

FINAL DRAFT

Analysis of AM Peak Period Inbound Travel in Northern Virginia's I-66 Corridor Outside the Beltway in the Fall of 2008

A National Capital Region Transportation Planning Board
Technical Assistance Project conducted for the
Virginia Department of Transportation

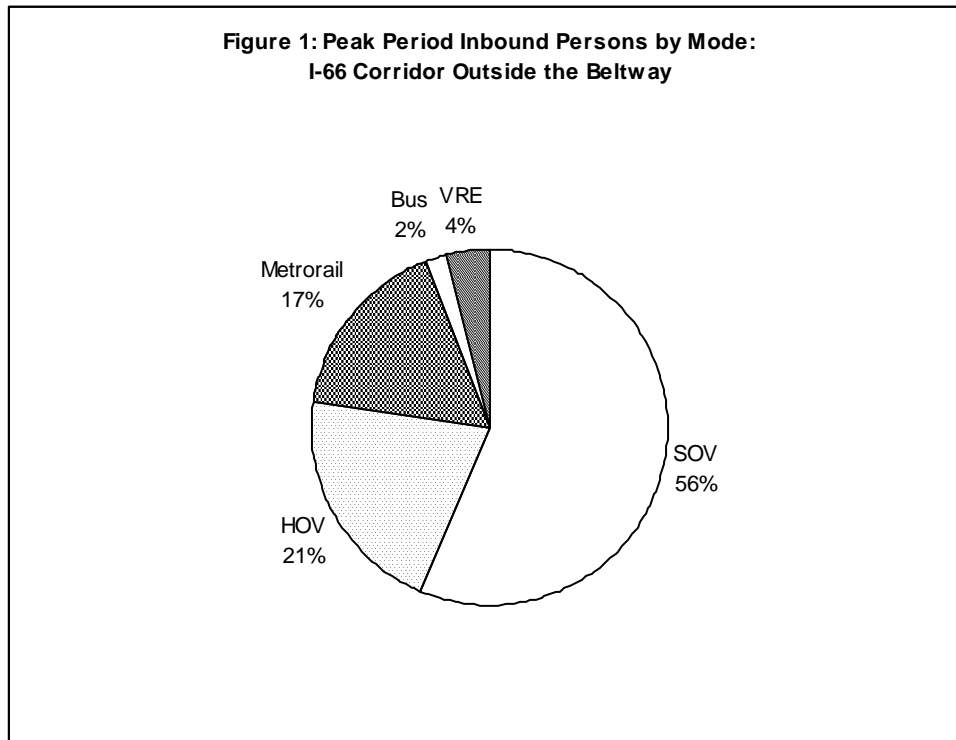
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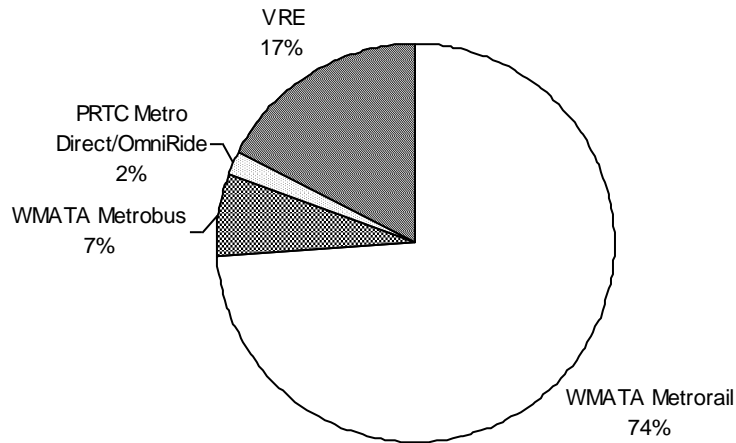
Summary

During the morning peak period of 6:30 AM to 9:30 AM, 44% of the nearly 68,300 inbound travelers in Northern Virginia's I-66 corridor outside the Capital Beltway (I-495) are using transit or multiple occupant carpools and vanpools with two or more occupants (HOVs) for their travel. The remainder of the AM peak period travelers are in single occupant vehicles and motorcycles (SOVs) (see Figure 1). These statistics are based on multi-day counts taken of traffic crossing a screen line located just outside the Capital Beltway in the fall of 2008.



Transit carries 23% of travelers across the screen line during the 6:30 AM to 9:30 AM peak period. Metrorail and the Virginia Railways Express (VRE) carry 14,200 persons traveling inbound across the counting screen line, or over 90% of the total transit observed. Passengers on Metrorail's Orange Line account for 11,500 of the total ridership and the VRE Manassas Line riders account for 2,700 of the total. Inbound AM peak period bus ridership, consisting of WMATA's Metrobus service and PRTC's Metro Direct / OmniRide, total 1,000 and 330, respectively (see Figure 2).

**Figure 2: Peak Period Inbound Persons by Transit Mode
I-66 Corridor Outside the Beltway**

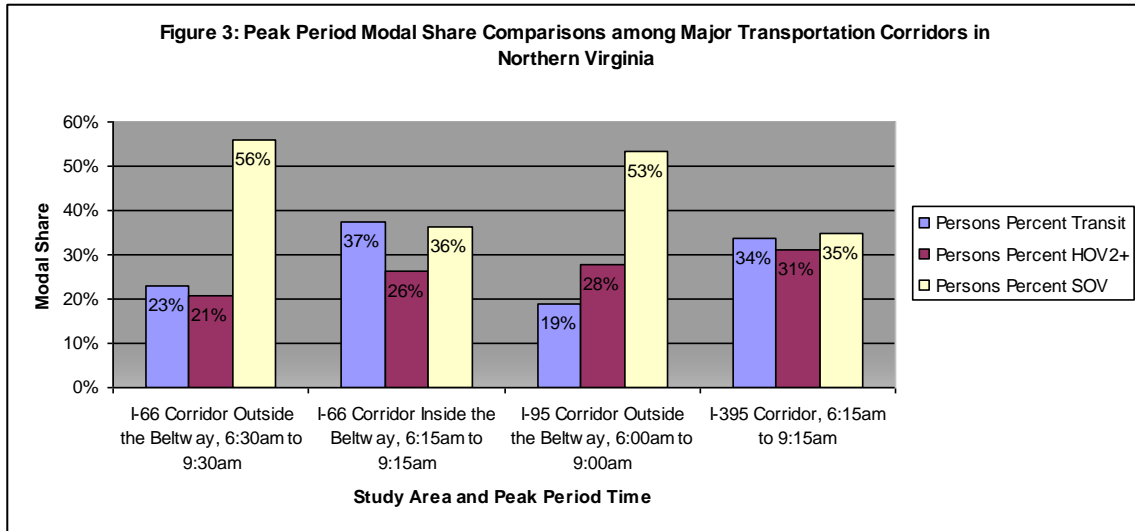


The share of persons in multiple occupant vehicles is slightly less than the transit modal share in the AM inbound peak period. Approximately 21% of travelers crossing the screen line are in carpools or vanpools. Half of the carpools and vanpools in the corridor were counted in the I-66 HOV-2 lane, which carries 7,000 total persons in HOVs during the AM peak period on a typical weekday (a non-holiday Tuesday, Wednesday, or Thursday). The I-66 HOV lane moves more carpools and vanpools than each of the other facilities during the peak period and carries, on average, more than twice the number of persons per lane hour than on the I-66 three non-restricted lanes and all other roadway facilities during the same three-hour period.

