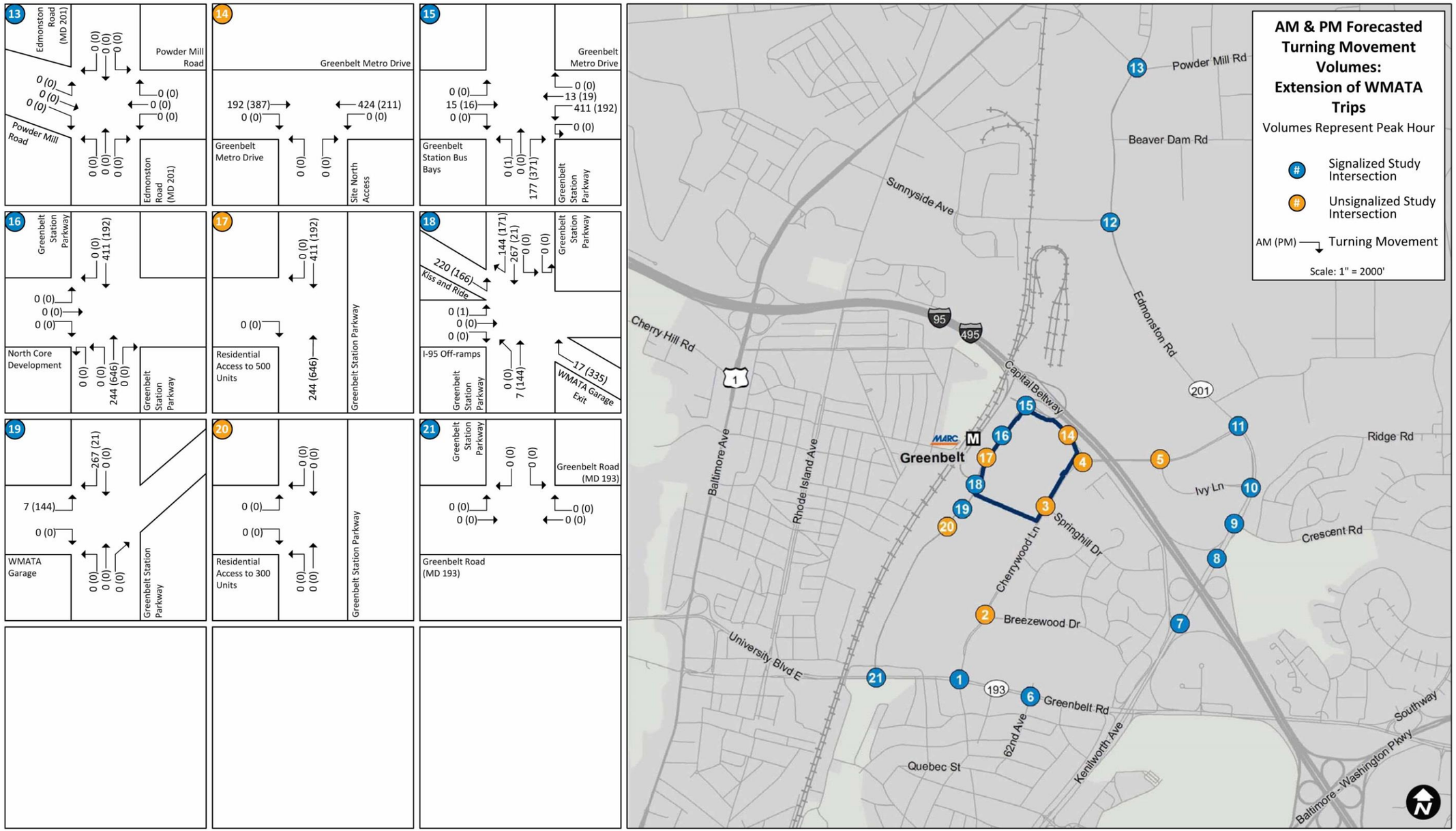
Figure 4-8: No-build AM and PM Existing Volumes Extended through the North Core and South Core Proposed Roadways (continued)



4.8.2.2 Percentage Shift in WMATA-based Trips

Once the existing volumes were adjusted to the peak hour of the study area, the vehicle volumes required a shift based on the opening of the proposed interchange ramps. The new ramps would create a quicker route for vehicles to and from I-95/I-495 South compared to the existing route via Kenilworth Avenue and Cherrywood Lane. Based on the existing condition volumes between the I-95/I-495 northbound off-ramp to Kenilworth Avenue and Cherrywood Lane and Greenbelt Metro Drive roundabout, the percentage of vehicles following the route were extracted. This process started at the off-ramp volume, or 807 vehicles, and tracked them through the five intersections leading to Greenbelt Metro Drive. At each intersection, the percentages for each vehicle movement were calculated, and the percentage representing travel in the appropriate direction leading to Greenbelt Metro Drive was applied. For example, the next intersection north of the I-95/I-495 off-ramp along Kenilworth Avenue is Crescent Road, which had 89.2 percent of the vehicles heading north on Kenilworth Avenue. Therefore, the 807 was multiplied by the 89.2 percent to arrive at 720 vehicles out of the 807 vehicles continuing north on Kenilworth. This process was followed to Cherrywood Lane, where the remaining number of vehicles was assumed to be destined to Greenbelt Metro Drive. It was assumed that all vehicle trips turning left from Ivy Lane to Cherrywood Lane during the AM peak hour were destined to Greenbelt Metro Drive. It was assumed that all vehicle trips turning left from Ivy Lane to Cherrywood Lane during the PM peak hour were not destined to Greenbelt Metro Drive.

The reverse from Greenbelt Metro Drive followed a similar process except all vehicles turning right from Cherrywood Lane onto Ivy Lane would continue to Kenilworth Avenue southbound. It was also assumed that all vehicles from Greenbelt Metro Drive reaching Kenilworth Avenue southbound would be destined to I-95/I-495 South.

Based on this process, approximately 50 percent of vehicles turning from Cherrywood Road westbound to Greenbelt Metro Drive or vehicles turning from Greenbelt Metro Drive to Cherrywood Drive would represent vehicles that would shift their travel pattern from Kenilworth Avenue and Cherrywood Lane to the new ramps serving Greenbelt Metro Station. Tables 4-14 and 4-15 contain the inbound and outbound I-95/I-495 South to Greenbelt Metro Drive travel pattern summaries, respectively.

Table 4-14: I-95/I-495 South to Greenbelt Metro Drive Travel Pattern Summary (Inbound)

	Volume from Off-Ramp	Movement Percent	Movement Direction	Volume from Ivy Lane	Movement Direction
AM Peak Hour					
Kenilworth Avenue and I-95/I-495 Ramp	807	100%	Right		
Kenilworth Avenue and Crescent Road	720	89.2%	Through		
Kenilworth Avenue and Ivy Lane	539	74.8%	Through		
Kenilworth Avenue and Cherrywood Lane	124	23.1%	Left		
Cherrywood Lane and Ivy Lane	124	100%	Through	51	Left
Cherrywood Lane and Greenbelt Metro Drive	124	100%	Right	51	Right
Volume Traveling from I-95/I-495 to Greenbelt Metro Drive				124+51=175	
Total Volume from Cherrywood Lane Westbound to Greenbelt Metro Drive				312	
Percent of Total Volume from Cherrywood Lane Westbound to Greenbelt Metro Drive originating from I-95/I-495				56.1% or ~50%	
PM Peak Hour					
Kenilworth Avenue and I-95/I-495 Ramp	506	100%	Right		
Kenilworth Avenue and Crescent Road	423	83.5%	Through		
Kenilworth Avenue and Ivy Lane	377	89.1%	Through		
Kenilworth Avenue and Cherrywood Lane	58	15.5%	Left		
Cherrywood Lane and Ivy Lane	58	100%	Through	0	Left
Cherrywood Lane and Greenbelt Metro Drive	58	100%	Right	0	Right
Volume Traveling from I-95/I-495 to Greenbelt Metro Drive				58	
Total Volume from Cherrywood Lane Westbound to Greenbelt Metro Drive				119	
Percent of Total Volume from Cherrywood Lane Westbound to Greenbelt Metro Drive originating from I-95/I-495				48.7% or ~50%	

Table 4-15: Greenbelt Metro Drive to I-95/I-495 South Travel Pattern Summary (Outbound)

	Volume from Greenbelt Metro Drive	Movement Percent	Movement Direction	Volume to/from Ivy Lane	Movement Direction
AM Peak Hour					
Cherrywood Lane and Greenbelt Metro Drive	116	100%	Left		
Cherrywood Lane and Ivy Lane	75	65%	Through	41	Right
Kenilworth Avenue and Cherrywood Lane	23	30.5%	Right		
Kenilworth Avenue and Ivy Lane	23	100%	Through		Right
Kenilworth Avenue and Crescent Road	64	91.5%	Through	Added back to Greenbelt Metro Drive Volume	
Kenilworth Avenue and I-95/I-495 Ramp	59	100%	Through		
Volume Traveling from Greenbelt Metro Drive to I-95/I-495 South				59	
Total Volume from Greenbelt Metro Drive to Cherrywood Lane				116	
Percent of Total Volume from Greenbelt Metro Drive to Cherrywood Lane Eastbound destined to I-95/I-495 South				50.9% or ~50%	
PM Peak Hour					
Cherrywood Lane and Greenbelt Metro Drive	261	100%	Right		
Cherrywood Lane and Ivy Lane	204	78.2%	Through	57	Right
Kenilworth Avenue and Cherrywood Lane	102	50%	Right		
Kenilworth Avenue and Ivy Lane	102	100%	Through		Right
Kenilworth Avenue and Crescent Road	159	100%	Through	Added back to Greenbelt Metro Drive Volume	
Kenilworth Avenue and I-95/I-495 Ramp	140	87.9%	Through		
Volume Traveling from Greenbelt Metro Drive to I-95/I-495 South				140	
Total Volume from Greenbelt Metro Drive to Cherrywood Lane				261	
Percent of Total Volume from Greenbelt Metro Drive to Cherrywood Lane Eastbound destined to I-95/I-495 South				53.6% or ~50%	

