	29	132	33	293	239	59	25	206	19
Lane Width		10.0			10.0			11.0			11.5	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left *			
Thru	*				Thru *			
Right	*				Right *			
Peds					Peds			
WB Left	*				SB Left *			
Thru	*				Thru *			
Right	*				Right *			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	20P				Green 30P			
Yellow/A-R	5				Yellow/A-R 5			
Lost Time	3.0				Lost Time 3.0			

Cycle Length: 60 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	LTR	1386	508	0.96	0.37	36.2	D	36.2	D
WB	LTR	1179	432	0.50	0.37	12.0	B	12.0	B
NB	LTR	1237	660	1.00	0.53	36.9	D	36.9	D
SB	LTR	1493	796	0.35	0.53	6.2	B	6.2	B

Intersection Delay = 28.2 (sec/veh) Intersection LOS = D

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) AGLER RD. (N-S) STELZER RD.
Analyst: LYDEN File Name: SAGL91P.HC9
Area Type: Other 10-10-92 1991 PM
Comment: FILE A:\51215\SAGL91P

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	<	1	1	<	1	1	1	1	1	<
Volumes	52	218	107	43	144	66	153	468	63	46	335	30
Lane Width	12.0	12.0		11.5	12.0		12.0	12.0	12.0	10.5	11.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
WB Left	*	*			SB Left	*	*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	8A	20A			Green	8A	26A		
Yellow/A-R	4	5			Yellow/A-R	4	5		
Lost Time	3.0	3.0			Lost Time	3.0	3.0		

Cycle Length: 80 secs Phase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	190	0.15	0.43	10.8	B	20.4	C
	TR	1694	466	0.77	0.28	21.9	C		
WB	L	1668	188	0.17	0.43	10.9	B	15.4	C
	TR	1699	467	0.50	0.28	16.4	C		
NB	L	1693	190	0.48	0.50	11.5	B	18.0	C
	T	1782	624	0.83	0.35	21.1	C		
	R	1515	530	0.13	0.35	11.5	B		
SB	L	1608	181	0.19	0.50	8.5	B	15.3	C
	TR	1708	598	0.68	0.35	16.1	C		

Intersection Delay = 17.5 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MCCUTCHEON ROAD (N-S) SUNBURY ROAD
Analyst: LYDEN File Name: MCSUN91P.HC9
Area Type: Other 10-10-92 1991 PM
Comment: FILE A:\51215\MCSUN91P

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	<	1	1	<	1	1	<	1	1	1
Volumes	68	420	87	51	336	38	89	327	74	38	297	41
Lane Width	12.5	12.0		10.5	9.5		10.0	12.0		10.0	10.0	10.5
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4		5	6	7	8
EB Left	*				NB Left	*			
Thru	*				Thru	*			
Right	*				Right	*			
Peds					Peds				
WB Left	*				SB Left	*			
Thru	*				Thru	*			
Right	*				Right	*			
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	25A				Green	25A			
Yellow/A-R	5				Yellow/A-R	5			
Lost Time	3.0				Lost Time	3.0			

Cycle Length: 60 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	895	403	0.19	0.45	7.6	B	10.3	B
	TR	1737	782	0.72	0.45	10.6	B		
WB	L	599	270	0.21	0.45	7.7	B	8.5	B
	TR	1606	723	0.57	0.45	8.6	B		
NB	L	884	398	0.25	0.45	7.8	B	8.4	B
	TR	1734	780	0.57	0.45	8.5	B		
SB	L	772	347	0.12	0.45	7.3	B	7.4	B
	T	1657	746	0.44	0.45	7.6	B		
	R	1439	648	0.07	0.45	6.1	B		

Intersection Delay = 8.8 (sec/veh) Intersection LOS = B

APPENDIX C

HIGHWAY CAPACITY SOFTWARE TECHNIQUES AND MODIFICATIONS

APPENDIX C: HIGHWAY CAPACITY SOFTWARE TECHNIQUES AND MODIFICATIONS

The Highway Capacity Software (HCS), Release 1.5, based on the 1985 Highway Capacity Manual (HCM), was used to analyze the capacity of the interstate freeway segments, weaving areas and ramps. Version 2.1 of the HCS was used to analyze the signalized intersections. In some instances the HCS techniques were modified or the analysis was performed by hand to reflect the particular conditions under study. This chapter will discuss those modified or hand techniques.

Major diverge analyses can not be performed using the HCS, therefore, all of these analyses were performed by hand using the techniques of the HCM. In most cases four freeway lanes, not three, as the technique assumes, approached the diverge point. Therefore, an appropriate volume for the fourth lane was assumed and deducted from the freeway volume and the analysis proceeded according to the three-lane approach techniques in HCM..

Dual on-ramp analyses were modified to reflect the more recent design standards implemented by ODOT. The HCS assumes that the inside ramp lane of a dual on-ramp merges immediately with the outside mainline lane at the nose (i.e. an "inside merge"). The outside ramp lane then merges with the outside mainline lane some distance beyond the first merge. The ODOT Location and Design (L&D) Manual specifies that for dual on-ramps, the outside ramp lane is to merge with the inside ramp lane 2000 feet downstream from the nose. This inside ramp lane then continues for another 2600 feet before merging with the outside mainline lane. For this reason, the analyses were modified. For dual on-ramps the HCS results were adjusted based on the HCM Figure 5-5, Percent of Ramp Vehicles in Lane 1. Based on data provided in the HCM for merge rates, the first merge point volume, where the outside ramp lane merges with the inside ramp lane, was found to consist of the outside ramp volume plus 19% of the inside ramp volume. This is due to the fact that in the 2000 feet that is available for this merge, 81% of the inside ramp lane merges into the outside through lane. The second merge point volume, where the inside ramp lane merges with the outside mainline lane, was calculated to consist of the outside ramp volume plus a portion of the inside ramp volume plus the volume in the

outside mainline lane. The portion of the inside ramp volume used was based on the HCM which implies that a portion of the traffic that merges from the inside ramp lane to the outside mainline lane in the first 2000 feet would further merge into the other mainline lanes in the 2600 feet before the second merge point. These modifications to the HCS analyses and results enabled **ms consultants** to appropriately analyze the ramp situations at these locations.

At three of the signalized intersections the adjustment factor for left turns was changed due to what **ms consultants** perceives to be an incorrect assumption on the part of the HCS. These three intersections are Morse Road & Loop Road A, Morse Road & I-270 N/B Off-Ramp and Crossroad & I-270 N/B Off-Ramp. For dual left turns with no opposing flow (e.g. at tee intersections or at diamond interchange off-ramps) the HCS uses the equivalent dual right turn factor of 0.75. This is based on sample problem Number 2 in Chapter 9 of the HCM in which the left turn movement (with no opposing flow) is treated as a right turn movement due to the conflicting pedestrian movement. In the situations that **ms consultants** is analyzing, an opposing pedestrian movement is not anticipated, therefore, **ms consultants** used the standard dual left turn factor of 0.92 instead of the software selected dual right turn factor of 0.75.

In some cases neither the HCM or HCS could model the particular situation due to its uniqueness or seldom encountered configuration. In these few cases a manual technique was employed wherein assumptions based on HCM techniques were made.

APPENDIX D

DESIGN YEAR
LEVEL OF SERVICE ANALYSES

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... -270 N/B bet. SR 317 & I-670/US 62
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN
DATE OF ANALYSIS..... 7-21-92
OTHER INFORMATION.... FILE A:\ACCESSPM\70NB1767

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 4
INPUT VOLUME..... 5735
V/C RATIO..... .81
LEVEL OF SERVICE.... D
SPEED (mph)..... 43
DENSITY (pcpmpl).... 38

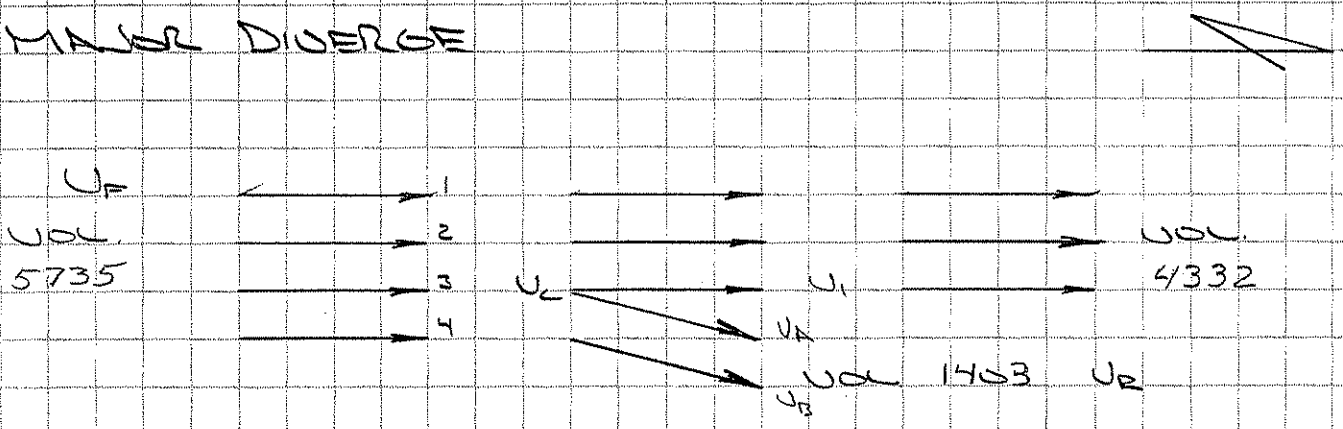
ms consultants, inc.
engineers, architects, planners

job no 10-89130 sheet 1/2
made by TMC date 4-13-93
checked _____ date _____
office _____
project MORSE & STELZER

2015 P.M. PEAK

I-270 N/B OFF RAMP @ I-670

MAJOR DIVERGE



ASSUME INSIDE LANE, #1, CARRIES 5735/4 = 1434 VEHICLES. DEDUCT FROM V_F 5735 - 1434 = 4301 AND TREAT AS A MAJOR DIVERGE, FIG. 1.5-13 IN THE HCM

V_F = 4301
V_R = 1403

FIG 1.5-13

$V_L = 64 + .285\,V_F + .141\,V_R$

$= 1488$

$V_1 = 173 + .295\,V_F - .320\,V_R$

$= 993$

$V_A = V_C - V_1 = 1488 - .993 = 495$

$V_B = V_D - V_A = 1403 - .495 = 908$

$V_C = V_{D1} = 1488$

$V_B = V_{D2} = 908$

CONVERT VOLUMES TO FLOW RATES

TRUCKS ON FREEWAY = 4301 X.02 = 86
TRUCKS ON RAMP = 1403 X.02 = 28
TRUCKS AFTER DIVERGE = 86 - 28 = 58
TRUCKS IN LANE 1 AFTER DIVERGE
= 58 X .54 (FIG 5-6) = 31
TRUCKS IN LANE A = 495 X.02 = 10
PROP. OF TRUCKS IN LANE V_C = $\frac{31+10}{1420}$ = .03

	VOL.	PROP TRUCKS	E_T	F_{HV}	PHF	FLOW RATE
V_{D1}	1488	.03	1.7	.98	.90	1687
V_{D2}	908	.02	1.7	.99	.90	1019
V_F	4301	.02	1.7	.99	.90	4827

V_{D1} = 1687 LOS D 1501 - 1800
V_{D2} = 1019 LOS B 651 - 1050
V_F = 4827 LOS D 4201 - 5100

FACILITY LOCATION.... JOHNSTOWN ROAD OFF RAMP FROM I-270 N/B
ANALYST..... MJH
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\70NBOFJO

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	1403	409	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	OFF	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 70 % OF FREEWAY TRUCKS

RAMP ANALYZED ALONE USING FIGURE I.5- 2

	V1	Vr	Vf
	****	****	*****
VPH	862	409	1403
ET	1.7	1.7	1.7
Fhv	0.99	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	967	459	1575

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	1575	B
DIVERGE:	967	B

IDENTIFYING INFORMATION

FACILITY LOCATION.... JOHNSTOWN ROAD OFF RAMP FROM I-270 N/B
TIME AND DATE..... 2015 PM PEAK ; 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\70NBOFJO

FACILITY LOCATION.... US 62 E/B OFF RAMP FROM I-270 N/B
ANALYST..... MJH
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\70NBOF62

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	994	251	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	OFF	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 77 % OF FREEWAY TRUCKS

RAMP ANALYZED ALONE USING FIGURE I.5- 2

	V1	Vr	Vf
	****	****	*****
VPH	638	251	994
ET	1.7	1.7	1.7
Fhv	0.99	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	716	282	1116

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	1116	B
DIVERGE:	716	B

IDENTIFYING INFORMATION

FACILITY LOCATION.... US 62 E/B OFF RAMP FROM I-270 N/B
TIME AND DATE..... 2015 PM PEAK ; 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\70NBOF62

FACILITY LOCATION.... I-670 E/B ON RAMP FROM I-270 N/B
ANALYST..... MJH
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\67EBEB62

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	1604	251	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 67 % OF FREEWAY TRUCKS

RAMP ANALYZED ALONE USING FIGURE I.5- 1

	V1	Vr	Vf
	****	****	*****
VPH	661	251	1604
ET	1.7	1.7	1.7
Fhv	0.98	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	749	282	1800

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2082	C
MERGE:	1031	C

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-670 E/B ON RAMP FROM I-270 N/B
TIME AND DATE..... 2015 PM PEAK ; 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\67EBEB62

FACILITY LOCATION.... US 62 E/B ON RAMP FROM S/B I-270
ANALYST..... MJH
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 07/24/1992
OTHER INFORMATION.... FILE A:\MSCDRD\62EBSB70

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) LEFT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	1855	334	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

LEFT-HAND RAMP ADJUSTMENT FACTOR: 1.25

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 25 % OF FREEWAY TRUCKS

RAMP ANALYZED ALONE USING FIGURE I.5- 1

	V1	Vr	Vf
	****	****	*****
VPH	923	334	1855
ET	1.7	1.7	1.7
Fhv	0.99	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1036	375	2082

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2457	C
MERGE:	1411	C

IDENTIFYING INFORMATION

FACILITY LOCATION.... US 62 E/B ON RAMP FROM S/B I-270
TIME AND DATE..... 2015 PM PEAK ; 07/24/1992
OTHER INFORMATION.... FILE A:\MSCDRD\62EBSB70

1985 HCM: BASIC FREEWAY SEGMENT

****

FACILITY SECTION..... US 62 E/B EAST OF I-270
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN
DATE OF ANALYSIS..... 08-06-1992
OTHER INFORMATION.... FILE A:\ACCESSPM\62EBE270

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS

****

NO. OF LANES..... 2
INPUT VOLUME..... 2189
V/C RATIO..... .62
LEVEL OF SERVICE.... C
SPEED (mph)..... 48
DENSITY (pcpmpl).... 25

1985 HCM: BASIC FREEWAY SEGMENT

****

FACILITY SECTION..... US 62 W/B EAST OF I-270
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN
DATE OF ANALYSIS..... 08-06-1992
OTHER INFORMATION.... FILE A:\ACCESSAM\62WBE270

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS

****

NO. OF LANES..... 2
INPUT VOLUME..... 2117
V/C RATIO..... .6
LEVEL OF SERVICE.... C
SPEED (mph)..... 48
DENSITY (pcpmpl).... 24

FACILITY LOCATION.... US 62 W/B TO I-270 N/B OFF RAMP
ANALYST..... MJH
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\62WBNB70

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	2117	344	375
% TRUCKS	N.A.	2	2	2
RAMP TYPE	N.A.	N.A.	OFF	OFF
DISTANCE	N.A.	N.A.	N.A.	1622

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 65 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH DOWNSTREAM RAMP USING APPROXIMATION METHOD

	V1	Vr	Vf
	****	****	*****
VPH	906	344	2117
ET	1.7	1.7	1.7
Fhv	0.98	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1027	386	2376

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2376	C
DIVERGE:	1027	B

IDENTIFYING INFORMATION

FACILITY LOCATION.... US 62 W/B TO I-270 N/B OFF RAMP
TIME AND DATE..... 2015 AM PEAK ; 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\62WBNB70

FACILITY LOCATION.... US 62 W/B OFF RAMP TO I-670 E/B OFF RAMP
ANALYST..... MJH
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\62WB67EB

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	2856	421	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 73 % OF FREEWAY TRUCKS

RAMP ANALYZED ALONE USING FIGURE I.5- 1

	V1	Vr	Vf
	****	****	*****
VPH	1073	421	2856
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1229	473	3205

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	3678	E
MERGE:	1702	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... US 62 W/B OFF RAMP TO I-670 E/B OFF RAMP
TIME AND DATE..... 2015 PM PEAK ; 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\62WB67EB

FACILITY LOCATION.... I-670 E/B TO N/B I-270 ON RAMP
ANALYST..... MJH
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\67EBNBON

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) ADDITION OF LANE AT ON-RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	4332	1639 x 2 = 3278	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

The merge criteria are applied directly to
the ON-RAMP flow rate as the checkpoint:

FLOW RATE = 1840 pcph
LOS = E

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 N/B bet. I-670/US 62 & CROSSROAD
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN
DATE OF ANALYSIS..... 07-20-1992
OTHER INFORMATION.... FILE A:\ACCESSPM\70NB67CR

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

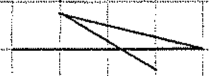
NO. OF LANES..... 5
INPUT VOLUME..... 7609
V/C RATIO..... .86
LEVEL OF SERVICE.... E
SPEED (mph)..... 41
DENSITY (pcpmpl).... 43 ⇐ D

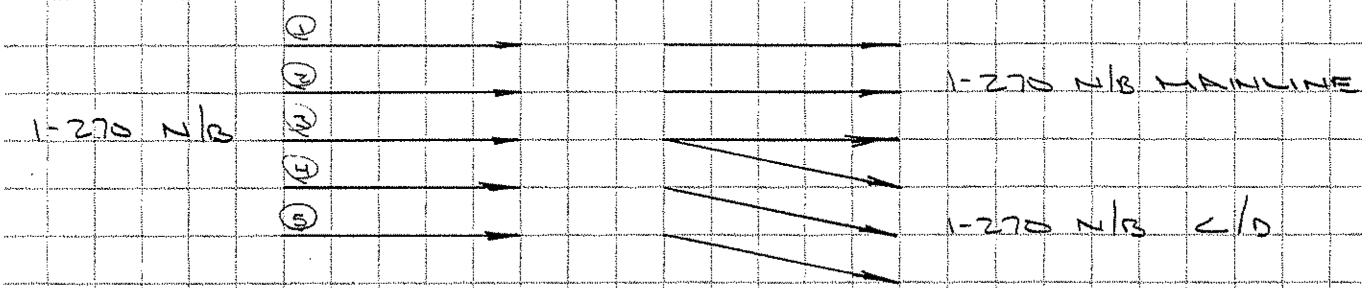
ms consultants, inc.
engineers, architects, planners

job no 10-00930 sheet 1/3
made by TML date 8-6-92
checked ______ date ______
office ______
project MORSE & STELZER

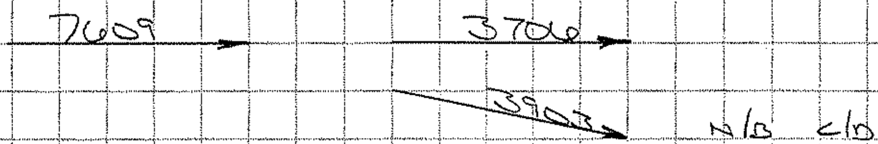
I-270 N/B OFF RAMP TO C/D ROAD

MAJOR DIVERGE





P.M. VOLUMES

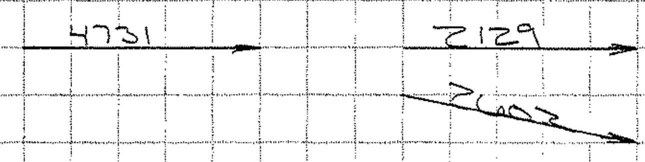


ASSUME: TRAFFIC TO N/B C/D SPLITS
EVENLY (3903 ÷ 3) = 1301

∴ (3706 + 2602) ÷ 4 = 1577 VEHICLES
IN LANE 1

REVISED TRAFFIC VOLUMES

7609
−1577 LANE 1
−1301 LANE 5
4731



$V_F = 4731$

$V_R = 2602$

$V_L = 64 + .285\,V_F + .141\,V_R$

$= 1779$

$V_1 = 173 + .295\,V_F - .320\,V_R$

$= 736$

$V_A = V_L - V_1 = 1779 - 736 = 1043$

$V_B = V_R - V_A = 2602 - 1043 = 1559$

$V_{D1} = V_L = 1779$

$V_{D2} = V_B = 1559$

ms consultants, inc.
engineers, architects, planners

job no _____ sheet 3/3
made by _____ date _____
checked _____ date _____
office _____
project _____

CONVERT VOLUMES TO FLOW RATES

TRUCKS ON FREEWAY = 4731 X.02 = 95
TRUCKS ON RAMP = 26 X.02 = 52
TRUCKS AFTER DIVERGE = 43.
TRUCKS IN LANE 1 AFTER DIVERGE
= 43 X .50 (FIG. 5-6) = 22
TRUCKS IN LANE 4 = 1043 X .02 = 21
PROP OF TRUCKS IN V_L = $\frac{22+21}{1779}$ = .02

	VOL.	PROP. TRUCKS	E_T	F_{HV}	PHF	FLOW RATE
V_{D1}	1779	.02	1.7	.99	.90	1997
V_{D2}	1559	.02	1.7	.99	.90	1750
V_F	4731	.02	1.7	.99	.90	5310

V_{D1} = 1997 LOS E
V_{D2} = 1750 LOS D
V_F = 5310 LOS E

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 N/B bet. CROSSROAD & MORSE
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN
DATE OF ANALYSIS..... 7-21-92
OTHER INFORMATION.... FILE A:\ACCESSPM\70NBCRMS

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 3706
V/C RATIO..... .7
LEVEL OF SERVICE.... ~~D~~ C
SPEED (mph)..... 46
DENSITY (pcpmpl).... 30

FACILITY LOCATION.... C/D N/B OFF TO NEW CROSSOVER
ANALYST.............. LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN
DATE OF ANALYSIS..... 07-21-1992
OTHER INFORMATION.... FILE A:\ACCESSPM\CDNBOFCR

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) DROPPING A LANE TO THE OFF- AT OFF-RAMP

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	3903	1267	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	OFF	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

The diverge criteria are applied directly to
the OFF-RAMP flow rate as the checkpoint:

FLOW RATE = 1422 pcph
LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) NEW CROSSROAD		(N-S) I-270 EAST RAMPS
Analyst: MJH		File Name: CR270E15.HC9
Area Type: Other		7-22-92 2015 AM
Comment: 2015 AM PEAK HOUR		

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2						2					
Volumes	422						1037					
Lane Width	12.0						12.0					
RTOR Vols			0						0			

Signal Operations

Phase combination	1	2	3	4		5	6	7	8
EB Left	*				NB Left	*			
Thru					Thru				
Right					Right				
Peds					Peds				
WB Left					SB Left				
Thru					Thru				
Right					Right				
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	40A				Green	70A			
Yellow/A-R	5				Yellow/A-R	5			
Lost Time	3.0				Lost Time	3.0			