A total of 38,500 persons, or 56%, of the inbound AM peak period travelers cross the screen line west of the Capital Beltway in single occupancy vehicles (including motorcycles) on a typical weekday. The greatest amount of AM peak period SOV travel is on the general purpose lanes of I-66 (11,200 persons). Braddock Road has the next highest number of persons traveling in SOVs with 9,000 persons.

The results of this study are consistent with the study conducted in the fall of 2007 outside the Beltway in the I-95/I-395 corridor, where transit ridership was observed at 19% of peak mode share and HOVs represented 28% of travelers. A September 2005 count of peak morning travel in the I-66 corridor within the Beltway showed a higher share of transit, carpool and vanpool use than this study outside the Beltway. It should be noted that the I-66 facility is HOV-only within the Beltway. In the 2005 study, transit

share was 37% and multiple occupant vehicles were 26%. Figure 3 shows the mode shares from this and each of the previous studies.



Based on the modal shares observed from the four corridor studies conducted by NVTC, the I-66 Inside the Beltway study has the highest share of transit travel at 37%, followed by 34% in the I-395 corridor. The I-395 corridor has the highest level of HOV2+ use at 31%, followed by I-95 Outside the Beltway corridor with a 28% carpool/vanpool share (Figure 3). Appendix A contains a detailed table comparing the modal shares during the peak period among the four studies.

Study Background

One of NVTC’s goals is to monitor and track daily transit ridership relative to peak period auto travel in Northern Virginia’s major commuting corridors. In pursuit of this goal, NVTC asked COG/TPB staff to include an I-66 Corridor Count project in its Technical Assistance work program.

Staff from the Metropolitan Washington Council of Governments/National Capital Region Transportation Planning Board (COG/TPB), the Washington Metropolitan Area Transit Authority (WMATA), the Virginia Railway Express (VRE), and the Potomac and Rappahannock Transportation Commission (PRTC) conducted these counts in late September and early October 2008 as part of a project sponsored by the Virginia Department of Transportation (VDOT) in response to a request by the Northern Virginia Transportation Commission (NVTC). The project was carried out as a VDOT Technical Assistance project in the TPB’s Fiscal Year 2009 Unified Planning Work Program (UPWP).

This study complements three previous corridor count projects requested by NVTC and funded by VDOT over the last three fiscal years to analyze peak period transit ridership and auto travel at screen lines inside the Beltway in the I-66 (FY 2006) and I-395 (FY 2007) corridors and outside the Beltway in the I-95 (FY 2008) corridor. These corridor count projects are designed to provide a snapshot of the overall volume of vehicle, person

and passenger movements crossing a screen line at a specific location within major travel corridors in Northern Virginia.

Study Area

To capture the I-66 corridor traffic outside the Beltway, the screen line was located just outside Gallows Road and the Capital Beltway (I-495). The roads surveyed, from north to south were: Idylwood Road, I-66 (both general purpose lanes and HOV lane), Lee Highway (US-29), Arlington Blvd (US-50), Little River Turnpike (VA-236), and Braddock Road (VA-620) (Figure 4). Braddock Road was included in the I-66 corridor, due to its east-west orientation as well as its proximity to I-66. However, the inclusion of this roadway could be debated, as some trips continue to the I-395 corridor.

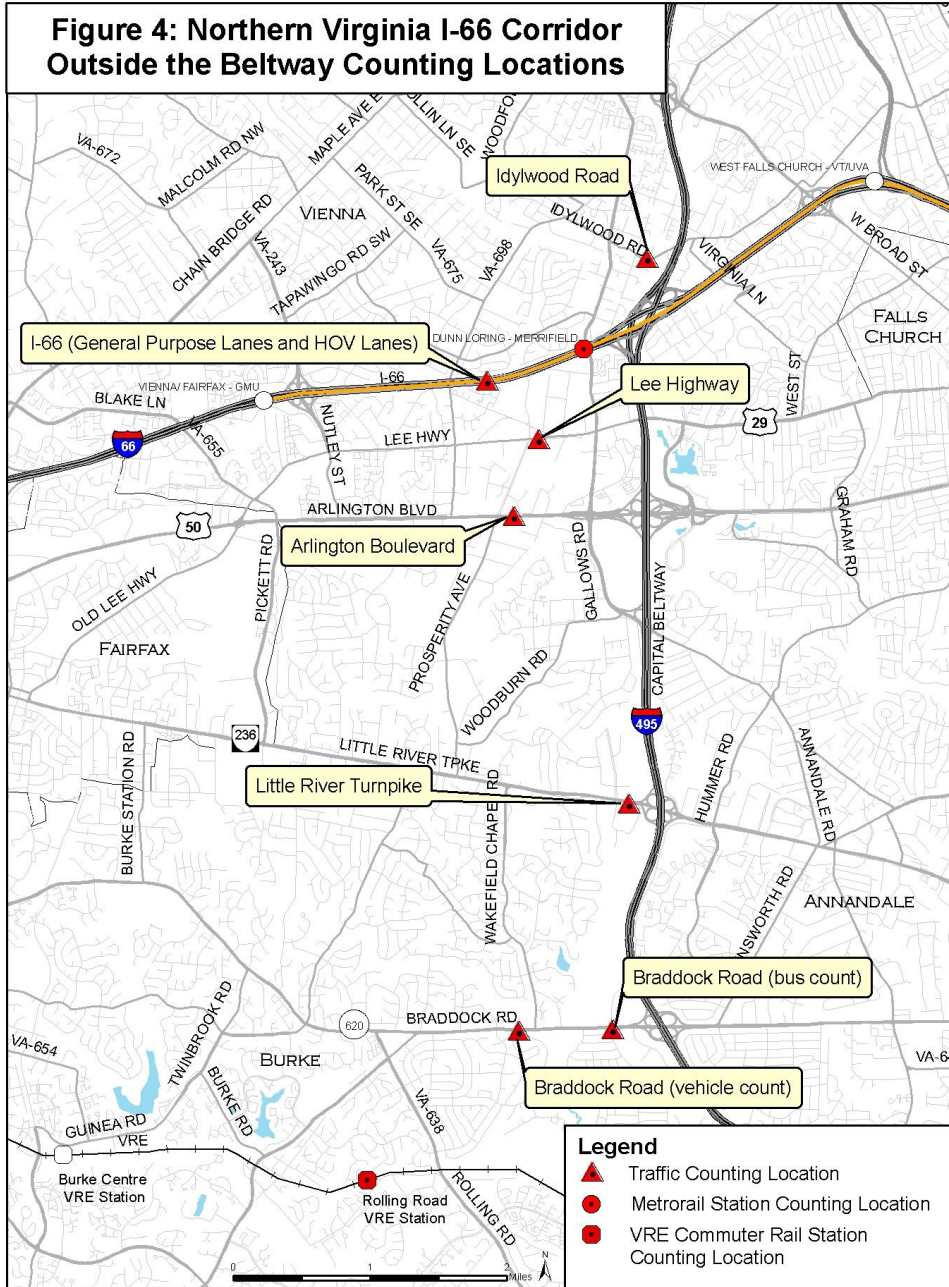
The transit counts were also performed at this screen line. Manassas Line VRE trips were included in this corridor as well. For the purposes of this study, AM peak period transit passengers boarding VRE Manassas line trains at the Broad Run, Manassas, Manassas Park, Burke Centre, and Rolling Road commuter rail stations were considered I-66 corridor outer area screen line travelers. Appendix B provides a list of all count locations and the days the counts were taken.