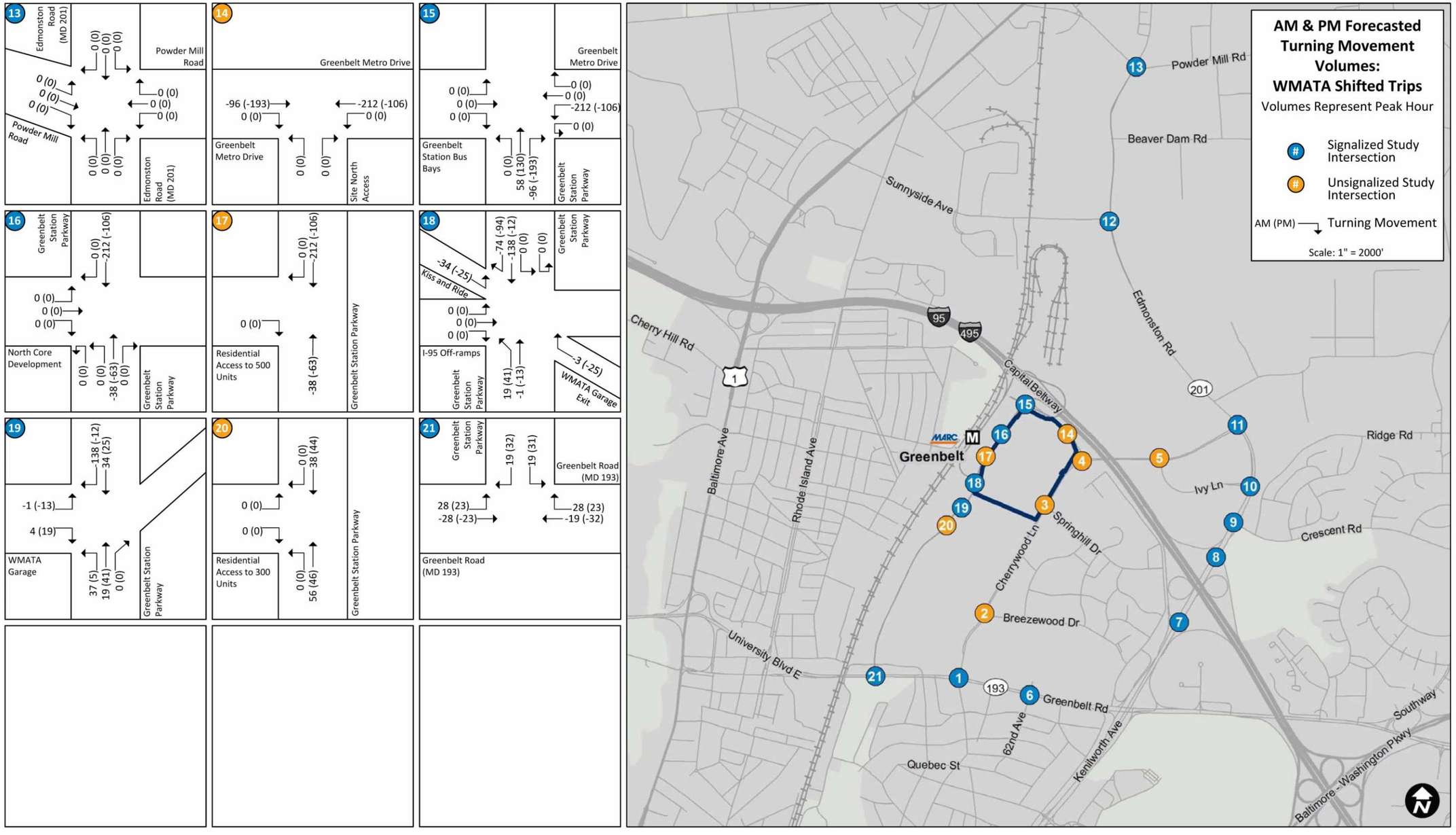
4.8.2.3 WMATA-Based Trips Shifted

The travel patterns demonstrated that approximately 50 percent of the existing volumes travel between Greenbelt Metro Drive and Cherrywood Road to and from the east. The existing volumes were shifted to match that pattern, representing the trips that would likely use the new I-95/I-495 Greenbelt ramps. This resulted in 214 vehicle trips being shifted from Kenilworth Avenue and Cherrywood Lane during the AM (156 inbound and 58 outbound) and 190 vehicle trips shifted from Kenilworth Avenue and Cherrywood Lane during the PM (60 inbound and 130 outbound). In addition, 50 percent of the vehicle volumes traveling between Greenbelt Metro Drive and

Cherrywood Lane to and from the west were shifted to Greenbelt Station Parkway through the South Core development based on the *Greenbelt WMATA, Mixed-Use, and FBI Headquarters Study* (Renard Development Company 2014). Figure 4-9 shows the AM and PM peak hour Greenbelt Metro Station shifted volumes.

Figure 4-9: AM and PM Peak Hour Greenbelt Metro Station Shifted Volumes

Figure 4-9: AM and PM Peak Hour Greenbelt Metro Station Shifted Volumes (continued)



4.8.3 Trip Generation/Modal Split

The process to add each development for the No-build Condition followed the M-NCPPC/Prince George's County guidelines by using the county's prescribed trip generation formulas (M-NCPPC 2012a). Depending on the type of development and size, the trip generation either relied on the Prince George's County trip rates or ITE trip rates. Prince George's County supplies trip rates for a number of typical land uses such as office and residential. Table 4-16 shows the trip generation rates used to cover the planned developments.

In addition to the planned developments, the WMATA-based trip growth and the forecasted cut-through traffic (traffic from adjacent areas both inside and outside the study area that would be expected to change their travel pattern to access I-95/I-495 using the new available roadway connections) was calculated.

Table 4-16: No-build Condition Trip Generation Rates

Land Use	Trip Generation Rate	Trips Entering	Trips Existing
General Office (Prince George's County Guidance)	AM Trips = 2.00 X units	90% inbound	10% outbound
	PM Trips = 1.85 X units	18.9% inbound	81.1% outbound
General Office (ITE - 710): Greater than 108,000 square feet	Ln(AM trips) = .80 Ln(units) + 1.57	90% inbound [a]	10% outbound [a]
	PM Trips = 1.12 X units + 78.45	18.9% inbound*	81.1% outbound*
Hotel (ITE - 310)	AM Trips = 0.53 X units	59% inbound	41% outbound
	PM Trips = 0.60 X units	51% inbound	49% outbound
Shopping Center (ITE - 820)	Ln(AM trips) = .61 Ln(units) + 2.24	62% inbound	38% outbound
	Ln(AM trips) = .67 Ln(units) + 3.31	48% inbound	52% outbound
Apartments (Prince George's County Guidance)	AM Trips = 0.52 X units	19% inbound	81% outbound
	PM Trips = 0.60 X units	65% inbound	35% outbound
Townhouses (Prince George's County Guidance)	AM Trips= 0.70 X units	20% inbound	80% outbound
	PM Trips = 0.80 X Units	65% inbound	35% outbound

[a] Follows Prince George's County distribution rates
Notes: Ln = Natural Log

4.8.3.1 Planned Development Trip Generation

After establishing the proper trip rate, the internal capture procedures outlined in National Cooperative Highway Research Program (NCHRP) 684 were followed to account for existing trips that would choose to walk between

nearby land uses rather than drive (TRB 2011). The NCHRP process relies on capture rates between specific land uses. This procedure is endorsed as the preferred procedure for handling internal capture by the ITE's *Proposed Trip Generation Handbook*, Third Edition (ITE 2014). Two planned developments required this procedure to reflect the mixed use. Appendix C8 contains the NCHRP 684 worksheets.

The M-NCPPC/Prince George's County guidelines were also followed in handling pass-by trips (M-NCPPC 2012a). These represent existing trips that include a stop at a retail use along their route and continue on their way following the stop. For example, a person may stop at the dry cleaners or take-out restaurant on their way home from work. According to the M-NCPPC/Prince George's County guidelines, the smaller the retail space, the higher the percentage of pass-by trips assigned. Two planned developments required this procedure.

M-NCPPC/Prince George's County procedures allow for a transit credit to be applied for developments within proximity of transit. A maximum of a 20 percent trip credit may be applied. This credit would be applied to the trip generation, thus reducing the forecasted vehicle trips and assigning them as transit trips. One site (South Core) is proposed to be located within 0.5 mile of the Greenbelt Metro Station; therefore, a 10 percent transit credit was applied to reflect the Metro transit access. The North Core development is planned to be situated next to the Metrorail station; therefore, the 2005 WMATA Ridership Survey was relied on instead of the M-NCPPC/Prince George's County procedures to provide the transit percentage by land use (WMATA 2006). The *Greenbelt WMATA, Mixed-Use, and FBI Headquarters Study* (Renard Development Company 2014) followed a similar process. Based on Table S-4 from the 2005 WMATA study, office had a 34 percent transit share, retail had a 37 percent transit share, residential had a 45 percent transit share, and hotel had a 31 percent transit share. These values represent the average transit share by land use.

4.8.3.2 WMATA-based Growth

In addition to the planned development trip generation, the future vehicle trip growth for the Greenbelt Metro Station was forecasted to 2022. The MWCOG travel demand model indicated a 2.07 annual growth rate for the Metrorail system. Based on the *Greenbelt WMATA, Mixed-Use, and FBI Headquarters Study*, a growth rate of 1.5 percent was used for vehicle trips destined to the proposed WMATA parking garage, along with that study's Kiss & Ride annual growth rate of 3 percent representing vehicles destined to the station's Kiss & Ride (Renard Development Company 2014). The annual growth rates were applied to the volume results from the shifted WMATA-based trips process covering the parking garage or the Kiss & Ride area. The percent split for future trips (between inbound and outbound) is assumed to be consistent with current trips.

Bus trips were also increased consistent with WMATA's request through the *Greenbelt WMATA, Mixed-Use, and FBI Headquarters Study*. Based on the study, the buses were grown at the same rate as the Kiss & Ride or 3.0 percent per year. Based on an 8-year growth, there was a total of four new buses during the AM peak hour and five new buses during the PM peak hour. Both values were adjusted to passenger car equivalents (1 bus equals 1.5 cars) for traffic modeling purposes (M-NCPPC 2012a). This resulted in 12 vehicles (6 entering and 6 departing) during the AM peak hour and 15 vehicles during the PM peak hour, eight entering and seven departing.

Table 4-17 presents the planned development and WMATA trip generation summary.

