Attachment J

October 2, 2014

Mr. Brandon Freeman
Charles P. Johnson and Associates
1751 Elton Road
Silver Spring, Maryland 21093

RE: Rockwood Manor
      Montgomery County, Maryland
      Our Job No: 2014-0615

Dear Mr Blass:

The Traffic Group, Inc. has had an opportunity to conduct a Preliminary Assessment of the proposed changes to the Rockwood Manor facility located in the Potomac area of Montgomery County. The Rockwood Manor Property is located in the northeast quadrant of the McArthur Boulevard and Belfast Road intersection as shown on Exhibit 1. At the present time, the subject facility is served by a single point of access along McArthur Boulevard for vehicles entering and exiting the subject site. In order to provide a more efficient operation on the subject site, it is currently proposed that access to the property be modified to include a single point of access inbound along McArthur Boulevard and a single point of egress along Belfast Road. A copy of the preliminary site plan is shown on Exhibit 2.

McArthur Boulevard is a two lane north/south roadway in the vicinity of the subject property. The posted speed limit along McArthur Boulevard is 35 MPH. Belfast Road is a two lane east/west roadway which intersects McArthur Boulevard along the east side. The Belfast Road approach to McArthur Boulevard is presently controlled by a stop sign. The posted speed limit along Belfast Road is 25 MPH. Exhibit 3 was prepared to show the existing lane use and traffic control along the adjacent roadways.

The Traffic Group, Inc., conducted 24-hour machine counts along McArthur Boulevard and Belfast Road from Wednesday, June 18th, 2014 to Monday, June 23, 2014. These counts were conducted to determine the hourly directional traffic along each of these roadways. A summary showing the total vehicles observed during each of the one hour intervals for each day is contained in Appendix A to this letter.

For the purposes of this analysis, we have presented a "worst case" scenario by using the highest volume observed during the morning and evening peak hours on any of the days that were counted and the highest one hour volumes observed on the weekend. Exhibit 4 was prepared to show the existing peak hour volumes along each of the study area roadways for both the weekday morning and evening peak hour and the weekend peak hour.

In anticipation of future growth along the adjacent roadways, we have adjusted the existing peak hour volumes to reflect a 2% growth per year for a three year period to represent conditions in the design year of the subject project. The 2017 peak hour volumes are shown on Exhibit 5.

Trip Generation

The Rockwood Manor facility has the capacity for approximately 170 individuals indoors or 200 individuals for an outdoor event. Based on this information, for the purposes of this analysis we are presenting a "worst case" scenario and assuming an event for 200 people.

Based on studies obtained of other similar type facilities, we have prepared Exhibit 6 which shows the trips projected to be generated by the subject facility for both the weekday morning and evening peak hours and the weekend peak hour. Once again, these numbers are based on the maximum capacity of the subject facility and the highest one hour volumes along the adjacent roadways..

The peak hour trips shown on Exhibit 6 were then distributed and assigned to the nearby road system as shown on Exhibit 7. Exhibit 8 shows the total peak hour volumes, which combines the trips projected to be generated by the subject facility along with the background traffic conditions.

Intersection Capacity Analyses and Two-Lane Highway Capacity Manual Methodology Analysis have been conducted for the study area roadways and intersections and the results are shown on Exhibit 9. Copies of the capacity worksheets are contained in Appendix B of this report.

A review of Exhibit 9 indicates that both of the access points to the subject facility along with the Belfast Road and McArthur Boulevard roadway segments are projected to operate at acceptable levels of service based on accepted standards for Montgomery County even when assuming an extreme worst case for the use of the subject facility.

Summary of Findings

Based on the information contained in this Technical Memorandum, it is our opinion that the proposed modifications to the Rockwood Manor Facility would not result in unsatisfactory traffic conditions along the adjacent roadways in Montgomery County.

If you have any questions concerning this information, please do not hesitate to contact me.

Sincerely,

Glenn Cook
Vice President

GEC/clg
(F:\2014\2014-0615_Rockwood Manor\DOCS\CORRESP\ANALYST\Technical Memorandum.docx)

SITE

Rockwood
Special Park

N

FAWSETT
FARMS

OMERY COUNTY

n a l
a l
c a l
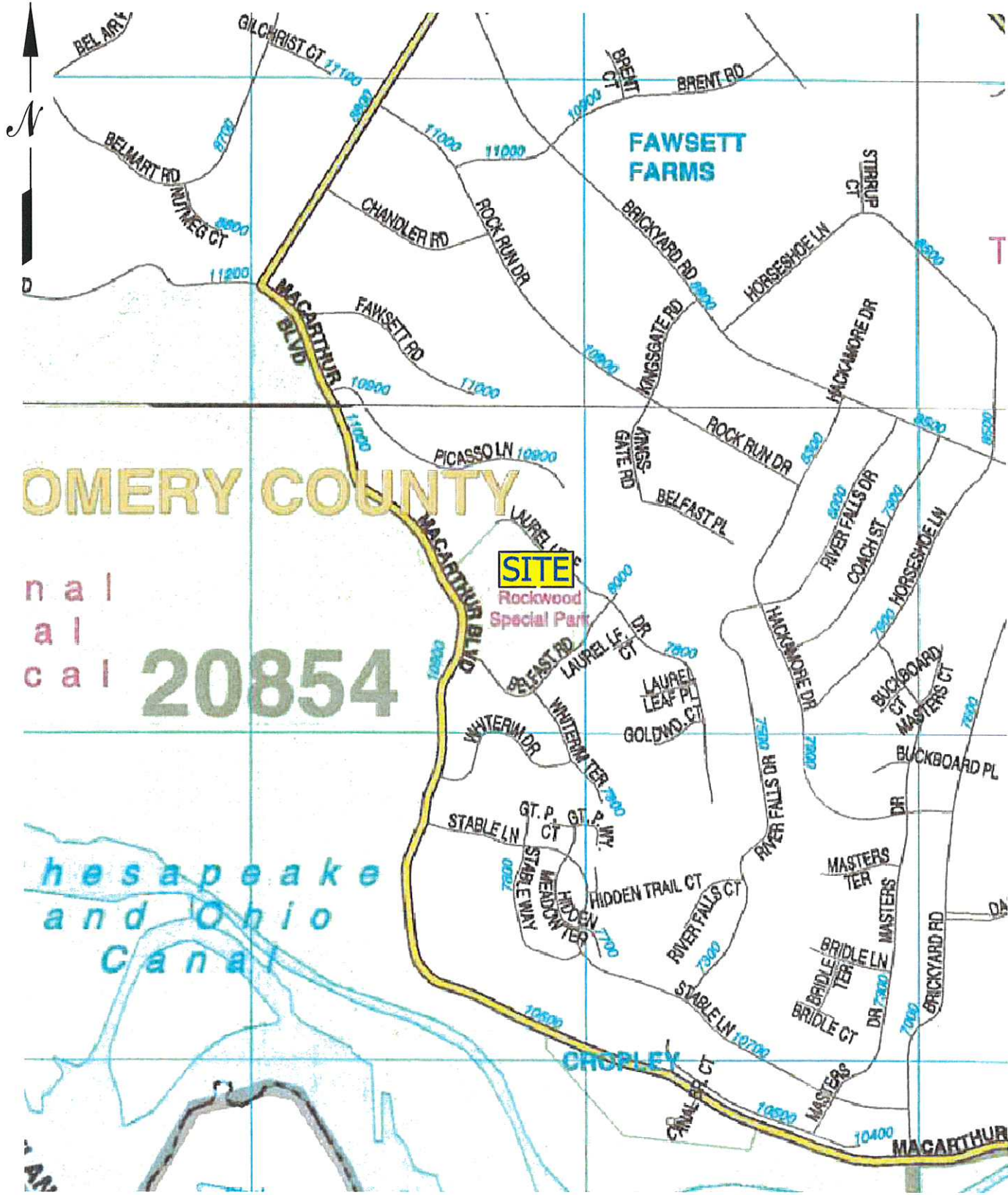
20854

hesapeake
and Ohio
Canal

BEL AIR
GILCHRIST CT 11100
BELMART RD NUTMEG CT
CHANDLER RD
ROCK RUN DR
BRENT CT
BRENT RD
STIRRUP CT
HORSESHOE LN
BRICKYARD RD
HACKAMORE DR
MACARTHUR BLVD
FAWSETT RD
KINGSGATE RD
PICASSO LN 10900
KINGS-GATE RD
ROCK RUN DR
BELFAST PL
RIVER FALLS DR
COACH ST
HORSESHOE LN
LAUREL LF
MACARTHUR BLVD
BELFAST RD
LAUREL LF DR CT
HACKAMORE DR
LAUREL LEAF PL
GOLDWD. CT
BUCKBOARD CT
MASTERS CT
WINTERIM DR
WINTERIM TER
BUCKBOARD PL
RIVER FALLS DR
MASTERS DR
STABLE LN
GT. P. CT
GT. P. WY.
STABLE WAY
HIDDEN MEADOW TER
HIDDEN TRAIL CT
RIVER FALLS CT
RIVER FALLS DR
MASTERS TER
MASTERS DR
BRIDLE LN
BRIDLE TER
BRIDLE CT
STABLE LN 10700
BRICKYARD RD
CROPLEY
CANAL CT. CT
MASTERS
MACARTHUR