Total Person Travel

The traffic and transit passenger counts taken for this study on two “typical weekdays” were averaged to compute a statistically dependable estimate of the three-hour AM peak period for inbound person travel across the I-66 outer area screen line. A “typical weekday” for the purposes of this study was defined as a non-holiday Tuesday, Wednesday, or Thursday on which there were no special events or major traffic incidents that would have affected typical traffic patterns on these days.

The count data collected in this study, presented in Table 1, show the three-hour peak period for persons traveling by automobile is 6:30 AM to 9:30 AM when approximately 68,300 persons are traveling inbound on the major roads and transit routes approaching the Capital Beltway. This three-hour AM peak period is 30 minutes later than the peak period at the FY 2008 I-95 Corridor Outside the Beltway report’s screen line, and is 15 minutes later than the three-hour 6:15 AM to 9:15 AM peak period observed in the FY 2006 I-66 Inner Corridor report’s screen line at Glebe Road. It should be noted that the peak three-hour period for transit is earlier than the peak period for overall person trips, with highest ridership between 6:00 AM and 9:00 AM.

Figure 4: Northern Virginia I-66 Corridor Outside the Beltway Counting Locations



Note: Vehicle counts and bus counts on Braddock Road (VA 620) were conducted at different locations because of safety reasons.

Table 1
AM Peak Period Travel in the I-66 Corridor
Total Inbound Person Trips at the Beltway Screen Line

Time Period	Persons Total AVG	Persons Auto AVG	Persons Transit AVG	Persons Percent Transit	Persons HOV2+ AVG	Persons Percent HOV2+	Persons SOV AVG	Persons Percent SOV
5:00 - 5:15 AM	1,202	1,080	123	10%	155	13%	925	77%
5:15 - 5:30 AM	2,042	1,782	261	13%	346	17%	1,436	70%
5:30 - 5:45 AM	3,185	2,486	699	22%	562	18%	1,924	60%
5:45 - 6:00 AM	3,263	2,743	520	16%	481	15%	2,262	69%
6:00 - 6:15 AM	4,126	2,947	1,179	29%	475	12%	2,472	60%
6:15 - 6:30 AM	4,443	3,416	1,027	23%	861	19%	2,555	58%
6:30 - 6:45 AM	5,670	4,020	1,651	29%	1,079	19%	2,941	52%
6:45 - 7:00 AM	5,613	4,452	1,162	21%	1,245	22%	3,207	57%
7:00 - 7:15 AM	6,562	4,623	1,940	30%	1,449	22%	3,174	48%
7:15 - 7:30 AM	5,940	4,740	1,201	20%	1,463	25%	3,277	55%
7:30 - 7:45 AM	6,038	4,667	1,371	23%	1,252	21%	3,416	57%
7:45 - 8:00 AM	6,478	4,415	2,063	32%	1,098	17%	3,317	51%
8:00 - 8:15 AM	5,861	4,426	1,435	24%	1,120	19%	3,307	56%
8:15 - 8:30 AM	6,270	4,385	1,886	30%	989	16%	3,396	54%
8:30 - 8:45 AM	5,542	4,363	1,180	21%	1,060	19%	3,303	60%
8:45 - 9:00 AM	5,007	4,306	701	14%	1,152	23%	3,154	63%
9:00 - 9:15 AM	4,806	4,255	551	11%	1,137	24%	3,118	65%
9:15 - 9:30 AM	4,501	4,115	386	9%	1,235	27%	2,881	64%
9:30 - 9:45 AM	4,561	4,131	430	9%	1,359	30%	2,772	61%
9:45 - 10:00 AM	4,144	3,853	291	7%	1,433	35%	2,420	58%
Total								
5:00-10:00 AM	95,250	75,200	20,051	21%	19,947	21%	55,253	58%
Standard Weekday Variation (STD)	5,106	4,923	183		2,413		2,510	
Percent Variation (CV)	5%	7%	1%		12%		5%	
Peak Period								
6:30-9:30 AM	68,287	52,764	15,523	23%	14,276	21%	38,488	56%
Standard Weekday Variation (STD)	1,291	1,228	63		1,102		126	
Percent Variation (CV)	2%	2%	0%		8%		0%	
Peak Hour								
7:00-8:00 AM	25,018	18,444	6,574	26%	5,261	21%	13,183	53%
Standard Weekday Variation (STD)	1,281	1,172	109		868		304	
Percent Variation (CV)	5%	6%	2%		16%		2%	

Note: The traffic count data presented in this table are the average of two “typical weekday” counts taken in late September and early October, 2008. The standard weekday variation is the standard deviation (STD) of these two counts. The percent variation is the coefficient of variation (CV) expressed as the ratio of the count standard deviation to the count average times 100%.

Table 1 also indicates that the standard weekday variation for travel during the AM peak period is 1,300 persons, or approximately 2% of the total inbound AM peak period person travel across the I-66 corridor outside the Beltway screen line. This variation was calculated using two days of count data. The standard weekday variation for AM peak period SOV travel and for AM peak period transit travel are both less than 1%. Carpool and vanpool travel has an 8% standard weekday variation during this peak time period. However, there was little day to day variation on the I-66 HOV lane for carpools and vanpool travelers. Most of the variation in HOV travel was seen in the I-66 general purpose lanes, on Lee Highway and Idylwood Road. The small variation in day-to-day travel for peak period carpool and vanpool travel on the I-66 HOV lane as well as for peak period SOV and transit trips suggests that most of the day-to-day variation in peak period HOV2+ travel in this corridor may be related to daily differences in HOV2+ peak period trips for non-commuting travel.

The data in Table 1 also show the one-hour morning peak for inbound total person travel across the I-66 corridor outer area screen line is 7:00 AM to 8:00 AM. The 25,000 peak hour travelers represent approximately 37% of persons crossing the screen line during the three-hour 6:30 AM to 9:30 AM morning peak period. Day-to-day variation for AM peak hour person travel is slightly more than for the AM peak period persons total, automobile persons total, and transit persons total. The HOV2+ mode has the greatest difference in percent variation between the peak hour (16%) and peak period (8%).