Table 4-17: Planned Development and WMATA Trip Generation Summary

PROJECT	UNITS/SIZE/ CREDITS	AM PEAK HOUR TRIPS			PM PEAK HOUR TRIPS		
		IN	OUT	TOTAL	IN	OUT	TOTAL
North Core (West side of Greenbelt Station Parkway)							
General Office (ITE - 710) [a]	350,000 square feet	469	52	521	89	381	470
Internal Capture Trips (following NCHRP 684 Tables)		-38	-15	-53	-13	-31	-44
Net External Trips		431	37	468	76	350	426
Transit Credit (following 2005 WMATA Ridership Survey) [b]	34% credit	-147	-13	-160	-26	-119	-145
Net External Vehicle Trips		284	24	308	50	231	281
Shopping Center (ITE - 820)	100,000 square feet	97	59	156	288	311	599
Internal Capture Trips (following NCHRP 684 Tables)		-22	-19	-41	-58	-103	-161
Net External Trips		75	40	115	230	208	438
Transit Credit (following 2005 WMATA Ridership Survey) [b]	37% credit	-28	-15	-43	-85	-77	-162
Net External Vehicle Trips		47	25	72	145	131	276
Pass-by Trips (reduction based on overall retail development)	20% pass-by	-9	-5	-14	-29	-26	-55
Net External Vehicle and Pass-by Trips		38	20	130	116	105	221
Apartments (Prince George's County Guidance)	800 units	79	337	416	312	168	480
Internal Capture Trips (following NCHRP 684 Tables)		-2	-10	-12	-88	-40	-128
Net External Trips		77	327	404	224	128	352
Transit Credit (following 2005 WMATA Ridership Survey) [b]	45% credit	-35	-147	-182	-101	-58	-159
Net External Vehicle Trips		42	180	222	123	70	193
Hotel (ITE - 310)	300 rooms	94	65	159	92	88	180
Internal Capture Trips (following NCHRP 684 Tables)		0	-18	-18	-21	-6	-27
Net External Trips		94	47	141	71	82	153
Transit Credit (following 2005 WMATA Ridership Survey) [b]	31% credit	-29	-15	-44	-22	-25	-47
Net External Vehicle Trips		65	32	97	49	57	106
TOTAL VEHICLE TRIPS		**429**	**256**	**685**	**338**	**463**	**801**

[a] Per Prince George's County Guidance ITE followed for developments exceeding 108,000 square feet

[b] 2005 WMATA Ridership Survey Table S-4

Table 4-17: Planned Development and WMATA Trip Generation Summary (continued)

PROJECT	UNITS/SIZE/ CREDITS	AM PEAK HOUR TRIPS			PM PEAK HOUR TRIPS		
		IN	OUT	TOTAL	IN	OUT	TOTAL
South Core							
Shopping Center (ITE - 820)	180,000 square feet	138	85	223	426	462	888
Internal Capture Trips (following NCHRP 684 Tables)		-4	-2	-6	-43	-120	-163
Net External Trips		134	83	217	383	342	725
Transit Credit (1/2 to 3/4 mile walk to Greenbelt Station) [c]	10% credit	-13	-8	-21	-38	-34	-72
Net External Vehicle Trips		121	75	196	345	308	653
Pass-by Trips	40% pass-by	-48	-30	-78	-138	-123	-261
Net External and Pass-by Trips		73	45	217	207	185	725
Apartments (Prince George's County Guidance)	550 units	54	232	286	215	115	330
Internal Capture Trips (following NCHRP 684 Tables)		-1	-2	-3	-65	-23	-88
Net External Trips		53	230	283	150	92	242
Transit Credit (1/2 to 3/4 mile walk to Greenbelt Station) [c]	10% credit	-5	-23	-28	-15	-9	-24
Net External Vehicle Trips		48	207	255	135	83	218
Townhouses (Prince George's County Guidance)	350 units	49	196	245	182	98	280
Internal Capture Trips (following NCHRP 684 Tables)		-1	-2	-3	-55	-20	-75
Net External Trips		48	194	242	127	78	205
Transit Credit (1/2 to 3/4 mile walk to Greenbelt Station) [c]	10% credit	-5	-19	-24	-13	-8	-21
Net External Vehicle Trips		43	175	218	114	70	184
TOTAL VEHICLE TRIPS		**164**	**427**	**591**	**456**	**338**	**794**
[c] MNCPPC approved 10% transit credit based on proximity to the Greenbelt Metro Station (50% of full 20% credit)							
Capital Office Park (North of Ivy Lane)							
General Office (ITE - 710)*	300,000 square feet	415	46	461	78	336	414
TOTAL VEHICLE TRIPS		**415**	**46**	**461**	**78**	**336**	**414**
[a] Per Prince George's County Guidance ITE followed for developments exceeding 108,000 square feet							
Capital Office Park (SW Corner of Cherrywood Lane and MD 201)							
General Office (Prince George's County Guidance)	46,000 square feet	83	9	92	16	69	85
TOTAL VEHICLE TRIPS		**83**	**9**	**92**	**16**	**69**	**85**
Greenbelt Station Kiss & Ride							
Kiss & Ride (passenger drop-off/pick-up)	3% annual growth	48	59	107	55	44	99
TOTAL VEHICLE TRIPS		**48**	**59**	**107**	**55**	**44**	**99**
Greenbelt Station Bus Service							
Local Bus Service	3% annual growth	6	6	12	8	7	15
TOTAL VEHICLE TRIPS		**6**	**6**	**12**	**8**	**7**	**15**
Greenbelt Station Parking Garage							
Metro Riders	1.5% annual growth	82	3	85	6	61	67
TOTAL VEHICLE TRIPS		**82**	**3**	**85**	**6**	**61**	**67**

4.8.3.3 *Cut-through Traffic*

In addition to the planned developments, the WMATA-based trip growth and the forecasted cut-through traffic (traffic from adjacent areas both inside and outside the study area that would be expected to change their travel pattern to access I-95/I-495 using the new available roadway connections) was calculated. The cut-through traffic would be a result of the connection provided by the new set of roadways between Greenbelt Road/Cherrywood Lane and I-95/I-495. These new connections would provide an alternative to using the existing U.S. Route 1 and Kenilworth Avenue interchanges to access I-95/I-495.

Based on the *Greenbelt WMATA, Mixed-Use, and FBI Headquarters Study*, M-NCPPC developed future forecasts through travel demand modeling to represent the condition in 2040 (Renard Development Company 2014). The model estimated 8,582 vehicles per day would use the new roadways as a cut-through. Because this volume represented the 2040 condition, the volumes were adjusted to represent 2022 by using a reverse compound formula with the Greenbelt Site Transportation Agreement approved background growth rate (0.33 percent). The result reduced the estimated volume from 8,582 to 8,088 vehicles per day ($8,582 / (1 + 0.0033)^{18}$).

Based on the *Greenbelt WMATA, Mixed-Use, and FBI Headquarters Study*, the cut-through trips were generated by following the same agreed process between Renard Development Company, LLC and Maryland SHA (Renard Development Company 2014). This process assumed 8 percent of the daily vehicles would travel during the peak hours. The directional split between those vehicles traveling toward I-95/I-495 or from I-95/I-495 would differ by time of day. During the AM peak hour, a 60/40 split was followed (60 percent of vehicles would be destined to I-95/I-495). During the PM peak hour, the direction split was reversed (40/60). Table 4-18 shows the cut-through trip process.

Table 4-18: Cut-through Trip Process

Steps	Value
Forecasted 2040 Daily Volume	8,582
Forecasted 2022 Daily Volume (Reverse Compound Formula for 18 years)	8,088
Peak Hour Volume (8 percent of Daily Volume)	647
AM Inbound to I-95/I-495/ PM outbound from I-95/I-495 (60 percent)	388
AM outbound from I-95/I-495/ PM inbound to I-95/I-495 (40 percent)	259

4.8.4 Trip Distribution

Once the total number of new vehicle trips was calculated through the trip generation process, the trips were systematically and logically distributed across the road network. This is typically a straightforward process, emulating the existing travel patterns on roadways. However, in this case, with new developments and new roadways introduced as part of the No-build Condition, the process required several additional steps to complete including the following:

1. Add the planned development trips.
2. Add the growth in Greenbelt Metro Station trips (WMATA garage and Kiss & Ride).
3. Add the growth in buses serving the Greenbelt Metro Station.
4. Add the background growth rate trips.
5. Add the cut-through vehicle trips.

4.8.4.1 Planned Development Trip Distribution

The planned developments included the North and South Core developments, plus the two Capital Office Park developments. The study followed the North Core distribution values based on the *Greenbelt WMATA, Mixed-Use, and FBI Headquarters Study* for the North and South Core planned land uses and MWCOG travel demand model trip tables from Version 2.3.52 Travel Demand Model for 2020 for the Capital Office Park developments (Renard Development Company 2014; MWCOG 2014b).

The *Greenbelt WMATA, Mixed-Use, and FBI Headquarters* study provided distributions for office, retail, hotel, and residential uses. Because the South Core development is in proximity to the North Core, the same distribution patterns were followed except for trips destined to Kenilworth Avenue to the south. It was assumed that these trips would use Greenbelt Road to access Kenilworth Avenue rather than Cherrywood Lane.

Trip tables from the 2020 model were obtained from MWCOG representing all trips originating at home for all purposes such as work or shopping (MWCOG 2014a). A transportation analysis zone (TAZ), which is the smallest geographical unit within a travel demand model, was selected to capture the travel patterns to and from office uses. TAZ 893, representing a 2020 forecast of 3,299 jobs, is located between Sunnyside Avenue and I-95/I-495. This zone represents the largest employment adjacent to the Greenbelt site TAZ.

Table 4-19 contains the distribution percentages for each planned development. Appendix C7 contains maps showing the distribution patterns for each planned development.

Table 4-19: Planned Development Trip Distribution

Origin / Destination	North Core				South Core		Capital Office Park
	Office	Residential	Retail	Hotel	Residential	Retail	Office
I-95/I-495 North	35%	30%	10%	50%	30%	10%	31%
I-95/I-495 South	30%	30%	10%	50%	30%	10%	26%
U.S. Route 1 North	0%	0%	0%	0%	0%	0%	12.5%
Edmonston Road North	7.5%	7.5%	12.5%	0%	7.5%	12.5%	2%
Kenilworth Avenue South	7.5%	7.5%	12.5%	0%	0%	0%	9.5%
Greenbelt Road West	7.5%	12.5%	12.5%	0%	12.5%	12.5%	11%
Greenbelt Road East	7.5%	12.5%	12.5%	0%	20%	25%	8%
Breezewood/Springhill Drive	5%	0%	30%	0%	0%	30%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

4.8.4.2 Distribution of Future Forecasted WMATA-based Vehicle Trips

The Greenbelt Metro Station forecasted future trips were distributed based on the travel patterns recorded during the peak hour of the existing station, not the peak hour of the study area to capture the highest vehicle flow for the calculation. The *Greenbelt WMATA, Mixed-Use, and FBI Headquarters Study* captured those volumes to develop the distribution pattern (Renard Development Company 2014). Prior to performing the calculations, the volumes representing the buses were removed, since the bus distribution pattern was separately determined. Table 4-20 summarizes the WMATA-based distribution pattern. Appendix C7 contains maps showing the distribution patterns for both peak hours.

Table 4-20: WMATA-based Distribution Pattern

Origin / Destination	AM Peak Hour		PM Peak Hour	
	Inbound	Outbound	Inbound	Outbound
I-95/I-495 North	42%	21%	30%	50%
I-95/I-495 South	22%	25%	32%	16%
Edmonston Road North	11%	11.5%	8.5%	8.5%
Kenilworth Avenue South	11%	11.5%	8.5%	8.5%
Greenbelt Road West	3.5%	8%	7%	4%
Greenbelt Road East	3.5%	8%	7%	4%
Breezewood/Springhill Drive	7%	15%	7%	9%
Total	**100%**	**100%**	**100%**	**100%**

4.8.4.3 Distribution of New Bus Trips

Bus trips followed the existing pattern of bus routes serving the Greenbelt Metro Station. All buses currently serve the station using Greenbelt Metro Drive; therefore, it was assumed that condition would not change in the future. Because the total number of vehicles added was small, trips were not distributed to all destinations, specifically Sunnyside Avenue. Table 4-21 summarizes the bus distribution pattern. Appendix C7 contains a map showing the bus distribution pattern for both peak hours.