Cycle Length: 120 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	3279	1148	0.43	0.35	22.8	C	22.8	C
NB	L	3279	1967	0.62	0.60	12.0	B	12.0	B

Intersection Delay = 15.1 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) NEW CROSSROAD (N-S) I-270 EAST RAMPS
Analyst: MJH File Name: CR270E15.HC9
Area Type: Other 9-14-92 2015 PM
Comment: FILE A:\ACCESSPM\CR270E15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2						2					
Volumes	515						1267					
Lane Width	12.0						12.0					
RTOR Vols			0						0			

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left *			
Thru					Thru			
Right					Right			
Peds					Peds			
WB Left					SB Left			
Thru					Thru			
Right					Right			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	43P				Green 67P			
Yellow/A-R	5				Yellow/A-R 5			
Lost Time	3.0				Lost Time 3.0			

Cycle Length: 120 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	3279	1230	0.49	0.38	22.1	C	22.1	C
NB	L	3279	1885	0.78	0.57	16.6	C	16.6	C

Intersection Delay = 18.2 (sec/veh) Intersection LOS = C

FACILITY LOCATION.... C/D N/B ON RAMP @ NEW CROSSOVER
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN
DATE OF ANALYSIS..... 7-22-92
OTHER INFORMATION.... FILE A:\ACCESSPM\CDNBONCR

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) ADDITION OF LANE AT ON-RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	2636	515	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

The merge criteria are applied directly to
the ON-RAMP flow rate as the checkpoint:

FLOW RATE = 578 pcph
LOS = A

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... C/D N/B bet. CROSSROAD & SR 161
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN
DATE OF ANALYSIS..... 07-21-1992
OTHER INFORMATION.... FILE A:\ACCESSPM\CDNBCR61

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 3151
V/C RATIO..... .59
LEVEL OF SERVICE.... C
SPEED (mph)..... 48
DENSITY (pcpmpl).... 24

FACILITY LOCATION.... I-270 N/B OFF RAMP @ MORSE
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN
DATE OF ANALYSIS..... 10-19-92
OTHER INFORMATION.... FILE A:\ACCESSPM\70NBOFMS

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) RIGHT-HAND RAMP.
(2) TWO LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	3706	1183	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	OFF	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 50 % OF FREEWAY TRUCKS

RESULTS USING FIGURE I.5- 12

ITEM	VPH	Phv	PCPH
V1	326	0.99	366
V(1+A)	642	0.99	721
Va	316	0.99	355
Vb	867	0.99	973
Vf	3706	0.99	4159

Vd1 = 721 pcph (LOS = B)
Vd2 = 973 pcph (LOS = B)

Vf(Before diverge) = 4159 pcph (LOS = C)

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 N/B OFF RAMP @ MORSE
TIME AND DATE..... 2015 PM DESIGN ; 10-19-92
OTHER INFORMATION.... FILE A:\ACCESSPM\70NBOFMS

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE ROAD (N-S) I-270 EAST RAMPS
Analyst: 92H File Name: MO270E15.HC9
Area Type: Other 7-21-92 2015 AM
Comment: FILE A:\ACCESSAM\MO270E15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	2			3		1	> 1	1			
Volumes	366	1345			1527		715	1	254			
Lane Width	12.0	12.0			12.0		12.0	12.0	12.0			
RTOR Vols			0			0			0			

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left *			
Thru	*	*			Thru *			
Right		*			Right *			
Peds					Peds			
WB Left					SB Left			
Thru		*			Thru			
Right					Right			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	21A	48A			Green 36A			
Yellow/A-R	5	5			Yellow/A-R 5			
Lost Time	3.0	3.0			Lost Time 3.0			

Cycle Length: 120 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	3279	628	0.68	0.19	36.3	D	15.5	C
	T	3564	2257	0.70	0.63	9.9	B		
WB	T	5346	2228	0.84	0.42	22.1	C	22.1	C
NB	L	1515	480	0.83	0.32	36.8	D	31.3	D
	LT	1515	480	0.83	0.32	31.4	D		
	R	1515	480	0.59	0.32	23.4	C		

Intersection Delay = 21.4 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE ROAD (N-S) I-270 EAST RAMPS
Analyst: MJH File Name: MO270E15.HC9
Area Type: Other 9-14-92 2015 PM
Comment: FILE A:\ACCESSPM\MO270E15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	2			3		1	> 1	1			
Volumes	448	1644			1249		873	1	310			
Lane Width	12.0	12.0			12.0		12.0	12.0	12.0			
RTOR Vols			0			0			0			

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left *			
Thru	*	*			Thru *			
Right		*			Right *			
Peds					Peds			
WB Left					SB Left			
Thru		*			Thru			
Right					Right			
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	27A	34A			Green 44A			
Yellow/A-R	5	5			Yellow/A-R 5			
Lost Time	3.0	3.0			Lost Time 3.0			

Cycle Length: 120 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	3279	792	0.66	0.24	32.6	D	24.6	C
	T	3564	2020	0.95	0.57	22.4	C		
WB	T	5346	1604	0.95	0.30	34.7	D	34.7	D
NB	L	1515	581	0.84	0.38	32.6	D	27.6	D
	LT	1515	581	0.84	0.38	27.9	D		
	R	1515	581	0.59	0.38	20.1	C		

Intersection Delay = 28.2 (sec/veh) Intersection LOS = D

FACILITY LOCATION.... I-270 N/B ON RAMP @ MORSE
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN
DATE OF ANALYSIS..... 10-19-92
OTHER INFORMATION.... FILE A:\ACCESSPM\70NBONMS

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) RIGHT-HAND RAMP.
(2) TWO LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	2523	902	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 50 % OF FREEWAY TRUCKS

RESULTS USING FIGURE I.5- 11

WARNING! IN USING THIS NOMOGRAPH:
Normal range for Vr is 1100 to 3000 vph

ITEM	VPH	Fhv	PCPH
V1	275	0.89	325
V(1+A)	1038	0.97	1189
Va	763	0.99	856
Vb	139	0.99	156
Vf	2523	0.99	2832

Vm1 = 1181 pcph (LOS = C)
Vm2 = 1345 pcph (LOS = C)

Vf(After merge) = 3844 pcph (LOS = C)

FIRST RAMP RESULTS USING APPROXIMATION METHOD (NOTE 3)

SECOND RAMP RESULTS USING APPROXIMATION METHOD (NOTE 3)

ITEM	VPH	Fhv	PCPH
V1	151	0.89	189
V(1+A)	602	0.96	697
Va	451	0.99	506
Vb	451	0.99	506
Vf	2523	0.99	2832

Vm1 = 695 pcph (LOS = B)
Vm2 = 1203 pcph (LOS = C)

Vf(After merge) = 3844 pcph (LOS = C)

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 N/B ON RAMP @ MORSE
TIME AND DATE..... 2015 PM DESIGN ; 10-19-92
OTHER INFORMATION.... FILE A:\ACCESSPM\70NBONMS

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... -270 N/B bet. MORSE & SR 161
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN
DATE OF ANALYSIS..... 7-21-92
OTHER INFORMATION.... FILE A:\ACCESSPM\70NBMS61

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 3425
V/C RATIO..... .64
LEVEL OF SERVICE.... C
SPEED (mph)..... 48
DENSITY (pcpmpl).... 26

FACILITY LOCATION.... DIVERGE N/B C/D ROAD & SR 161 RAMPS
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN HOUR
DATE OF ANALYSIS..... 09-17-92
OTHER INFORMATION.... FILE A:\1LOOP\NBDIVRG1

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) DROPPING A LANE TO THE OFF- AT OFF-RAMP

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	3151	515	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	OFF	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

The diverge criteria are applied directly to
the OFF-RAMP flow rate as the checkpoint:

FLOW RATE = 578 pcph
LOS = A

FACILITY LOCATION.... N/B C/D RAMP DIVERGE TO E/B & W/B
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 09-17-1992
OTHER INFORMATION.... FILE A:\1LOOP\NBDIVRG3

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) LEFT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	2636	916	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	OFF	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

LEFT-HAND RAMP ADJUSTMENT FACTOR: 1.1

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 51 % OF FREEWAY TRUCKS

RAMP ANALYZED ALONE USING FIGURE I.5- 2

	V1	Vr	Vf
	****	****	*****
VPH	1706	916	2636
ET	1.7	1.7	1.7
Fhv	0.99	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1915	1028	2958

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2958	D
DIVERGE:	1915	E

IDENTIFYING INFORMATION

FACILITY LOCATION.... N/B C/D RAMP DIVERGE TO E/B & W/B
TIME AND DATE..... 2015 PM PEAK ; 09-17-1992
OTHER INFORMATION.... FILE A:\1LOOP\NBDIVRG3

FACILITY LOCATION.... I-270 N/B C/D TO SR 161 E/B C/D
ANALYST.............. LYDEN
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 09-30-1992
OTHER INFORMATION.... FILE A:\1LOOP\EBMERGE3

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) ADDITION OF LANE AT ON-RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	2636	860	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

The merge criteria are applied directly to
the ON-RAMP flow rate as the checkpoint:

FLOW RATE = 965 pcph
LOS = B

FACILITY LOCATION.... I-270 S/B RAMP TO SR 161 E/B C/D
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 09-30-1992
OTHER INFORMATION.... FILE A:\1LOOP\EBMERGE4

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) ADDITION OF LANE AT ON-RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	1757	813	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

The merge criteria are applied directly to
the ON-RAMP flow rate as the checkpoint:

FLOW RATE = 912 pcph
LOS = B

FACILITY SECTION..... E/B SR 161 BETWEEN I-270 & SUNBURY
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN HOUR
DATE OF ANALYSIS..... 9-21-92
OTHER INFORMATION.... FILE A:\1LOOP\EB270SUN

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES..... 0
PERCENTAGE OF RECREATIONAL VEHICLES... 0
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS ON BOTH SIDES
DISTANCE FROM ROADWAY EDGE (FT)..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	E T	E B	E R	f HV	f w	f p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) INPUT VOLUMES

VOL	(vph)	(pcph)	DESCRIPTION
V 1	1,436	1,617	is the nonweaving vehicles on the freeway
V 2	189	212	is the down weaving vehicles
V 3	940	1,059	is the up weaving vehicles
V 4	780	878	is the ramp-to-ramp nonweaving vehicles

D) ANALYSIS RESULTS

WEAVE TYPE..... C
NO. OF LANES..... 4
LENGTH OF SECTION..... 1950
NO. OF MAINLINE LANES..... 3
(Upstream of Weave Section)

	LOS	SPEED
WEAVING VEHICLES	D	41 mph
NONWEAVING VEHICLES	E	39 mph

OPERATION OF WEAVING AREA IS UNCONSTRAINED

	ANALYZED	MAXIMUM
WEAVING VOLUME (VW)..	1,272	3,000
VOLUME RATIO (VR)....	0.34	0.50
WEAVING RATIO (R)....	0.17	0.40
WEAVING LENGTH (L)...	1,950	2,500

FACILITY LOCATION.... E/B OFF RAMP FROM SR 161 TO SUNBURY
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\EBOF61SY

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	218	1949	145	928
% TRUCKS	2	2	2	2
RAMP TYPE	OFF	N.A.	OFF	ON
DISTANCE	2275	N.A.	N.A.	1350

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 66 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH UPSTREAM RAMP USING FIGURE I.5- 2

	V1	Vr	Vf
	****	****	*****
VPH	838	145	1731
ET	1.7	1.7	1.7
Fhv	0.98	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	950	163	1943

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	1943	B
DIVERGE:	950	B

IDENTIFYING INFORMATION

FACILITY LOCATION.... E/B OFF RAMP FROM SR 161 TO SUNBURY
TIME AND DATE..... 2015 PM PEAK ; 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\EBOF61SY

C) RAMP ANALYSIS RESULTS (CONTINUED)

RAMP ANALYZED WITH DOWNSTREAM RAMP USING FIGURE I.5- 2

	V1	Vr	Vf
	****	****	*****
VPH	838	145	1731
ET	1.7	1.7	1.7
Fhv	0.98	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	950	163	1943

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	1943	B
DIVERGE:	950	B

IDENTIFYING INFORMATION

FACILITY LOCATION.... E/B OFF RAMP FROM SR 161 TO SUNBURY
TIME AND DATE..... 2015 PM PEAK ; 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\EBOF61SY

C) RAMP ANALYSIS RESULTS (CONTINUED)

RAMP ANALYZED ALONE USING FIGURE I.5- 2

	Vi	Vr	Vf
	****	****	*****
VPH	838	145	1731
ET	1.7	1.7	1.7
Fhv	0.98	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	950	163	1943

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	1943	B
DIVERGE:	950	B

IDENTIFYING INFORMATION

FACILITY LOCATION.... E/B OFF RAMP FROM SR 161 TO SUNBURY
TIME AND DATE..... 2015 PM PEAK ; 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\EBOF61SY

FACILITY LOCATION.... SR 161 E/B C/D RAMP TO SUNBURY ROAD
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 09-30-1992
OTHER INFORMATION.... FILE A:\1LOOP\61EBCDSY

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 4 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) DROPPING A LANE TO THE OFF- AT OFF-RAMP

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	3345	969	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	OFF	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

The diverge criteria are applied directly to
the OFF-RAMP flow rate as the checkpoint:

FLOW RATE = 1088 pcph
LOS = C

FACILITY LOCATION.... E/B ON RAMP FROM SUNBURY TO SR 161
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\EBONSY61

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	145	1731	928	2376
% TRUCKS	2	2	2	2
RAMP TYPE	OFF	N.A.	ON	ON
DISTANCE	1350	N.A.	N.A.	1200

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 68 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH UPSTREAM RAMP USING FIGURE I.5- 1

	V1	Vr	Vf
	****	****	*****
VPH	576	928	1586
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	660	1042	1780

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2822	D
MERGE:	1702	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... E/B ON RAMP FROM SUNBURY TO SR 161
TIME AND DATE..... 2015 PM PEAK ; 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\EBONSY61

C) RAMP ANALYSIS RESULTS (CONTINUED)

RAMP ANALYZED WITH DOWNSTREAM RAMP USING FIGURE I.5- 1

	V1	Vr	Vf
	****	****	*****
VPH	576	928	1586
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	660	1042	1780

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2822	D
MERGE:	1702	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... E/B ON RAMP FROM SUNBURY TO SR 161
TIME AND DATE..... 2015 PM PEAK ; 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\EBONSY61

C) RAMP ANALYSIS RESULTS (CONTINUED)

RAMP ANALYZED ALONE USING FIGURE I.5- 1

	V1	Vr	Vf
	****	****	*****
VPH	576	928	1586
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	660	1042	1780

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2822	D
MERGE:	1702	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... E/B ON RAMP FROM SUNBURY TO SR 161
TIME AND DATE..... 2015 PM PEAK ; 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\EBONSY61

FACILITY SECTION..... SR 161 E/B bet. SUNBURY & LITTLE TURTLE
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\TDEBSYLT

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	2	(TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES.....	0	
PERCENTAGE OF RECREATIONAL VEHICLES...	0	
PEAK HOUR FACTOR.....	.9	
DRIVER POPULATION FACTOR.....	1	(WEEKDAY/COMMUTER)
LANE WIDTH (FT).....	12	
OBSTRUCTIONS ON BOTH SIDES		
DISTANCE FROM ROADWAY EDGE (FT).....	6	

B) CORRECTION FACTORS

TERRAIN TYPE	E T	E B	E R	f HV	f w	f p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) INPUT VOLUMES

VOL	(vph)	(pcph)	DESCRIPTION
V 1	2,084	2,347	is the nonweaving vehicles on the freeway
V 2	430	484	is the down weaving vehicles
V 3	1,782	2,007	is the up weaving vehicles
V 4	594	669	is the ramp-to-ramp nonweaving vehicles

D) ANALYSIS RESULTS

WEAVE TYPE..... C
NO. OF LANES..... 5
LENGTH OF SECTION..... 2340
NO. OF MAINLINE LANES..... 3
(Upstream of Weave Section)

	LOS	SPEED
WEAVING VEHICLES	E	39 mph
NONWEAVING VEHICLES	E	36 mph

OPERATION OF WEAVING AREA IS UNCONSTRAINED

	ANALYZED	MAXIMUM
WEAVING VOLUME (VW)..	2,492	3,000
VOLUME RATIO (VR)....	0.45	0.50
WEAVING RATIO (R)....	0.19	0.40
WEAVING LENGTH (L)...	2,340	2,500

FACILITY SECTION..... SR 161 W/B bet. SUNBURY & LITTLE TURTLE
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 12-15-92
OTHER INFORMATION.... FILE A:\1LOOP\ODOTCOMP

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES..... 0
PERCENTAGE OF RECREATIONAL VEHICLES... 0
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS ON BOTH SIDES
DISTANCE FROM ROADWAY EDGE (FT)..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	E T	E B	E R	f HV	f w	f p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) INPUT VOLUMES

VOL	(vph)	(pcph)	DESCRIPTION
V 1	2,150	2,422	is the nonweaving vehicles on the freeway
V 2	1,755	1,977	is the down weaving vehicles
V 3	420	473	is the up weaving vehicles
V 4	580	653	is the ramp-to-ramp nonweaving vehicles

D) ANALYSIS RESULTS

WEAVE TYPE..... C
NO. OF LANES..... 5
LENGTH OF SECTION..... 2660
NO. OF MAINLINE LANES..... 3
(Upstream of Weave Section)

	LOS	SPEED
WEAVING VEHICLES	D	40 mph
NONWEAVING VEHICLES	E	37 mph

OPERATION OF WEAVING AREA IS UNCONSTRAINED

	ANALYZED	MAXIMUM	
WEAVING VOLUME (VW)..	2,450	3,000	
VOLUME RATIO (VR)....	0.44	0.50	
WEAVING RATIO (R)....	0.19	0.40	
WEAVING LENGTH (L)...	2,660	2,500	*** EXCEEDS MAX

****

FACILITY LOCATION.... W/B OFF RAMP FROM SR 161 TO SUNBURY
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 10-27-92
OTHER INFORMATION.... FILE A:\1LOOP\WBOF61SY

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
****
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP ********	FREEWAY *******	ANALYSIS RAMP ********	DOWNSTREAM RAMP **********
VOLUME	2335	4905	759	156
% TRUCKS	2	2	2	2
RAMP TYPE	OFF	N.A.	OFF	ON
DISTANCE	850	N.A.	N.A.	1325

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 68 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH UPSTREAM RAMP USING FIGURE I.5- 2

	V1	Vr	Vf
	****	****	*****
VPH	1446	759	2570
ET	1.7	1.7	1.7
Fhv	0.99	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1623	852	2884

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2884	D
DIVERGE:	1623	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... W/B OFF RAMP FROM SR 161 TO SUNBURY
TIME AND DATE..... 2015 AM PEAK ; 10-27-92
OTHER INFORMATION.... FILE A:\1LOOP\WBOF61SY

C) RAMP ANALYSIS RESULTS (CONTINUED)

RAMP ANALYZED WITH DOWNSTREAM RAMP USING FIGURE I.5- 2

	V1	Vr	Vf
	****	****	*****
VPH	1446	759	2570
ET	1.7	1.7	1.7
Fhv	0.99	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1623	852	2884

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2884	D
DIVERGE:	1623	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... W/B OFF RAMP FROM SR 161 TO SUNBURY
TIME AND DATE..... 2015 AM PEAK ; 10-27-92
OTHER INFORMATION.... FILE A:\1LOOP\WBOF61SY

C) RAMP ANALYSIS RESULTS (CONTINUED)

RAMP ANALYZED ALONE USING FIGURE I.5- 2

	V1	Vr	Vf
	****	****	*****
VPH	1446	759	2570
ET	1.7	1.7	1.7
Fhv	0.99	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1623	852	2884

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2884	D
DIVERGE:	1623	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... W/B OFF RAMP FROM SR 161 TO SUNBURY
TIME AND DATE..... 2015 AM PEAK ; 10-27-92
OTHER INFORMATION.... FILE A:\1LOOP\WBOF61SY

FACILITY LOCATION.... SR 161 W/B C/D RAMP FROM SUNBURY ROAD
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 12-15-92
OTHER INFORMATION.... FILE A:\1LOOP\61WBCDSY

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	2335	1042	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 51 % OF FREEWAY TRUCKS

RAMP ANALYZED ALONE USING FIGURE I.5- 6

WARINING! IN USING THIS NOMOGRAPH:
Normal range for Vf is 2400 to 6200 vph

	V1	Vr	Vf
	****	****	*****
VPH	449	1042	2335
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	514	1169	2621

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	3790	C
MERGE:	1683	D

RAMP ANALYZED ALONE USING APPROXIMATION METHOD

	V1	Vr	Vf
	****	****	*****
VPH	140	1042	2335
ET	1.7	1.7	1.7
Fhv	0.89	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	175	1169	2621

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	3790	C
MERGE:	1344	C

IDENTIFYING INFORMATION

FACILITY LOCATION.... SR 161 W/B C/D RAMP FROM SUNBURY ROAD
TIME AND DATE..... 2015 AM PEAK ; 12-15-92
OTHER INFORMATION.... FILE A:\1LOOP\61WBCDSY

FACILITY LOCATION.... W/B ON RAMP FROM SUNBURY TO SR 161
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 9-12-92
OTHER INFORMATION.... FILE A:\1LOOP\WBONSY61

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	1811	156	749
% TRUCKS	N.A.	2	2	2
RAMP TYPE	N.A.	N.A.	ON	ON
DISTANCE	N.A.	N.A.	N.A.	3625

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 66 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH DOWNSTREAM RAMP USING FIGURE I.5- 1

	V1	Vr	Vf
	****	****	*****
VPH	743	156	1811
ET	1.7	1.7	1.7
Fhv	0.98	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	842	175	2033

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2208	C
MERGE:	1017	C

IDENTIFYING INFORMATION

FACILITY LOCATION.... W/B ON RAMP FROM SUNBURY TO SR 161
TIME AND DATE..... 2015 AM PEAK ; 9-12-92
OTHER INFORMATION.... FILE A:\1LOOP\WBONSY61

FACILITY SECTION..... W/B SR 161 BETWEEN SUNBURY & I-270
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN HOUR
DATE OF ANALYSIS..... 9-21-92
OTHER INFORMATION.... FILE A:\1LOOP\WBSUN270

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES..... 0
PERCENTAGE OF RECREATIONAL VEHICLES... 0
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS ON BOTH SIDES
DISTANCE FROM ROADWAY EDGE (FT)..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	E T	E B	E R	f HV	f w	f p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) INPUT VOLUMES

VOL	(vph)	(pcph)	DESCRIPTION
V 1	204	229	is the nonweaving vehicles on the freeway
V 2	838	944	is the down weaving vehicles
V 3	1,418	1,597	is the up weaving vehicles
V 4	917	1,033	is the ramp-to-ramp nonweaving vehicles

D) ANALYSIS RESULTS

WEAVE TYPE..... B
NO. OF LANES..... 3
LENGTH OF SECTION..... 3050
NO. OF MAINLINE LANES..... 2
(Upstream of Weave Section)