The one-hour AM peak at the Beltway screen line is also one-half hour earlier than the 7:30 AM to 8:30 AM peak hour observed at the I-66 inner area Glebe Road screen line and is the same as in the I-95 outer area study. The peak hour for transit was observed to be 7:30 AM to 8:30 AM in this study. The peak hour for HOV2+ was observed at 6:45 AM to 7:45 AM. In addition, in the I-66 Corridor outside the Beltway, the number of people traveling toward the end of the AM peak period does not decline as rapidly as observed in the other corridors. While transit ridership drops off significantly before 9:00 AM, HOV2+ was observed to increase through the end of the morning period (10:00 AM).

Modal Shares

The data collected in this study indicate that on a typical weekday travel by SOV accounts for the greatest share of total AM peak period person travel. Approximately 56% of travelers were observed in SOVs during the peak period. Table 1 shows that transit accounts for a 23% share and is followed by carpooling/vanpooling with a 21% share.

When comparing the peak hour of 7:00 AM to 8:00 AM to the peak period, the mode share of transit increases three percent to 26% and the mode share of HOV remains at 21% during the morning peak hour, while the SOV share decreases by three percent. The modal share of SOVs during the peak hour decreases three percentage points (from 56% to 53%) when compared to the peak period.

Table 1 also shows that there is more variation in the peak hour HOV counts than in the three-hour peak period HOV, and also more variation in the three-hour HOV counts than in any other mode. The variation in the HOV travel mode increases from 8% during the AM peak period to 16% during the AM peak hour. This difference indicates a modest amount of day-to-day variation in the timing of HOV2+ travel flows in this corridor during the three-hour AM peak period.

Travel by Transit

Approximately 15,500 people travel by transit in the AM peak period across the I-66 corridor screen line outside the Beltway. Table 2 and Figure 2 show that Metrorail accounts for the greatest share of transit ridership (74%), with nearly 11,500 persons traveling inbound during the three-hour morning peak period.

The VRE Manassas Line provides service in the I-66 Corridor outside the Beltway. Data in Table 2 show that VRE trains serve approximately 2,700 I-66 inbound corridor transit passengers during the three-hour AM peak period. This total represents a 17% share of total transit ridership during the peak time period in the corridor.

The data presented in Table 2 show that on a typical weekday WMATA Metrobuses serve 1,000 inbound AM peak period weekday passengers for their travel across the I-66 corridor screen line located outside the Beltway. In addition, PRTC's Omniride and Metro Direct buses carry over 300 persons traveling inbound in the I-66 Corridor outside the Beltway during the morning peak period. It should also be pointed out that PRTC carries almost 300 passengers in the hour preceding the peak period. This reflects the earlier travel demand in the outer portions of the corridor. Transit, particularly regional providers such as PRTC and VRE, carry 26% of persons traveling in the corridor from 6:15 AM until 7:15 AM. During this hour, HOVs account for 21% of trips and SOVs account for 53% of trips.

Of all the various transit modes that were counted in this study, Metrorail exhibits the least day-to-day variation with an average percent difference of less than 1% for the three-hour AM peak period. VRE trains have a 1% variation and PRTC bus service have a 2% variation. Metrobus service has a 1% variation during this time period.

Travel by High Occupancy Vehicles

This study also found that approximately 14,300 persons are traveling inbound across the I-66 corridor outer area screen line in passenger vehicles with two or more occupants on a typical weekday morning during the peak period. Table 3 shows that the greatest amount of HOV2+ person travel is on the I-66 HOV-2 lane, which carries nearly 7,000 carpoolers/vanpoolers during the peak inbound time period. Table 4 shows that from the total HOVs observed in the corridor in Table 3, the I-66 HOV-2 lane carries the greatest number of HOV3+ commuters during the peak period identifying 900 persons traveling in vehicles with three or more occupants. Use of the I-66 inbound HOV-2 lane outside the Beltway is restricted to HOV2+ persons from 5:30 AM to 9:30 AM. Single occupancy vehicles with special "clean fuel" license tags, motorcycles, and law

enforcement vehicles are exempt from the restrictions. HOV2+ vehicles include all vehicles with two or more passengers, including vanpools and carpools with three or more passengers (HOV3+). Table 3 (Total Inbound Persons in HOV2+ Vehicles at the Beltway Screen Line) includes the HOV3+ totals from Table 4 (Total Inbound Persons in HOV3+ Vehicles at the Beltway Screen Line).

The highest volume of HOV2+ commuters on the I-66 HOV-2 lane occurs during the first hour (6:30 AM to 7:30 AM) of the peak period. Nearly one-half of the total peak period travel in the I-66 HOV-2 lane occurs during this initial hour. HOV2+ person travel shows a slight increase on the I-66 HOV lane and on Arlington Boulevard toward the end of the five hour observation period and after the I-66 HOV restrictions are lifted.

The I-66 HOV-2 lane carries more carpools and vanpools than all the other roadways combined. The second highest number of inbound AM peak HOV2+ person travel is in the general purpose I-66 lanes, which could reflect the HOV's weaving from the GP to the HOV lanes. These lanes have just over 1,600 persons in carpools and vanpools during the morning peak period. Arlington Boulevard (US-50), Little River Turnpike (VA-236) and Braddock Road (VA-620) average approximately 1,400 HOV2+ persons on each of these three roadway facilities during this three-hour time period. Lee Highway (US 29) had an average of 973 HOV2+ persons during the same time period.

The I-66 HOV-2 lane moves a larger number of persons per lane of roadway per hour during the morning peak period than any of the other facilities studied. During the three-hour AM inbound peak period, the single I-66 HOV lane carries an average of 2,600 persons per lane hour, compared to an average of 1,423 persons per lane hour on the three I-66 non-restricted general purpose lanes (see Table 8).

The largest number of HOV3+ person travel occurs on I-66 with half of all HOV3+ travelers, or over 1,100 persons during the peak period. Slightly less than 900 persons travel in the I-66 HOV lane on this facility. The next highest number of AM peak HOV3+ travel is on Lee Highway, with just over 300 HOV3+ persons.

The number of carpools and vanpools on I-66 nearly doubles with the start of the I-66 HOV restrictions at 5:30 AM from 186 to 360 persons and markedly rises again from 335 to 618 between the 6:00 – 6:15 AM and the 6:15 – 6:30 AM time periods. This increase occurs before the 6:30 AM HOV-2 restriction for I-66 inside the Beltway. The other roadways do not see such large increases during these time periods.