1,000 ft

EXHIBIT 1
SITE LOCATION MAP

The Traffic Group®

myc, 140615_rockwood manor\initial\ex.dwg-loc_st, f10/3/2014

VEHICULAR CIRCULATION
1. Alternate Exit Drive on Belfast Road
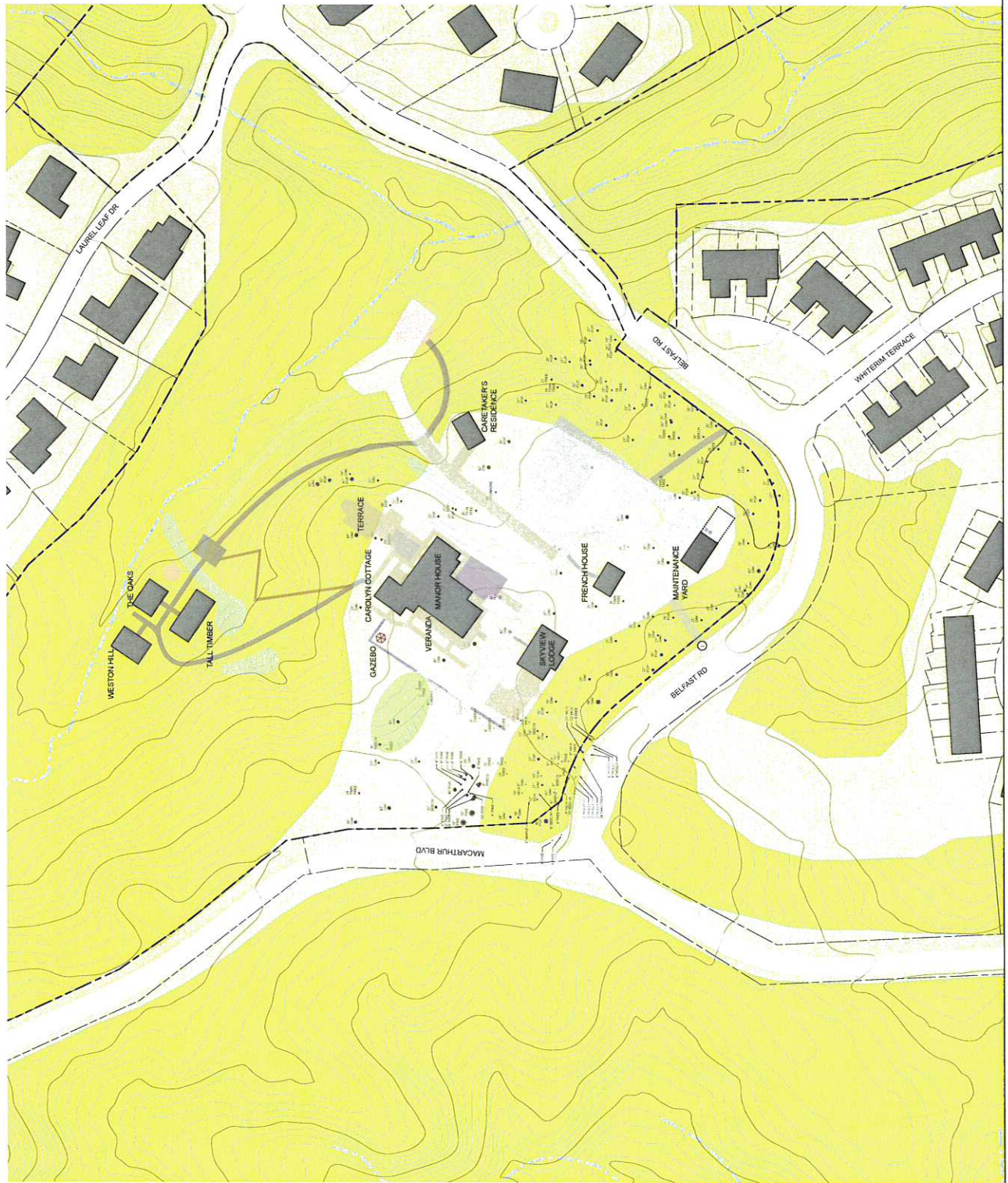
EXHIBIT 2

Charrette Sketch Alternative B

April 28, 2014

Rockwood Manor Feasibility Study
Potomac, Maryland

Map labels: LAUREL LEAF DR, WESTON HILL, THE OAKS, TALL TIMBER, TERRACE, CAROLYN COTTAGE, GAZEBO, VERANDA, MANOR HOUSE, CARETAKER'S RESIDENCE, SKYVIEW LODGE, FRENCH HOUSE, MAINTENANCE YARD, BELFAST RD, BELFAST RD, MACARTHUR BLVD, WHITERIM TERRACE

SPEED
LIMIT
35

New Entrance

SITE

MacAuthur Blvd

New Exit

Belfast Rd

SPEED
LIMIT
25
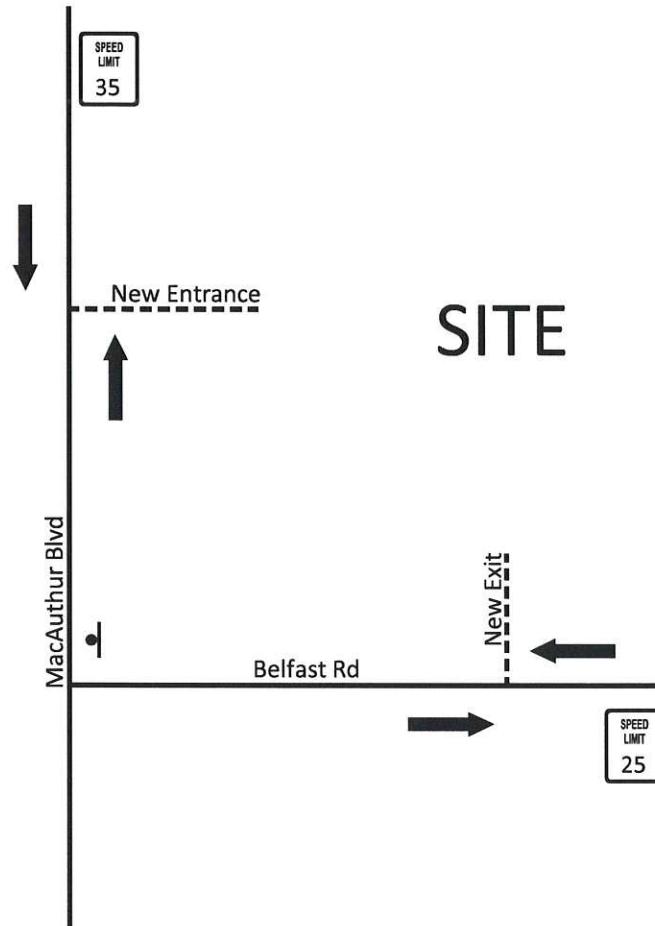
: Stop Sign

NOT TO SCALE

EXHIBIT 3
EXISTING LANE USE

The
Traffic
Group®

The Traffic Group, Inc.
Since 1985

569 (290) [233]

New Entrance

SITE

[245] (595) 74

MacAuthur Blvd

New Exit

54 (24) [26]