	LOS	SPEED
WEAVING VEHICLES	D	42 mph
NONWEAVING VEHICLES	D	44 mph

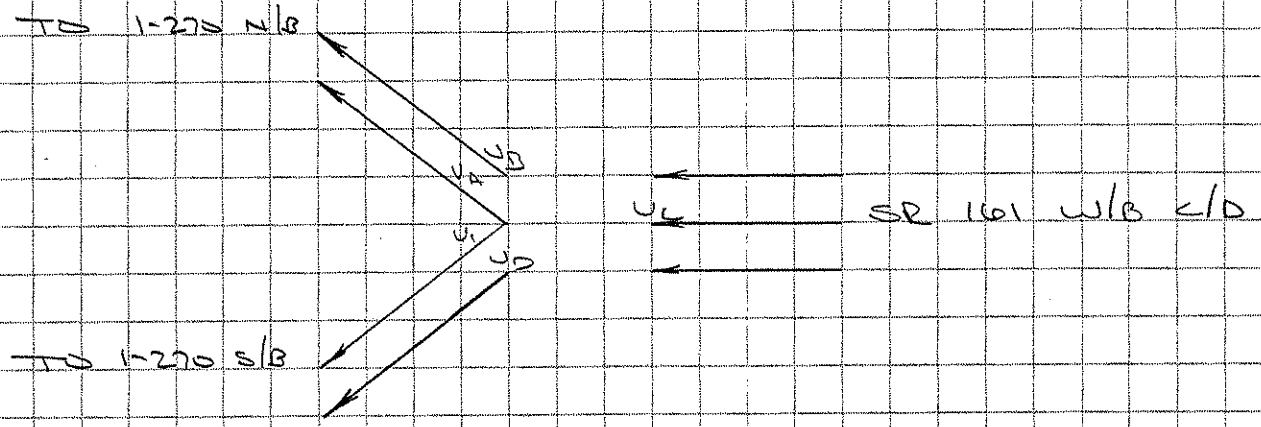
OPERATION OF WEAVING AREA IS UNCONSTRAINED

	ANALYZED	MAXIMUM	
WEAVING VOLUME (VW)..	2,541	3,000	
VOLUME RATIO (VR)....	0.67	0.80	
WEAVING RATIO (R)....	0.37	0.50	
WEAVING LENGTH (L)...	3,050	2,500	*** EXCEEDS MAX

ms consultants, inc.
engineers, architects, planners

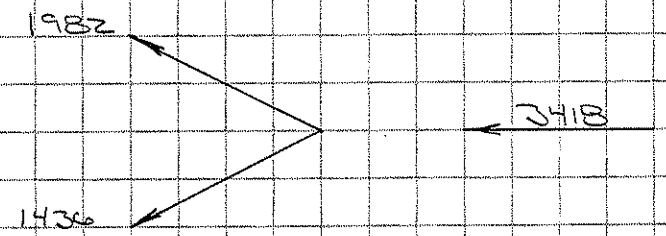
job no 10-059.210 sheet 1 / ~
made by TML date 10-1-92
checked _____ date _____
office _____
project SR 161

SR 161 WB C/D TO NB & SB I-270



USE FIG 1.5-13 FROM HCM

P.M. PEAK HOUR (CRITICAL)



$V_F = 3318$

$V_R = 1982$

$V_C = 64 + .235 V_F + .141 V_R$

$= 1318$

$V_A = 173 + .295 V_F - .320 V_R$

$= 518$

ms consultants, inc.
engineers, architects, planners

job no _____ sheet 2 / 2
made by _____ date _____
checked _____ date _____
office _____
project _____

$V_A = V_C - V_1 = 1318 - 518 = 800$

$V_B = V_2 - V_A = 1982 - 800 = 1182$

$V_{D1} = V_C = 1318$
$V_{D2} = V_B = 1182$

FLOW RATES

TRUCKS ON FREEWAY = 3318 x .02 = 66
TRUCKS ON RAMP = 1982 x .02 = 40
TRUCKS AFTER DIVERGE = 66 - 40 = 26
TRUCKS IN LANE 1 AFTER DIVERGE
26 x .50 = 13
(FIG. 5-6)
TRUCKS IN LANE A = 800 x .02 = 16
PROP TRUCKS IN V_C = 13 + 16 / 1318 = .02

		PROP TRUCK	E_T	F_{HV}	PHF	FLOW RATE
V_C	1318	.02	1.7	.99	.90	1479
V_B	1182	.02	1.7	.99	.90	1327
V_F	3318	.02	1.7	.99	.90	3724

V_{C1} = 1479 LOS C
V_B = 1327 LOS C
V_F = 3724 LOS C

$V_D = 1436 - (1318 - 800) = 918 \div .9 \div .99 = 1030 \Rightarrow$ LOS C

FACILITY LOCATION.... MERGE N/B I-270 & N/B I-270 C/D ROAD
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN HOUR
DATE OF ANALYSIS..... 09-17-92
OTHER INFORMATION.... FILE A:\LOOP1\NBMERGE1

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	3425	733	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 49 % OF FREEWAY TRUCKS

RAMP ANALYZED ALONE USING FIGURE I.5- 6

	V1	Vr	Vf
	****	****	*****
VPH	715	733	3425
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	819	823	3844

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	4667	D
MERGE:	1642	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... MERGE N/B I-270 & N/B I-270 C/D ROAD
TIME AND DATE..... 2015 PM DESIGN HOUR ; 09-17-92
OTHER INFORMATION.... FILE A:\LOOP1\NBMERGE1

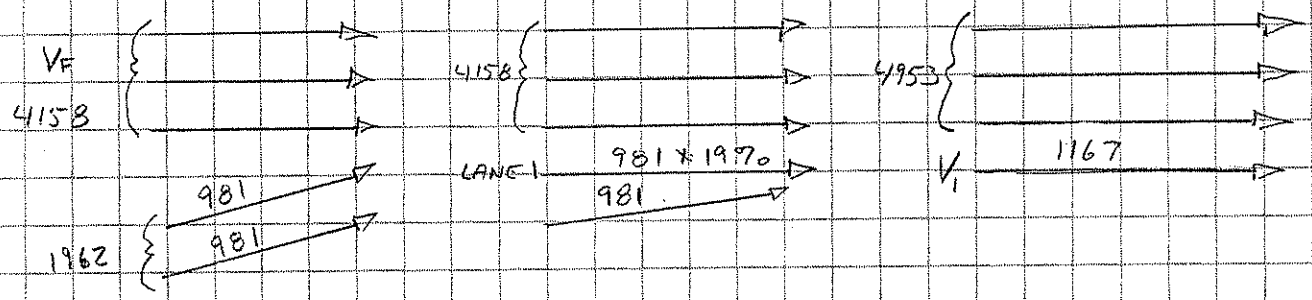
ms consultants, inc.
engineers, architects, planners

2015 PM PEAK

I-270 N/B ON-RAMP

job no 10.059.210 sheet 1 of 1
made by MJH date 8/26/92
checked _____ date _____
office Columbus
project I-270 @ SR 161

MAJOR JUNCTION



USING APPROXIMATION METHOD:

Volume in Lane 1 after 2000' = 981 (0.19) = 186

V_1 = 981 + 186 + 1167 ÷ 0.9 ÷ 0.99 = 1310 ⇒ LOS C

V_F = 4953 ÷ .9 ÷ .99 = 5559 ⇒ LOS E

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 N/B bet. SR 161 & SR 3
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN
DATE OF ANALYSIS..... 07-21-1992
OTHER INFORMATION.... FILE A:\ACCESSPM\70NB1613

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	2	(TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES	0	
PERCENTAGE OF RECREATIONAL VEHICLES..	0	
DESIGN SPEED (MPH).....	60	
PEAK HOUR FACTOR.....	.9	
DRIVER POPULATION FACTOR.....	1	(WEEKDAY/COMMUTER)
LANE WIDTH (FT).....	12	
OBSTRUCTIONS.....	NO SIDES	
DISTANCE (FT) FROM ROADWAY EDGE.....	6	

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 4
INPUT VOLUME..... 6140
V/C RATIO..... .86
LEVEL OF SERVICE.... E
SPEED (mph)..... 41
DENSITY (pcpmpl).... 43 42=D

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 S/B bet. SR 161 & SR 3
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 DESIGN
DATE OF ANALYSIS..... 7-21-92
OTHER INFORMATION.... FILE A:\ACCESSAM\70SB1613

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 4
INPUT VOLUME..... 6127
V/C RATIO..... .86
LEVEL OF SERVICE.... E
SPEED (mph)..... 41
DENSITY (pcpmpl).... 43 42-5

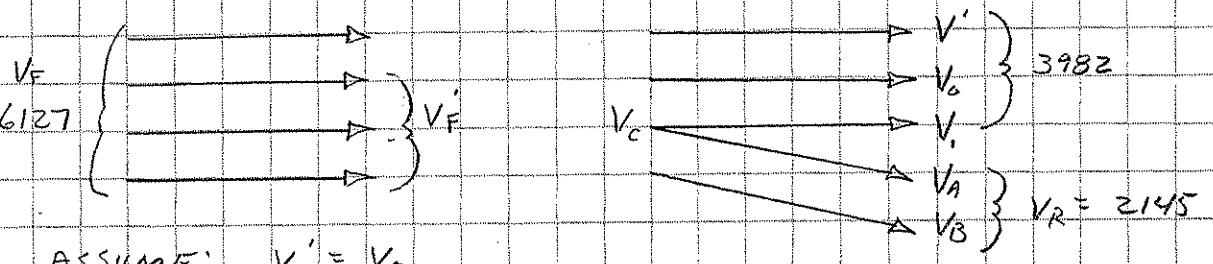
ms consultants, inc.
engineers, architects, planners

2015 AM PEAK

I-270 S/B DIVERGE @ SR 161

job no 10-059.210 sheet 1 of 1
made by MJH date 8/25/92
checked _____ date _____
office Columbus
project I-270 @ SR 161

MAJOR DIVERGE



ASSUME: $V' = V_o$

$V_F' = 6127 - V_o$

$2V_o + V_1 = 3982 \Rightarrow V_o = (3982 - V_1)/2$

$V_F' = 6127 - \left(\frac{3982 - V_1}{2}\right)$

$V_F' = 4136 + V_1/2$

From nomograph I.5-13:

$V_1 = 173 + 0.295 V_F' - 0.320 V_R$

$V_1 = 173 + 0.295(4136 + V_1/2) - 0.320(2145)$

$V_1 = 707 + 0.1475(V_1) \Rightarrow V_1 = 707/(1 - 0.1475) \Rightarrow V_1 = 829$

Therefore:

$V_o = (3982 - 829)/2 = \underline{1576}$

$V_F' = 6127 - 1576 = 4551$

From nomograph I.5-13

$V_C = 64 + 0.285 V_F' + 0.141 V_R$

$V_C = 64 + 0.285(4551) + 0.141(2145) = \underline{1663}$

Therefore:

$V_A = V_C - V_1 = 1663 - 829 = \underline{834}$

$V_B = V_R - V_A = 2145 - 834 = \underline{1311}$

LANE	VOLUME		PHF		HVF	PCE	LOS
V'	1577	÷	0.9	÷	0.99	1770	D
V_o	1576	÷	0.9	÷	0.99	1769	D
V_C	1663	÷	0.9	÷	0.99	1866	E
V_B	1311	÷	0.9	÷	0.99	1471	C

FACILITY LOCATION.... S/B SPLIT OF E/B AND W/B SR 161 RAMPS
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN HOUR
DATE OF ANALYSIS..... 10-1-92
OTHER INFORMATION.... FILE A:\1LOOP\SBDIVRG2

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	2145	593	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	OFF	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 65 % OF FREEWAY TRUCKS

RAMP ANALYZED ALONE USING FIGURE I.5- 2

	V1	Vr	Vf
	****	****	*****
VPH	1213	593	2145
ET	1.7	1.7	1.7
Fhv	0.99	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1361	666	2407

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2407	C
DIVERGE:	1361	C

IDENTIFYING INFORMATION

FACILITY LOCATION.... S/B SPLIT OF E/B AND W/B SR 161 RAMPS
TIME AND DATE..... 2015 AM DESIGN HOUR ; 10-1-92
OTHER INFORMATION.... FILE A:\1LOOP\SBDIVRG2

FACILITY LOCATION.... DIVERGE S/B I-270 & C/D ROAD
ANALYST..... MJH
TIME OF ANALYSIS..... 2015 AM DESIGN HOUR
DATE OF ANALYSIS..... 09-01-1992
OTHER INFORMATION.... FILE A:\1LOOP\SBDIVRG3

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	3982	1125	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	OFF	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 52 % OF FREEWAY TRUCKS

RAMP ANALYZED ALONE USING FIGURE I.5- 7

	V1	Vr	Vf
	****	****	*****
VPH	1548	1125	3982
ET	1.7	1.7	1.7
Fhv	0.98	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1755	1263	4469

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	4469	D
DIVERGE:	1755	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... DIVERGE S/B I-270 & C/D ROAD
TIME AND DATE..... 2015 AM DESIGN HOUR ; 09-01-1992
OTHER INFORMATION.... FILE A:\1LOOP\SBDIVRGS

****

FACILITY LOCATION.... N/B C/D TO W/B SR 161 ON RAMP
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\NBCDWB61

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
****
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
	********	*******	********	**********
VOLUME	156	1811	749	593
% TRUCKS	2	2	2	2
RAMP TYPE	ON	N.A.	ON	ON
DISTANCE	3625	N.A.	N.A.	575

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 65 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH UPSTREAM RAMP USING FIGURE I.5- 5

WARINING! IN USING THIS NOMOGRAPH:
Normal range for Du is 400 to 2000 ft

	V1	Vr	Vf
	****	****	*****
VPH	756	749	1967
ET	1.7	1.7	1.7
Fhv	0.98	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	857	841	2208

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	3049	D
MERGE:	1698	D

RAMP ANALYZED WITH UPSTREAM RAMP USING APPROXIMATION METHOD

	V1	Vr	Vf
	****	****	*****
VPH	469	749	1967
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	537	841	2208

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	3049	D
MERGE:	1378	C

IDENTIFYING INFORMATION

FACILITY LOCATION.... N/B C/D TO W/B SR 161 ON RAMP
TIME AND DATE..... 2015 AM PEAK ; 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\NBCDWB61

C) RAMP ANALYSIS RESULTS (CONTINUED)

RAMP ANALYZED WITH DOWNSTREAM RAMP USING FIGURE I.5- 1

	V1	Vr	Vf
	****	****	*****
VPH	728	749	1967
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	834	841	2208

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	3049	D
MERGE:	1675	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... N/B C/D TO W/B SR 161 ON RAMP
TIME AND DATE..... 2015 AM PEAK ; 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\NBCDW361

C) RAMP ANALYSIS RESULTS (CONTINUED)

RAMP ANALYZED ALONE USING FIGURE I.5- 1

	V1	Vr	Vf
	****	****	*****
VPH	728	749	1967
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	834	841	2208

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	3049	D
MERGE:	1675	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... N/B C/D TO W/B SR 161 ON RAMP
TIME AND DATE..... 2015 AM PEAK ; 09-25-1992
OTHER INFORMATION.... FILE A:\1LOOP\NBCDWB61

FACILITY LOCATION.... I-270 S/B C/D RAMP TO W/B SR 161
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 10-01-1992
OTHER INFORMATION.... FILE A:\1LOOP\161WBADD

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) ADDITION OF LANE AT ON-RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	2145	593	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

The merge criteria are applied directly to
the ON-RAMP flow rate as the checkpoint:

FLOW RATE = 666 pcph
LOS = B

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) SR 161 (N-S) STRAWBERRY/BUENOS AI
Analyst: LYDEN File Name: 161STRAW.HC9
Area Type: Other 9-19-92 2015 AM
Comment: FILE A:\2015AM\161STRAW

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	<	1	3	1	1	1	1	1	1	<
Volumes	54	1821	46	188	2718	403	77	11	135	292	14	10
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4		5	6	7	8
EB Left	*		*		NB Left		*		
Thru			*		Thru		*		
Right			*		Right		*		
Peds					Peds				
WB Left	*	*	*		SB Left	*	*		
Thru		*	*		Thru	*	*		
Right		*	*		Right	*	*		
Peds					Peds				
NB Right	*	*			EB Right				
SB Right					WB Right	*			
Green	5A	13A	50A		Green	19A	8A		
Yellow/A-R	5	5	5		Yellow/A-R	5	5		
Lost Time	3.0	3.0	3.0		Lost Time	3.0	3.0		

Cycle Length: 120 secs Phase combination order: #1 #2 #3 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	99	0.37	0.49	15.6	C	31.6	D
	TR	5330	2310	0.99	0.43	32.0	D		
WB	L	1693	310	0.56	0.64	10.9	B	38.6	D
	T	5346	3118	1.07	0.58	45.1	E		
	R	1515	1149	0.39	0.76	3.3	A		
NB	L	1782	148	0.58	0.08	44.2	E	30.1	D
	T	1782	148	0.08	0.08	32.8	D		
	R	1515	442	0.34	0.29	21.7	C		
SB	L	1693	296	0.80	0.28	40.3	E	38.8	D
	TR	1672	474	0.06	0.28	20.2	C		

Intersection Delay = 35.9 (sec/veh) Intersection LOS = D

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) SR 161 (N-S) STRAWBERRY/BUENOS
Analyst: LYDEN File Name: 161STRAW.HC9
Area Type: Other 9-24-92 2015 PM
Comment: FILE A:\2015AM\161STRAW

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	3	<	1	3	1	1	1	1	1	1	<
Volumes	65	2159	37	113	1645	244	94	14	160	347	11	8
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*		*		NB Left	*		
Thru			*		Thru	*		
Right			*		Right	*		
Peds					Peds			
WB Left	*	*	*		SB Left	*	*	
Thru		*	*		Thru	*	*	
Right		*	*		Right	*	*	
Peds					Peds			
NB Right	*	*			EB Right			
SB Right					WB Right	*		
Green	5A	2A	55A		Green	24A	9A	
Yellow/A-R	5	5	5		Yellow/A-R	5	5	
Lost Time	3.0	3.0	3.0		Lost Time	3.0	3.0	

Cycle Length: 120 secs Phase combination order: #1 #2 #3 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	99	0.46	0.53	15.4	C	47.4	E
	TR	5330	2532	1.06	0.47	48.2	E		
WB	L	1693	155	0.59	0.59	15.7	C	12.9	B
	T	5346	2851	0.71	0.53	14.0	B		
	R	1515	1136	0.24	0.75	3.0	A		
NB	L	1782	163	0.64	0.09	45.4	E	34.9	D
	T	1782	163	0.10	0.09	32.3	D		
	R	1515	316	0.56	0.21	29.0	D		
SB	L	1693	367	0.80	0.33	35.9	D	34.9	D
	TR	1667	556	0.04	0.33	17.4	C		

Intersection Delay = 31.7 (sec/veh) Intersection LOS = D

FACILITY LOCATION.... DIVERGE E/B SR 161 TO S/B I-270 C/D
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM PEAK
DATE OF ANALYSIS..... 10-01-1992
OTHER INFORMATION.... FILE A:\1LOOP\61EBDROP

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) DROPPING A LANE TO THE OFF- AT OFF-RAMP

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	2248	876	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	OFF	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

The diverge criteria are applied directly to
the OFF-RAMP flow rate as the checkpoint:

FLOW RATE = 983 pcph
LOS = B

FACILITY LOCATION.... SR 161 E/B RAMP TO S/B I-270 C/D
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN HOUR
DATE OF ANALYSIS..... 10-8-92
OTHER INFORMATION.... FILE A:\1LOOP\SBMERGE1

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	1755	876	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

ASSUME 1755 OCCUPY THE FAR RIGHT 2 LANES BECAUSE THE S/B C/D TRAFFIC HAS NOT HAD TIME TO INTER-MIX IN THE 3 LANE SECTION.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 66 % OF FREEWAY TRUCKS

RAMP ANALYZED ALONE USING FIGURE I.5- 1

	V1	Vr	Vf
	****	****	*****
VPH	641	876	1755
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	734	983	1970

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2953	D
MERGE:	1717	D

IDENTIFYING INFORMATION

FACILITY LOCATION.... SR 161 E/B RAMP TO S/B I-270 C/D
TIME AND DATE..... 2015 AM DESIGN HOUR ; 10-8-92
OTHER INFORMATION.... FILE A:\1LOOP\SBMERGE1

FACILITY LOCATION.... SR 161 W/B TO I-270 S/B RAMP
ANALYST..... TML
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 09-18-1992
OTHER INFORMATION.... FILE A:\1LOOP\SBMERGE2

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) ADDITION OF LANE AT ON-RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	3377	878	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

The merge criteria are applied directly to
the ON-RAMP flow rate as the checkpoint:

FLOW RATE = 985 pcph
LOS = B

FACILITY LOCATION.... I-270 S/B RAMP TO S/B I-270 C/D
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 10-7-92
OTHER INFORMATION.... FILE A:\1LOOP\270SBADD

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) ADDITION OF LANE AT ON-RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	3982	1125	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

The merge criteria are applied directly to
the ON-RAMP flow rate as the checkpoint:

FLOW RATE = 1263 pcph
LOS = C

FACILITY LOCATION.... DIVERGE E/B SR 161 LOOP RAMP
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN HOUR
DATE OF ANALYSIS..... 9-25-92
OTHER INFORMATION.... FILE A:\1LOOP\EBDIVRG2

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	717	2666	218	N.A.
% TRUCKS	2	2	2	N.A.
RAMP TYPE	OFF	N.A.	OFF	N.A.
DISTANCE	1550	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 66 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH UPSTREAM RAMP USING FIGURE I.5- 2

	V1	Vr	Vf
	****	****	*****
VPH	951	218	1949
ET	1.7	1.7	1.7
Fhv	0.98	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1078	245	2187

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	2187	C
DIVERGE:	1078	C

IDENTIFYING INFORMATION

FACILITY LOCATION.... DIVERGE E/B SR 161 LOOP RAMP
TIME AND DATE..... 2015 PM DESIGN HOUR ; 9-25-92
OTHER INFORMATION.... FILE A:\1LOOP\EBDIVRG2

FACILITY LOCATION.... MERGE N/B I-270 & E/B TO N/B LOOP RAMP
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN HOUR
DATE OF ANALYSIS..... 10-8-92
OTHER INFORMATION.... FILE A:\1LOOP\NBMERGE2

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)
ONLY 1 LANE ON N/B JD AT THIS POINT. VOLUME = 515. USE 2 LANE FREEWAY WITH 1245 VEHICLES THIS RESULTS IN v_1 = 515

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.
(3) LOOP RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	1245	218	0
% TRUCKS	N.A.	2	2	2
RAMP TYPE	N.A.	N.A.	ON	OFF
DISTANCE	N.A.	N.A.	N.A.	6000

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 72 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH DOWNSTREAM RAMP USING FIGURE I.5- 4

	V1	Vr	Vf
	****	****	*****
VPH	515	218	1245
ET	1.7	1.7	1.7
Fhv	0.98	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	584	245	1397

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	1642	B
MERGE:	829	B

IDENTIFYING INFORMATION

FACILITY LOCATION.... MERGE N/B I-270 & E/B TO N/B LOOP RAMP
TIME AND DATE..... 2015 PM DESIGN HOUR ; 10-8-92
OTHER INFORMATION.... FILE A:\1LOOP\NBMERGE2