Table 2
AM Peak Period Travel in the I-66 Corridor
Total Inbound Transit Passengers at the Beltway Screen Line

Time Period	TOTAL TRANSIT	WMATA BUS	WMATA RAIL	VRE RAIL	PRTC BUS
5:00 - 5:15 AM	123	0	123	0	0
5:15 - 5:30 AM	261	4	164	0	94
5:30 - 5:45 AM	699	5	273	421	0
5:45 - 6:00 AM	520	59	410	0	51
6:00 - 6:15 AM	1,179	25	488	614	53
6:15 - 6:30 AM	1,027	145	704	0	178
6:30 - 6:45 AM	1,651	113	749	748	42
6:45 - 7:00 AM	1,162	139	972	0	51
7:00 - 7:15 AM	1,940	141	952	758	90
7:15 - 7:30 AM	1,201	87	1,077	0	37
7:30 - 7:45 AM	1,371	119	1,202	0	51
7:45 - 8:00 AM	2,063	72	1,250	685	57
8:00 - 8:15 AM	1,435	131	1,304	0	0
8:15 - 8:30 AM	1,886	61	1,315	510	0
8:30 - 8:45 AM	1,180	38	1,142	0	0
8:45 - 9:00 AM	701	45	657	0	0
9:00 - 9:15 AM	551	36	515	0	0
9:15 - 9:30 AM	386	54	333	0	0
9:30 - 9:45 AM	430	46	384	0	0
9:45 - 10:00 AM	291	27	250	0	14
Total					
5:00-10:00 AM	20,051	1,343	14,258	3,734	717
Standard Weekday Variation (STD)	183	35	86	35	27
Percent Variation (CV)	1%	3%	1%	1%	4%
Peak Period					
6:30-9:30 AM	15,523	1,033	11,464	2,699	328
Standard Weekday Variation (STD)	63	11	35	32	7
Percent Variation (CV)	0%	1%	0%	1%	2%
Peak Hour					
7:00-8:00 AM	6,574	418	4,480	1,442	235
Standard Weekday Variation (STD)	109	31	139	2	1
Percent Variation (CV)	2%	7%	3%	0%	0%

Note: The traffic count data presented in this table are the average of two “typical weekday” counts taken in late September and early October, 2008. The standard weekday variation is the standard deviation (STD) of these two counts. The percent variation is the coefficient of variation (CV) expressed as the ratio of the count standard deviation to the count average times 100%.

Table 3
AM Peak Period Travel in the I-66 Corridor
Total Inbound Persons in HOV2+ Vehicles at the Beltway Screen Line

Time Period	Total HOV2+ Persons	HOV2+ Persons by I-66 Corridor Roadway Facility						
		Idylwood Road	I-66 GP	I-66 HOV	Lee Highway	Arlington Blvd	Little River Turnpike	Braddock Road
5:00 - 5:15 AM	155	0	46	89	0	15	4	2
5:15 - 5:30 AM	346	0	133	186	0	9	17	3
5:30 - 5:45 AM	562	0	135	360	2	51	13	2
5:45 - 6:00 AM	481	0	67	327	2	59	22	4
6:00 - 6:15 AM	475	4	54	336	12	34	30	6
6:15 - 6:30 AM	861	1	115	618	5	18	76	28
6:30 - 6:45 AM	1,079	1	108	785	42	26	73	45
6:45 - 7:00 AM	1,245	8	182	770	21	44	102	118
7:00 - 7:15 AM	1,449	50	204	777	79	84	129	129
7:15 - 7:30 AM	1,463	28	228	763	98	95	88	165
7:30 - 7:45 AM	1,252	43	166	571	92	109	103	170
7:45 - 8:00 AM	1,098	59	107	490	66	134	96	147
8:00 - 8:15 AM	1,120	70	83	470	112	126	127	134
8:15 - 8:30 AM	989	91	99	387	54	102	122	136
8:30 - 8:45 AM	1,060	67	112	418	77	146	113	129
8:45 - 9:00 AM	1,152	42	151	493	102	119	137	110
9:00 - 9:15 AM	1,137	42	95	507	101	141	104	149
9:15 - 9:30 AM	1,235	39	101	539	133	158	131	135
9:30 - 9:45 AM	1,359	27	185	573	133	180	116	147
9:45 - 10:00 AM	1,433	27	297	598	118	162	104	128
Total								
5:00-10:00 AM	19,947	595	2,664	10,052	1,244	1,807	1,703	1,883
Weekday Variation (STD)	2,413	111	649	944	288	424	178	41
Percent Variation (CV)	12%	19%	24%	9%	23%	23%	10%	2%
Peak Period								
6:30-9:30 AM	14,276	537	1,633	6,966	973	1,281	1,323	1,565
Weekday Variation (STD)	1,102	100	816	20	153	117	113	17
Percent Variation (CV)	8%	19%	50%	0%	16%	9%	9%	1%
Peak Hour								
7:00-8:00 AM	5,261	179	704	2,599	334	421	415	610
Weekday Variation (STD)	868	18	403	304	57	92	86	56
Percent Variation (CV)	16%	10%	57%	12%	17%	22%	21%	9%

Note: The traffic count data presented in this table are the average of two "typical weekday" counts taken in late September and early October, 2008. The standard weekday variation is the standard deviation (STD) of these two counts. The percent variation is the coefficient of variation (CV) expressed as the ratio of the count standard deviation to the count average times 100%.

Note: HOV2+ vehicles include all vehicles carrying two or more passengers, including vanpools.

Table 4
AM Peak Period Travel in the I-66 Corridor
Total Inbound Persons in HOV3+ Vehicles at the Beltway Screen Line

Time Period	Total HOV3+ Persons	HOV3+ Persons by I-66 Corridor Roadway Facility						
		Idylwood Road	I-66 GP	I-66 HOV	Lee Highway	Arlington Blvd	Little River Turnpike	Braddock Road
5:00 - 5:15 AM	43	0	10	24	0	8	0	2
5:15 - 5:30 AM	143	0	66	70	0	5	2	2
5:30 - 5:45 AM	199	0	44	150	0	0	4	2
5:45 - 6:00 AM	132	0	15	108	0	0	6	3
6:00 - 6:15 AM	137	2	12	89	12	9	12	2
6:15 - 6:30 AM	229	0	25	162	0	12	18	12
6:30 - 6:45 AM	182	0	3	126	14	8	12	20
6:45 - 7:00 AM	190	0	18	132	10	8	9	13
7:00 - 7:15 AM	154	2	23	50	40	5	23	14
7:15 - 7:30 AM	170	2	41	47	34	17	5	26
7:30 - 7:45 AM	146	3	32	51	6	14	27	15
7:45 - 8:00 AM	157	5	21	53	12	40	12	15
8:00 - 8:15 AM	150	2	10	69	26	24	8	13
8:15 - 8:30 AM	201	24	17	58	26	29	30	19
8:30 - 8:45 AM	195	18	31	54	25	17	34	18
8:45 - 9:00 AM	263	11	33	91	44	25	38	23
9:00 - 9:15 AM	199	0	20	62	21	33	32	33
9:15 - 9:30 AM	250	2	24	86	56	12	56	15
9:30 - 9:45 AM	248	4	31	57	50	39	41	28
9:45 - 10:00 AM	201	5	71	36	39	21	12	18
Total								
5:00-10:00 AM	3,478	69	524	1,531	405	310	371	269
Weekday Variation (STD)	41	28	53	469	111	38	74	180
Percent Variation (CV)	1%	41%	10%	31%	27%	12%	20%	67%
Peak Period								
6:30-9:30 AM	2,254	66	270	875	310	229	284	222
Weekday Variation (STD)	166	42	66	354	47	59	43	133
Percent Variation (CV)	7%	64%	24%	40%	15%	26%	15%	60%
Peak Hour								
7:00-8:00 AM	626	11	116	199	91	75	66	69
Weekday Variation (STD)	106	2	33	120	15	24	12	18
Percent Variation (CV)	17%	18%	29%	60%	17%	32%	18%	26%

Note: The traffic count data presented in this table are the average of two “typical weekday” counts taken in late September and early October, 2008. The standard weekday variation is the standard deviation (STD) of these two counts. The percent variation is the coefficient of variation (CV) expressed as the ratio of the count standard deviation to the count average times 100%.