Belfast Rd

[31] (38) 17
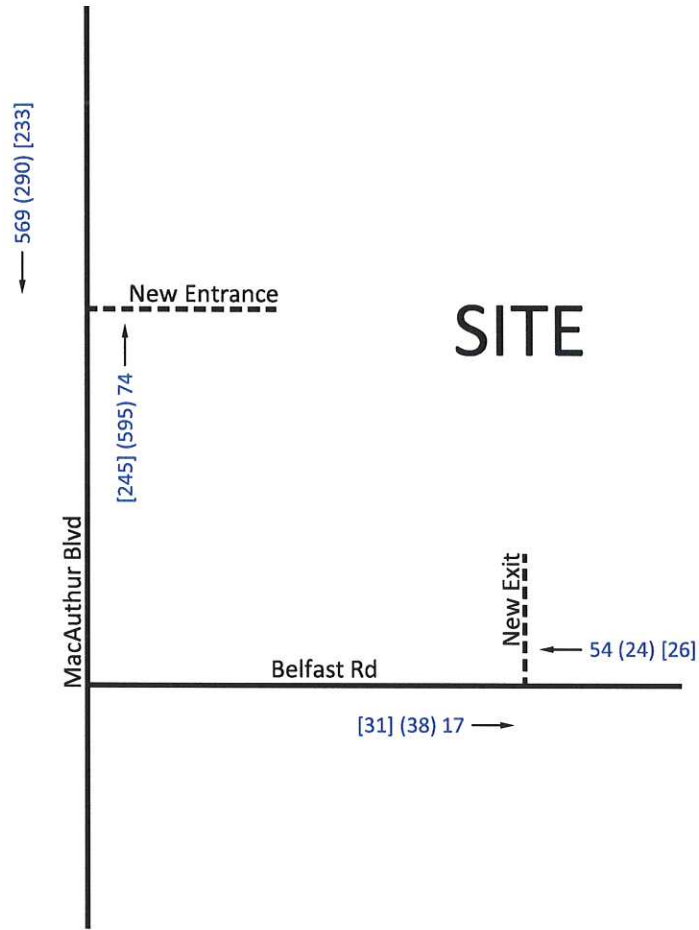
The Traffic Group ®

NOT TO SCALE

00   - MORNING PEAK HOUR
(00) - EVENING PEAK HOUR
[00] - WEEKEND PEAK HOUR

EXHIBIT 4
EXISTING PEAK HOUR
TRAFFIC VOLUMES

myc, 140615_rockwood manor\initial\ex.dwg-exist, f7/10/2014

The Traffic Group, Inc.
Since 1985

604 (308) [247]

New Entrance

[260] (631) 79

SITE

MacAuthur Blvd

New Exit

54 (24) [26]

Belfast Rd

[31] (38) 17

Note: Traffic growth of 2% per year was applied to through traffic along MacAuthur Blvd for 3 years.

NOT TO SCALE

The Traffic Group®

00   - MORNING PEAK HOUR
(00) - EVENING PEAK HOUR
[00] - WEEKEND PEAK HOUR

EXHIBIT 5
BACKGROUND PEAK HOUR
TRAFFIC VOLUMES

myc, 140615_rockwood manor\initial\ex.dwg-back, f7/10/2014

TRIP GENERATION

	MORNING PEAK HOUR			EVENING PEAK HOUR			WEEKEND PEAK HOUR		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
Rockwood Manor									
Banquet Hall Trip Rate(trips/seat)	*0.28*	*0*	*0.28*	*0.28*	*0.15*	*0.43*	*0.28*	*0.15*	*0.43*
200 Seats	56	0	56	56	30	86	56	30	86

Note:
1. The following resources were reviewed to determine the trip rates for banquet facilities. The highest rates are choosen for a more conservative approach.
    a. TIS for Valhalla Brandywine prepared by McMahon, Oct 14, 2008.
    b. TIS for The Regent at Stone House prepared by The Traffic Group, Jul 1, 2014.
    c. Trip generation rates from NJDOT.
2. It is assumed that there are only inbound trips during the morning peak hour and they are the same as evening peak hours.

The Traffic Group

EXHIBIT 6

TRIP GENERATION

FOR SUBJECT SITE

30%

The Traffic Group, Inc.
Since 1985

17 (17) [17]

New Entrance

SITE
IN: 56 (56) [56]
OUT: 0 (30) [30]

[9] (9) 0
[39] (39) 39

MacAuthur Blvd

0 (9) [9]

0 (30) [30]

New Exit

0 (21) [21]

Belfast Rd

70%

NOT TO SCALE

The Traffic Group ®
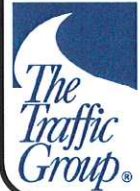
00 - MORNING PEAK HOUR
(00) - EVENING PEAK HOUR
[00] - WEEKEND PEAK HOUR

EXHIBIT 7
TRIP ASSIGNMENT
FOR SUBJECT SITE

myc, 140615_rockwood manor\initial\ex.dwg-stn, f10/2/2014

The Traffic Group, Inc.
Since 1985

604 (308) [247]
17 (17) [17]

New Entrance

SITE

[269] (640) 79
[39] (39) 39

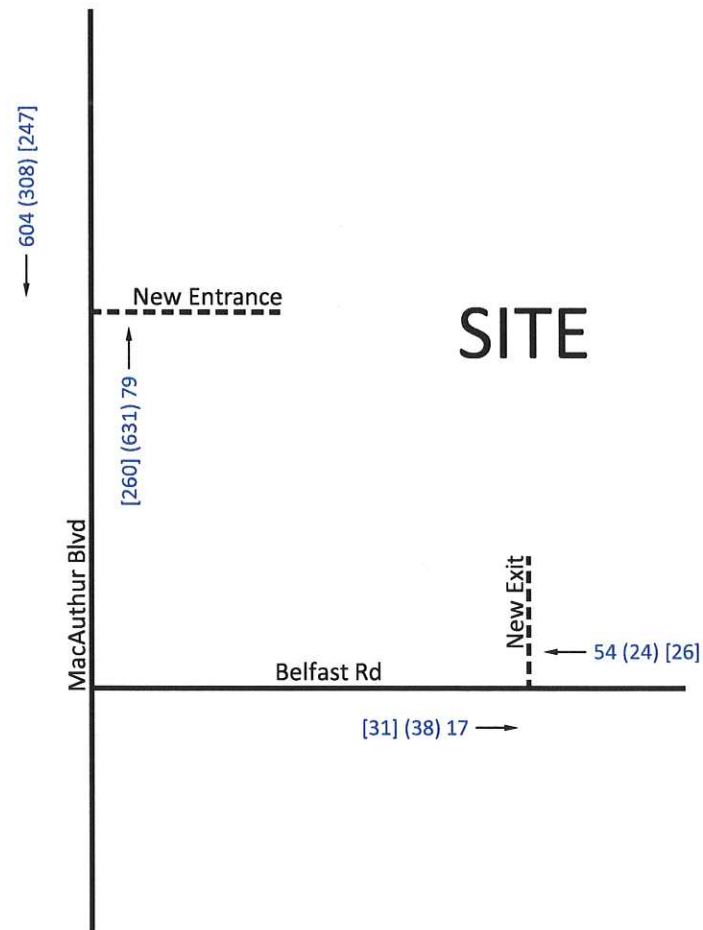MacAuthur Blvd

0 (30) [30]

New Exit

54 (24) [26]

Belfast Rd

[31] (38) 17
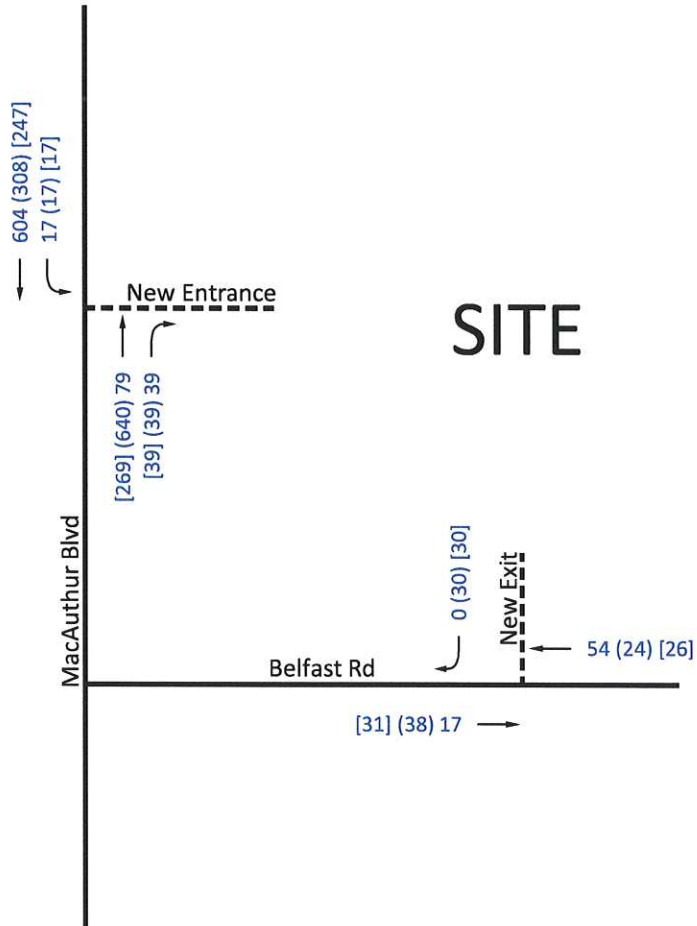
NOT TO SCALE

00 - MORNING PEAK HOUR
(00) - EVENING PEAK HOUR
[00] - WEEKEND PEAK HOUR

EXHIBIT 8
TOTAL PEAK HOUR
TRAFFIC VOLUMES

CLV Analysis

Intersection	Total Traffic		
	AM Peak	PM Peak	Weekend Peak
	LOS / CLV	LOS / CLV	LOS / CLV
MacArthur Blvd & New Entrance	A / 621	A / 696	A / 325
Belfast Rd & New Exit	A / 54	A / 54	A / 56