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... C/D S/B bet. CROSSROAD & SR 161
ANALYST.............. LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN
DATE OF ANALYSIS..... 10-7-92
OTHER INFORMATION.... FILE A:\ACCESSAM\CDSBCR61

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 3756
V/C RATIO..... .71
LEVEL OF SERVICE.... D
SPEED (mph)..... 46
DENSITY (pcpmpl).... 31

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 S/B bet. MORSE & SR 161
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN
DATE OF ANALYSIS..... 10-7-92
OTHER INFORMATION.... FILE A:\ACCESSAM\70SBMS61

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 2857
V/C RATIO..... .54
LEVEL OF SERVICE.... C
SPEED (mph)..... 49
DENSITY (pcpmpl).... 21

FACILITY LOCATION.... I-270 S/B OFF RAMP @ MORSE
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN
DATE OF ANALYSIS..... 10-19-92
OTHER INFORMATION.... FILE A:\ACCESSAM\70SBOFMS

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) TWO LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	2857	890	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	OFF	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 49 % OF FREEWAY TRUCKS

RESULTS USING FIGURE I.5- 12

WARNING! IN USING THIS NOMOGRAPH:
Normal range for Vr is 1100 to 6000 vph

ITEM	VPH	Fhv	PCPH
V1	254	0.98	285
V(1+A)	447	0.99	502
Va	193	0.99	217
Vb	697	0.99	782
Vf	2857	0.99	3207

Vd1 = 502 pcph (LOS = A)
Vd2 = 782 pcph (LOS = B)

Vf(Before diverge) = 3207 pcph (LOS = C)

FIRST RAMP RESULTS USING APPROXIMATION METHOD (NOTE 4)

SECOND RAMP RESULTS USING APPROXIMATION METHOD (NOTE 4)

ITEM	VPH	Fhv	PCPH
V1	563	0.98	638
V(1+A)	563	0.97	645
Va	445	0.99	499
Vb	445	0.99	499
Vf	2857	0.99	3207

Vd1 = 645 pcph (LOS = B)
Vd2 = 499 pcph (LOS = A)

Vf(Before diverge) = 3207 pcph (LOS = C)

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 S/B OFF RAMP @ MORSE
TIME AND DATE..... 2015 AM DESIGN ; 10-19-92
OTHER INFORMATION.... FILE A:\ACCESSAM\70SBOFMS

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE ROAD (N-S) I-270 WEST RAMPS
Analyst: LYDEN File Name: MO270W15.HC9
Area Type: Other 10-8-92 2015 AM
Comment: FILE A:\ACCESSAM\MO270W15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes		3		1	3					1 >		< 1
Volumes		1354		272	2128					437		453
Lane Width		12.0		12.0	12.0					12.0	12.0	12.0
RTOR Vols			0			0						0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left					NB Left			
Thru		*			Thru			
Right					Right			
Peds					Peds			
WB Left	*				SB Left	*		
Thru	*	*			Thru	*		
Right					Right	*		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	28A	38A			Green	39A		
Yellow/A-R	5	5			Yellow/A-R	5		
Lost Time	3.0	3.0			Lost Time	3.0		

Cycle Length: 120 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	5346	1782	0.93	0.33	30.6	D	30.6	D
WB	L	1698	426	0.71	0.25	35.1	D	14.8	B
	T	5346	3252	0.80	0.61	12.5	B		
SB	L	1515	518	0.47	0.34	24.1	C	14.1	B
	LR	1540	1052	0.47	0.68	5.9	B		
	R	1515	518	0.48	0.34	20.6	C		

Intersection Delay = 19.4 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE ROAD (N-S) I-270 WEST RAMPS
Analyst: MJH File Name: MO270W15.HC9
Area Type: Other 10-8-92 2015 PM
Comment: FILE A:\ACCESSPM\MO270W15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes		3		1	3					1 >		< 1
Volumes		1655		223	1741					357		371
Lane Width		12.0		12.0	12.0					12.0	12.0	12.0
RTOR Vols			0			0						0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left					NB Left			
Thru		*			Thru			
Right					Right			
Peds					Peds			
WB Left	*				SB Left	*		
Thru	*	*			Thru	*		
Right					Right	*		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	27A	44A			Green	34A		
Yellow/A-R	5	5			Yellow/A-R	5		
Lost Time	3.0	3.0			Lost Time	3.0		

Cycle Length: 120 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	5346	2049	0.99	0.38	34.6	D	34.6	D
WB	L	1693	409	0.61	0.24	32.6	D	10.6	B
	T	5346	3475	0.61	0.65	8.1	B		
SB	L	1515	455	0.44	0.30	26.1	D	16.4	C
	LR	1540	924	0.44	0.60	8.6	B		
	R	1515	455	0.45	0.30	22.4	C		

Intersection Delay = 20.8 (sec/veh) Intersection LOS = C

FACILITY LOCATION.... I-270 S/B ON RAMP @ MORSE
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN
DATE OF ANALYSIS..... 10-7-92
OTHER INFORMATION.... FILE A:\ACCESSAM\70SBONMS

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) RIGHT-HAND RAMP.
(2) TWO LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	1967	1275	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 52 % OF FREEWAY TRUCKS

RESULTS USING FIGURE I.5- 11

ITEM	VPH	Fhv	PCPH
V1	254	0.95	297
V(1+A)	1093	0.98	1239
Va	839	0.99	942
Vb	436	0.99	489
Vf	1967	0.99	2208

Vm1 = ~~1239~~ pcph (LOS = ~~C~~) = $.19(V_A) + V_B$ = 668 LOS B
Vm2 = ~~1706~~ pcph (LOS = ~~D~~) = $V_1 + (.81)(.14)(V_A) + V_B$ = 893 LOS B

Vf(After merge) = 3639 pcph (LOS = C)

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 S/B ON RAMP @ MORSE
TIME AND DATE..... 2015 AM DESIGN ; 10-7-92
OTHER INFORMATION.... FILE A:\ACCESSAM\70SBONMS

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 S/B bet. CROSSROAD & MORSE
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN
DATE OF ANALYSIS..... 10-7-92
OTHER INFORMATION.... FILE A:\ACCESSAM\70SBCRMS

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	2	(TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES	0	
PERCENTAGE OF RECREATIONAL VEHICLES..	0	
DESIGN SPEED (MPH).....	60	
PEAK HOUR FACTOR.....	.9	
DRIVER POPULATION FACTOR.....	1	(WEEKDAY/COMMUTER)
LANE WIDTH (FT).....	12	
OBSTRUCTIONS.....	NO SIDES	
DISTANCE (FT) FROM ROADWAY EDGE.....	6	

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	P
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 3
INPUT VOLUME..... 3242
V/C RATIO..... .61
LEVEL OF SERVICE.... C
SPEED (mph)..... 48
DENSITY (pcpmpl).... 25

FACILITY LOCATION.... S/B C/D OFF RAMP @ CROSSROAD
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN
DATE OF ANALYSIS..... 10-9-92
OTHER INFORMATION.... FILE A:\ACCESSAM\CDSBOFCR

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	3756	480	1199
% TRUCKS	N.A.	2	2	2
RAMP TYPE	N.A.	N.A.	OFF	ON
DISTANCE	N.A.	N.A.	N.A.	1575

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 50 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH DOWNSTREAM RAMP USING FIGURE I.5- 7

	V1	Vr	Vf
	****	****	*****
VPH	1191	480	3756
ET	1.7	1.7	1.7
Fhv	0.98	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1350	539	4215

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	4215	D
DIVERGE:	1350	C

IDENTIFYING INFORMATION

FACILITY LOCATION.... S/B C/D OFF RAMP @ CROSSROAD
TIME AND DATE..... 2015 AM DESIGN ; 10-9-92
OTHER INFORMATION.... FILE A:\ACCESSAM\CDSBOFCR

FACILITY LOCATION.... C/D S/B ON AT NEW CROSSOVER
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN
DATE OF ANALYSIS..... 12-22-92
OTHER INFORMATION.... FILE A:\ACCESSAM\CDSBONCR

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	480	3756	1199	N.A.
% TRUCKS	2	2	2	N.A.
RAMP TYPE	OFF	N.A.	ON	N.A.
DISTANCE	1575	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 49 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH UPSTREAM RAMP USING FIGURE I.5- 6

	V1	Vr	Vf
	****	****	*****
VPH	643	1199	3276
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	737	1346	3677

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	5023	D
MERGE:	2083	F

(SEE NEXT 2 SHEETS)

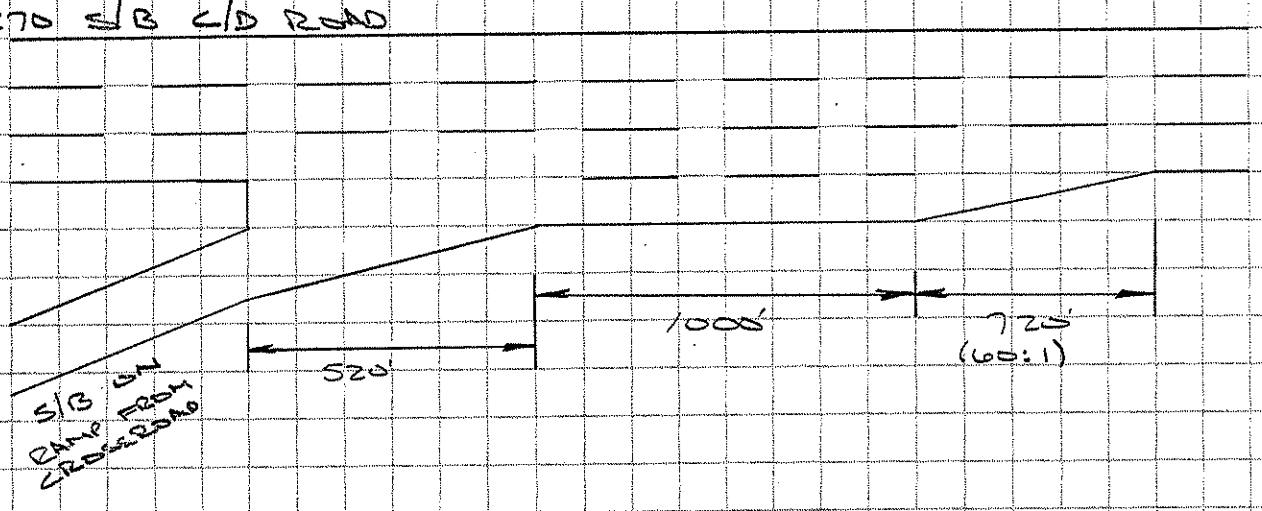
IDENTIFYING INFORMATION

FACILITY LOCATION.... C/D S/B ON AT NEW CROSSOVER
TIME AND DATE..... 2015 AM DESIGN ; 12-22-92
OTHER INFORMATION.... FILE A:\ACCESSAM\CDSBONCR

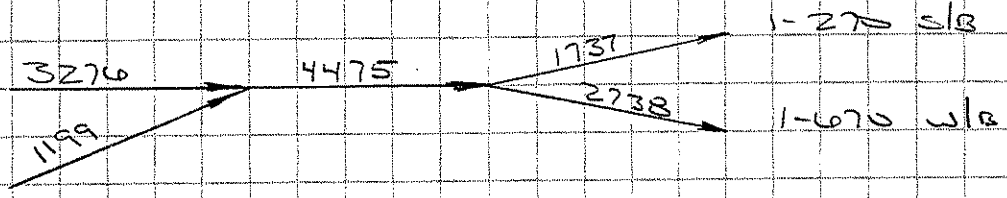
ms consultants, inc.
engineers, architects, planners

job no 10-009.310 sheet _____
made by TML date 12-21-92
checked _____ date _____
office _____
project MORSE & STELZER

C/D S/B ON & NEW CROSSROAD



DESIGN HOUR VOLUMES



CROSSROAD S/B ON RAMP IS EXTENDED 1000' BEYOND TYPICAL TAPER POINT TO ALLOW ADDITIONAL DISTANCE FOR VEHICLES TO MERGE. FIGURE 5.5 OF HCM INDICATES 41% OF VEHICLES WILL MERGE IN ADDITIONAL 1000'.

ms consultants, inc.
engineers, architects, planners

job no _____ sheet _____
made by _____ date _____
checked _____ date _____
office _____
project _____

ASSUME LANE 1 VOLUME (643) MERGES INTO LANE 2 SO THAT ON RAMP VOLUME (1199) CAN MANUVER INTO LANE 1.

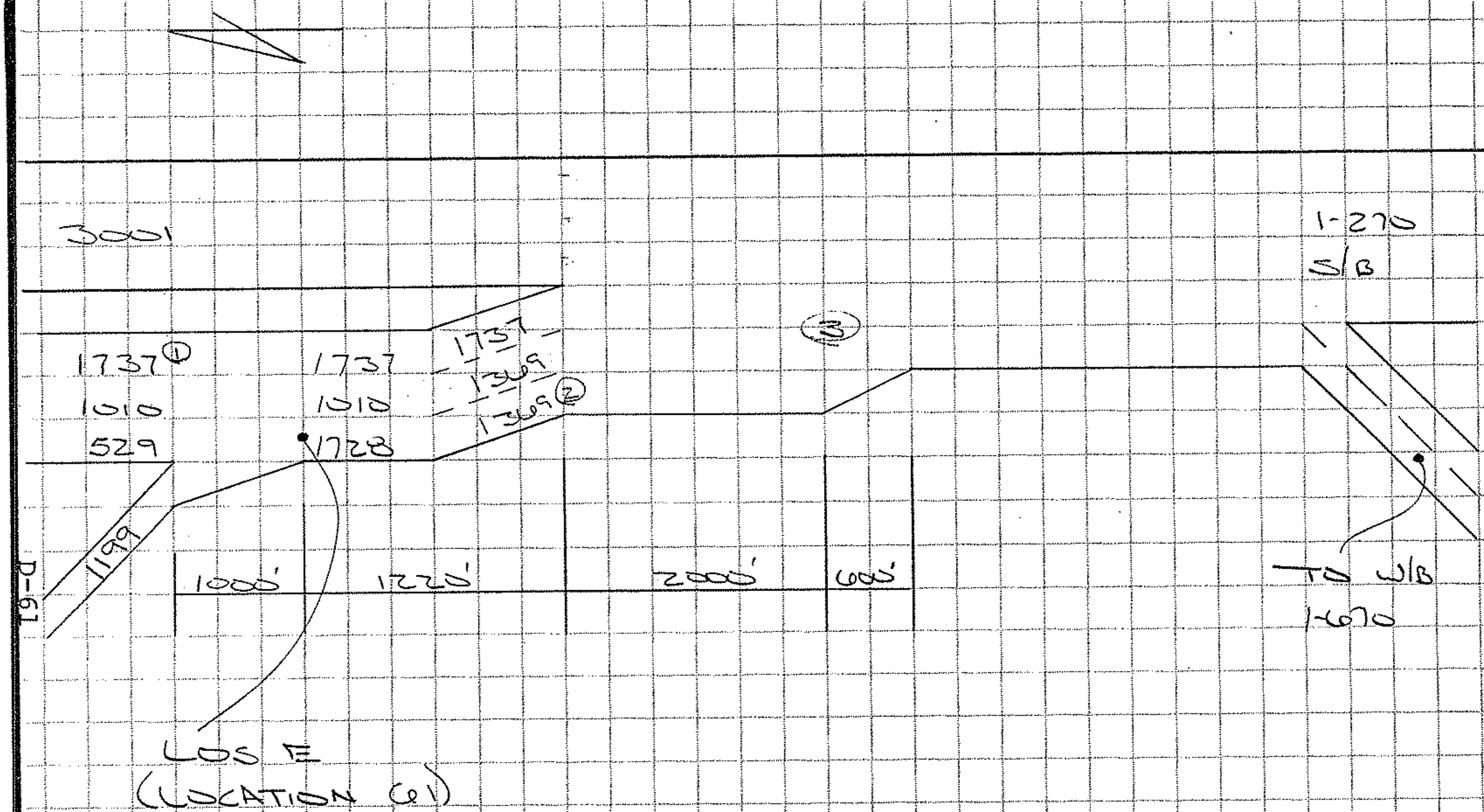
643 x (1 - .41) + 1199 = 1578

1578 ÷ .99 ÷ .90 = 1771 LOSE

ms consultants, inc.
engineers, architects, planners

job no 10-009.310 sheet 1/1
made by TML date 10-10-92
checked ______ date ______
office ______
project MORSE & STELZER

I-270 S/B bet CROSSROAD & I-670/US62



① VEHICLES ON C/D DESTINED FOR I-270 S/B
② FIG. 5.5 IN HCM, AT 1000' FROM RAMP ≈ 60% OF ON RAMP VEHICLES REMAIN IN LANE 1
③ 2000' FROM THE POINT WHERE THE MAINLINE AND C/D ARE MERGED AND WHERE LANE 6 DROPS OUT. SEE NEXT PAGE

ms consultants, inc.
engineers, architects, planners

job no _____ sheet 2/2
made by TML date 10-10-92
checked _____ date _____
office _____
project _____

SEE FIG 5-5 HCM

LANE 4	1737	1737	.6×1737 = 1042	.30×1737 + .40×1369 = 1069	.19×1737 + .70×1369 = 1288	
5	1369	1369	1369	.6×1369 = 821	.30×1369 = 411	③
6	1369	1369	1369	1369	1369	

0' 500' 1000' 1500' 2000'
DISTANCE FROM RAMP

AT POINT ③ LANE 5 = 411 + 1369 = 1780

PHF = .90
F_{HV} = .99 ⇒ 2% TRUCK

1780 ÷ .9 ÷ .99 = 1997 LOS E

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 S/B bet. I-670 & CROSSROAD
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN
DATE OF ANALYSIS..... 8-6-92
OTHER INFORMATION.... FILE A:\ACCESSAM\70SB67CR

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

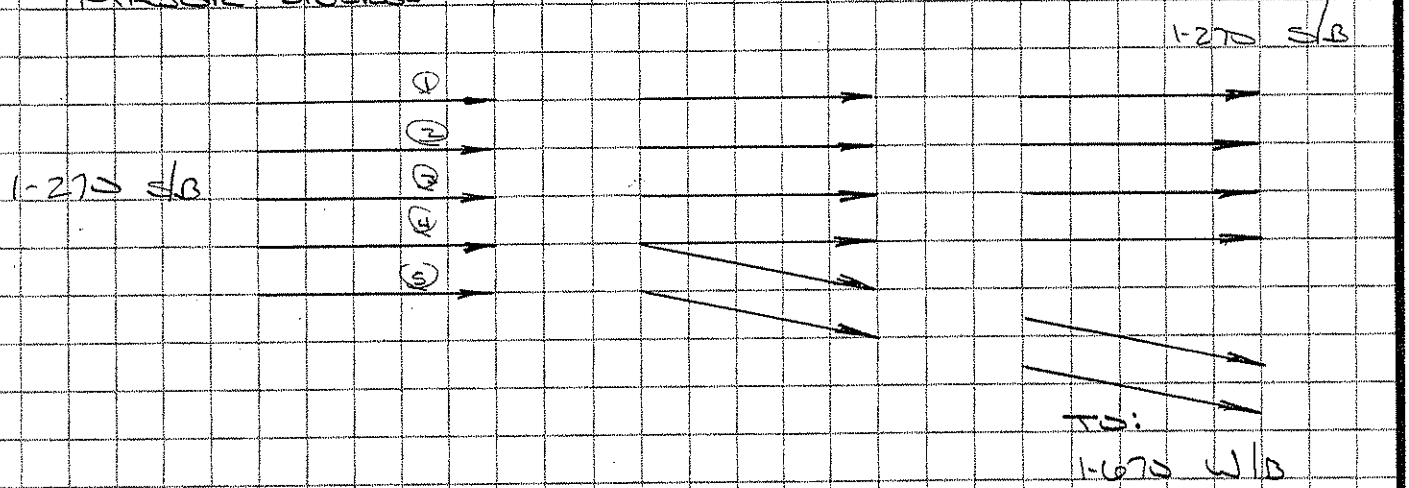
NO. OF LANES..... 5
INPUT VOLUME..... 7717
V/C RATIO..... .87
LEVEL OF SERVICE.... E
SPEED (mph)..... 41
DENSITY (pcpmpl).... 44

ms consultants, inc.
engineers, architects, planners

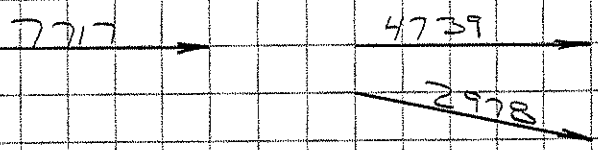
job no 10-00930 sheet _____
made by THL date 10-1-92
checked _____ date _____
office _____
project MORSE : STELZER

I-270 S/B OFF RAMP TO I-670 W/B

MAJOR DIVERGE



A.M. VOLUMES



ASSUME VEHICLES SELECT PATH TO EQUALIZE LEVELS OF SERVICE

LANE 1, 2, 3 = $\frac{4739}{3}$ = 1580/LANE

LANE 4, 5 = $\frac{2978}{2}$ = 1489/LANE

ms consultants, inc.
engineers, architects, planners

job no _____ sheet 2/2

made by _____ date _____

checked _____ date _____

office _____

project _____

$\%$ TRUCK = 2 $\%$ $\Rightarrow$ F_{HV} = .99

PHF = .90

MAINLINE = 1580 ÷ .99 ÷ .90 = 1772 $\Rightarrow$ LOS E

RAMPS = 1489 ÷ .99 ÷ .90 = 1671 $\Rightarrow$ LOS D

FACILITY LOCATION.... I-670 W/B TO S/B I-270 ON RAMP
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 10-1-92
OTHER INFORMATION.... FILE A:\MSCDRD\67WBSB70

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 4 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.
(3) LOOP RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	4739	375	408
% TRUCKS	N.A.	2	2	2
RAMP TYPE	N.A.	N.A.	ON	OFF
DISTANCE	N.A.	N.A.	N.A.	600

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 41 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH DOWNSTREAM RAMP USING FIGURE I.5- 10

WARINING! IN USING THIS NOMOGRAPH:
Normal range for Dd is 1500 to 3000 ft

	V1	Vr	Vf
	****	****	*****
VPH	767	375	4739
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	879	421	5319

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	5740	D
MERGE:	1300	C

RAMP ANALYZED WITH DOWNSTREAM RAMP USING APPROXIMATION METHOD

	V1	Vr	Vf
	****	****	*****
VPH	750	375	4739
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	859	421	5319

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	5740	D
MERGE:	1280	C

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-670 W/B TO S/B I-270 ON RAMP
TIME AND DATE..... 2015 AM PEAK ; 10-1-92
OTHER INFORMATION.... FILE A:\MSCDRD\67WBSB70

FACILITY LOCATION.... US 62 W/B OFF RAMP TO I-270 S/B
ANALYST..... MJH
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\62WBSB70

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 2 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	344	2117	375	N.A.
% TRUCKS	2	2	2	N.A.
RAMP TYPE	OFF	N.A.	OFF	N.A.
DISTANCE	1622	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 66 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH UPSTREAM RAMP USING FIGURE I.5- 2