HOV 3+ vehicles and persons are included in the HOV 2+ vehicles and counts in Table 3.

Travel by Single Occupant Vehicles

The results of the two-day traffic counts conducted for this study show that on a typical weekday approximately 38,500 AM peak period travelers cross the I-66 Beltway screen line in single occupancy autos and motorcycles (SOVs). The greatest amount of AM period SOV travel is on the I-66 general purpose lanes. During the three-hour period peak period from 6:30 AM to 9:30 AM, SOV travel on these three general purpose lanes total 12,000 persons, which is nearly one-third of all SOV persons. Another 900 persons in SOVs travel on the I-66 HOV lanes. These SOVs include vehicles with a clean fuel vehicle exemption, motorcycles, as well as law enforcement vehicles.

Table 5 shows that persons in SOVs traveling inbound across the I-66 corridor outside the Beltway screen line in the AM peak period total 9,000 on Braddock Road, 6,800 on Arlington Boulevard, 5,400 on Little River Turnpike, 4,000 on Lee Highway, and 1,200 on Idylwood Road.

Passenger Vehicle Counts (autos, vans, motorcycles)

Total typical weekday inbound AM peak period passenger vehicle flows across the I-66 corridor outside the Beltway screen line on the major roadways analyzed in this study total averaged nearly 44,900 vehicles, as shown in Table 6. The greatest number of these AM peak period vehicle movements is on the I-66 general purpose lanes with an inbound vehicle flow of approximately 11,900 vehicles, or 27% of the total. The I-66 HOV lane carries an additional 4,100 vehicles during the same time period resulting in I-66 carrying 36% of all vehicles in the study area during the peak period. Braddock Road has the second highest vehicle count in the corridor with an inbound flow of nearly 9,700 cars, followed by Arlington Boulevard with 7,400 vehicles. During the inbound morning peak period at the outside the Beltway screen line, the study counted 6,000 vehicles on Little River Turnpike, 4,400 vehicles on Lee Highway, and 1,400 vehicles on Idylwood Road.

The largest weekday variation during the peak period was observed on Lee Highway with a 15% variation, nearly twice the next highest of 8% for Little River Turnpike and the I-66 general purpose lanes. The next highest variation was measured on the I-66 HOV-2 lanes.

Table 5
AM Peak Period Travel in the I-66 Corridor
Total Inbound Persons in SOV Vehicles at the Beltway Screen Line

Time Period	Total SOV Persons	SOV Persons by I-66 Corridor Roadway Facility						
		Idylwood Road	I-66 GP	I-66 HOV	Lee Highway	Arlington Blvd	Little River Turnpike	Braddock Road
5:00 - 5:15 AM	925	11	395	236	27	35	32	191
5:15 - 5:30 AM	1,436	9	598	380	50	89	59	252
5:30 - 5:45 AM	1,924	23	1,037	229	74	119	82	361
5:45 - 6:00 AM	2,262	21	1,239	176	105	157	130	436
6:00 - 6:15 AM	2,472	24	1,245	188	122	256	157	481
6:15 - 6:30 AM	2,555	38	1,180	110	135	355	184	555
6:30 - 6:45 AM	2,941	33	1,115	46	194	484	290	780
6:45 - 7:00 AM	3,207	65	1,071	51	244	560	434	782
7:00 - 7:15 AM	3,174	83	1,010	49	283	559	449	743
7:15 - 7:30 AM	3,277	71	982	54	334	611	499	728
7:30 - 7:45 AM	3,416	97	905	105	438	601	484	787
7:45 - 8:00 AM	3,317	121	851	90	449	582	412	814
8:00 - 8:15 AM	3,307	118	870	96	355	578	473	818
8:15 - 8:30 AM	3,396	124	989	126	306	589	476	788
8:30 - 8:45 AM	3,303	103	901	109	345	570	501	774
8:45 - 9:00 AM	3,154	128	836	64	402	608	485	633
9:00 - 9:15 AM	3,118	134	873	53	359	586	462	652
9:15 - 9:30 AM	2,881	103	774	71	294	521	454	665
9:30 - 9:45 AM	2,772	81	850	117	265	503	382	577
9:45 - 10:00 AM	2,420	84	755	105	301	418	337	420
Total								
5:00-10:00 AM	55,253	1,463	18,447	2,409	5,069	8,768	6,769	12,218
Weekday Variation (STD)	2,510	77	1,072	385	1,176	103	993	1,600
Percent Variation (CV)	5%	5%	6%	16%	23%	1%	15%	13%
Peak Period								
6:30-9:30 AM	38,488	1,178	11,175	912	4,001	6,846	5,416	8,962
Weekday Variation (STD)	126	99	1,319	31	589	164	452	438
Percent Variation (CV)	0%	8%	12%	3%	15%	2%	8%	5%
Peak Hour								
7:00-8:00 AM	13,183	372	3,747	297	1,502	2,352	1,844	3,071
Weekday Variation (STD)	304	23	539	16	258	159	223	514
Percent Variation (CV)	2%	6%	14%	5%	17%	7%	12%	17%

Note: The traffic count data presented in this table are the average of two “typical weekday” counts taken in late September and early October, 2008. The standard weekday variation is the standard deviation (STD) of these two counts. The percent variation is the coefficient of variation (CV) expressed as the ratio of the count standard deviation to the count average times 100%.

Table 6
AM Peak Period Travel in the I-66 Corridor
Total Inbound Passenger Vehicles at the Beltway Screen Line