Table 4-21: WMATA-based Distribution Pattern

Origin/Destination	Percent
Edmonston Road North	20%
Kenilworth Avenue South	25%
Greenbelt Road West	20%
Greenbelt Road East	20%
60th Avenue	10%
Sunnyside Avenue	5%
Total	**100%**

4.8.4.4 Background Growth Rate

Once all the vehicle trips were properly shifted, the planned development growth applied, and the WMATA-based growth applied, the vehicle background growth trips were applied. This consisted of applying a 0.33 percent annual growth factor to all roadways (non-Interstate and Interstate) based on the volumes after shifting existing vehicle trips due to the opening of the new North and South Core roadway network and new interstate ramps. The new North and South Core roadways themselves were not grown to avoid double-counting because they already contained the growth from the planned developments and Greenbelt Metro Station-based growth. In addition, the cut-through volumes were added to these roadways based on the new connections to/from the Interstate becoming available. Appendix C7 contains a map showing the background growth pattern for both peak hours.

4.8.4.5 Cut-through Traffic Distribution

Lastly, the cut-through traffic was distributed to the study area roadways causing some volumes to increase and some to decrease. For example, ramp volumes serving U.S. Route 1 and Kenilworth Avenue to/from I-95/I-495 decreased reflecting the shift in vehicles from these facilities to the new North and South Core roadway network and interchange. The distribution pattern followed a similar pattern as the *Greenbelt WMATA, Mixed-Use, and FBI Headquarters Study*, extending it to the study area boundary (Renard Development Company 2014). It was assumed that the vehicles using Greenbelt Metro Drive would either be destined to the Ivy Lane office corridor or Breezeway/Springhill Drive residential corridor. These vehicle trips would be shifted from Kenilworth Avenue. It was also assumed that the vehicles using Greenbelt Station Parkway from Greenbelt Road would be split 50/50 between destinations to the east or west along Greenbelt Road. These vehicle trips would be shifted from Kenilworth Avenue (Greenbelt Road to the east) or the U.S. Route 1 corridor (Greenbelt Road to the west).

Table 4-22 contains the cut-through distributions. Figures 4-10 and 4-11 show the shifted trip patterns. Appendix C7 contains a map showing the cut-through distributions.

Table 4-22: Cut-through Traffic Distribution

Origin/Destination	Percent
Interstate Split	
I-95/I-495 North	50%
I-95/I-495 South	50%
Local Destinations	
Ivy lane Corridor	17%
Greenbelt Road West	25%
Greenbelt Road East	25%
Breezewood Drive	16.5%
Springhill Drive	16.5%
Total	**100%**

Figure 4-10: Shifted Trip Pattern between Kenilworth Avenue (MD 201) and Proposed Greenbelt Interchange

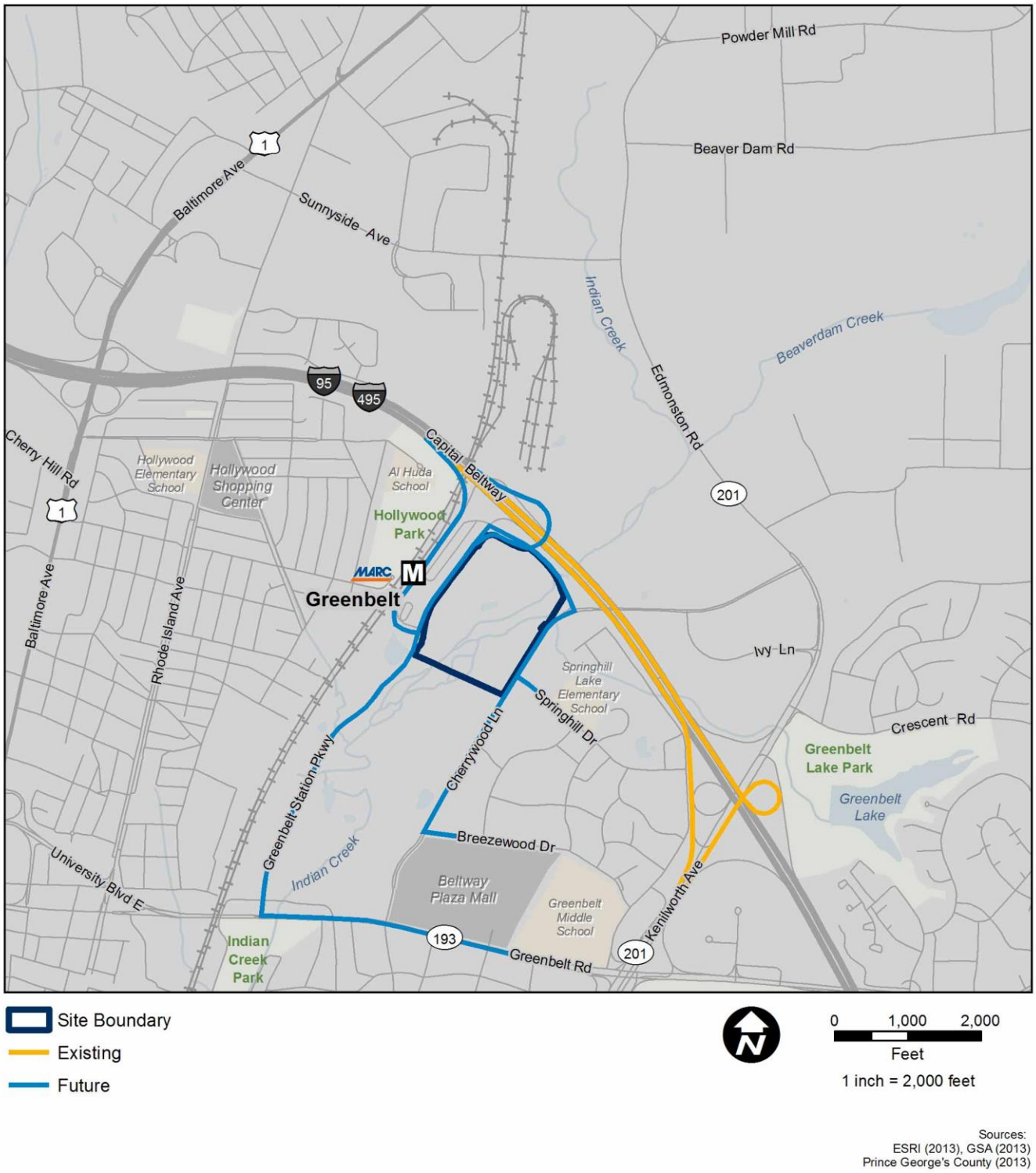
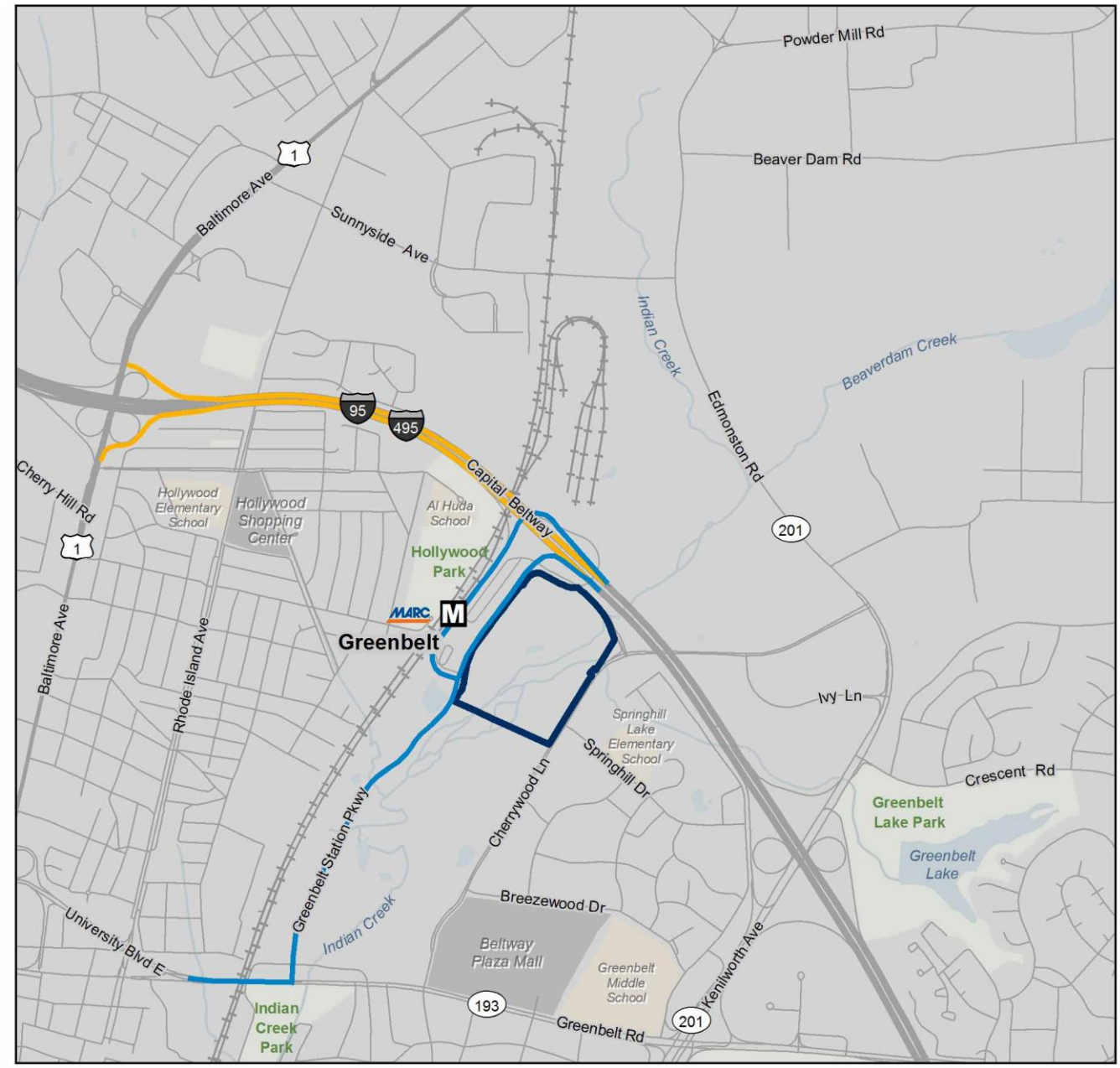


Figure 4-11: Shifted Trip Pattern between U.S. Route 1 and Proposed Greenbelt Interchange



4.8.5 Development of No-build Condition

The planned developments, Greenbelt Metro Station growth, background growth, cut-through trips, and planned roadway improvements were summed together to create complete No-build Condition vehicle volumes covering all study area intersections and Interstate facilities. Figure 4-12 shows the No-Build Condition total background turning movement volumes. Combining the total background and existing condition trips, figure 4-13 shows the No-build Condition turning movement volumes. All intersection facilities were evaluated based on a PHF of 0.92. The PHF is the ratio of the 60-minute volume divided by 4 times the highest 15-minute volume in the peak hour of the day. We are using the lowest accepted value by the Virginia Department of transportation (VDOT) to be consistent for all three sites, and to use a conservative value for the analysis of future facilities.