HCM Two-Lane Highway Analysis

Highway Segment	Total Traffic		
	AM Peak	PM Peak	Weekend Peak
	V/C	V/C	V/C
MacAuthur Blvd			
from Belfast Rd/Site Entrance	0.41	0.46	0.21
North of Site Entrance	0.42	0.43	0.18
Belfast Rd			
From Site Exit to MacAuthur Blvd	0.04	0.04	0.04

EXHIBIT 9
RESULTS OF INTERSECTION
CAPACITY ANALYSES

The Traffic Group

APPENDIX A

Traffic Counts

The Traffic Group, Inc.
9900 Franklin Square Drive Suite H
Baltimore, MD 21236
(800)583-8411

MacArthur Blvd
North of Belfast Road
Montgomery County, Maryland

Site Code: 000000100082
Station ID: 0000000ROCK2

Latitude: 0' 0.000 Undefined

Start Time	Mon 16-Jun-14 NB	SB	Tue NB	SB	Wed NB	SB	Thu NB	SB	Fri NB	SB	Weekday Average NB	SB	Sat NB	SB	Sun NB	SB
12:00 AM	*	*	*	*	*	*	6	3	10	4	8	4	12	17	26	8
01:00	*	*	*	*	*	*	6	1	7	4	6	2	7	2	7	6
02:00	*	*	*	*	*	*	1	4	2	4	2	4	6	3	6	4
03:00	*	*	*	*	*	*	3	2	1	1	2	2	2	0	5	3
04:00	*	*	*	*	*	*	4	12	0	11	2	12	4	5	2	4
05:00	*	*	*	*	*	*	11	72	12	67	12	70	11	11	9	18
06:00	*	*	*	*	*	*	37	334	32	259	34	296	22	33	22	29
07:00	*	*	*	*	*	*	69	648	79	490	74	569	63	51	48	44
08:00	*	*	*	*	*	*	110	579	126	408	118	494	92	77	79	71
09:00	*	*	*	*	*	*	117	311	127	254	122	282	132	116	155	97
10:00	*	*	*	*	*	*	127	142	133	160	130	151	123	115	214	133
11:00	*	*	*	*	*	*	139	125	162	154	150	140	141	136	163	157
12:00 PM	*	*	*	*	141	153	121	141	201	162	161	152	146	131	245	233
01:00	*	*	*	*	256	131	137	132	257	164	178	150	150	148	255	216
02:00	*	*	*	*	473	129	242	149	358	167	285	149	150	140	229	208
03:00	*	*	*	*	625	166	456	134	509	225	479	163	125	148	173	254
04:00	*	*	*	*	619	282	583	201	579	317	596	228	131	167	194	244
05:00	*	*	*	*	515	178	600	284	567	303	595	290	124	176	182	202
06:00	*	*	*	*	181	93	553	158	295	202	454	179	120	128	113	143
07:00	*	*	*	*	117	73	337	72	144	112	221	92	83	95	76	76
08:00	*	*	*	*	77	48	136	66	115	84	123	74	73	68	101	95
09:00	*	*	*	*	43	15	80	45	92	55	83	49	66	44	59	41
10:00	*	*	*	*	32	7	55	14	65	32	54	20	55	27	40	18
11:00	*	*	*	*			28	9	26	14	29	10	51	21	20	9
Total	0	0	0	0	3079	1275	3958	3638	3899	3653	3918	3582	1889	1859	2423	2313
Day	0		0		4354		7596		7552		7500		3748		4736	
AM Peak							11:00	07:00	11:00	07:00	11:00	07:00	11:00	11:00	10:00	11:00
Vol.							139	648	162	490	150	569	141	136	214	157
PM Peak					16:00	17:00	17:00	17:00	16:00	16:00	16:00	17:00	13:00	17:00	13:00	15:00
Vol.					625	282	600	284	579	317	596	290	150	176	255	254

MacArthur Blvd
North of Belfast Road
Montgomery County, Maryland

Site Code: 000000100082
Station ID: 0000000ROCK2

Latitude: 0' 0.000 Undefined

Start Time	23-Jun-14 NB	SB	Tue NB	SB	Wed NB	SB	Thu NB	SB	Fri NB	SB	Weekday Average NB	SB	Sat NB	SB	Sun NB	SB
12:00 AM	9	4	*	*	*	*	*	*	*	*	9	4	*	*	*	*
01:00	3	6	*	*	*	*	*	*	*	*	3	6	*	*	*	*
02:00	3	3	*	*	*	*	*	*	*	*	3	3	*	*	*	*
03:00	0	1	*	*	*	*	*	*	*	*	0	1	*	*	*	*
04:00	1	14	*	*	*	*	*	*	*	*	1	14	*	*	*	*
05:00	17	80	*	*	*	*	*	*	*	*	17	80	*	*	*	*
06:00	36	354	*	*	*	*	*	*	*	*	36	354	*	*	*	*
07:00	68	**574**	*	*	*	*	*	*	*	*	68	**574**	*	*	*	*
08:00	135	538	*	*	*	*	*	*	*	*	135	538	*	*	*	*
09:00	125	299	*	*	*	*	*	*	*	*	125	299	*	*	*	*
10:00	103	147	*	*	*	*	*	*	*	*	103	147	*	*	*	*
11:00	**159**	137	*	*	*	*	*	*	*	*	**159**	137	*	*	*	*
12:00 PM	156	**130**	*	*	*	*	*	*	*	*	156	**130**	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total	815	2287	0	0	0	0	0	0	0	0	815	2287	0	0	0	0
Day	3102		0		0		0		0		3102		0		0	
AM Peak	11:00	07:00									11:00	07:00				
Vol.	159	574									159	574				
PM Peak	12:00	12:00									12:00	12:00				
Vol.	156	130									156	130				
Comb. Total	3102		0		4354		7596		7552		10602		3748		4736	
ADT	ADT 6,202				AADT 6,202											

The Traffic Group, Inc.
9900 Franklin Square Drive Suite H
Baltimore, MD 21236
(800)583-8411

Belfast Road
East of MacArthur Blvd
Montgomery County, Maryland

Site Code: 000000102043
Station ID: 0000000ROCK1

Latitude: 0' 0.000 Undefined

Start Time	16-Jun-14 EB	16-Jun-14 WB	Tue EB	Tue WB	Wed EB	Wed WB	Thu EB	Thu WB	Fri EB	Fri WB	Weekday Average EB	Weekday Average WB	Sat EB	Sat WB	Sun EB	Sun WB
12:00 AM	*	*	*	*	*	*	1	0	2	0	2	0	6	0	5	0
01:00	*	*	*	*	*	*	0	0	0	1	0	0	0	3	2	4
02:00	*	*	*	*	*	*	1	0	1	0	1	0	0	0	2	1
03:00	*	*	*	*	*	*	1	1	0	0	0	0	1	0	2	2
04:00	*	*	*	*	*	*	0	1	0	1	0	1	0	2	0	2
05:00	*	*	*	*	*	*	0	5	3	11	2	8	2	1	1	1
06:00	*	*	*	*	*	*	5	19	2	14	4	16	1	6	0	2
07:00	*	*	*	*	*	*	10	38	16	34	13	36	4	18	4	10
08:00	*	*	*	*	*	*	21	46	13	61	17	54	10	21	6	16
09:00	*	*	*	*	*	*	25	35	17	30	21	32	12	30	12	32
10:00	*	*	*	*	*	*	21	31	18	21	20	26	13	31	10	35
11:00	*	*	*	*	*	*	27	35	27	31	27	33	17	24	31	26
12:00 PM	*	*	*	*	71	49	31	30	31	31	31	30	36	29	23	25
01:00	*	*	*	*	25	78	25	32	25	21	40	34	35	31	25	16
02:00	*	*	*	*	39	21	27	26	32	41	28	48	21	22	26	28
03:00	*	*	*	*	25	30	33	30	40	33	37	28	31	30	30	25
04:00	*	*	*	*	39	21	25	22	35	27	28	26	35	29	35	25
05:00	*	*	*	*	42	22	35	25	41	25	38	24	44	22	25	32
06:00	*	*	*	*	41	20	36	22	36	25	38	23	31	22	32	15
07:00	*	*	*	*	27	14	35	11	26	16	34	16	17	19	21	20
08:00	*	*	*	*	19	6	30	15	24	8	27	12	23	17	33	14
09:00	*	*	*	*	13	4	21	5	19	12	20	8	22	17	23	14
10:00	*	*	*	*	3	4	16	5	24	5	18	5	17	10	11	8
11:00	*	*	*	*			7	5	2	1	4	3	10	8	5	1
Total	0	0	0	0	344	269	433	439	434	449	450	463	388	392	364	354
Day	0		0		613		872		883		913		780		718	
AM Peak					13:00	14:00	11:00	08:00	11:00	08:00	11:00	08:00	11:00	10:00	11:00	10:00
Vol.					71	78	27	46	27	61	27	54	17	31	31	35
PM Peak					13:00	14:00	18:00	13:00	17:00	14:00	13:00	14:00	17:00	13:00	16:00	17:00
Vol.					71	78	36	32	41	41	40	48	44	31	35	32