Time Period	Total Vehicles	Passenger Vehicles by I-66 Corridor Roadway Facility						
		Idylwood Road	I-66 GP	I-66 HOV	Lee Highway	Arlington Blvd	Little River Turnpike	Braddock Road
5:00 - 5:15 AM	990	11	415	272	27	41	34	191
5:15 - 5:30 AM	1,560	9	642	448	50	92	67	253
5:30 - 5:45 AM	2,130	23	1,089	350	75	145	88	362
5:45 - 6:00 AM	2,454	21	1,267	299	106	187	138	437
6:00 - 6:15 AM	2,660	26	1,269	322	123	271	167	484
6:15 - 6:30 AM	2,894	39	1,228	354	137	359	214	564
6:30 - 6:45 AM	3,411	33	1,169	389	210	494	323	795
6:45 - 7:00 AM	3,767	69	1,158	390	251	579	482	838
7:00 - 7:15 AM	3,844	108	1,105	417	307	600	505	805
7:15 - 7:30 AM	3,947	84	1,080	417	369	655	542	802
7:30 - 7:45 AM	4,002	118	978	379	482	651	527	869
7:45 - 8:00 AM	3,822	150	899	324	478	635	456	882
8:00 - 8:15 AM	3,825	152	908	316	401	633	535	881
8:15 - 8:30 AM	3,835	162	1,035	307	324	630	529	849
8:30 - 8:45 AM	3,774	131	947	306	375	639	545	833
8:45 - 9:00 AM	3,639	146	900	279	435	662	539	681
9:00 - 9:15 AM	3,621	155	913	288	401	646	503	716
9:15 - 9:30 AM	3,412	122	816	309	339	598	501	728
9:30 - 9:45 AM	3,369	93	932	383	311	583	425	643
9:45 - 10:00 AM	3,074	96	878	395	345	495	386	480
Total	0							
5:00-10:00 AM	64,024	1,744	19,622	6,939	5,541	9,590	7,502	13,088
Weekday Variation (STD)	3,882	49	720	486	1,293	129	1,059	1,586
Percent Variation (CV)	6%	3%	4%	7%	23%	1%	14%	12%
Peak Period								
6:30-9:30 AM	44,895	1,427	11,904	4,118	4,369	7,419	5,984	9,677
Weekday Variation (STD)	780	66	945	253	645	81	471	371
Percent Variation (CV)	2%	5%	8%	6%	15%	1%	8%	4%
Peak Hour								
7:00-8:00 AM	15,615	459	4,060	1,536	1,635	2,539	2,030	3,357
Weekday Variation (STD)	789	14	330	197	284	122	271	475
Percent Variation (CV)	5%	3%	8%	13%	17%	5%	13%	14%

Note: The traffic count data presented in this table are the average of two “typical weekday” counts taken in late September and early October, 2008. The standard weekday variation is the standard deviation (STD) of these two counts. The percent variation is the coefficient of variation (CV) expressed as the ratio of the count standard deviation to the count average times 100%.

Average Vehicle Occupancies

A total of 52,800 persons in 44,900 passenger vehicles were observed traveling inbound across the I-66 corridor Beltway screen line during the three-hour AM peak period. Table 7 shows that the average occupancy rate for passenger vehicles for the study peak period is 1.18 passengers per vehicle. The passenger vehicle totals and the average vehicle totals include autos, vans and motorcycles.

The data in Table 7 also show that the total number of inbound AM peak period passenger vehicle flows on the single I-66 HOV lane is nearly a third of the vehicle volume of the three I-66 general purpose lanes. It is noteworthy that the single I-66 HOV lane carries nearly twice the number of persons per lane than the I-66 general purpose lanes (per lane) during the peak period. Table 8 shows that on a typical weekday morning the I-66 HOV lane, which has an average vehicle occupancy of 1.91 persons, carries more persons in fewer vehicles than all the other roadways in the study.

Other comparable typical weekday AM peak period vehicle occupancies in the I-66 outer corridor are 1.2 persons per vehicle on Idylwood Road, 1.13 on Little River Turnpike (VA-236), 1.14 on Lee Highway (US-29), 1.1 on Arlington Boulevard (US-50), 1.09 on Braddock Road (VA-620), and 1.08 on the I-66 general purpose lanes (see Table 7).

The data in Tables 9 and 10 present the number and percentage distribution of vehicle occupancies classified by the number of persons in the vehicle for AM peak period passenger vehicle flows across the I-66 corridor outer area screen line. The tables show that 90% or more of passenger vehicles on all the roadways except Idylwood Road and the I-66 HOV lane are carrying a single occupant. On the I-66 HOV facility during the same time period approximately 74% of the passenger vehicles (including vans) are carrying two or more occupants.

Table 7
AM Peak Period Travel in the I-66 Corridor
Average Inbound Passenger Vehicle Occupancies
at the Beltway Screen Line
3-Hour AM Peak Period - (6:30 AM to 9:30 AM)

Roadway Facility	Number of Inbound Lanes	Passenger Vehicles		
		Person Count	Vehicle Count	Average Occupancy
Idylwood Road	1	1,715	1,427	1.20
I-66 (General Purpose Lanes)	3	12,808	11,904	1.08
I-66 (HOV Lanes)	1	7,878	4,118	1.91
Lee Highway	2	4,973	4,369	1.14
Arlington Boulevard	3	8,127	7,419	1.10
Little River Turnpike	2	6,739	5,984	1.13
Braddock Road	3	10,527	9,677	1.09
TOTAL	15	52,764	44,895	1.18

Table 8
AM Peak Period Travel in the I-66 Corridor
Passenger Volume per Lane and Passenger Volume per Lane Hour at the Beltway Screen Line
3-Hour AM Peak Period – (6:30 AM to 9:30 AM)

Roadway Facility	Number of Inbound Lanes	Vol/Lane	Vol/Lane/Hr
Idylwood Road	1	1,715	572
I-66 (General Purpose Lanes)	3	4,269	1,423
I-66 (HOV Lanes)	1	7,878	2,626
Lee Highway	2	2,487	829
Arlington Boulevard	3	2,709	903
Little River Turnpike	2	3,369	1,123
Braddock Road	3	3,509	1,170

Table 9
AM Peak Period Travel in the I-66 Corridor
Inbound Passenger Vehicle Counts Classified by Number of Persons in Vehicle
at the Beltway Screen Line
3-Hour AM Peak Period -- (6:30 AM to 9:30 AM)

Roadway Facility	1-Person Autos	2-Person Autos	3+-Person Autos	Passenger Vans	Motorcycles	Total Passenger Vehicles
Idylwood Road	1,167	236	12	3	11	1,427
I-66 (General Purpose Lanes)	11,141	682	34	14	34	11,904
I-66 (HOV Lanes)	859	3,046	118	43	53	4,118
Lee Highway	3,989	332	16	21	12	4,369
Arlington Boulevard	6,829	526	38	9	17	7,419
Little River Turnpike	5,402	520	33	15	15	5,984
Braddock Road	8,937	672	34	9	26	9,677
Corridor Total	38,322	6,011	284	113	166	44,895

Table 10
AM Peak Period Travel in the I-66 Corridor
Distribution of Inbound Passenger Vehicle Counts Classified by Number of Persons in Vehicle
at the Beltway Screen Line
3-Hour AM Peak Period - (6:30 AM to 9:30 AM)

Roadway Facility	1-Person Autos	2-Person Autos	3+-Person Autos	Passenger Vans	Motorcycles	Total Passenger Vehicles
Idylwood Road	82%	17%	1%	0%	1%	100%
I-66 (General Purpose Lanes)	94%	6%	0%	0%	0%	100%
I-66 (HOV Lanes)	21%	74%	3%	1%	1%	100%
Lee Highway	91%	8%	0%	0%	0%	100%
Arlington Boulevard	92%	7%	1%	0%	0%	100%
Little River Turnpike	90%	9%	1%	0%	0%	100%
Braddock Road	92%	7%	0%	0%	0%	100%
Corridor Total	85%	13%	1%	0%	0%	100%

Statistical Confidence Levels for AM Peak Period Modal Share Estimates

One of the intended purposes of this study is to develop a statistically reliable estimate of the transit mode share of inbound AM peak period travel in Northern Virginia's I-66 corridor outside the Capital Beltway screen line. Based on the statistical analysis of the two-day auto occupancy and transit passenger counts conducted, transit's share of inbound AM peak period travel on a typical weekday is estimated to be 22.7% plus or minus 0.1 percentage points at the 90% confidence level. This share at this confidence level means that, statistically, one can be 90% confident that the actual share of AM peak period travel in the I-66 corridor by transit would be found in the range from 22.6% to 22.8% if these counts had been taken on every typical weekday between Tuesday, September 30, 2008 and Thursday, October 9, 2008.