	V1	Vr	Vf
	****	****	*****
VPH	972	375	1773
ET	1.7	1.7	1.7
Fhv	0.99	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1091	421	1990

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	1990	B
DIVERGE:	1091	C

IDENTIFYING INFORMATION

FACILITY LOCATION.... US 62 W/B OFF RAMP TO I-270 S/B
TIME AND DATE..... 2015 AM PEAK ; 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\62WBSB70

FACILITY LOCATION.... I-270 S/B TO E/B I-670 OFF RAMP
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 10-1-92
OTHER INFORMATION.... FILE A:\MSCDRD\70SBEB67

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 4 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) RIGHT-HAND RAMP.
(2) ONE LANE RAMP.
(3) LOOP RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	375	4739	408	N.A.
% TRUCKS	2	2	2	N.A.
RAMP TYPE	ON	N.A.	OFF	N.A.
DISTANCE	600	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 45 % OF FREEWAY TRUCKS

RAMP ANALYZED WITH UPSTREAM RAMP USING APPROXIMATION METHOD

	V1	Vr	Vf
	****	****	*****
VPH	1099	408	5114
ET	1.7	1.7	1.7
Fhv	0.97	0.99	0.99
PHF	0.90	0.90	0.90
PCPH	1259	458	5740

CHECKPOINT	VOLUME	LOS
**********	******	***
FREEWAY:	5740	D
DIVERGE:	1259	C

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 S/B TO E/B I-670 OFF RAMP
TIME AND DATE..... 2015 AM PEAK ; 10-1-92
OTHER INFORMATION.... FILE A:\MSCDRD\70SBEB67

FACILITY LOCATION.... I-270 N/B TO W/B I-670 ON RAMP
ANALYST..... MJH
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\70NBWB62

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 4 (per direction)

ANALYSIS RAMP CHARACTERISTICS:

(1) ADDITION OF LANE AT ON-RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
VOLUME	N.A.	4376	372	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

The merge criteria are applied directly to
the ON-RAMP flow rate as the checkpoint:

FLOW RATE = 418 pcph
LOS = A

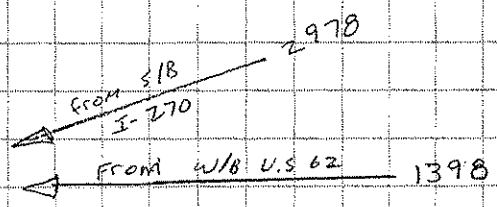
ms consultants, inc.
engineers, architects, planners

2015 AM PEAK

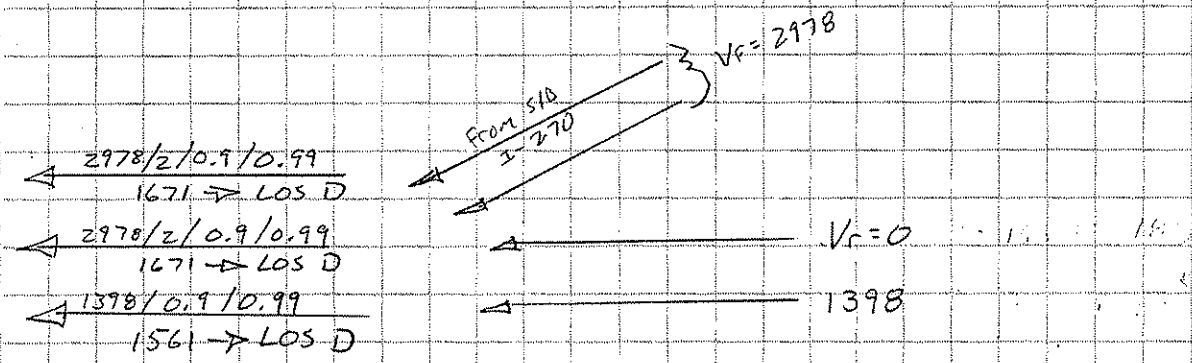
job no 10-009.310 sheet 1/1
made by MJH date 7-27-92
checked _____ date _____
office _____
project Morse & Stelzer

I-270 S/B to W/B I-670 ON RAMP

MAJOR MERGE



- Use S/B I-270 as mainline traffic assume $V_r = 0$ and use checkpoint analyses



1985 HCM: BASIC FREEWAY SEGMENT

****

FACILITY SECTION..... I-670 W/B WEST OF I-270
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN
DATE OF ANALYSIS..... 08-06-1992
OTHER INFORMATION.... FILE A:\ACCESSAM\67WBW270

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS

****

NO. OF LANES..... 5
INPUT VOLUME..... 4984
V/C RATIO..... .56
LEVEL OF SERVICE.... C
SPEED (mph)..... 49
DENSITY (pcpmpl).... 22

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-670 E/B WEST OF I-270
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 PM DESIGN
DATE OF ANALYSIS..... 08-06-1992
OTHER INFORMATION.... FILE A:\ACCESSPM\67EBW270

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 60
PEAK HOUR FACTOR..... .9
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO SIDES
DISTANCE (FT) FROM ROADWAY EDGE..... 6

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	w	p
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 4
INPUT VOLUME..... 5263
V/C RATIO..... .74
LEVEL OF SERVICE.... D
SPEED (mph)..... 45
DENSITY (pcpmpl).... 33

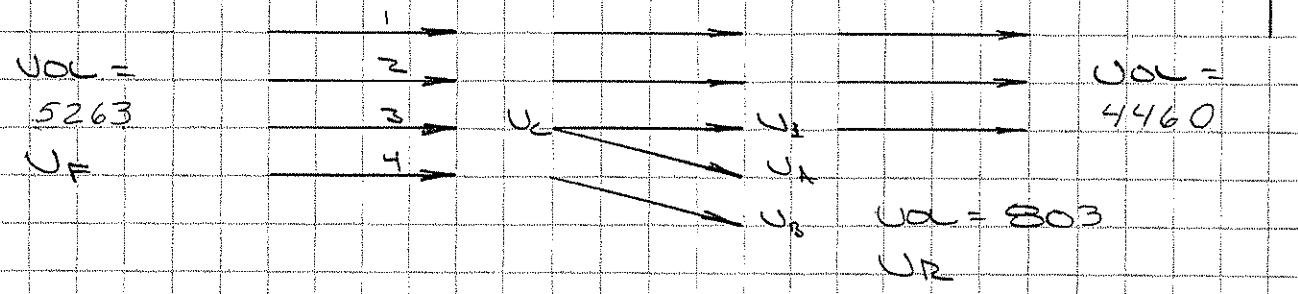
ms consultants, inc.
engineers, architects, planners

job no 10-009.310 sheet 1/2
made by TML date 4-14-92
checked _____ date _____
office _____
project MORSE & STELZER

2015 PM PEAK

I-670 E/B OFF RAMP TO I-270 S/B

MAJOR DIVERGE



ASSUME INSIDE LANE, 1 CARRIES 5263/4 = 1316 VEHICLES. DEDUCT FROM VF 5263 - 1316 = 3947 AND TREAT AS A MAJOR DIVERGE, FIG 1.5-13 IN THE HCM.

$V_F = 3947$
$V_R = 803$

FIG 1.5-13

$V_C = 604 + .285\,V_F + .141\,V_R$

$= 1302$

$V_A = 173 + .295\,V_F - .320\,V_R$

$= 1080$

ms consultants, inc.
engineers, architects, planners

job no 10-009.30 sheet 2/2
made by TML date 4-14-92
checked _____ date _____
office _____
project _____

$V_A = V_C - V_1 = 1136 - 1080 = 222$

$V_B = V_R - V_A = 803 - 222 = 581$

$V_C = V_{D1} = 1302$

$V_B \quad V_{D2} = 581$

CONVERT VOLUMES TO FLOW RATES

TRUCKS ON FREEWAY = 3947 x.02 = 79
TRUCKS ON RAMP = 803 x.02 = 16
TRUCKS AFTER DIVERGE = 63
TRUCKS IN LANE 1 AFTER DIVERGE
= 63 x .50 (FIG 5-6) = 32
TRUCKS IN LANE A = 222 x.02 = 11
PROP OF TRUCKS IN LANE V_C = 32+11 / 1196 = .04

	V or C	PROP TRUCKS	E_T	F_{HV}	PHF	FLOW RATE
V_{D1}	1302	.04	1.7	.97	.90	1491
V_{D2}	581	.02	1.7	.99	.90	652
V_F	3947	.02	1.7	.99	.90	4430

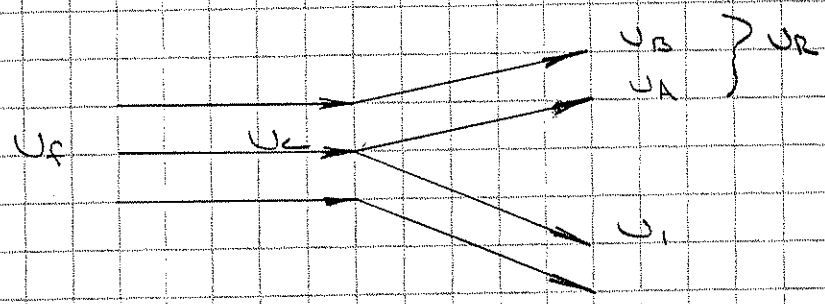
V_{D1} = 1491 LOS C
V_{D2} = 652 LOS B
V_F = 4430 LOS D

ms consultants, inc.
engineers, architects, planners
2015 P.M. D.H

job no D-009.31N sheet 1/2
made by TML date 3-30-92
checked _____ date _____
office _____
project MORSE & STEUER

1-670 E/B TO 1-270 N/B & US 62 E/B

MAJOR DIVERGE



$V_F = 4460$
$V_R = 2856$

FIGURE 1.5-13

$V_C = 64 + .235 V_F + .141 V_R$

$= 1738$

$V_1 = 173 + .295 V_F - .320 V_R$

$= 575$

$V_A = V_C - V_1 = 1738 - 575 = 1163$

$V_B = V_R - V_A = 2856 - 1163 = 1693$

$V_{D1} = V_C = 1738$

$V_{D2} = V_B = 1693$

ms consultants, inc.
engineers, architects, planners

job no _____ sheet 2/2
made by _____ date _____
checked _____ date _____
office _____
project _____

CONVERT VOLUMES TO FLOW RATES

TRUCKS ON FREEWAY = 4460 x .02 = 89
TRUCKS ON RAMP = 2856 x .02 = 56
TRUCKS AFTER DIVERGE = 32
TRUCKS IN LANE 1 AFTER DIVERGE
= 32 x 55% (FIG 5-6) = 18
TRUCKS IN LANE A 1132 x .02 = 23
PROP. OF TRUCKS IN LANE U1 = $\frac{18+23}{1738}$ = 2

	VOL	PROP TRUCKS	E_T	F_{HV}	PHF	FLOW RATE
U_{D1}	1738	.02	1.7	.99	.90	1950
U_{D2}	1693	.02	1.7	.99	.90	1900
U_F	4460	.02	1.7	.99	.90	5006

U_{D1} =	1950	LOS E	1801 - 2000
U_{D2} =	1900	LOS E	1801 - 2000
U_F =	5006	LOS D	4201 - 5100

4TH LANE $(U_F - U_R) - U_1$ = 1029

1029 ÷ 9 ÷ .99 = 1155 LOS C

****

FACILITY LOCATION.... I-270 S/B ON RAMP @ I-670
ANALYST..... MJH
TIME OF ANALYSIS..... 2015 AM PEAK
DATE OF ANALYSIS..... 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\70SBON67

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 2 (Typical - 200 #/HP)
PEAK HOUR FACTOR..... .9
HIGHWAY DESIGN SPEED (mph)..... 60
(BUSES AND RV'S ARE CONSIDERED AS TRUCKS)

LEVEL TERRAIN

B) INPUT INFORMATION

NO. OF LANES ON FREEWAY : 3 (per direction)

ANALYSIS RAMP CHARACTERISTICS:
****

(1) RIGHT-HAND RAMP.
(2) TWO LANE RAMP.

	UPSTREAM RAMP	FREEWAY	ANALYSIS RAMP	DOWNSTREAM RAMP
	********	*******	********	**********
VOLUME	N.A.	4706	981	N.A.
% TRUCKS	N.A.	2	2	N.A.
RAMP TYPE	N.A.	N.A.	ON	N.A.
DISTANCE	N.A.	N.A.	N.A.	N.A.

C) RAMP ANALYSIS RESULTS

TRUCK PRESENCE IN LANE 1: 59 % OF FREEWAY TRUCKS

RESULTS USING FIGURE I.5- 11

WARNING! IN USING THIS NOMOGRAPH:
Normal range for Vf is 600 to 3000 vph
Normal range for Vr is 1100 to 3000 vph

ITEM	VPH	Fhv	PCPH
V1	431	0.95	521
V(1+A)	1710	0.97	1959
Va	1279	0.99	1435
Vb	0	0.99	0
Vf	4706	0.99	5282

Vm1 = 1956 pcph (LOS = E)
Vm2 = 1959 pcph (LOS = E)

Vf(After merge) = 6717 pcph (LOS = F)

FIRST RAMP RESULTS USING APPROXIMATION METHOD (NOTE 3)

SECOND RAMP RESULTS USING APPROXIMATION METHOD (NOTE 3)

ITEM	VPH	Fhv	PCPH
V1	847	0.95	991
V(1+A)	1338	0.97	1533
Va	491	0.99	551
Vb	491	0.99	551
Vf	4706	0.99	5282

Vm1 = ~~1542~~ pcph (LOS = ~~D~~) $0.19(V_a) + V_b = 656$ LOS B
Vm2 = ~~2084~~ pcph (LOS = ~~F~~) $V_1 + 0.81(0.14)V_a + V_b = 1604$ LOS D

Vf(After merge) = 6384 pcph (LOS = F)

IDENTIFYING INFORMATION

FACILITY LOCATION.... I-270 S/B ON RAMP @ I-670
TIME AND DATE..... 2015 AM PEAK ; 07-24-1992
OTHER INFORMATION.... FILE A:\MSCDRD\70SBON67

1985 HCM: BASIC FREEWAY SEGMENT
****

FACILITY SECTION..... I-270 S/B bet. SR 317 & I-670/US 62
ANALYST..... LYDEN
TIME OF ANALYSIS..... 2015 AM DESIGN
DATE OF ANALYSIS..... 8-6-92
OTHER INFORMATION.... FILE A:\ACCESSAM\70SB1767

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	2	(TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES	0	
PERCENTAGE OF RECREATIONAL VEHICLES..	0	
DESIGN SPEED (MPH).....	60	
PEAK HOUR FACTOR.....	.9	
DRIVER POPULATION FACTOR.....	1	(WEEKDAY/COMMUTER)
LANE WIDTH (FT).....	12	
OBSTRUCTIONS.....	NO SIDES	
DISTANCE (FT) FROM ROADWAY EDGE.....	6	

B) CORRECTION FACTORS

TERRAIN TYPE	T	B	R	HV	W	P
LEVEL	1.7	1.5	1.6	0.99	1.00	1.00

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 4
INPUT VOLUME..... 5687
V/C RATIO..... .8
LEVEL OF SERVICE.... D
SPEED (mph)..... 44
DENSITY (pcpmpl).... 37

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE ROAD (N-S) LOOP ROAD A
Analyst: MJH File Name: MSLRDA15.HC9
Area Type: Other 10-19-92 2105 AM
Comment: FILE A:\ACCCESSAM\MSLRDA15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes		3	1	1	3		2		1			
Volumes		2016	640	352	1480		705		283			
Lane Width		12.0	12.0	12.0	12.0		12.0		12.0			
RTOR Vols			0			0			0			

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left					NB Left *			
Thru		*			Thru			
Right		*			Right *			
Peds					Peds			
WB Left	*	*			SB Left			
Thru	*	*			Thru			
Right					Right			
Peds					Peds			
NB Right	*				EB Right *			
SB Right					WB Right			
Green	22A	53A			Green 30A			
Yellow/A-R	5	5			Yellow/A-R 5			
Lost Time	3.0	3.0			Lost Time 3.0			

Cycle Length: 120 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	5346	2450	1.01	0.46	34.0	D	27.8	D
	R	1515	1098	0.65	0.73	6.3	B		
WB	L	1693	339	0.98	0.68	46.6	E	13.2	B
	T	5346	3653	0.49	0.68	6.0	B		
NB	L	3279	874	0.94	0.27	45.6	E	36.9	D
	R	1515	707	0.44	0.47	14.2	B		

Intersection Delay = 24.5 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE ROAD (N-S) LOOP ROAD A
Analyst: LYDEN File Name: MSLRDA15.HC9
Area Type: Other 10-19-92 2015 PM
Comment: FILE A:\ACCCESSPM\MSLRDA15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes		3	1	1	3		2		1			
Volumes		1649	523	288	1808		861		346			
Lane Width		12.0	12.0	12.0	12.0		12.0		12.0			
RTOR Vols			0			0			0			

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left					NB Left *			
Thru		*			Thru			
Right		*			Right *			
Peds					Peds			
WB Left	*	*			SB Left			
Thru	*	*			Thru			
Right					Right			
Peds					Peds			
NB Right	*				EB Right *			
SB Right					WB Right			
Green	19A	46A			Green 40A			
Yellow/A-R	5	5			Yellow/A-R 5			
Lost Time	3.0	3.0			Lost Time 3.0			

Cycle Length: 120 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	5346	2138	0.94	0.40	28.2	D	22.8	C
	R	1515	1136	0.51	0.75	4.2	A		
WB	L	1693	296	0.90	0.60	35.4	D	14.0	B
	T	5346	3208	0.69	0.60	11.0	B		
NB	L	3279	1148	0.88	0.35	33.4	D	27.5	D
	R	1515	795	0.48	0.52	12.0	B		

Intersection Delay = 20.4 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY
MS Consultants

Streets: (E-W) MORSE ROAD (N-S) STELZER ROAD
Analyst: MJH File Name: MSSZ15.HC9
Area Type: Other 10-19-92 2015 AM
Comment: FILE A:\ACCESSAM\MSSZ15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	4	1	2	3	1	2	2	2	2	2	<
Volumes	133	1751	228	369	1649	563	240	226	287	319	430	110
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*		*		NB Left *			
Thru			*		Thru	*		
Right			*		Right	*		
Peds					Peds			
WB Left	*	*			SB Left *			
Thru		*	*		Thru	*		
Right		*	*		Right	*		
Peds					Peds			
NB Right	*	*			EB Right *			
SB Right					WB Right *			
Green	8A	9A	39A		Green	16A	23A	
Yellow/A-R	5	5	5		Yellow/A-R	5	5	
Lost Time	3.0	3.0	3.0		Lost Time	3.0	3.0	

Cycle Length: 120 secs Phase combination order: #1 #2 #3 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	141	0.74	0.43	34.0	D	25.5	D
	T	7128	2435	0.88	0.34	26.5	D		
	R	1515	745	0.34	0.49	12.1	B		
WB	L	3279	574	0.75	0.17	39.5	D	20.8	C
	T	5346	2450	0.82	0.46	19.7	C		
	R	1515	922	0.68	0.61	11.3	B		
NB	L	3279	492	0.57	0.15	37.2	D	25.7	D
	T	3564	742	0.36	0.21	26.3	D		
	R	2673	1091	0.31	0.41	15.6	C		
SB	L	3279	492	0.76	0.15	41.7	E	38.6	D
	TR	3457	720	0.87	0.21	36.7	D		

Intersection Delay = 25.3 (sec/veh) Intersection LOS = D

HCM: SIGNALIZED INTERSECTION SUMMARY
MS Consultants

Streets: (E-W) MORSE ROAD (N-S) STELZER ROAD
Analyst: LYDEN File Name: MSSZ15.HC9
Area Type: Other 10-19-92 2015 PM
Comment: FILE A:\ACCESSPM\MSSZ15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	4	1	2	3	1	2	2	2	2	2	<
Volumes	109	1735	187	302	1349	461	294	277	351	390	352	135
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*		*		NB Left *			
Thru			*		Thru	*		
Right			*		Right	*		
Peds					Peds			
WB Left	*	*			SB Left *			
Thru		*	*		Thru	*		
Right		*	*		Right	*		
Peds					Peds			
NB Right	*	*			EB Right *			
SB Right					WB Right *			
Green	8A	9A	40A		Green	19A 19A		
Yellow/A-R	5	5	5		Yellow/A-R	5 5		
Lost Time	3.0	3.0	3.0		Lost Time	3.0 3.0		

Cycle Length: 120 secs Phase combination order: #1 #2 #3 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	141	0.60	0.43	24.7	C	23.9	C
	T	7128	2495	0.85	0.35	25.1	D		
	R	1515	795	0.26	0.52	10.2	B		
WB	L	3279	574	0.62	0.17	36.2	D	17.4	C
	T	5346	2495	0.66	0.47	16.3	C		
	R	1515	972	0.53	0.64	7.9	B		
NB	L	3279	574	0.60	0.17	35.9	D	27.2	D
	T	3564	624	0.52	0.17	29.5	D		
	R	2673	1002	0.41	0.38	18.0	C		
SB	L	3279	574	0.79	0.17	41.2	E	44.6	E
	TR	3414	597	0.95	0.17	47.3	E		

Intersection Delay = 25.1 (sec/veh) Intersection LOS = D

HCM: SIGNALIZED INTERSECTION SUMMARY
MS Consultants

Streets: (E-W) NEW CROSSROAD (N-S) STELZER ROAD
Analyst: MJH File Name: SZCROS15.SIG
Area Type: Other 7-21-92 2015 AM
Comment: FILE A:\ACCESSAM\SZCROS15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	2	2	1	2	2	1	2	2	<
Volumes	43	429	189	452	609	456	188	764	558	634	571	49
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4
EB Left	*		*	
Thru			*	
Right			*	
Peds				
WB Left	*	*		
Thru		*	*	
Right		*	*	
Peds				
NB Right	*	*		
SB Right				
Green	5A	17A	16A	
Yellow/A-R	5	5	5	
Lost Time	3.0	3.0	3.0	

	5	6	7	8
NB Left	*			
Thru			*	
Right			*	
Peds				
SB Left	*	*		
Thru		*	*	
Right		*	*	
Peds				
EB Right	*			
WB Right	*	*		
Green	14A	10A	28A	
Yellow/A-R	5	5	5	
Lost Time	3.0	3.0	3.0	

Cycle Length: 120 secs Phase combination order: #1 #2 #3 #5 #6 #7

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	99	0.30	0.21	31.1	D	39.9	D
	T	3564	535	0.94	0.15	47.6	E		
	R	1515	429	0.49	0.28	23.7	C		
WB	L	3279	710	0.74	0.22	36.2	D	22.9	C
	T	3564	1188	0.60	0.33	22.0	C		
	R	1515	896	0.57	0.59	10.3	B		
NB	L	3279	437	0.50	0.13	37.5	D	37.7	D
	T	3564	891	1.00	0.25	48.8	E		
	R	1515	745	0.83	0.49	21.7	C		
SB	L	3279	765	0.97	0.23	52.7	E	36.2	D
	TR	3521	1320	0.55	0.38	19.4	C		