The PHF is used to convert 60-minute volumes into peak 15-minute volumes because the HCM traffic operations analysis procedures require a 15-minute peak volume. The PHF is the ratio of the 60-minute volume divided by 4 times the highest 15-minute volume in the peak hour of the day. All transportation facilities in the study area were evaluated based on a peak hour factor (PHF) of 0.92. The study uses the lowest accepted value following the VDOT requirement that all future facility traffic evaluation use a PHF between 0.92 and 1.00 to be consistent for all three sites, and to use the most conservative value for the analysis of future facilities (VDOT 2012). Since the HCM 2000 traffic analysis is based on a 15-minute period, a PHF of 0.92 represents an analyzed vehicle volume based on the highest 15-minute vehicle volume. As a comparison, a PHF of 1.0 represents an analyzed vehicle volume based on a uniform 15-minute vehicle volume or the least conservative.

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Figure 4-12: No-build Condition Total background Turning Movement Volumes

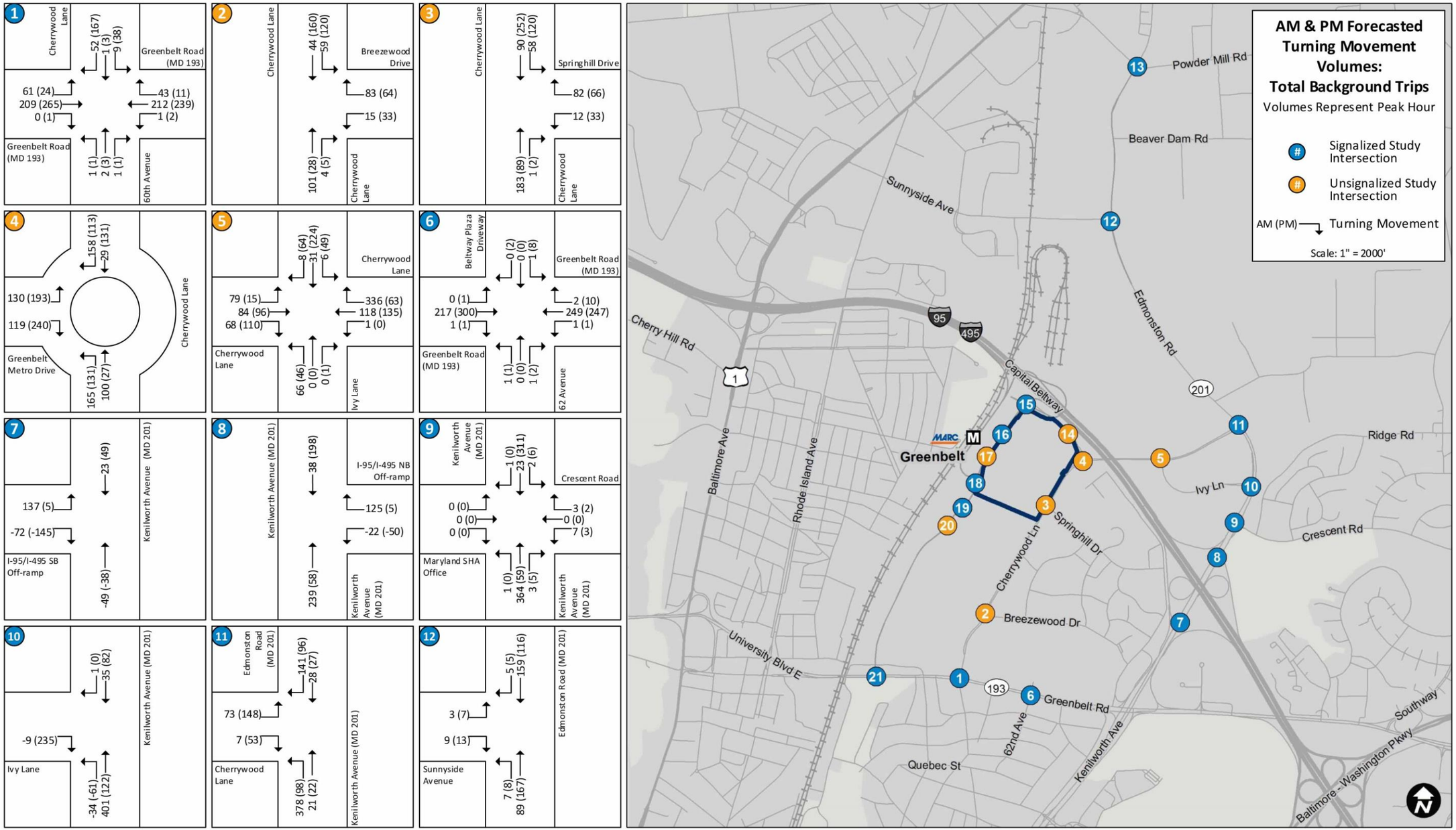


Figure 4-12: No-build Condition Total background Turning Movement Volumes (continued)