The carpool/vanpool person share of inbound AM peak period travel on a typical weekday at the Beltway screen line is estimated to be 20.9% plus or minus 1.3 percentage points at the 90% confidence level. The share of SOV travel at this same screen line is estimated to be 56.4% plus or minus 2.4 percentage points at the 90% confidence level.

Major Findings and Conclusions

- Analysis of two-day auto occupancy and transit passenger counts conducted on typical weekdays in late-September and early-October 2008 show that 44% of inbound AM peak period travelers in Northern Virginia's I-66 corridor at a traffic counting screen line just outside the Capital Beltway are using transit or carpools or vanpools.
- Approximately 15,500 persons were counted traveling across the I-66 corridor Beltway screen line on Metrorail, Virginia Railways Express (VRE), or on a Metrobus, OmniRide, or Metro Direct bus. Combined rail and bus travel during the 6:30 AM to 9:30 AM peak period accounts for a 23% share of the total inbound AM peak period person travel across the screen line.
- A total of 11,500, or 17%, of the inbound AM peak period travelers at the Beltway screen line in the I-66 corridor are on Metrorail. These riders were counted at the Orange Line Metro stations outside the Beltway.
- VRE trains carry 2,700 passengers across the I-66 corridor Beltway screen line during the AM peak period. Ridership on these VRE Manassas Line trains accounts for 4% of the total inbound AM peak period person travel across the Beltway screen line in this travel corridor.
- A total of 1,350 of the AM peak period inbound travelers at the Beltway screen line in the I-66 corridor are on public transportation buses. Riders on PRTC OmniRide and Metro Direct buses account for over 300 of this total. Ridership on WMATA Metrobus service accounts for 1,030 persons.
- Almost 14,300 or 21% of the inbound AM peak period travelers in the I-66 corridor at the Beltway screen line are in carpools or vanpools. More than half of these HOV2+ persons (7,000) travel on the I-66 HOV lane.
- The effectiveness of the I-66 HOV lane in its efficiency in moving large numbers of people per lane of roadway is apparent in the count data collected. During the time period the I-66 HOV lane restrictions are in effect, the single I-66 HOV lane carries an average of 2,600 persons per lane hour compared to an average of 1,400 persons per lane hour on the I-66 general purpose lanes.
- On a typical weekday during the peak period, approximately 38,500 persons, or 56% of all travelers, cross the I-66 corridor outside the Beltway screen line in single occupant vehicles (SOVs). The greatest amount of AM peak period SOV travel is on the general purpose lanes of I-66 (11,200 persons), followed by Braddock Road (9,000 persons).

- Vehicle occupancies for inbound vehicles on the I-66 HOV lane at the Beltway screen line during the 6:30 AM to 9:30 AM peak period average 1.9 persons per vehicle. Average vehicle occupancies for inbound vehicles on other roadway facilities in the corridor range from 1.08 on the I-66 general purpose lanes to 1.2 on Idylwood Road.

Appendix A
AM Peak Period Travel in Major Transportation Corridors in Northern Virginia
Total Inbound Person Trips

Study and Peak Time Period	Persons Total AVG	Persons Auto AVG	Persons Transit AVG	Persons Percent Transit	Persons HOV2+ AVG	Persons Percent HOV2+	Persons SOV AVG	Persons Percent SOV
I-66 Corridor Outside the Beltway, AM Peak Period (6:30-9:30AM), Fall 2008	68,287	52,764	15,523	23%	14,276	21%	38,488	56%
Standard Weekday Variation (STD)	1,291	1,228	63		1,102		126	
Percent Variation (CV)	2%	2%	0%		8%		0%	
I-66 Corridor Inside the Beltway, AM Peak Period (6:15-9:15AM), Fall 2005	63,283	39,593	23,690	37%	16,694	26%	22,899	36%
Standard Weekday Variation (STD)	1,299	223	1,076		697			
Percent Variation (CV)	2%	1%	5%		4%			
I-395 Corridor, AM Peak Period (6:15- 9:15AM), Fall 2006	94,276	62,349	31,928	34%	29,451	31%	32,898	35%
Standard Weekday Variation (STD)	756	3,627	2,871		4,794		1,167	
Percent Variation (CV)	1%	6%	9%		16%		4%	
I-95 Corridor Outside the Beltway, AM Peak Period (6:00-9:00AM), Fall 2007	101,008	81,822	19,186	19%	28,057	28%	53,765	53%
Standard Weekday Variation	1,462	1,223	239		3,793		2,570	
Percent Variation (CV)	1%	1%	1%		14%		5%	

Appendix B
I-66 Corridor Beltway Screen Line
Counting Stations / Locations

I-66 Corridor Facility/Service	Counting Location	Counting Dates
<u>Roadway</u>		
Idylwood Road	Between Spring Street and Virginia Lane	Wed 10/08/08 Thu 10/09/08
I-66 (General Purpose Lanes)	Between Va. 243 (Nutley Street) and I-495	Tue 09/30/08 Wed 10/01/08
I-66 (HOV Lanes)	Between Va. 243 (Nutley Street) and I-495	Tue 09/30/08 Wed 10/01/08
Lee Highway	Between Prosperity Avenue and Gallows Road	Wed 10/08/08 Thu 10/09/08
Arlington Boulevard	Between Prosperity Avenue and Gallows Road	Wed 10/08/08 Thu 10/09/08
Little River Turnpike	Between Pineridge Drive and I-495	Thu 10/02/08 Tue 10/07/08
Braddock Road	Between Southampton Drive and Wakefield Chapel Road	Thu 10/02/08 Tue 10/07/08
<u>Metrorail</u>		
Orange Line	Vienna Metro Station and Dunn Loring Metro Station	Tue 10/07/08 Wed 10/08/08
<u>Metrobus Routes</u>		
29K, 29E, 29X, 29N, 17H, 17M, 17G, 17L, 17A	Little River Turnpike @ Pineridge Drive (Direction East)	Tue 10/07/08 Wed 10/08/08
	Braddock Road @ Port Road (Direction East)	Tue 10/07/08 Thu 10/09/08
<u>PRTC Routes</u>		
WFC	Williamson Blvd and Stonehouse Drive	Tue 9/30/08 Thu 10/02/08
M	Williamson Blvd and Stonehouse Drive	Tue 9/30/08 Thu 10/02/08
LH	Linton Hall Rd and Hunting Cove Place	Tue 9/30/08 Thu 10/02/08
<u>Virginia Railway Express</u>		
Manassas Line	Rolling Road Station	Tue 9/30/08 Wed 10/01/08