Intersection Delay = 33.1 (sec/veh) Intersection LOS = D

HCM: SIGNALIZED INTERSECTION SUMMARY
MS Consultants

Streets: (E-W) NEW CROSSROAD (N-S) STELZER ROAD
Analyst: MJH File Name: SZCROS15.HC9
Area Type: Other 9-14-92 2015 PM
Comment: FILE A:\ACCESSPM\SZCROS15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	1	2	2	1	2	2	1	2	2	<
Volumes	52	361	231	495	666	498	154	625	531	604	698	40
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*		*		NB Left *			
Thru			*		Thru		*	
Right			*		Right		*	
Peds					Peds			
WB Left	*	*			SB Left *	*		
Thru		*	*		Thru	*	*	
Right		*	*		Right	*	*	
Peds					Peds			
NB Right	*	*			EB Right *			
SB Right					WB Right *	*		
Green	5A	16A	17A		Green 15A	10A	27A	
Yellow/A-R	5	5	5		Yellow/A-R 5	5	5	
Lost Time	3.0	3.0	3.0		Lost Time 3.0	3.0	3.0	

Cycle Length: 120 secs Phase combination order: #1 #2 #3 #5 #6 #7

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	99	0.36	0.22	31.4	D	30.5	D
	T	3564	564	0.75	0.16	34.3	D		
	R	1515	455	0.57	0.30	23.9	C		
WB	L	3279	683	0.84	0.21	41.4	E	24.9	C
	T	3564	1188	0.65	0.33	22.8	C		
	R	1515	909	0.61	0.60	10.5	B		
NB	L	3279	465	0.39	0.14	35.8	D	28.9	D
	T	3564	861	0.85	0.24	32.7	D		
	R	1515	720	0.82	0.47	21.9	C		
SB	L	3279	792	0.89	0.24	42.1	E	30.7	D
	TR	3537	1297	0.66	0.37	21.3	C		

Intersection Delay = 28.2 (sec/veh) Intersection LOS = D

HCM: SIGNALIZED INTERSECTION SUMMARY
MS Consultants

Streets: (E-W) LOOP ROAD A (N-S) STELZER ROAD
Analyst: MJH File Name: LRDASZ15.HC9
Area Type: Other 7-22-92 2015 AM
Comment: FILE A:\ACCESSAM\LRDASZ15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1		1				1	2			2	<
Volumes	23		102				102	1430			1083	26
Lane Width	12.0		12.0				12.0	12.0			12.0	
RTOR Vols			0						0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left	*	*	
Thru					Thru	*	*	
Right	*				Right			
Peds					Peds			
WB Left					SB Left			
Thru					Thru		*	
Right					Right		*	
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	41A				Green	8A	56A	
Yellow/A-R	5				Yellow/A-R	5	5	
Lost Time	3.0				Lost Time	3.0	3.0	

Cycle Length: 120 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1515	543	0.05	0.36	19.1	C	17.6	C
	R	1515	543	0.21	0.36	17.3	C		
NB	L	1693	141	0.56	0.59	15.0	C	13.5	B
	T	3564	2109	0.79	0.59	13.4	B		
SB	TR	3553	1717	0.75	0.48	17.4	C	17.4	C

Intersection Delay = 15.3 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY
MS Consultants

Streets: (E-W) LOOP ROAD A (N-S) STELZER ROAD
Analyst: MJH File Name: LRDASZ15.HC9
Area Type: Other 9-14-92 2015 PM
Comment: FILE A:\ACCESSPM\LRDASZ15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1		1				1	2			2 <	
Volumes	28		124				83	1170			1324	21
Lane Width	12.0		12.0				12.0	12.0			12.0	
RTOR Vols			0						0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left	*	*	
Thru					Thru	*	*	
Right	*				Right			
Peds					Peds			
WB Left					SB Left			
Thru					Thru		*	
Right					Right		*	
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	39P				Green	5P	61P	
Yellow/A-R	5				Yellow/A-R	5	5	
Lost Time	3.0				Lost Time	3.0	3.0	

Cycle Length: 120 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1515	518	0.06	0.34	20.2	C	21.5	C
	R	1515	518	0.27	0.34	21.8	C		
NB	L	1693	99	0.58	0.61	16.5	C	12.1	B
	T	3564	2168	0.63	0.61	11.8	B		
SB	TR	3553	1865	0.84	0.52	21.0	C	21.0	C

Intersection Delay = 17.0 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY
MS Consultants

Streets: (E-W) McCUTCHEON ROAD (N-S) STELZER ROAD
Analyst: MJH File Name: SZMC15.HC9
Area Type: Other 7-21-92 2015 AM
Comment: FILE A:\ACCESSAM\SZMC15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1 <		1	1	1	1	2 <		1	2 <	
Volumes	305	136	45	55	122	355	48	768	71	255	612	236
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4
EB Left	*	*	*	
Thru		*	*	
Right		*	*	
Peds				
WB Left	*		*	
Thru			*	
Right			*	
Peds				
NB Right				
SB Right				
Green	5A	7A	22A	
Yellow/A-R	5	5	5	
Lost Time	3.0	3.0	3.0	

		5	6	7	8
NB	Left	*		*	
	Thru			*	
	Right			*	
	Peds				
SB	Left	*	*	*	
	Thru		*	*	
	Right		*	*	
	Peds				
EB	Right				
WB	Right	*	*		
Green		5A	15A	36A	
Yellow/A-R		5	5	5	
Lost Time		3.0	3.0	3.0	

Cycle Length: 120 secs Phase combination order: #1 #2 #3 #5 #6 #7

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	226	0.85	0.36	44.9	E	36.3	D
	TR	1715	514	0.39	0.30	21.7	C		
WB	L	1693	99	0.28	0.26	27.5	D	21.3	C
	T	1782	356	0.38	0.20	27.1	D		
	R	1515	644	0.61	0.43	18.4	C		
NB	L	1693	99	0.33	0.38	21.1	C	29.6	D
	TR	3521	1115	0.88	0.32	30.0	D		
SB	L	1693	339	0.71	0.54	20.1	C	16.1	C
	TR	3414	1650	0.60	0.48	14.9	B		

Intersection Delay = 24.2 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY
MS Consultants

Streets: (E-W) McCUTCHEON ROAD (N-S) STELZER ROAD
Analyst: MJH File Name: SZMC15.HC9
Area Type: Other 9-14-92 2015 PM
Comment: FILE A:\ACCESSPM\SZMC15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1 <		1	1	1	1	2 <		1	2 <	
Volumes	249	111	37	67	150	291	59	628	58	311	748	289
Lane Width	12.0	12.0		12.0	12.0	12.0	12.0	12.0		12.0	12.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4
EB Left	*	*	*	
Thru		*	*	
Right		*	*	
Peds				
WB Left	*		*	
Thru			*	
Right			*	
Peds				
NB Right				
SB Right				
Green		5A	8A	23A
Yellow/A-R		5	5	5
Lost Time		3.0	3.0	3.0

	5	6	7	8
NB Left	*		*	
Thru			*	
Right			*	
Peds				
SB Left	*	*	*	
Thru		*	*	
Right		*	*	
Peds				
EB Right				
WB Right	*	*		
Green	5A	12A	37A	
Yellow/A-R	5	5	5	
Lost Time	3.0	3.0	3.0	

Cycle Length: 120 secs Phase combination order: #1 #2 #3 #5 #6 #7

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	240	0.70	0.38	29.9	D	26.2	D
	TR	1715	543	0.30	0.32	20.1	C		
WB	L	1693	99	0.28	0.27	27.0	D	21.8	C
	T	1782	371	0.45	0.21	27.3	D		
	R	1515	619	0.52	0.41	17.8	C		
NB	L	1693	99	0.42	0.38	22.3	C	23.9	C
	TR	3521	1144	0.70	0.32	24.0	C		
SB	L	1693	296	0.89	0.52	38.0	D	22.7	C
	TR	3414	1593	0.76	0.47	18.4	C		

Intersection Delay = 23.3 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY
MS Consultants

Streets: (E-W) AGLER ROAD (N-S) STELZER ROAD
Analyst: MJH File Name: SZAGL15.SIG
Area Type: Other 7-21-92 2015 AM
Comment: FILE A:\ACCESSAM\SZAGL15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	<	1	1	<	1	2	<	1	2	<
Volumes	91	194	145	108	305	94	143	679	123	72	528	61
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*	*			NB Left	*	*	
Thru		*			Thru		*	
Right		*			Right		*	
Peds					Peds			
WB Left	*	*			SB Left	*	*	
Thru		*			Thru		*	
Right		*			Right		*	
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	7A	40A			Green	8A	45A	
Yellow/A-R	5	5			Yellow/A-R	5	5	
Lost Time	3.0	3.0			Lost Time	3.0	3.0	

Cycle Length: 120 secs Phase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	127	0.39	0.45	17.8	C	21.6	C
	TR	1667	583	0.65	0.35	22.6	C		
WB	L	1693	127	0.39	0.45	17.7	C	23.3	C
	TR	1721	602	0.74	0.35	24.8	C		
NB	L	1693	141	0.48	0.50	17.0	C	20.0	C
	TR	3484	1365	0.69	0.39	20.5	C		
SB	L	1693	141	0.33	0.50	14.2	B	17.7	C
	TR	3511	1375	0.50	0.39	18.1	C		

Intersection Delay = 20.3 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY
MS Consultants

Streets: (E-W) AGLER ROAD (N-S) STELZER ROAD
Analyst: MJH File Name: SZAGL15.HC9
Area Type: Other 9-14-92 2015 PM
Comment: FILE A:\ACCESSPM\SZAGL15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	<	1	1	<	1	2	<	1	2	<
Volumes	74	237	119	88	249	77	175	555	151	88	645	75
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*	*			NB Left *	*		
Thru		*			Thru	*		
Right		*			Right	*		
Peds					Peds			
WB Left	*	*			SB Left *	*		
Thru		*			Thru	*		
Right		*			Right	*		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	8A	41A			Green 10A	41A		
Yellow/A-R	5	5			Yellow/A-R 5	5		
Lost Time	3.0	3.0			Lost Time 3.0	3.0		

Cycle Length: 120 secs Phase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	141	0.24	0.47	14.8	B	21.0	C
	TR	1694	607	0.65	0.36	22.3	C		
WB	L	1693	141	0.30	0.47	15.5	C	20.0	C
	TR	1718	616	0.59	0.36	21.2	C		
NB	L	1693	169	0.71	0.48	27.1	D	22.8	C
	TR	3452	1237	0.67	0.36	21.8	C		
SB	L	1693	169	0.35	0.48	15.2	C	21.1	C
	TR	3511	1258	0.67	0.36	21.8	C		

Intersection Delay = 21.5 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY
MS Consultants

Streets: (E-W) MORSE ROAD (N-S) LOOP ROAD A
Analyst: MJH File Name: MSLRDA15.HC9
Area Type: Other 7-21-92 2105 AM
Comment: FILE A:\ACCCESSAM\MSLRDA15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes		3	1	2	3		2		1			
Volumes		2016	640	352	1480		705		283			
Lane Width		12.0	12.0	12.0	12.0		12.0		12.0			
RTOR Vols			0			0			0			

Signal Operations

Phase combination	1	2	3	4
EB Left				
Thru		*		
Right		*		
Peds				
WB Left	*			
Thru	*	*		
Right				
Peds				
NB Right	*			
SB Right				
Green	18A	52A		
Yellow/A-R	5	5		
Lost Time	3.0	3.0		

	5	6	7	8
NB Left	*			
Thru				
Right	*			
Peds				
SB Left				
Thru				
Right				
Peds				
EB Right	*			
WB Right				
Green	35A			
Yellow/A-R	5			
Lost Time	3.0			

Cycle Length: 120 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	5346	2406	1.02	0.45	38.8	D	31.2	D
	R	1515	1149	0.62	0.76	4.9	A		
WB	L	3279	546	0.75	0.17	40.2	E	13.7	B
	T	5346	3430	0.53	0.64	7.6	B		
NB	L	3279	1011	0.81	0.31	32.7	D	27.5	D
	R	1515	720	0.44	0.47	13.7	B		

Intersection Delay = 24.6 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE ROAD (N-S) LOOP ROAD A
Analyst: MJH File Name: MSLRDA15.HC9
Area Type: Other 9-14-92 2015 PM
Comment: FILE A:\ACCCESSPM\MSLRDA15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes		3	1	2	3		2		1			
Volumes		1649	523	288	1808		861		346			
Lane Width		12.0	12.0	12.0	12.0		12.0		12.0			
RTOR Vols			0			0			0			

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left					NB Left *			
Thru		*			Thru			
Right		*			Right *			
Peds					Peds			
WB Left	*				SB Left			
Thru	*	*			Thru			
Right					Right			
Peds					Peds			
NB Right	*				EB Right *			
SB Right					WB Right			
Green	18A	46A			Green 41A			
Yellow/A-R	5	5			Yellow/A-R 5			
Lost Time	3.0	3.0			Lost Time 3.0			

Cycle Length: 120 secs Phase combination order: #1 #2 #5

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	T	5346	2138	0.94	0.40	28.2	D	22.7	C
	R	1515	1149	0.51	0.76	3.9	A		
WB	L	3279	546	0.61	0.17	36.8	D	14.8	B
	T	5346	3163	0.70	0.59	11.4	B		
NB	L	3279	1175	0.86	0.36	31.6	D	26.2	D
	R	1515	795	0.48	0.52	12.0	B		

Intersection Delay = 20.4 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE ROAD (N-S) SUNBURY ROAD
Analyst: MJH File Name: MSSUN15.HC9
Area Type: Other 7-21-92 2015 AM
Comment: FILE A:\ACCESSAM\MSSUN15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	3	1	1	3	<	1	1	<	1	1	1
Volumes	338	2620	151	42	2155	96	128	80	31	85	100	399
Lane Width	12.0	12.0	12.0	12.0	12.0		12.0	12.0		12.0	12.0	12.0
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*	*		
Thru		*	*		Thru		*		
Right		*	*		Right		*		
Peds					Peds				
WB Left	*		*		SB Left	*	*		
Thru			*		Thru		*		
Right			*		Right		*		
Peds					Peds				
NB Right					EB Right	*			
SB Right	*	*			WB Right				
Green	7A	12A	60A		Green	7A	9A		
Yellow/A-R	5	5	5		Yellow/A-R	5	5		
Lost Time	3.0	3.0	3.0		Lost Time	3.0	3.0		

Cycle Length: 120 secs Phase combination order: #1 #2 #3 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	3279	628	0.63	0.19	35.3	D	15.6	C
	T	5346	3519	0.91	0.66	13.8	B		
	R	1515	1111	0.15	0.73	3.1	A		
WB	L	1693	127	0.25	0.59	9.2	B	30.0	D
	TR	5314	2746	1.00	0.52	30.4	D		
NB	L	1693	127	0.76	0.19	49.6	E	48.5	E
	TR	1707	156	0.79	0.09	47.3	E		
SB	L	1693	127	0.50	0.19	35.6	D	42.3	E
	T	1782	163	0.68	0.09	40.3	E		
	R	1515	467	0.95	0.31	44.2	E		

Intersection Delay = 24.5 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) MORSE ROAD (N-S) SUNBURY ROAD
Analyst: MJH File Name: MSSUN15.HC9
Area Type: Other 9-14-92 2015 PM
Comment: FILE A:\ACCESSPM\MSSUN15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	2	3	1	1	3	<	1	1	<	1	1	1
Volumes	413	2144	123	34	2634	80	156	97	37	100	82	327
Lane Width	12.0	12.0	12.0	12.0	12.0		12.0	12.0		12.0	12.0	12.0
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left *	*		
Thru	*	*			Thru	*		
Right	*	*			Right	*		
Peds					Peds			
WB Left		*			SB Left *	*		
Thru		*			Thru	*		
Right		*			Right	*		
Peds					Peds			
NB Right					EB Right *			
SB Right	*				WB Right			
Green	17A	66A			Green 7A	10A		
Yellow/A-R	5	5			Yellow/A-R 5	5		
Lost Time	3.0	3.0			Lost Time 3.0	3.0		

Cycle Length: 120 secs Phase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	3279	519	0.93	0.16	54.6	E	12.2	B
	T	5346	4010	0.65	0.75	5.0	A		
	R	1515	1250	0.11	0.82	1.3	A		
WB	L	106	60	0.63	0.57	26.1	D	59.2	E
	TR	5322	3016	1.10	0.57	59.6	E		
NB	L	1693	127	0.83	0.20	57.8	E	56.6	E
	TR	1707	171	0.87	0.10	55.2	E		
SB	L	1693	127	0.40	0.20	32.9	D	41.1	E
	T	1782	178	0.51	0.10	34.8	D		
	R	1515	391	0.93	0.26	45.2	E		

Intersection Delay = 37.4 (sec/veh) Intersection LOS = D

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) McCUTCHEON ROAD (N-S) SUNBURY ROAD
Analyst: MJH File Name: MCSUN15.SIG
Area Type: Other 7-21-92 2015 AM
Comment: FILE A:\ACCESSAM\MCSUN15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	<	1	1	<	1	1	<	1	1	<
Volumes	96	405	154	68	334	11	125	460	65	17	334	97
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4		5	6	7	8
EB Left	*	*			NB Left	*	*		
Thru		*			Thru	*	*		
Right		*			Right	*	*		
Peds					Peds				
WB Left	*	*			SB Left		*		
Thru		*			Thru		*		
Right		*			Right		*		
Peds					Peds				
NB Right					EB Right				
SB Right					WB Right				
Green	5A	45A			Green	7A	43A		
Yellow/A-R	5	5			Yellow/A-R	5	5		
Lost Time	3.0	3.0			Lost Time	3.0	3.0		

Cycle Length: 120 secs Phase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	99	0.32	0.48	15.5	C	31.7	D
	TR	1707	669	0.93	0.39	34.5	D		
WB	L	1693	99	0.48	0.48	18.9	C	18.9	C
	TR	1774	695	0.55	0.39	18.9	C		
NB	L	1693	127	0.53	0.47	19.9	C	18.0	C
	TR	1750	831	0.70	0.47	17.6	C		
SB	L	321	120	0.16	0.38	19.0	C	23.5	C
	TR	1721	645	0.74	0.38	23.7	C		

Intersection Delay = 23.5 (sec/veh) Intersection LOS = C

HCM: SIGNALIZED INTERSECTION SUMMARY

MS Consultants

Streets: (E-W) McCUTCHEON ROAD (N-S) SUNBURY ROAD
Analyst: MJH File Name: MCSUN15.HC9
Area Type: Other 9-14-92 2015 PM
Comment: FILE A:\ACCESSPM\MCSUN15

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	<	1	1	<	1	1	<	1	1	<
Volumes	79	331	126	83	408	9	153	376	54	21	408	119
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
RTOR Vols			0			0			0			0

Signal Operations

Phase combination	1	2	3	4	5	6	7	8
EB Left	*	*			NB Left	*	*	
Thru		*			Thru	*	*	
Right		*			Right	*	*	
Peds					Peds			
WB Left	*	*			SB Left		*	
Thru		*			Thru		*	
Right		*			Right		*	
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green		5A	44A		Green	9A	42A	
Yellow/A-R		5	5		Yellow/A-R	5	5	
Lost Time		3.0	3.0		Lost Time	3.0	3.0	

Cycle Length: 120 secs Phase combination order: #1 #2 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	1693	99	0.34	0.47	16.3	C	23.2	C
	TR	1707	654	0.78	0.38	24.4	C		
WB	L	1693	99	0.41	0.47	17.5	C	20.9	C
	TR	1777	681	0.68	0.38	21.6	C		
NB	L	1693	155	0.79	0.48	35.6	D	20.3	C
	TR	1747	844	0.57	0.48	14.8	B		
SB	L	505	185	0.12	0.37	19.2	C	35.2	D
	TR	1721	631	0.93	0.37	35.8	D		

Intersection Delay = 24.9 (sec/veh) Intersection LOS = C

APPENDIX E

ENVIRONMENTAL DOCUMENTS

ODNR
OHIO DEPARTMENT OF
NATURAL RESOURCES

Fountain Square
Columbus, Ohio 43224

July 17, 1991

Mr. Frank Gargiulo
MS Consultants, Inc.
4150 Belden Village Street NW
Suite 300
Canton, OH 44718

Dear Mr. Gargiulo:

After reviewing our maps and files, I find the Division of Natural Areas and Preserves has no records of rare and endangered species in the area of the Morse-Steltzer interchange project.

There are no existing or proposed nature preserves or scenic rivers in the project area, and we are unaware of any unique ecological sites in the vicinity of the Morse-Steltzer project.

Because our inventory program has not surveyed Ohio and relies on information supplied by a number of individuals and organizations, a lack of records for any particular area is not a statement that special plant or animal species are lacking from a site.

Please contact me if I can be of further assistance.

Sincerely,

Victoria Hugo

Victoria Hugo, Ecological Analyst
Division of Natural Areas & Preserves

VH/slc

RECEIVED
7-19-91

ATTACHMENT

Ohio Department of Transportation
Bureau of Environmental Services

FARMLAND PROTECTION POLICY ACT PROJECT SCREENING SHEET

I. Project Information (District):

A. County, route, section: _____
P.F. _____ Length _____

B. Brief description (see attached map(s)): _____
_____
_____

C. SCREENING CRITERIA for land to be acquired:
[If only blocks in left-hand column are checked, project generally will not require completion of SCS's form AD-1006.]

☐ Zoned nonagricultural or developed with 30 structures per 40 acres.
Type of zoning: _____
Administered by: _____

☐ Designated nonagricultural in a comprehensive land use plan adopted within 10 years preceding project programming.
Date of land use plan adoption: _____
Planning agency: _____

☐ Bridge replacement requiring less than 1 acre of new R/W (Item 2 of MOU) - (approx. _____ acre required).
☐ 1 or more acres required (approx. _____ acres).

☐ Widening with linear strip new R/W of less than 3 acres (Item 3 of MOU) - (approx. _____ acres required).
☐ 3 or more acres required (approx. _____ acres).

☐ Intersection improvement requiring less than 3 acres of new R/W (Item 4 of MOU) - (approx. _____ acres required).
☐ 3 or more acres required (approx. _____ acres).

☐ Temporary R/W, to be returned to existing or greater productive capability (Item 5 of MOU) - (approx. _____ acres required).
☐ degradation of productive capability (approx. _____ acres - to be evaluated by BES for each project.)

☐ Channel easement for shaping existing channel (approx. _____ acres required).

II. Proposed Processing (BES and FHWA only):

ODOT	FHWA	
☐	☐	Project type falls within SCS/FHWA/ODOT Memorandum of Understanding (MOU) or is otherwise exempt and completion of Form AD-1006 is not required.
☐	☐	Completion of Form AD-1006 is required.

Reviewed: _____ _____
ODOT/BES Date

Accepted: _____ _____
FHWA Date

ATTACHMENT 1

SOURCE: US SOIL CONSERVATION SERVICE

FRANKLIN COUNTY, OHIO

LIST OF HYDRIC SOILS

MAP SYMBOL	MAP UNIT NAME
Cc	Carlisle muck, 0 - 2%
Cn	Condit Silt Loam, 0 - 2%
Ko	Kokomo silty clay loam, 0 - 2%
Ms	Montgomery silty clay loam, 0 - 2%
Pm	Pewamo silty clay loam, 0 - 2%
So	Sloan silt loam, 0 - 2%
Wt	Westland silty clay loam, 0 - 2%

These soils may have been artificially drained.