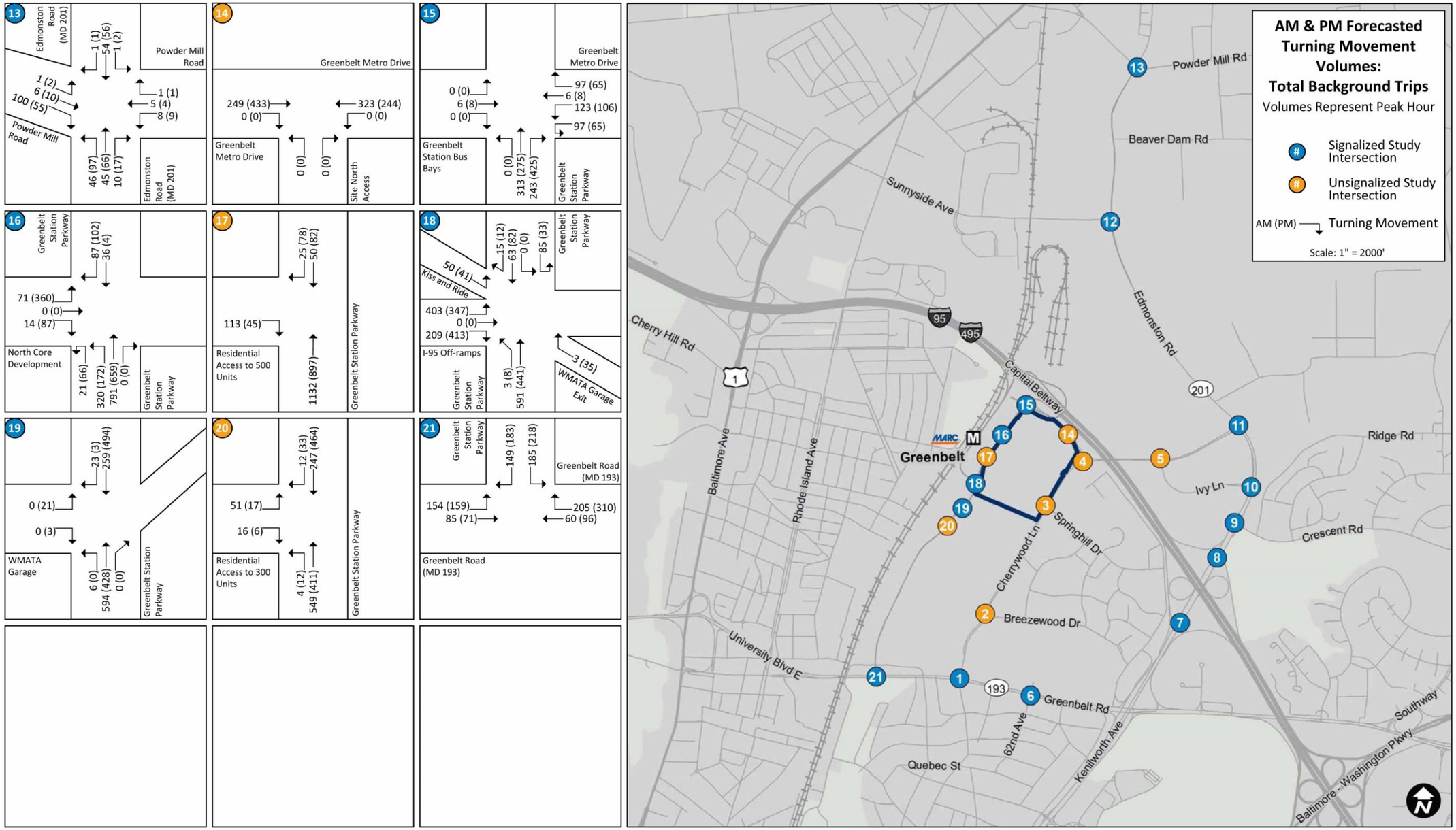


Figure 4-13: No-build Condition Turning Movement Volumes

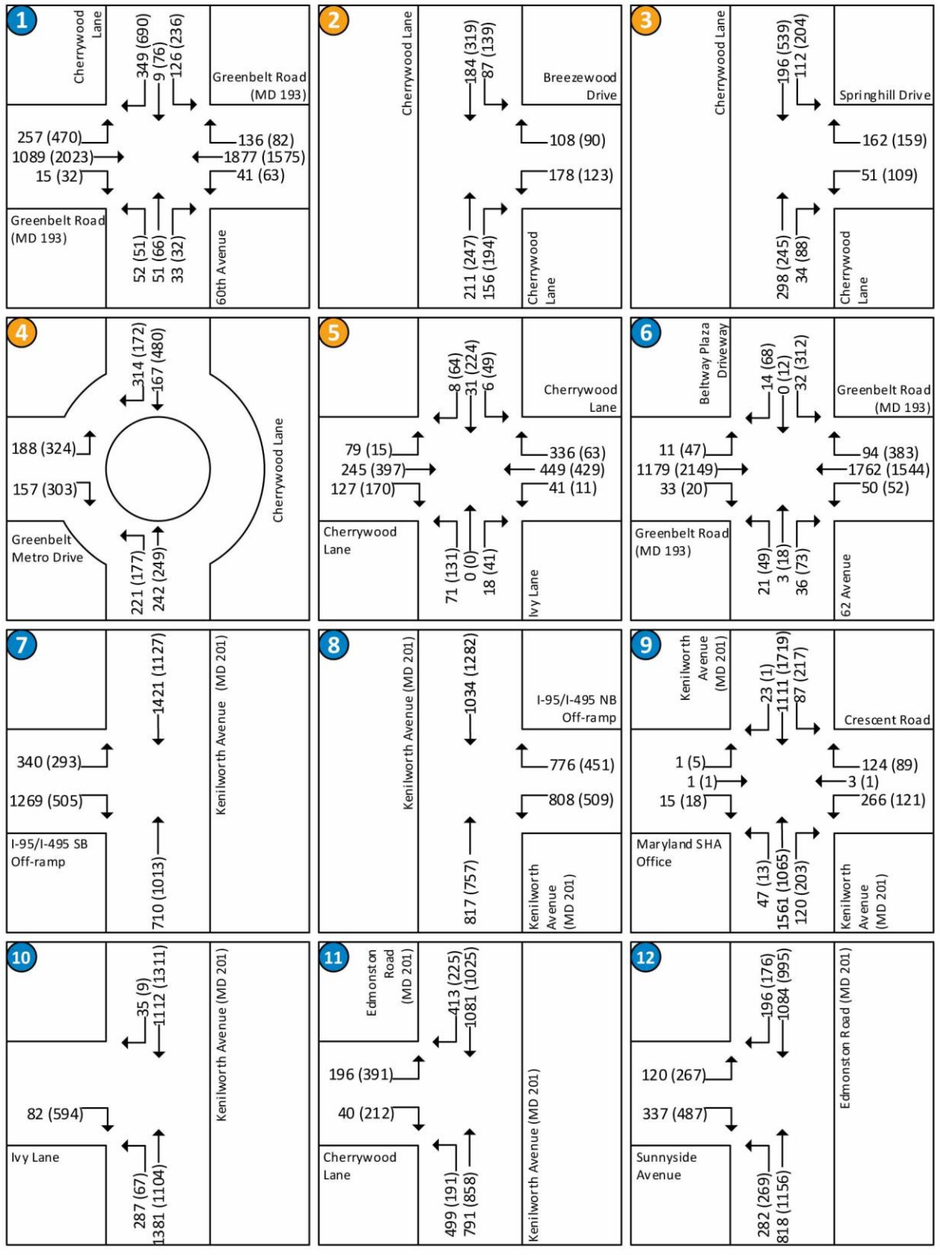
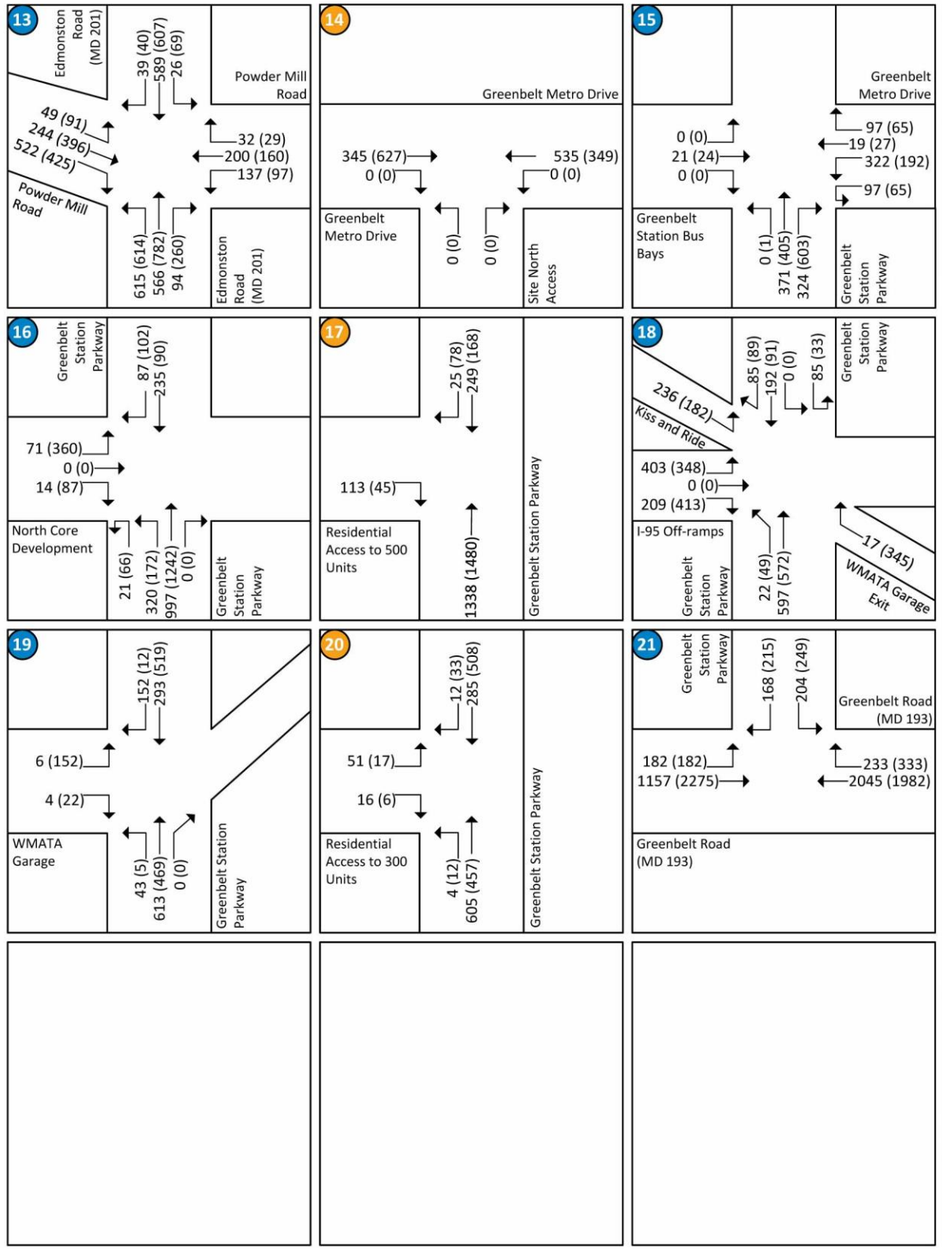


Figure 4-13: No-build Condition Turning Movement Volumes (continued)



4.8.6 No-build Condition Operations Analysis

Synchro™ was used to calculate the vehicle delay and LOS operation based on the HCM 2000 method for each study area intersection. Custom designed Excel sheets were used to calculate the LOS operation based on the Critical Lane Volume (CLV) method.

4.8.6.1 Signalized Intersection Operations Analysis

Based on the Synchro™ and CLV-based Excel worksheet analysis, many of the signalized study area intersections operate at acceptable overall conditions during the morning and afternoon peak hours (average control delay exceeds 55 seconds). However, the following intersections in the study area operate with overall unacceptable conditions, which include LOS E or LOS F using the HCM 2000 method or LOS F using the CLV method:

- Edmonston Road (MD 201) and Sunnyside Avenue (Intersection #12) during the PM peak hour
- Edmonston Road (MD 201) and Powder Mill Road (Intersection #13) during the PM peak hour

Based on the Synchro™ analysis, the following individual signalized intersection lane groups or overall approaches operate under unacceptable conditions (LOS E or LOS F) during the morning or afternoon peak hours. The lane group within the approach that is operating under unacceptable conditions is noted in parentheses; when "overall" is noted, the overall approach movements operate under unacceptable conditions. Note that intersections with an asterisk (*) are included in the No-build Condition, but not the Existing Condition.

- Greenbelt Road (MD 193) and Cherrywood Lane/60th Avenue (Intersection #1)
    - Eastbound Greenbelt Road (left turns), during the AM peak hour
    - Westbound Greenbelt Road (left turns), northbound 60th Avenue (overall) and southbound Cherrywood Lane (overall) during the AM and PM peak hours
- Greenbelt Road (MD 193) and 62nd Avenue/Beltway Plaza Driveway (Intersection #6)
    - Northbound 62nd Ave (overall) and southbound Beltway Plaza Drive (overall) during AM and PM peak hours
- Kenilworth Avenue (MD 201) and Crescent Road/Maryland SHA Office (Intersection #9)
    - Southbound Kenilworth Avenue (left turns) during AM peak hour
    - Northbound Kenilworth Avenue (left turns) during the PM peak hour
- Edmonston Road (MD 201) and Sunnyside Avenue (Intersection #12)
    - Eastbound Sunnyside Avenue (overall) and northbound Edmonston Road (left turns) during both the AM and PM peak hours
- Edmonston Road (MD 201) and Powder Mill Road (Intersection #13)
    - Eastbound Powder Mill Road (through movements) and westbound Powder Mill Road (left turns) during the AM peak hour
    - Eastbound Powder Mill Road (overall), westbound Powder Mill Road (left turns), northbound Edmonston Road (left turns) and southbound Edmonston Road (overall) during the PM peak hour
- Greenbelt Station Bus Bays/Greenbelt Metro Drive and Greenbelt Station Parkway* (Intersection #15)
    - Eastbound Greenbelt Station bus bays (overall) and westbound Greenbelt Metro Drive (left turns) during the AM peak hour
- Greenbelt Station Parkway and North Core Development/Site Northwest Access* (Intersection #16)
    - Eastbound North Core Development (overall) during the AM peak hour
- Greenbelt Station Parkway and I-95/I-495 Off-ramps/Site South Access/Kiss & Ride* (Intersection #18)
    - Eastbound I-95 Off-ramps (overall), eastbound kiss and ride (overall), and northbound Greenbelt Station Parkway (left turns) during the AM peak hour

    - Southbound Greenbelt Station Parkway (overall) during the PM peak hour
- Greenbelt Station Parkway and WMATA Garage* (Intersection #19)
    - Eastbound WMATA garage (overall) and northbound Greenbelt Station Parkway (combined left and through movements) during the AM peak hour
- Greenbelt Road (MD 193) and Greenbelt Station Parkway* (Intersection #21)
    - Eastbound Greenbelt Road (left turns) and southbound Greenbelt Station Parkway (overall) during the AM peak hour
    - Eastbound Greenbelt Road (left turns) and southbound Greenbelt Station Parkway (left turns) during the PM peak hour

4.8.6.2 Unsignalized Intersection Operations Analysis

Based on the unsignalized intersection analysis, only the intersection of Cherrywood Lane and Ivy Lane (Intersection #5) operates at overall unacceptable conditions during the PM peak hour. All other unsignalized intersections in the study area operate at acceptable overall conditions during the AM and PM peak hours.

The following individual unsignalized intersection lane groups or overall approaches also operate under unacceptable conditions (LOS E or LOS F) during the morning or afternoon peak hours:

- Westbound Springhill Drive (overall) at the intersection of Cherrywood Lane and Springhill Drive during the PM peak hour

- In addition to the overall intersection failing at Cherrywood Lane and Ivy Lane during the PM peak hour, the northbound (left and through movement) and southbound (all movements) approaches on Ivy Lane fail during the AM peak hour

4.8.6.3 Complete Intersection Operations Analysis

This section summarizes the differences in LOS impacts between the Existing Condition and the No-build Condition by quantifying the change in intersection operation failures. Following the summary, this section also includes the complete results of the operations analysis in both figures and a table.