The Traffic Group, Inc.
9900 Franklin Square Drive Suite H
Baltimore, MD 21236
(800)583-8411

Belfast Road
East of MacArthur Blvd
Montgomery County, Maryland

Site Code: 00000102043
Station ID: 0000000ROCK1

Latitude: 0' 0.000 Undefined

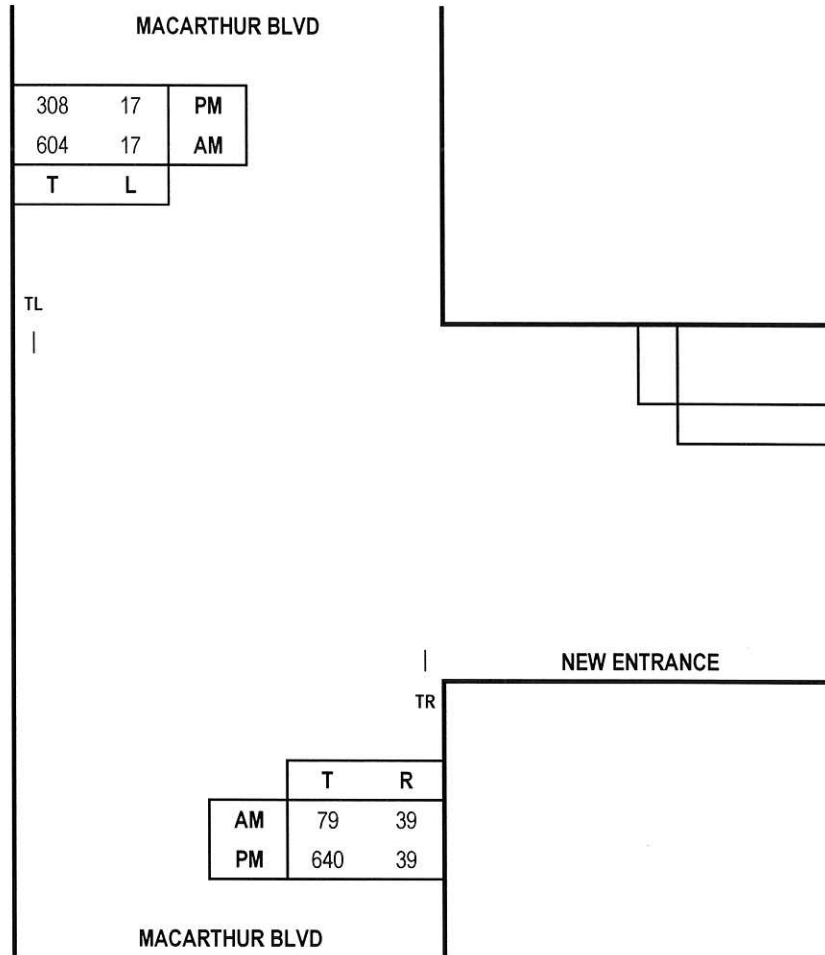| Start Time	23-Jun-14 EB	WB	Tue EB	WB	Wed EB	WB	Thu EB	WB	Fri EB	WB	Weekday Average EB	WB	Sat EB	WB	Sun EB	WB
12:00 AM	3	2	*	*	*	*	*	*	*	*	3	2	*	*	*	*
01:00	0	0	*	*	*	*	*	*	*	*	0	0	*	*	*	*
02:00	1	0	*	*	*	*	*	*	*	*	1	0	*	*	*	*
03:00	0	0	*	*	*	*	*	*	*	*	0	0	*	*	*	*
04:00	0	2	*	*	*	*	*	*	*	*	0	2	*	*	*	*
05:00	1	8	*	*	*	*	*	*	*	*	1	8	*	*	*	*
06:00	3	18	*	*	*	*	*	*	*	*	3	18	*	*	*	*
07:00	15	44	*	*	*	*	*	*	*	*	15	44	*	*	*	*
08:00	14	**57**	*	*	*	*	*	*	*	*	14	**57**	*	*	*	*
09:00	16	36	*	*	*	*	*	*	*	*	16	36	*	*	*	*
10:00	20	29	*	*	*	*	*	*	*	*	20	29	*	*	*	*
11:00	**28**	22	*	*	*	*	*	*	*	*	**28**	22	*	*	*	*
12:00 PM	**24**	**28**	*	*	*	*	*	*	*	*	**24**	**28**	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total	125	246	0	0	0	0	0	0	0	0	125	246	0	0	0	0
Day	371		0		0		0		0		371		0		0	
AM Peak	11:00	08:00									11:00	08:00				
Vol.	28	57									28	57				
PM Peak	12:00	12:00									12:00	12:00				
Vol.	24	28									24	28				
Comb. Total	371		0		613		872		883		1284		780		718	
ADT	ADT 842						AADT 842									

APPENDIX B

Capacity Analysis Worksheets

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for Montgomery County

E/W Road: New Entrance   **Date of Count:**

N/S Road: Macarthur Blvd   **Day of Count:**

Conditions: Total Traffic   **Analyst:** Ming-Yu Chien

The Traffic Group ®

N

MACARTHUR BLVD

308	17	PM
604	17	AM
T	L	

TL

NEW ENTRANCE

TR

	T	R
AM	79	39
PM	640	39

MACARTHUR BLVD

Capacity Analysis

	Morning Peak Hour						AM
	Thru Volumes			+ Opposing Lefts			
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
WB	0	0.00	0				0
NB	118	1.00	118	17	1.00	17	621
SB	621	1.00	621				
						CLV TOTAL=	**621**

	Evening Peak Hour						PM
	Thru Volumes			+ Opposing Lefts			
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
WB	0	0.00	0				0
NB	679	1.00	679	17	1.00	17	696
SB	325	1.00	325				
						CLV TOTAL=	**696**

Scenario ID - TOT1

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for Montgomery County

E/W Road: New Entrance **Date of Count:**

N/S Road: Macarthur Blvd **Day of Count:**

Conditions: Total Traffic **Analyst:** Ming-Yu Chien

The Traffic Group®

Peak:

N

MACARTHUR BLVD

247	17	SUN
T	L	

TL

NEW ENTRANCE

TR

	T	R
SUN	269	39

MACARTHUR BLVD

Capacity Analysis

							SUN
Weekend Peak Hour							
	Thru Volumes			+ Opposing Lefts			SUN
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
WB	0	0.00	0				0
NB	308	1.00	308	17	1.00	17	325
SB	264	1.00	264				
						CLV TOTAL=	**325**

Scenario ID - TOT1

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for Montgomery County

E/W Road: Belfast Rd   **Date of Count:**

N/S Road: New Exit   **Day of Count:**

Conditions: Total Traffic   **Analyst:** Ming-Yu Chien

NEW EXIT

30	0	PM
0	0	AM
R	L	

R

BELFAST RD

— T

R	0	0
T	54	24
	AM	PM

BELFAST RD

Capacity Analysis

	Morning Peak Hour						AM		Evening Peak Hour						PM
	Thru Volumes			+ Opposing Lefts					Thru Volumes			+ Opposing Lefts			
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV	Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
SB	0	1.00	0				0	SB	30	1.00	30				30
WB	54	1.00	54	0	0.00	0	54	WB	24	1.00	24	0	0.00	0	24
					CLV TOTAL=		54						CLV TOTAL=		54

Scenario ID - TOT2

CRITICAL LANE VOLUME (CLV) METHODOLOGY
for Montgomery County

E/W Road: Belfast Rd

N/S Road: New Exit

Conditions: Total Traffic

Date of Count:

Day of Count:

Analyst: Ming-Yu Chien
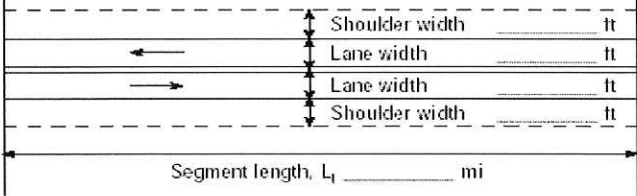
The Traffic Group®

Peak:

N

NEW EXIT

30	0	SUN
R	L	

R

BELFAST RD

— T

R	0
T	26
SUN	

SUN	
0	
31	

BELFAST RD
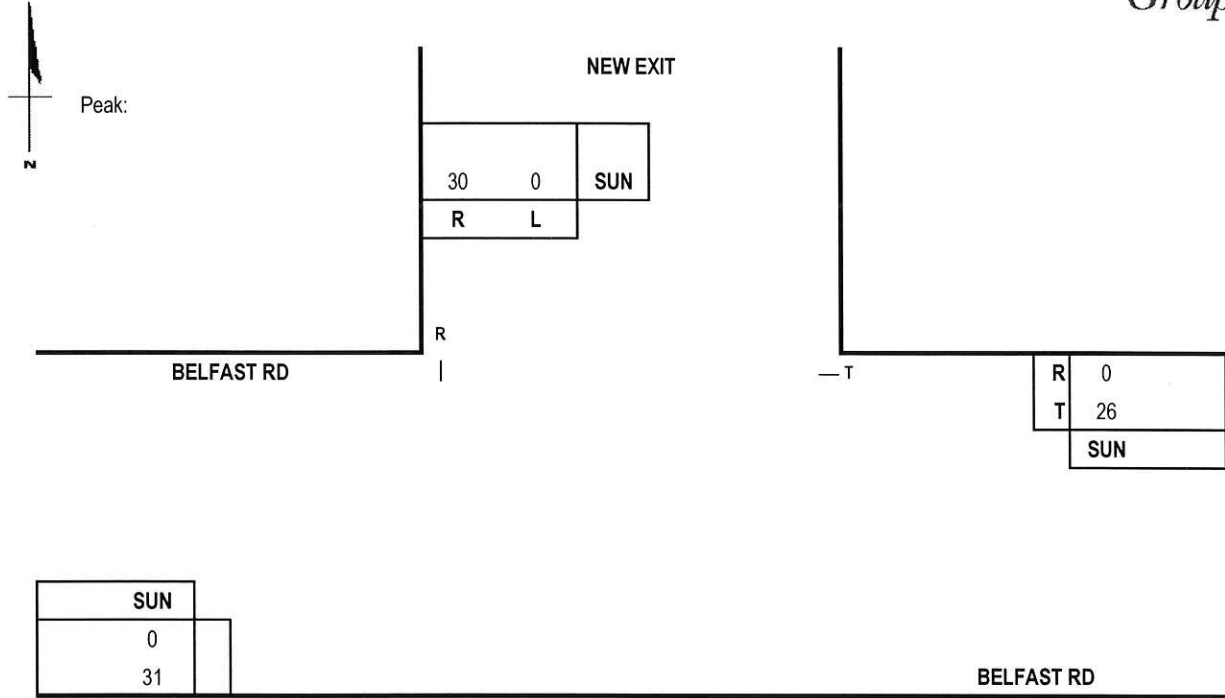
Capacity Analysis

	Weekend Peak Hour						SUN
	Thru Volumes			+ Opposing Lefts			
Dir	VOL	x LUF	= Total	VOL	x LUF	= Total	CLV
SB	30	1.00	30				30
WB	26	1.00	26	0	0.00	0	26
					CLV TOTAL=		56

Scenario ID - TOT2

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	RH	Highway / Direction of Travel	MacAuthur Blvd
Agency or Company	The Traffic Grop, Inc.	From/To	Belfast Rd/Entrance
Date Performed	7/3/2014	Jurisdiction	Montgomery Couny, MD
Analysis Time Period	AM Peak	Analysis Year	Total

Project Description: Rockwood Manor

Input Data

Shoulder width _____ ft
Lane width _____ ft
Lane width _____ ft
Shoulder width _____ ft

Segment length, L_t _____ mi

Show North Arrow

Analysis direction vol., V_d 604veh/h
Opposing direction vol., V_o 118veh/h

☐ Class I highway   ☑ Class II highway

Terrain   ☑ Level   ☐ Rolling
Grade Length   mi   Up/down
Peak-hour factor, PHF   0.88
No-passing zone   100%
% Trucks and Buses , P_T 5 %
% Recreational vehicles, P_R 5%
Access points/ mi   0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.1	1.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.995	0.966
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	690	139

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field measured speed[3], S_{FM}	mi/h	Base free-flow speed[3], $BFFS_{FM}$	45.0 mi/h
Observed volume[3], V_f	veh/h	Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	2.6 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	mi/h	Adj. for access points[3], f_A (Exhibit 20-5)	0.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 3.0 mi/h		Free-flow speed, FFS_d (FSS=$BFFS-f_{LS}-f_A$)	42.4 mi/h
		Average travel speed, $ATS=FFS-0.00776v_p-f_{np}$	32.9 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.0	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	0.995
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate[2], v_i(pc/h)=$V_i/(PHF*f_{HV}*f_G)$	686	135
Base percent time-spent-following[4], $BPTSF(\%)=100(1-e^{av_d^b})$	55.3	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	26.1	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	77.1	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, v/c=V_p/ 1,700	0.41
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi)=$0.25L_t$(V/PHF)	17
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi)=$V*L_t$	60
Peak 15-min total travel time, TT_{15}(veh-h)=VMT_{15}/ATS	0.5

Notes
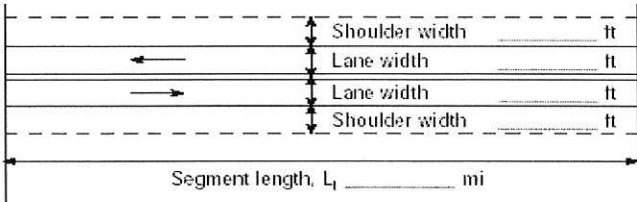
1. If the highway is extended segment (level) or rolling terrain, fG=1.0 .
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

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DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information

Analyst	RH		
Agency or Company	The Traffic Grop, Inc.		
Date Performed	7/3/2014		
Analysis Time Period	PM Peak		

Project Description: Rockwood Manor

Site Information

Highway / Direction of Travel	MacAuthur Blvd
From/To	Belfast Rd/Entrance
Jurisdiction	Montgomery Couny, MD
Analysis Year	Total

Input Data

Shoulder width _____ ft
Lane width _____ ft (←)
Lane width _____ ft (→)
Shoulder width _____ ft

Segment length, L_t _____ mi

Analysis direction vol., V_d 679veh/h
Opposing direction vol., V_o 308veh/h

Show North Arrow

☐ Class I highway   ☑ Class II highway

Terrain   ☑ Level   ☐ Rolling

Grade Length	mi	Up/down
Peak-hour factor, PHF		0.88
No-passing zone		100%
% Trucks and Buses , P_T		5 %
% Recreational vehicles, P_R		5%
Access points/ mi		0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.1	1.2
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.995	0.990
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	775	354

Free-Flow Speed from Field Measurement

Field measured speed[3], S_{FM}	mi/h
Observed volume[3], V_f	veh/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	3.0 mi/h

Estimated Free-Flow Speed

Base free-flow speed[3], $BFFS_{FM}$	45.0 mi/h
Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	2.6 mi/h
Adj. for access points[3], f_A (Exhibit 20-5)	0.0 mi/h
Free-flow speed, FFS_d (FSS=$BFFS$-f_{LS}-f_A)	42.4 mi/h
Average travel speed, $ATS=FFS-0.00776v_p-f_{np}$	30.6 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.0	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	0.995
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate[2], v_i(pc/h)=$V_i/(PHF*f_{HV}*f_G)$	772	352
Base percent time-spent-following[4], $BPTSF(\%)=100(1-e^{av_d^b})$	63.4	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	28.9	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	83.3	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, v/c=V_p/ 1,700	0.46
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi)=$0.25L_t$(V/PHF)	19
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi)=V*L_t	68
Peak 15-min total travel time, TT_{15}(veh-h)=VMT_{15}/ATS	0.6

Notes

1. If the highway is extended segment (level) or rolling terrain, fG=1.0 .
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

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DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	RH	Highway / Direction of Travel	MacAuthur Blvd
Agency or Company	The Traffic Grop, Inc.	From/To	Belfast Rd/Entrance
Date Performed	7/3/2014	Jurisdiction	Montgomery Couny, MD
Analysis Time Period	Weekend Peak	Analysis Year	Total

Project Description: Rockwood Manor

Input Data

Shoulder width _____ ft
Lane width _____ ft
Lane width _____ ft
Shoulder width _____ ft

Segment length, L_t _____ mi

Show North Arrow

Analysis direction vol., V_d 308 veh/h
Opposing direction vol., V_o 247 veh/h

☐ Class I highway   ☑ Class II highway

Terrain   ☑ Level   ☐ Rolling
Grade Length   mi   Up/down
Peak-hour factor, PHF   0.88
No-passing zone   100%
% Trucks and Buses, P_T 5 %
% Recreational vehicles, P_R 5%
Access points/ mi   0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.2	1.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.990	0.966
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	354	291