ATTACHMENT #2

SOURCE: US SOIL CONSERVATION SERVICE

FRANKLIN COUNTY, OHIO

SUPPLEMENTAL LIST OF NON-HYDRIC MAP UNITS WITH HYDRIC COMPONENTS

Map Symbol		
AdB	Alexandria silt loam, 2-6%	depressions along waterways
AdC2	Alexandria silt loam, 6-12%	along drainageways
Ag	Algiers silt loam, 0-2%	depresssions
BeA	Bennington silt loam, 0-2%	along waterways and in depressions
BFA	Bennington Urban-land complex, 0-2%	in depresssions and along waterways
BfB	Bennington Urban-land complex, 2-6%	along waterways
BoA	Blount silt loam, 0-2%	depresssions & waterways
BoB	Blount silt loam, 2-6%	oval depressions & drainageways
CaB	Cardington silt loam, 2-6%	along drainageways
CaB2	Cardington silt loam, 2-6%	along drainageways
CaC2	Cardington silt loam, 6-12%	along drainageways
CbB	Cardington Urban-land complex, 2-6%	in depresssions
Cc	Carlisle muck, 0-2%	underlying the muck
CeA	Celina silt loam, 0-2%	along drainageways
CeB	Celina silt loam, 2-6%	along drainageways
CeB2	Celina silt loam, 2-6%	along drainageways
CeC2	Celina silt loam, 6-12%	along drainageways

CfB	Celina Urban-land complex, 2-6%	strips in depresssions
Cn	Condit silt loam, 0-2%	depressions & strips along waterways
CrA	Crosby silt loam, 0-2%	depressions
CrB	Crosby silt loam, 2-6%	along waterways & in depressions
CsA	Crosby-Urban land complex, 0-2%	along waterways
CsB	Crosby-Urban land complex, 2-6%	along waterways
Ee	Eel silt loam, occasionally flooded, 0-2%	old channels, near terraces
E1A	Eldean silt loam, 0-2%	drainageways and depressions
E1B	Eldean silt loam, 2-6%	drainageways
EmA	Eldean-Urban land complex, 0-2%	drainageways and depressions
EmB	Eldean-Urban land complex, 2-6%	drainageways and depressions
GwB	Glynwood silt loam, 2-6%	drainageways & oval depressions
GwC2	Glynwood silt loam, 6-12%	drainageways & oval depressions
LeB	Lewisburg-Crosby complex, 2-6%	between knolls & along drainageways
Mh	Medway silt loam, 0-2%	slope breaks and terraces
MkB	Miamian silt loam, 2-6%	strips along waterways
M1B2	Miamian silty clay loam, 2-6%	along drainageways
M1C2	Miamian silty clay loam, 6-12%	along drainageways
McC3	Miamian clay loam, 6-12%	along drainageways

OcA	Ockley silt loam, 0-2%	depressions and drainageways
Sh	Shoals silt loam, 0-2%	depressions and high water channels
SIA	Sleeth silt loam, 0-2%	depressions
SmA	Sleeth-Urban land complex, 0-2%	depressions
ThA	Thackery silt loam, 0-2%	depressions & waterways
ThB	Thackery silt loam, 2-6%	along waterways
Uu	Urban land-bennington complex, 0-2%	depressions
Ur	Urban land-Celina complex, 0-2%	depressions & along water-ways

APPENDIX F

PRELIMINARY PLAN AND PROFILE

INTERSTATE 270

INTERSTATE 161

HARBIN DRIVE

RAMP "A"

RAMP "B"

RAMP "C"

RAMP "D"

RAMP "E"

RAMP "F"

RAMP "G"

RAMP "H"

PC = F-1255+73.10

D-1255+00

PT = F-1258+12.93

F-1250+00

D-1250+00

D-1255+00

G-1250+00

1250+00

A-857+75.41

C-1255+00

PT = C-1255+92.77

C-1245+00

C-1260+00

PC = G-1242+58.91

RAMP "C"

PC = C-1263+99.33

C-1265+00

C=1270+00

PT = C-1273+02.2

PC = 852+77.04

C-854+79.44

H-1250+00

H-1255+00

A-853+00

H-1260+00

H-1245+00

PT=H-1244+67.3

C-1260+00

825+00

830+00

833+00

835+00

840+00

845+00

850+00

A-830+00

PC=833+30.97

A-835+00

A-850+00

PT = A-835+02.91

PC = A-837+19.64

PT = A-847+75.11

A-840+00

H-1265+00

A-845+00

1265+00

1270+00

D-1265+00

D-1270+00

D-1275+00

D-1280+00

PT=D-1289+88.26

B-1280+00

PC=D-1286+43.95

D-1285+00

PT=D-1280+94.79

B-1265+00

PT = B-1265+79.21

PT=H-1269+55.36

H-1270+00

B-1270+00

PT=E-825+00

E-825+00

G-1255+00

PT=G-1267+66.02

PT=E-826+03.77

E-830+00

PC=E-831+08.75

G-1270+00

PC=G-1272+18.98

N

GRAPHIC SCALE

0 100 200 300 500

(IN FEET)

FRA-270-30.00

INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

Figure F-1

PRELIMINARY PLAN I-270 & S.R. 161 INTERCHANGE RAMPS

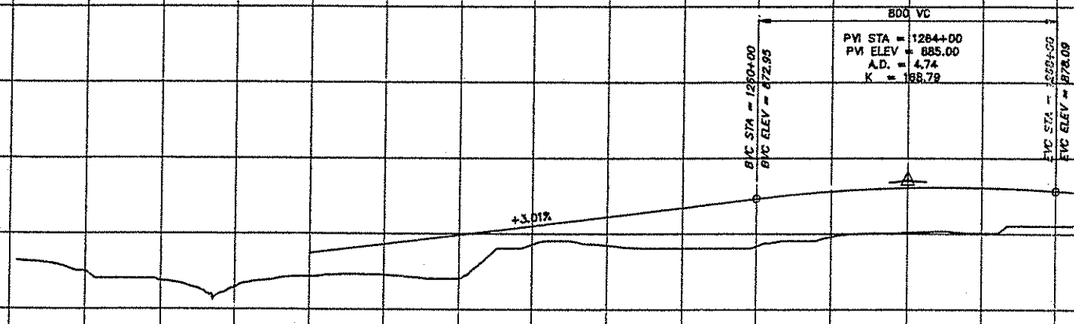
Prepared by

ms consultants, inc.

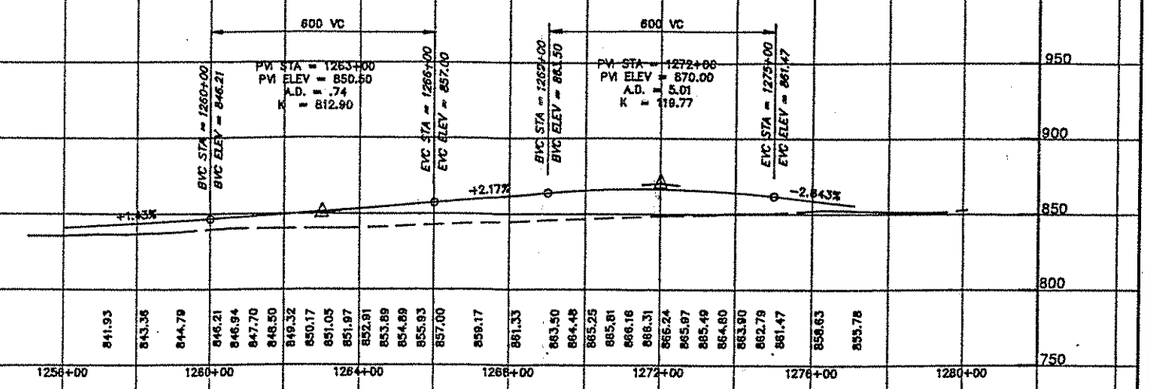
Columbus, Ohio

PROFILE GRADE SAME AS EXISTING RAMP "A"

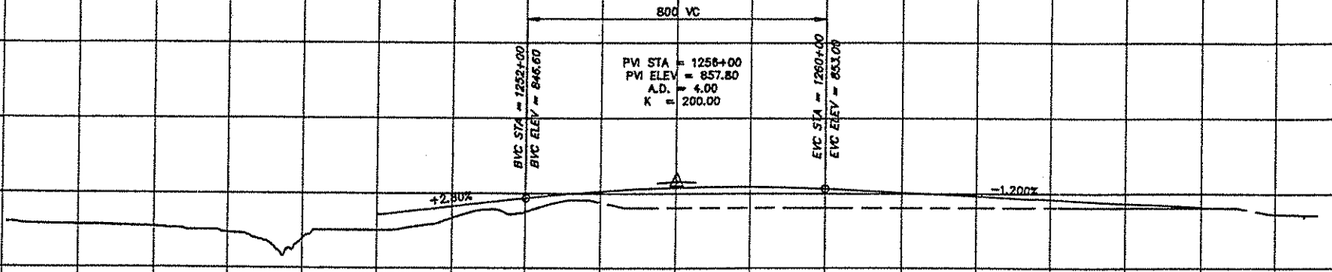
S.R. 161 INTERCHANGE – RAMP "A"



S.R. 161 INTERCHANGE – RAMP "B"



S.R. 161 INTERCHANGE – RAMP "D"



S.R. 161 INTERCHANGE – RAMP "C"

FRA–270–30.00

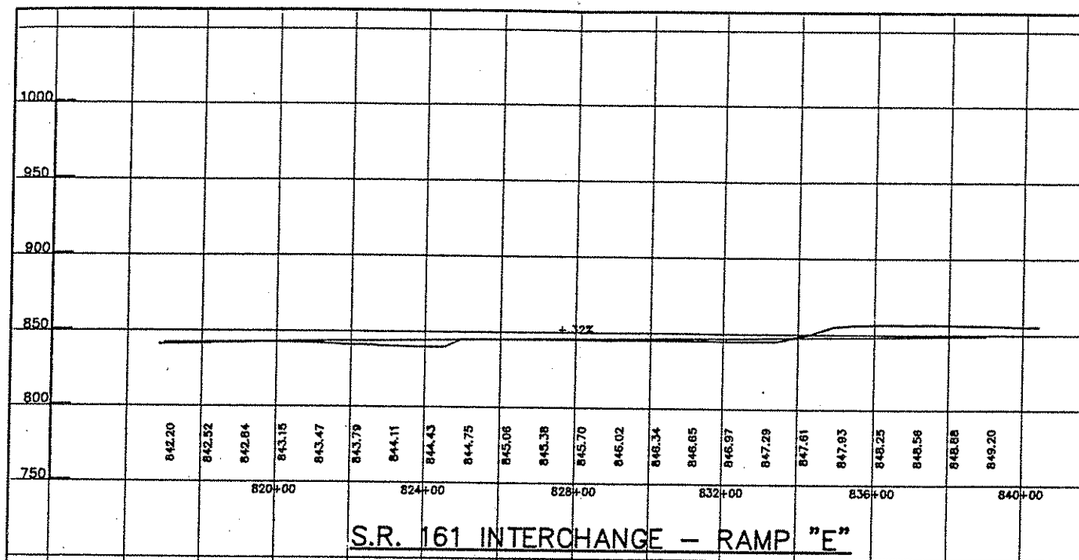
INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

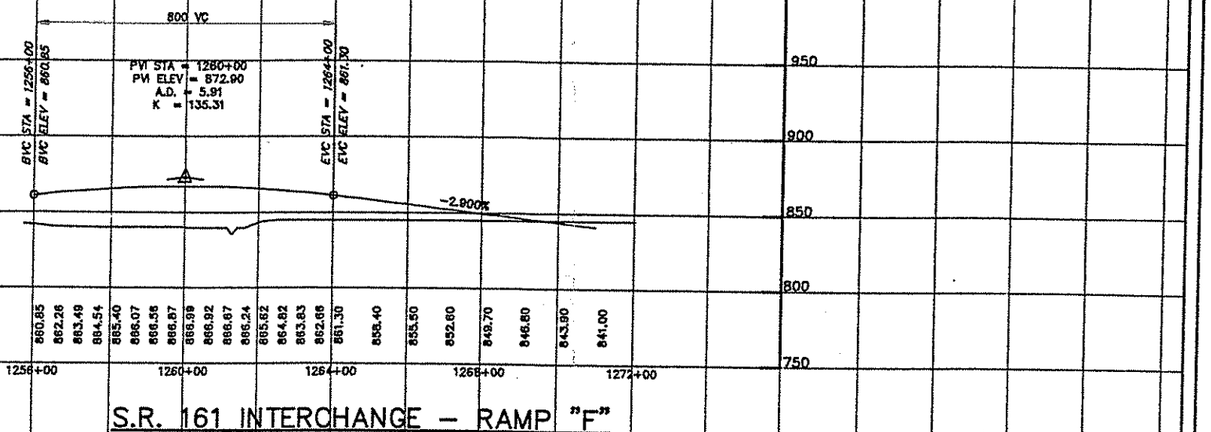
Figure F–1A

PRELIMINARY PROFILE I–270: S.R. 161 INTERCHANGE RAMPS

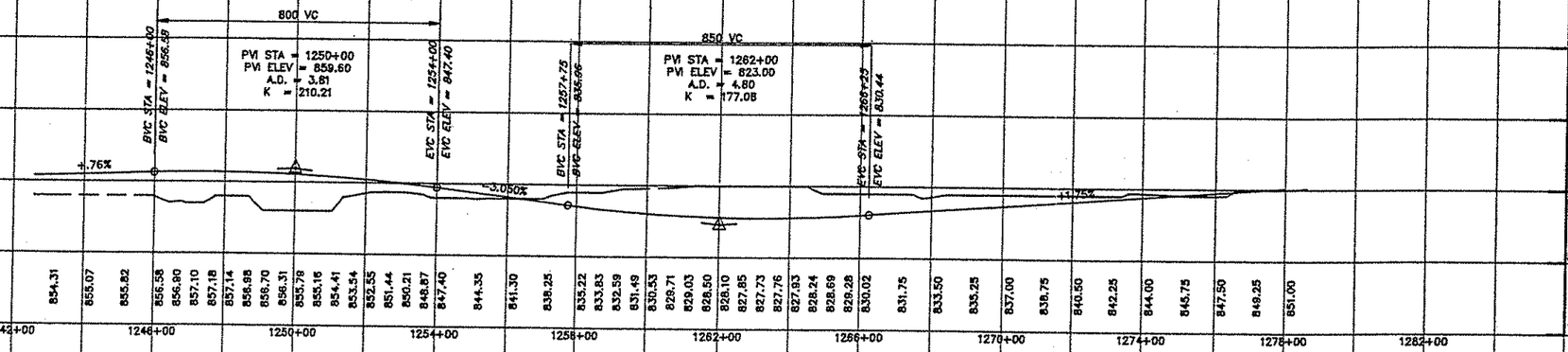
Prepared by
ms consultants, inc.
Columbus, Ohio



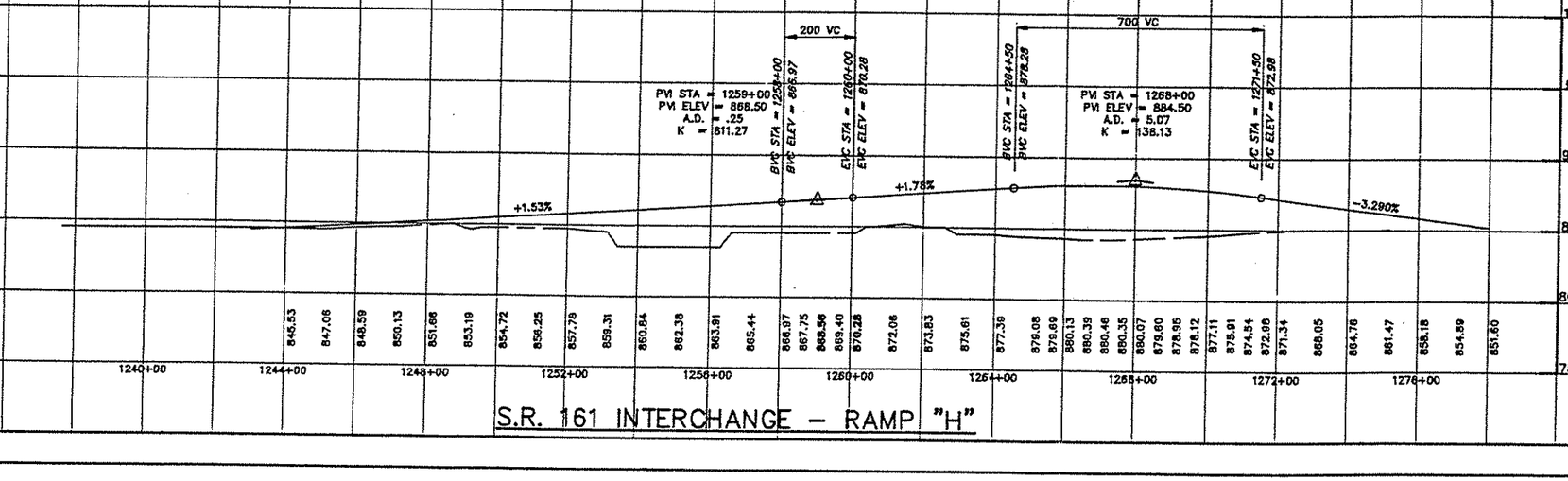
S.R. 161 INTERCHANGE – RAMP "E"



S.R. 161 INTERCHANGE – RAMP "F"



S.R. 161 INTERCHANGE – RAMP "G"



S.R. 161 INTERCHANGE – RAMP "H"

FRA–270–30.00

INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

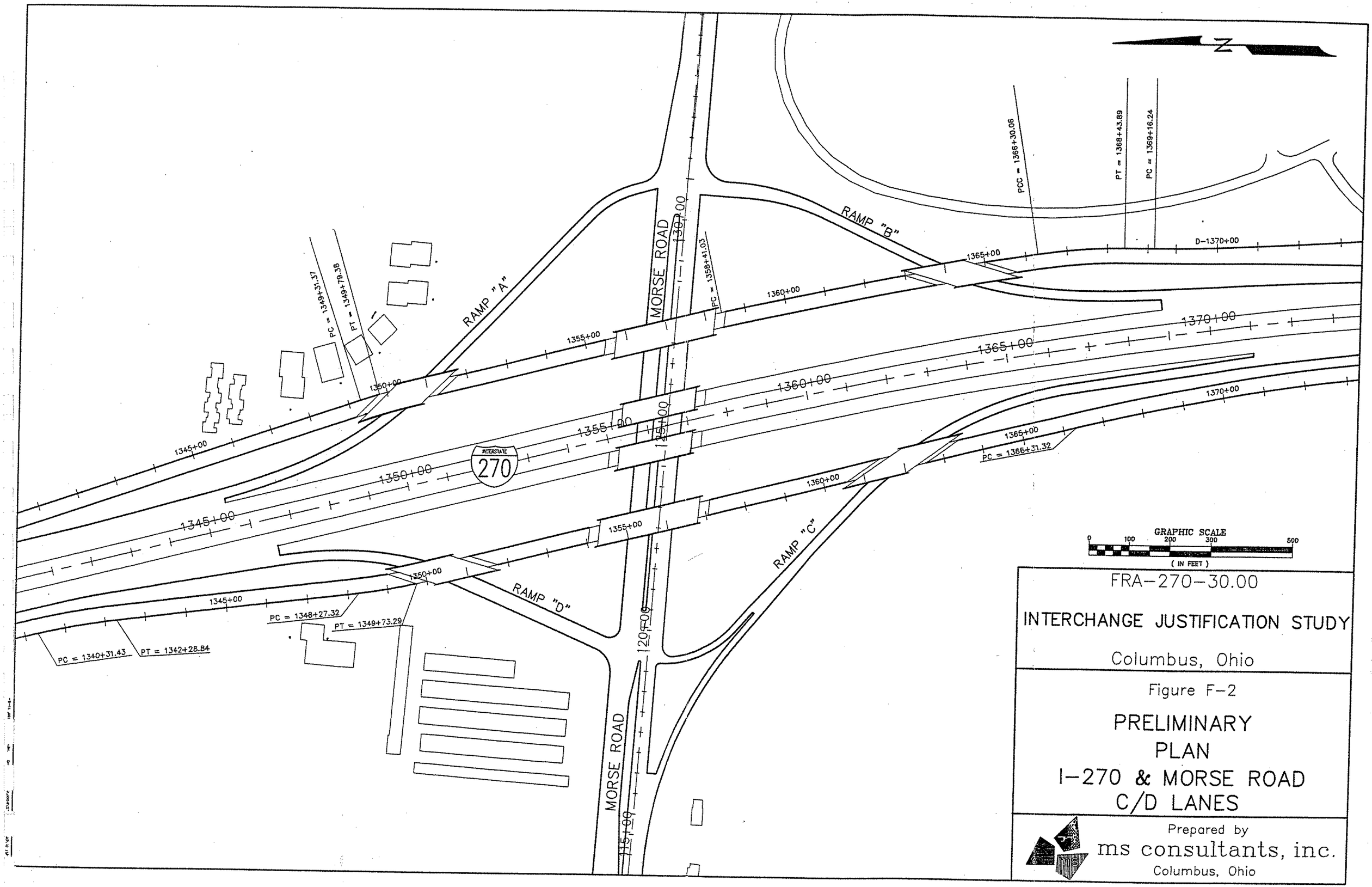
Figure F–1B

PRELIMINARY PROFILE I–270 & S.R. 161 INTERCHANGE RAMPS

Prepared by

ms consultants, inc.