Based on the Synchro™ analysis, a total of 10 signalized and 2 unsignalized intersections would experience an unacceptable conditions for one or more turning movements. Compared to the Existing Condition, the No-build Condition would have no change in the number of intersections failing during the AM peak hour and there would be one more intersection failing during the PM peak hour. In the AM peak hour, compared to the Existing Condition, there are zero intersections that passed overall but would fail, 13 that would not change, and zero that were failing but would now pass. In the PM peak hour, there are two intersections that passed overall but would now fail, 10 that would not change, and one that was failing but would now pass.

Table 4-23 provides a summary of the number of intersections that meet the following criteria for the overall directional approach that would change between the Existing Condition and the No-build Condition:

- New Failing Approach
    - Number of intersections that have at least one failing overall approach that did **NOT** have a failing overall approach in the previous condition

- Additional Failing Approaches
    - Number of intersections that had at least one failing overall approach in the previous condition and now would have additional/more failing overall approaches than before

- No Change
    - Number of intersections that would have no change in the number of failing overall approaches, or the number of failing overall approaches would be the same as in the previous condition

- Fewer Failing Approaches
    - Number of intersections that would have less failing overall approaches than the previous condition, but still would have some failing overall approaches

- No Failing Approaches
    - Number of intersections that had failing overall approaches in the previous condition, but would no longer have failing overall approaches

Table 4-23: Intersection Operations Summary Comparing Existing Condition to No-build Condition

Type of Change Between Conditions	AM	PM
New Failing Approach	1	2
Additional Failing Approaches	0	1
No Change	11	9
Fewer Failing Approaches	1	0
No Failing Approaches	0	1
Total Signalized and Unsignalized Intersections	**13**	**13**

The average LOS for the various approaches to the intersections and the overall intersection LOS grades for the No-build Condition are depicted in figures 4-14 and 4-15 for the AM and PM peak hours, respectively. Table 4-24 shows the results of the LOS capacity analysis and the intersection projected delay under the No-build Condition conditions during the AM and PM peak hours.

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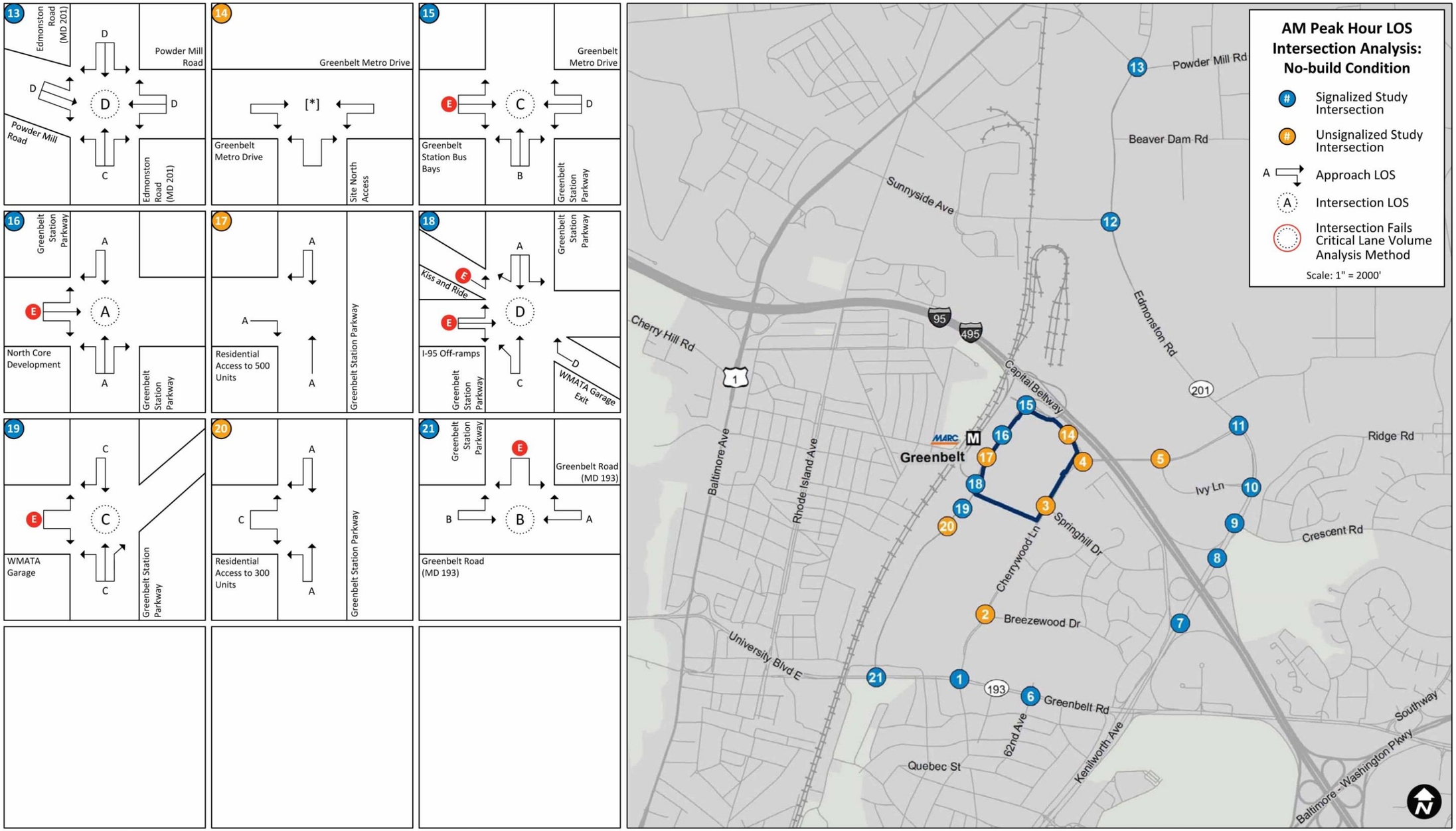
Figure 4-14: No-build Condition Intersection LOS for AM Peak Hour

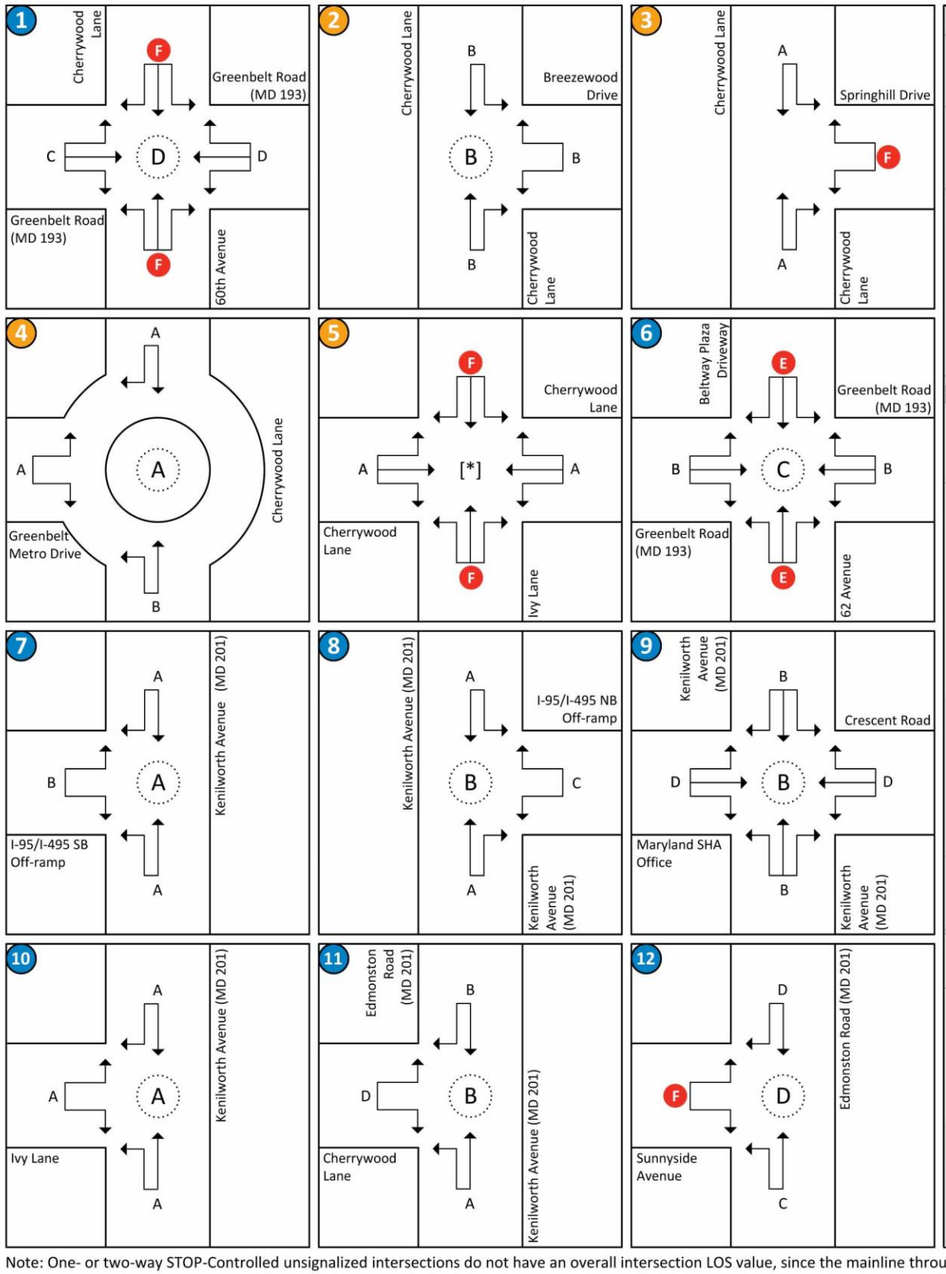
Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at LOS E or F.
[*] =Intersection #14 for use with the Build condition, but was included as part of the No-build design provided by Renard Development Company, LLC.