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field measured speed[3], S_{FM}	mi/h	Base free-flow speed[3], $BFFS_{FM}$	45.0 mi/h
Observed volume[3], V_f	veh/h	Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	2.6 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	mi/h	Adj. for access points[3], f_A (Exhibit 20-5)	0.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 3.4 mi/h		Free-flow speed, FFS_d $(FSS=BFFS-f_{LS}-f_A)$	42.4 mi/h
		Average travel speed, $ATS=FFS-0.00776v_p-f_{np}$	34.0 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.1	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.995	0.995
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate[2], v_i(pc/h)=$V_i/(PHF*f_{HV}*f_G)$	352	282
Base percent time-spent-following[4], $BPTSF(\%)=100(1-e^{av_d^b})$	36.9	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	53.4	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	66.6	

Level of Service and Other Performance Measures

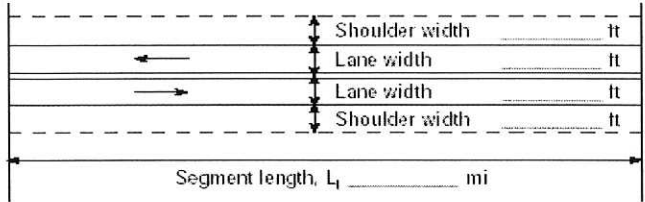|	
Level of service, LOS (Exhibit 20-3 or 20-4)	C
Volume to capacity ratio, v/c=V_p/ 1,700	0.21
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi)=$0.25L_t(V/PHF)$	9
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi)=$V*L_t$	31
Peak 15-min total travel time, TT_{15}(veh-h)=VMT_{15}/ATS	0.3

Notes

1. If the highway is extended segment (level) or rolling terrain, fG=1.0 .
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

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DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information

Analyst	RH
Agency or Company	The Traffic Grop, Inc.
Date Performed	7/3/2014
Analysis Time Period	AM Peak

Project Description: Rockwood Manor

Site Information

Highway / Direction of Travel	MacAuthur Blvd
From/To	North of Entrance
Jurisdiction	Montgomery Couny, MD
Analysis Year	Total

Input Data

Shoulder width _____ ft
Lane width _____ ft
Lane width _____ ft
Shoulder width _____ ft

Segment length, L_t _____ mi

Show North Arrow

Analysis direction vol., V_d 621veh/h
Opposing direction vol., V_o 79veh/h

☐ Class I highway   ☑ Class II highway

Terrain   ☑ Level   ☐ Rolling

Grade Length	mi	Up/down
Peak-hour factor, PHF		0.88
No-passing zone		100%
% Trucks and Buses , P_T		5 %
% Recreational vehicles, P_R		5%
Access points/ mi		0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.1	1.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.995	0.966
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	709	93

Free-Flow Speed from Field Measurement

Field measured speed[3], S_{FM}		mi/h
Observed volume[3], V_f		veh/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$		mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.4	mi/h

Estimated Free-Flow Speed

Base free-flow speed[3], $BFFS_{FM}$	45.0	mi/h
Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	2.6	mi/h
Adj. for access points[3], f_A (Exhibit 20-5)	0.0	mi/h
Free-flow speed, FFS_d (FSS=$BFFS$-f_{LS}-f_A)	42.4	mi/h
Average travel speed, ATS=FFS-$0.00776v_p$-f_{np}	33.8	mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.0	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	0.995
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate[2], v_i(pc/h)=$V_i/(PHF*f_{HV}*f_G)$	706	90
Base percent time-spent-following[4], BPTSF(%)=$100(1-e^{av_d^b})$	56.3	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	21.9	
Percent time-spent-following, PTSF(%)=BPTSF+f_{np}	75.7	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, v/c=V_p/ 1,700	0.42
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi)=$0.25L_t$(V/PHF)	18
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi)=$V*L_t$	62
Peak 15-min total travel time, TT_{15}(veh-h)=VMT_{15}/ATS	0.5

Notes

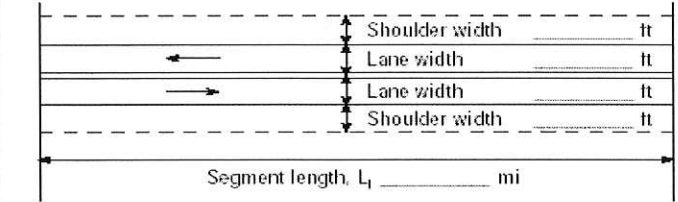1. If the highway is extended segment (level) or rolling terrain, fG=1.0 .
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

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DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information

		Site Information	
Analyst	RH	Highway / Direction of Travel	MacAuthur Blvd
Agency or Company	The Traffic Grop, Inc.	From/To	North of Entrance
Date Performed	7/3/2014	Jurisdiction	Montgomery Couny, MD
Analysis Time Period	PM Peak	Analysis Year	Total

Project Description: Rockwood Manor

Input Data

Shoulder width	ft
Lane width	ft
Lane width	ft
Shoulder width	ft

Segment length, L_t _____ mi

Show North Arrow

Analysis direction vol., V_d 640veh/h
Opposing direction vol., V_o 325veh/h

☐ Class I highway   ☑ Class II highway

Terrain   ☑ Level   ☐ Rolling
Grade Length   mi   Up/down
Peak-hour factor, PHF   0.88
No-passing zone   100%
% Trucks and Buses , P_T 5 %
% Recreational vehicles, P_R 5%
Access points/ mi   0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.1	1.2
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.995	0.990
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	731	373

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field measured speed[3], S_{FM}	mi/h	Base free-flow speed[3], $BFFS_{FM}$	45.0 mi/h
Observed volume[3], V_f	veh/h	Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	2.6 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	mi/h	Adj. for access points[3], f_A (Exhibit 20-5)	0.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.9 mi/h	Free-flow speed, FFS_d (FSS=BFFS-f_{LS}-f_A)	42.4 mi/h
		Average travel speed, ATS=FFS-0.00776v_p-f_{np}	31.0 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.0	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	1.000	0.995
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate[2], v_i(pc/h)=$V_i/(PHF*f_{HV}*f_G)$	727	371
Base percent time-spent-following[4], BPTSF(%)=100(1-e$^{av_d^b}$)	61.6	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	31.1	
Percent time-spent-following, PTSF(%)=BPTSF+f_{np}	82.2	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	D
Volume to capacity ratio, v/c=V_p/ 1,700	0.43
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi)=0.25L_t(V/PHF)	18
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi)=V*L_t	64
Peak 15-min total travel time, TT_{15}(veh-h)=VMT_{15}/ATS	0.6

Notes

1. If the highway is extended segment (level) or rolling terrain, fG=1.0 .
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis—the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

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DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information

Analyst	RH		
Agency or Company	The Traffic Grop, Inc.		
Date Performed	7/3/2014		
Analysis Time Period	Weekend Peak		

Site Information

Highway / Direction of Travel	MacAuthur Blvd
From/To	North of Entrance
Jurisdiction	Montgomery Couny, MD
Analysis Year	Total

Project Description: Rockwood Manor

Input Data

Shoulder width _____ ft
Lane width _____ ft
Lane width _____ ft
Shoulder width _____ ft

Segment length, L_t _____ mi

Analysis direction vol., V_d 269veh/h
Opposing direction vol., V_o 264veh/h

Show North Arrow

☐ Class I highway   ☑ Class II highway

Terrain   ☑ Level   ☐ Rolling
Grade Length   mi   Up/down
Peak-hour factor, PHF   0.88
No-passing zone   100%
% Trucks and Buses , P_T 5 %
% Recreational vehicles, P_R 5%
Access points/ mi   0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.2	1.2
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.990	0.990
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	309	303

Free-Flow Speed from Field Measurement

Field measured speed[3], S_{FM}		mi/h
Observed volume[3], V_f		veh/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$		mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	3.3	mi/h

Estimated Free-Flow Speed

Base free-flow speed[3], $BFFS_{FM}$	45.0	mi/h
Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	2.6	mi/h
Adj. for access points[3], f_A (Exhibit 20-5)	0.0	mi/h
Free-flow speed, FFS_d (FSS=$BFFS$-f_{LS}-f_A)	42.4	mi/h
Average travel speed, ATS=FFS-$0.00776v_p$-f_{np}	34.3	mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.1	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.995	0.995
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate[2], v_i(pc/h)=$V_i/(PHF*f_{HV}*f_G)$	307	302
Base percent time-spent-following[4], BPTSF(%)=$100(1-e^{av_d{}^b})$	33.7	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	56.3	
Percent time-spent-following, PTSF(%)=BPTSF+f_{np}	62.1	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	C
Volume to capacity ratio, v/c=V_p/ 1,700	0.18
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi)=$0.25L_t$(V/PHF)	8
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi)=V*L_t	27
Peak 15-min total travel time, TT_{15}(veh-h)=VMT_{15}/ATS	0.2