Columbus, Ohio



FRA-270-30.00

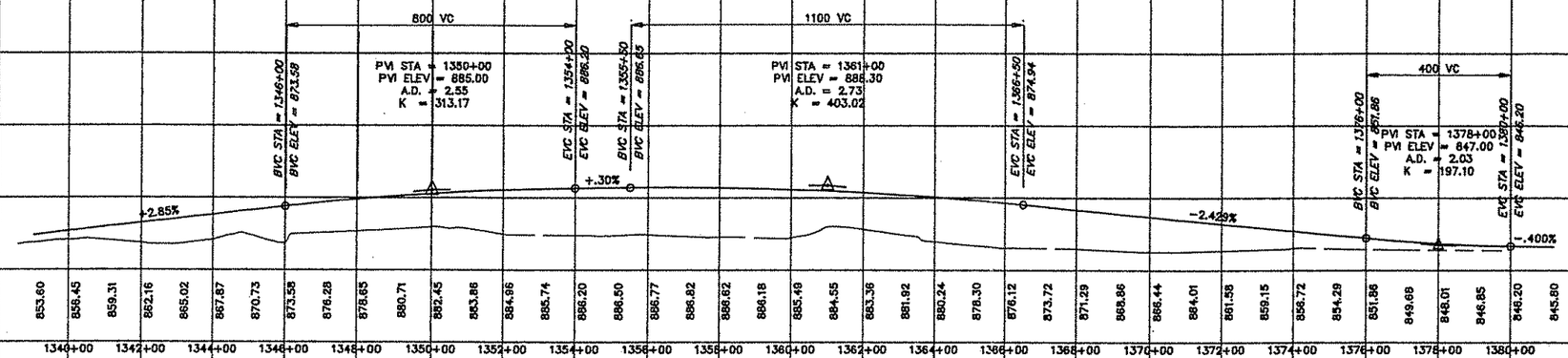
INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

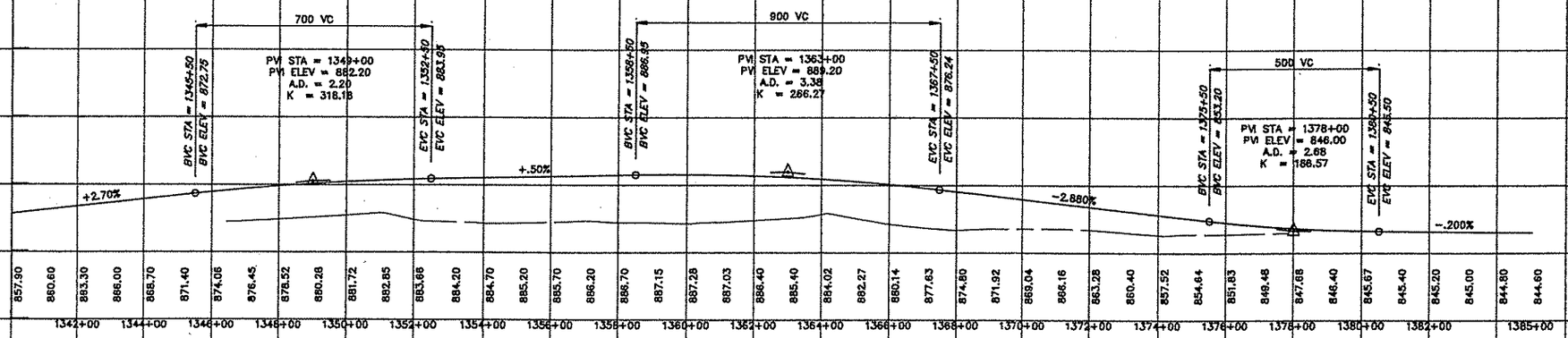
Figure F-2

PRELIMINARY PLAN
I-270 & MORSE ROAD C/D LANES

Prepared by
ms consultants, inc.
Columbus, Ohio



CD LANES–SOUTHBOUND @ MORSE ROAD



CD LANES–NORTHBOUND @ MORSE ROAD

FRA–270–30.00

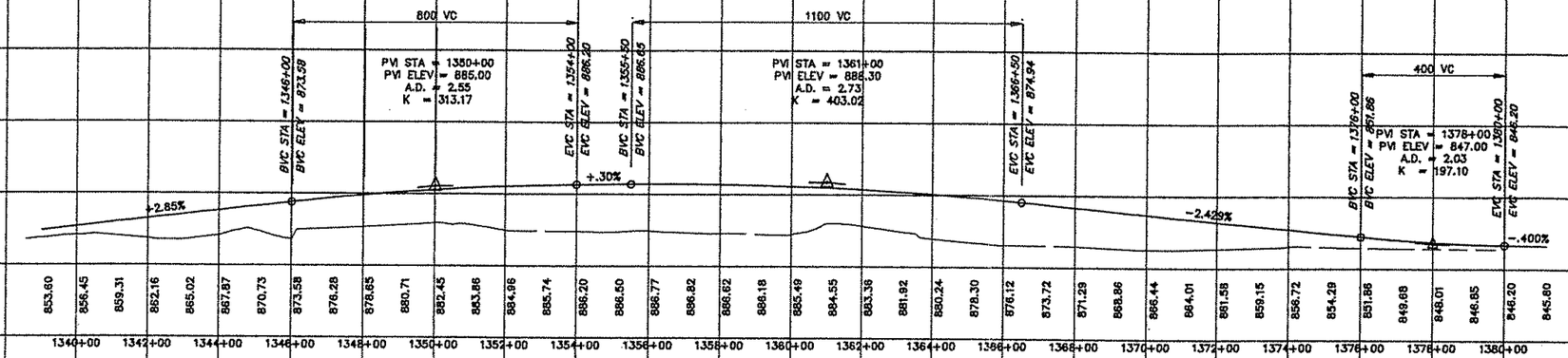
INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

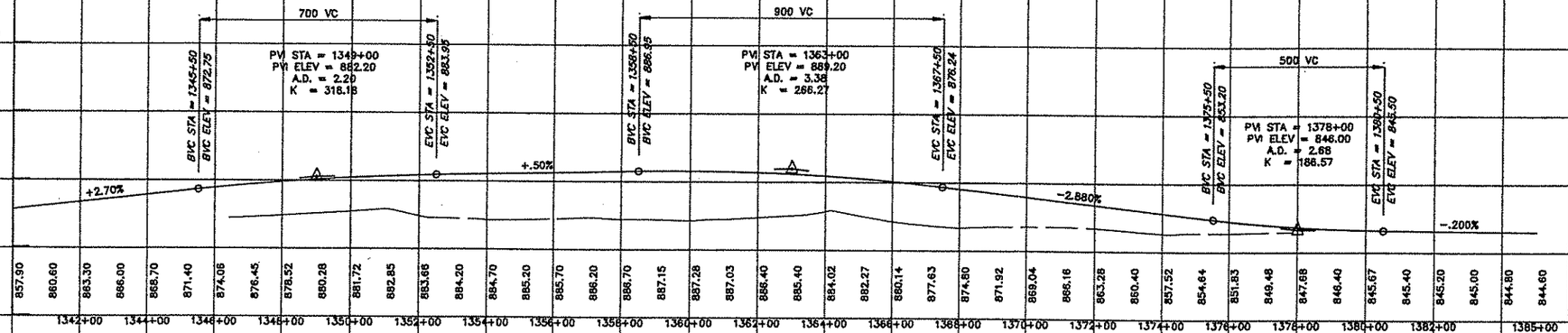
Figure F–2A

PRELIMINARY PROFILE I–270 & MORSE ROAD C/D LANES

Prepared by
ms consultants, inc.
Columbus, Ohio



CD LANES–SOUTHBOUND @ MORSE ROAD



CD LANES–NORTHBOUND @ MORSE ROAD

FRA–270–30.00

INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

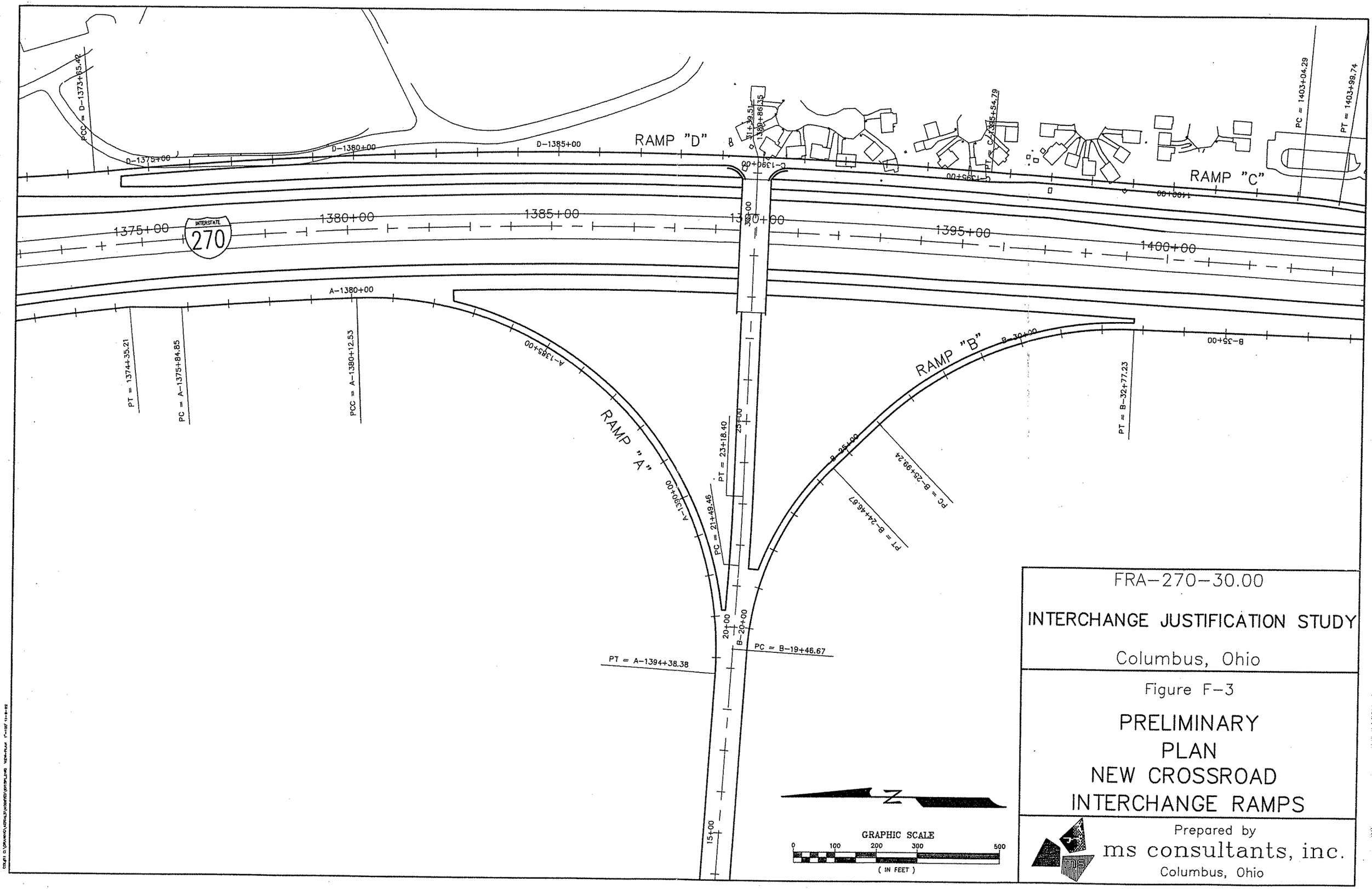
Figure F–2A

PRELIMINARY PROFILE I–270 & MORSE ROAD C/D LANES

Prepared by

ms consultants, inc.

Columbus, Ohio



FRA-270-30.00

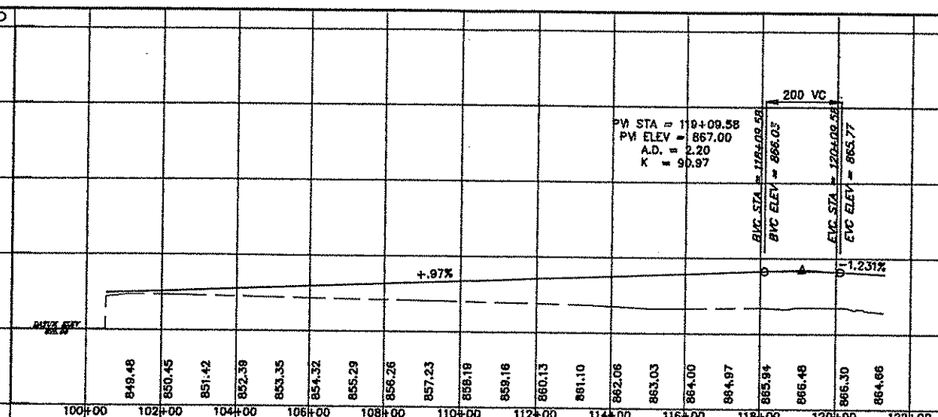
INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

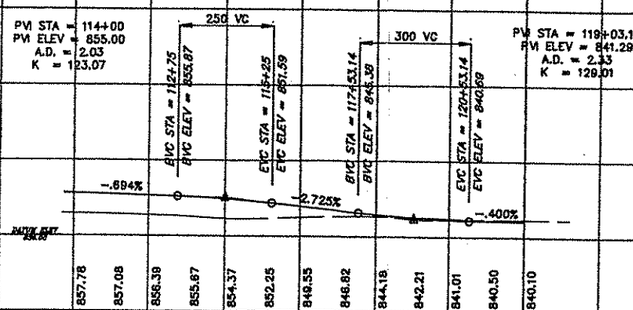
Figure F-3

PRELIMINARY PLAN NEW CROSSROAD INTERCHANGE RAMPS

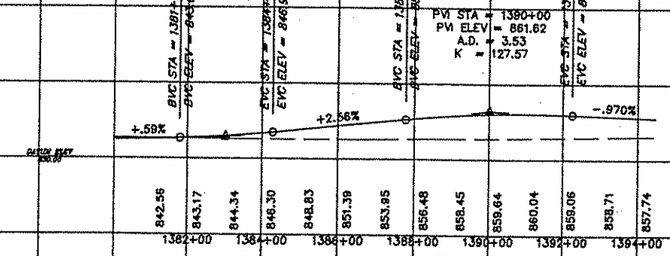
Prepared by
ms consultants, inc.
Columbus, Ohio



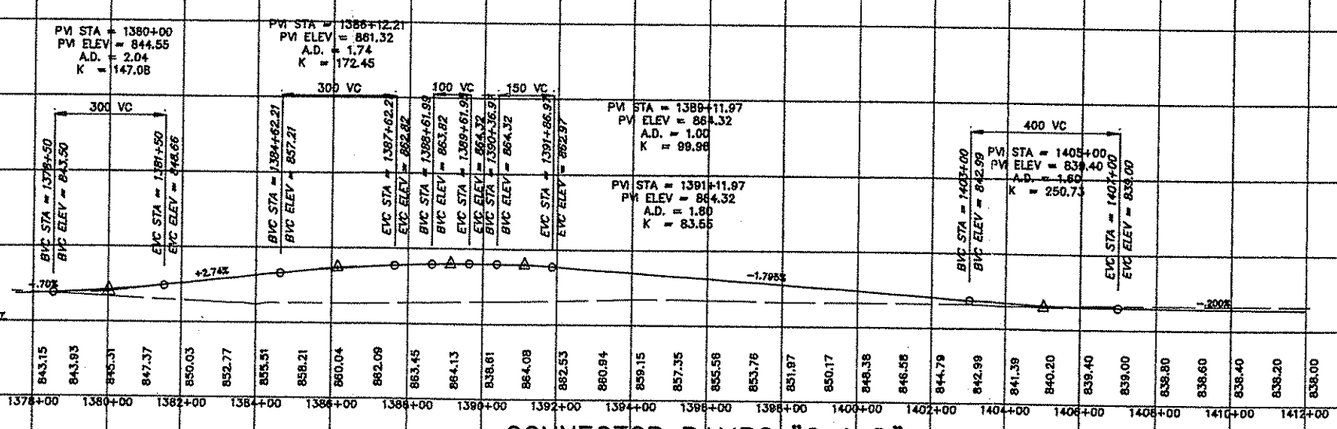
CONNECTOR



CONNECTOR RAMP "A"



CONNECTOR RAMP "B"



CONNECTOR RAMPS "C & D"

FRA-270-30.00

INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

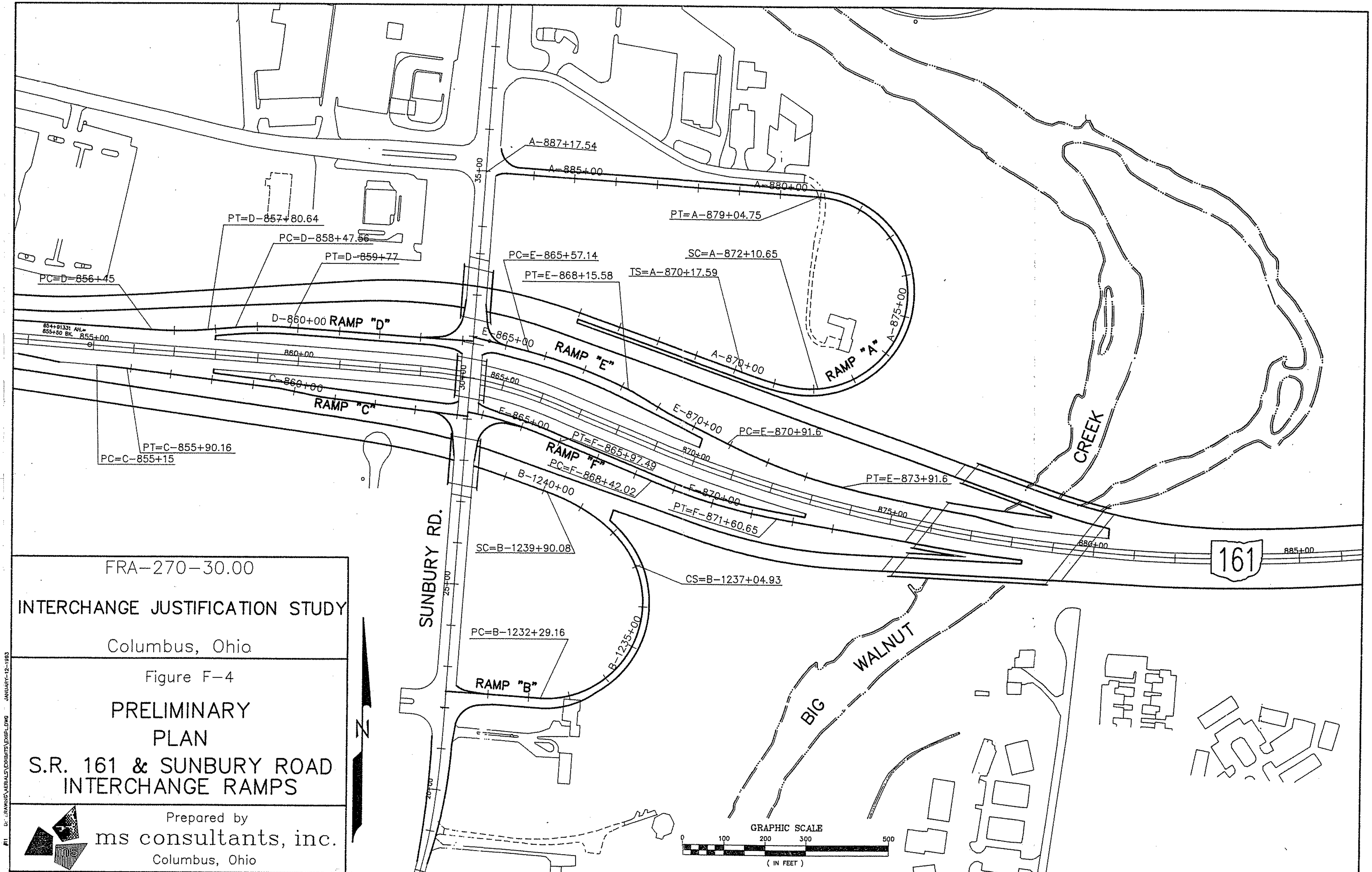
Figure F-3A

PRELIMINARY PROFILE NEW CROSSROAD INTERCHANGE RAMPS

Prepared by

ms consultants, inc.

Columbus, Ohio



FRA-270-30.00

INTERCHANGE JUSTIFICATION STUDY

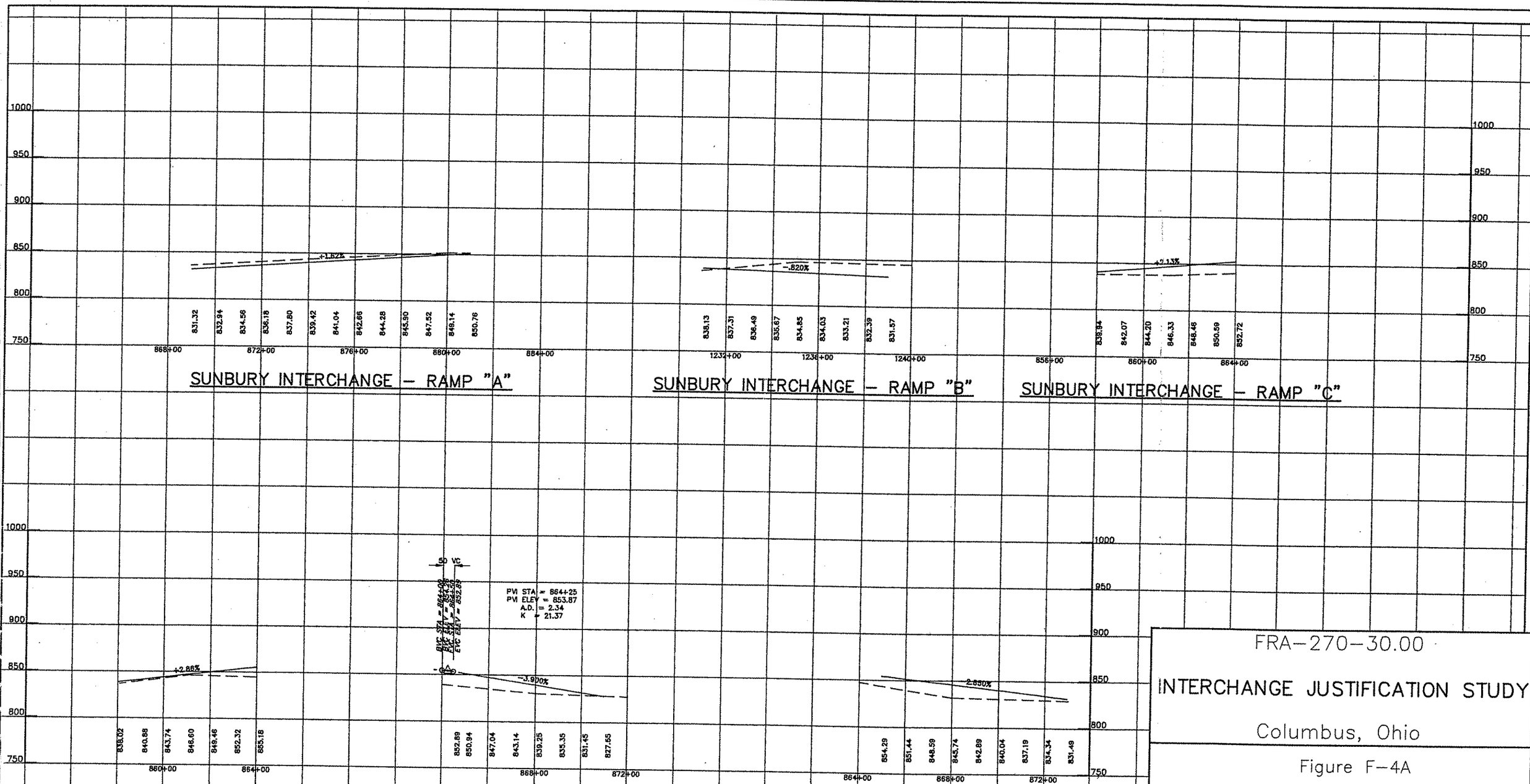
Columbus, Ohio

Figure F-4

PRELIMINARY PLAN

S.R. 161 & SUNBURY ROAD INTERCHANGE RAMPS

Prepared by
ms consultants, inc.
Columbus, Ohio



FRA–270–30.00

INTERCHANGE JUSTIFICATION STUDY

Columbus, Ohio

Figure F–4A

PRELIMINARY PROFILE S.R. 161: SUNBURY ROAD INTERCHANGE RAMPS

Prepared by

ms consultants, inc.

Columbus, Ohio