Notes

1. If the highway is extended segment (level) or rolling terrain, fG=1.0 .
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

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DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information

		Site Information	
Analyst	RH	Highway / Direction of Travel	Belfast Rd
Agency or Company	The Traffic Grop, Inc.	From/To	Site Exit/MacAuthur Blvd
Date Performed	7/3/2014	Jurisdiction	Montgomery Couny, MD
Analysis Time Period	AM Peak	Analysis Year	Total

Project Description: Rockwood Manor

Input Data

Shoulder width _____ ft
Lane width _____ ft
Lane width _____ ft
Shoulder width _____ ft

Segment length, L_t _____ mi

Analysis direction vol., V_d 54 veh/h
Opposing direction vol., V_o 17 veh/h

Show North Arrow

☐ Class I highway   ☑ Class II highway

Terrain ☑ Level   ☐ Rolling
Grade Length   mi   Up/down
Peak-hour factor, PHF   0.88
No-passing zone   100%
% Trucks and Buses , P_T 5 %
% Recreational vehicles, P_R 5%
Access points/ mi   0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.7	1.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.966	0.966
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	64	20

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field measured speed[3], S_{FM}	mi/h	Base free-flow speed[3], $BFFS_{FM}$	45.0 mi/h
Observed volume[3], V_f	veh/h	Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	4.2 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	mi/h	Adj. for access points[3], f_A (Exhibit 20-5)	0.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19) 2.4 mi/h		Free-flow speed, FFS_d (FSS=$BFFS-f_{LS}-f_A$)	40.8 mi/h
		Average travel speed, ATS=FFS-0.00776v_p-f_{np}	37.7 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.1	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.995	0.995
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $=V_i/(PHF*f_{HV}*f_G)$	62	19
Base percent time-spent-following[4], BPTSF(%)=100(1-$e^{av_d^b}$)	7.5	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	48.2	
Percent time-spent-following, PTSF(%)=BPTSF+f_{np}	44.4	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	B
Volume to capacity ratio, v/c=V_p/ 1,700	0.04
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi)=0.25L_t(V/PHF)	2
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi)=V*L_t	5
Peak 15-min total travel time, TT_{15}(veh-h)=VMT_{15}/ATS	0.1

Notes

1. If the highway is extended segment (level) or rolling terrain, fG=1.0 .
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis—the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

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DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information

Analyst	RH
Agency or Company	The Traffic Grop, Inc.
Date Performed	7/3/2014
Analysis Time Period	PM Peak

Project Description: Rockwood Manor

Site Information

Highway / Direction of Travel	Belfast Rd
From/To	Site Exit/MacAuthur Blvd
Jurisdiction	Montgomery Couny, MD
Analysis Year	Total

Input Data

Shoulder width _____ ft
Lane width _____ ft
Lane width _____ ft
Shoulder width _____ ft

Segment length, L_t _____ mi

Show North Arrow

Analysis direction vol., V_d 54veh/h
Opposing direction vol., V_o 38veh/h

☐ Class I highway   ☑ Class II highway

Terrain   ☑ Level   ☐ Rolling
Grade Length   mi   Up/down
Peak-hour factor, PHF   0.88
No-passing zone   100%
% Trucks and Buses , P_T 5 %
% Recreational vehicles, P_R 5%
Access points/ mi   0

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.7	1.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.966	0.966
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	64	45

Free-Flow Speed from Field Measurement

Field measured speed[3], S_{FM}		mi/h
Observed volume[3], V_f		veh/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$		mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.4	mi/h

Estimated Free-Flow Speed

Base free-flow speed[3], $BFFS_{FM}$	45.0 mi/h
Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	4.2 mi/h
Adj. for access points[3], f_A (Exhibit 20-5)	0.0 mi/h
Free-flow speed, FFS_d (FSS=BFFS-f_{LS}-f_A)	40.8 mi/h
Average travel speed, ATS=FFS-0.00776v_p-f_{np}	37.6 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.1	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.995	0.995
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate[2], v_i(pc/h)=$V_i/(PHF*f_{HV}*f_G)$	62	43
Base percent time-spent-following[4], BPTSF(%)=100(1-$e^{av_d^b}$)	7.5	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	53.4	
Percent time-spent-following, PTSF(%)=BPTSF+f_{np}	39.0	

Level of Service and Other Performance Measures

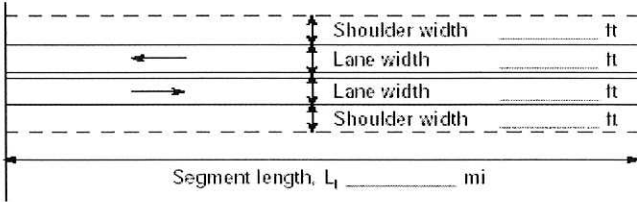|	
Level of service, LOS (Exhibit 20-3 or 20-4)	A
Volume to capacity ratio, v/c=V_p/ 1,700	0.04
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi)=0.25L_t(V/PHF)	2
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi)=V*L_t	5
Peak 15-min total travel time, TT_{15}(veh-h)=VMT_{15}/ATS	0.1

Notes

1. If the highway is extended segment (level) or rolling terrain, fG=1.0 .
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

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DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	RH	Highway / Direction of Travel	Belfast Rd
Agency or Company	The Traffic Grop, Inc.	From/To	Site Exit/MacAuthur Blvd
Date Performed	7/3/2014	Jurisdiction	Montgomery Couny, MD
Analysis Time Period	Weekend Peak	Analysis Year	Total

Project Description: Rockwood Manor

Input Data

Shoulder width _____ ft
Lane width _____ ft
Lane width _____ ft
Shoulder width _____ ft

Segment length, L_t _____ mi

Show North Arrow

☐ Class I highway   ☑ Class II highway

Terrain   ☑ Level   ☐ Rolling
Grade Length ____ mi   Up/down
Peak-hour factor, PHF   0.88
No-passing zone   100%
% Trucks and Buses , P_T 5 %
% Recreational vehicles, P_R 5%
Access points/ mi   0

Analysis direction vol., V_d 56veh/h
Opposing direction vol., V_o 31veh/h

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 20-9 or 20-15)	1.7	1.7
Passenger-car equivalents for RVs, E_R (Exhibit 20-9 or 20-17)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.966	0.966
Grade adjustment factor [1], f_G (Exhibit 20-7 or 20-13)	1.00	1.00
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV}*f_G)$	66	36

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Field measured speed[3], S_{FM}	mi/h	Base free-flow speed[3], $BFFS_{FM}$	45.0 mi/h
Observed volume[3], V_f	veh/h	Adj. for lane width and shoulder width,[3] f_{LS}(Exh 20-5)	4.2 mi/h
Free-flow speed, FFS_d $FFS=S_{FM}+0.00776(V_f/f_{HV})$	mi/h	Adj. for access points[3], f_A (Exhibit 20-5)	0.0 mi/h
Adjustment for no-passing zones, f_{np} (Exhibit 20-19)	2.4 mi/h	Free-flow speed, FFS_d ($FSS=BFFS-f_{LS}-f_A$)	40.8 mi/h
		Average travel speed, $ATS=FFS-0.00776v_p-f_{np}$	37.6 mi/h

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 20-10 or 20-16)	1.1	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 20-10 or 20-16)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.995	0.995
Grade adjustment factor[1], f_G (Exhibit 20-8 or 20-14)	1.00	1.00
Directional flow rate[2], v_i(pc/h)$=V_i/(PHF*f_{HV}*f_G)$	64	35
Base percent time-spent-following[4], $BPTSF(\%)=100(1-e^{av_d^b})$	7.7	
Adj. for no-passing zone, f_{np} (Exhibit. 20-20)	51.2	
Percent time-spent-following, $PTSF(\%)=BPTSF+f_{np}$	40.8	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 20-3 or 20-4)	B
Volume to capacity ratio, $v/c=V_p/1,700$	0.04
Peak 15-min veh-miles of travel, VMT_{15} (veh- mi)$=0.25L_t(V/PHF)$	2
Peak-hour vehicle-miles of travel, VMT_{60}(veh- mi)$=V*L_t$	6
Peak 15-min total travel time, TT_{15}(veh-h)$=VMT_{15}/ATS$	0.1

Notes

1. If the highway is extended segment (level) or rolling terrain, fG=1.0 .
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only.
4. Exhibit 20-21 provides factors a and b.
5. Use alternative Equation 20-14 if some trucks operate at crawl speeds on a specific downgrade.

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