Figure 4-14: No-build Condition Intersection LOS for AM Peak Hour (continued)



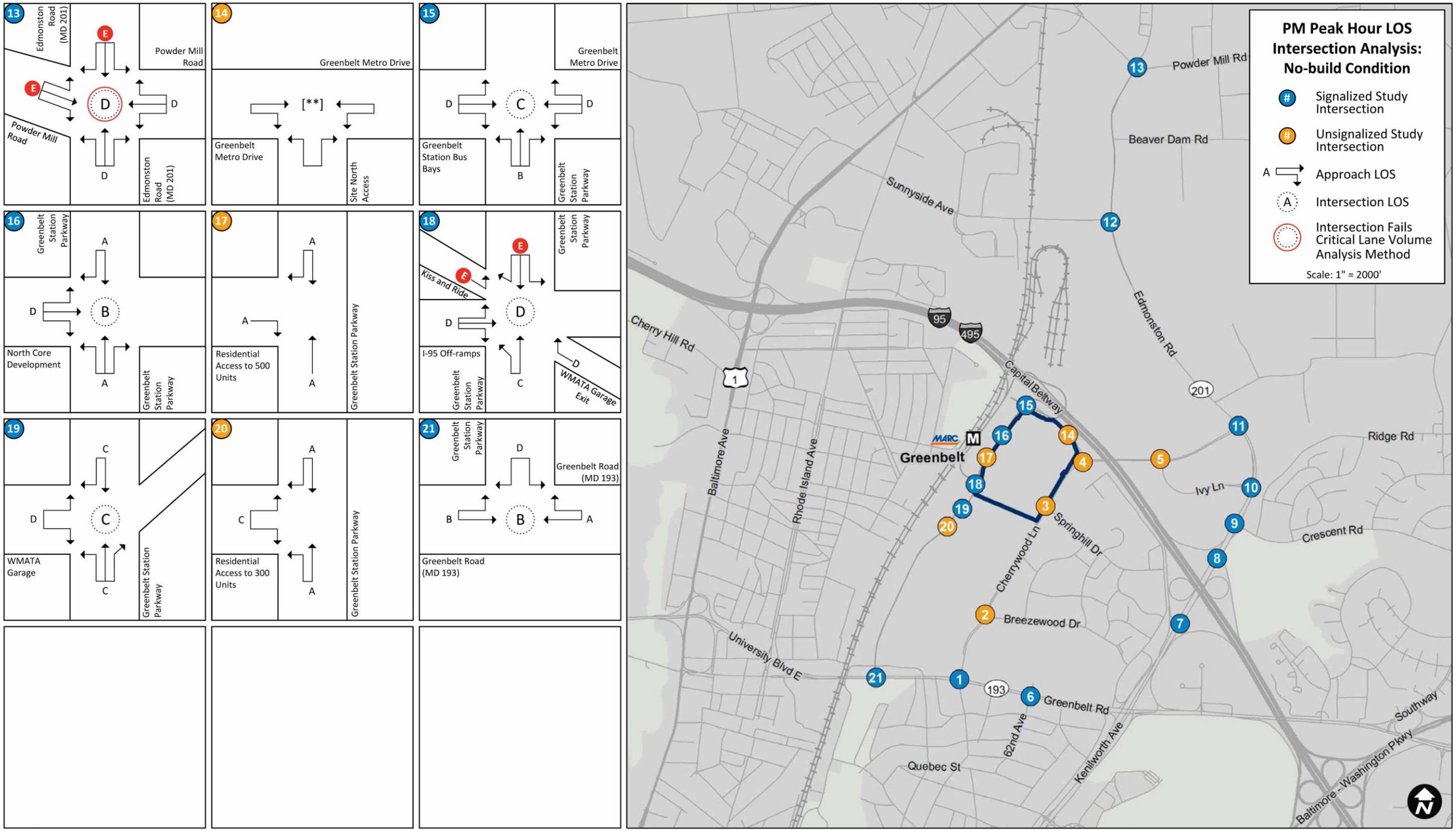
Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at LOS E or F.
[*] =Intersection #14 for use with the Build condition, but was included as part of the No-build design provided by Renard Development Company, LLC.

Figure 4-15: No-build Condition Intersection LOS for PM Peak Hour



Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at LOS E or F.
[*] = Unsignalized intersection requires attention due to failing minor approach movements.
[**] =Intersection #14 for use with the Build condition, but was included as part of the No-build design provided by Renard Development Company, LLC.

Figure 4-15: No-build Condition Intersection LOS for PM Peak Hour (continued)



Note: One- or two-way STOP-Controlled unsignalized intersections do not have an overall intersection LOS value, since the mainline through move operates freely through the intersection. Red shaded circles denote intersections/approaches operating at LOS E or F.
[*] = Unsignalized intersection requires attention due to failing minor approach movements.
[**] =Intersection #14 for use with the Build condition, but was included as part of the No-build design provided by Renard Development Company, LLC.

Table 4-24: No-build Condition AM and PM Peak Hour Operations Analysis

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV			HCM 2000		CLV		
			Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	Check	Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	Check
1	**Greenbelt Road (MD 193) & Cherrywood Lane/60th Avenue (Signalized)**											
	EB (Greenbelt Rd)	L	63.2	E				53.0	D			
	EB (Greenbelt Rd)	TR	8.8	A				13.9	B			
	EB Overall (Greenbelt Rd)		**19.1**	**B**				**21.2**	**C**			
	WB (Greenbelt Rd)	L	64.2	E				67.0	E			
	WB (Greenbelt Rd)	TR	20.6	C				35.7	D			
	WB Overall (Greenbelt Rd)		**21.5**	**C**				**36.9**	**D**			
	NB (60th Ave)	LTR	74.0	E				132.4	F			
	NB Overall (60th Ave)		**74.0**	**E**				**132.4**	**F**			
	SB (Cherrywood Ln)	L	76.7	E				106.8	F			
	SB (Cherrywood Ln)	LT	76.7	E				108.0	F			
	SB (Cherrywood Ln)	R	70.0	E				83.5	F			
	SB Overall (Cherrywood Ln)		**71.9**	**E**				**91.0**	**F**			
	Overall		**28.5**	**C**	**1,315**	**D**	**Pass**	**42.2**	**D**	**1,504**	**E**	**Pass**
2	**Cherrywood Lane & Breezewood Drive (AWSC)**											
	WB (Breezewood Dr)	LR	13.3	-				12.5	-			
	WB Overall (Breezewood Dr)		**13.3**	**B**				**12.5**	**B**			
	NB (Cherrywood Ln)	T	11.2	-				12.4	-			
	NB (Cherrywood Ln)	R	8.7	-				9.4	-			
	NB Overall (Cherrywood Ln)		**10.1**	**B**				**11.1**	**B**			
	SB (Cherrywood Ln)	L	9.7	-				10.5	-			
	SB (Cherrywood Ln)	T	10.8	-				15.1	-			
	SB Overall (Cherrywood Ln)		**10.4**	**B**				**13.7**	**B**			
	Overall		**11.2**	**B**	**N/A**	**N/A**	**Pass**	**12.5**	**B**	**N/A**	**N/A**	**Pass**
3	**Cherrywood Lane & Springhill Drive (TWSC)**											
	WB (Springhill Dr)	LR	16.4	C				128.6	F			
	WB Overall (Springhill Dr)		**16.4**	**C**				**128.6**	**F**			
	SB (Cherrywood Ln)	L	8.3	A				8.7	A			
	SB Overall (Cherrywood Ln)		**3.0**	**-**				**2.4**	**-**			
	Overall		**5.2**	**-**	**N/A**	**N/A**	**Pass**	**27.0**	**-**	**N/A**	**N/A**	**Pass**
4	**Cherrywood Lane & Greenbelt Metro Drive (Roundabout)** [a]											
	EB (Greenbelt Metro Dr)	LR	6.1	A				14.6	B			
	EB Overall (Greenbelt Metro Dr)		**3.3**	**A**				**7.5**	**A**			
	NB (Cherrywood Ln)	LT	11.8	B				14.4	B			
	NB Overall (Cherrywood Ln)		**11.8**	**B**				**14.4**	**B**			
	SB (Cherrywood Ln)	T	6.3	A				12.0	B			
	SB Overall (Cherrywood Ln)		**2.2**	**A**				**8.9**	**A**			
	Overall		**6.0**	**A**	**N/A**	**N/A**	**Pass**	**9.8**	**A**	**N/A**	**N/A**	**Pass**

Table 4-24: No-build Condition AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV			HCM 2000		CLV		
			Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	Check	Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	Check
5	**Cherrywood Lane & Ivy Lane (TWSC)**											
	EB (Cherrywood Ln)	LTR	3.0	A				0.4	A			
	EB Overall (Cherrywood Ln)		**3.0**	**-**				**0.4**	**-**			
	WB (Cherrywood Ln)	L	8.3	A				8.8	A			
	WB (Cherrywood Ln)	TR	0.0	-				0.0	-			
	WB Overall (Cherrywood Ln)		**0.4**	**-**				**0.2**	**-**			
	NB (Ivy Ln)	LT	67.2	F				^	F			
	NB (Ivy Ln)	R	10.3	B				12.1	B			
	NB Overall (Ivy Ln)		**55.7**	**F**				^	**F**			
	SB (Ivy Ln)	LTR	41.0	E				402.7	F			
	SB Overall (Ivy Ln)		**41.0**	**E**				**402.7**	**F**			
	Overall		**6.0**	**-**	**N/A**	**N/A**	**Pass**	[b]	**-**	**N/A**	**N/A**	**Fail**
6	**Greenbelt Road (MD 193) & 62 Avenue/Beltway Plaza Driveway (Signalized)**											
	EB (Greenbelt Rd)	L	1.7	A				7.0	A			
	EB (Greenbelt Rd)	TR	2.6	A				11.3	B			
	EB Overall (Greenbelt Rd)		**2.6**	**A**				**11.2**	**B**			
	WB (Greenbelt Rd)	L	4.0	A				24.7	C			
	WB (Greenbelt Rd)	T	7.5	A				18.3	B			
	WB (Greenbelt Rd)	R	4.7	A				14.8	B			
	WB Overall (Greenbelt Rd)		**7.2**	**A**				**17.8**	**B**			
	NB (62th Ave)	LTR	68.1	E				71.4	E			
	NB Overall (62th Ave)		**68.1**	**E**				**71.4**	**E**			
	SB (Beltway Plaza Drwy)	L	68.2	E				69.8	E			
	SB (Beltway Plaza Drwy)	LT	68.3	E				69.5	E			
	SB (Beltway Plaza Drwy)	R	66.7	E				54.9	D			
	SB Overall (Beltway Plaza Drwy)		**67.8**	**E**				**67.1**	**E**			
	Overall		**7.5**	**A**	**742**	**A**	**Pass**	**20.4**	**C**	**1,206**	**C**	**Pass**
7	**Kenilworth Avenue (MD 201) & I-95/I-495 SB Off-ramp (Signalized)**											
	EB (I-95/I-495 SB Off-ramp)	L	39.7	D				39.7	D			
	EB (I-95/I-495 SB Off-ramp)	R	6.9	A				0.6	A			
	EB Overall (I-95/I-495 SB Off-ramp)		**13.8**	**B**				**14.9**	**B**			
	NB (Kenilworth Ave)	T	4.0	A				4.0	A			
	NB Overall (Kenilworth Ave)		**4.0**	**A**				**4.0**	**A**			
	SB (Kenilworth Ave)	T	6.2	A				3.6	A			
	SB Overall (Kenilworth Ave)		**6.2**	**A**				**3.6**	**A**			
	Overall		**9.1**	**A**	**730**	**A**	**Pass**	**6.8**	**A**	**593**	**A**	**Pass**

Table 4-24: No-build Condition AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV		Check	HCM 2000		CLV		Check
			Delay (sec/ veh)	LOS	Critical Lane Volume	LOS		Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	
8	**Kenilworth Avenue (MD 201) & I-95/I-495 NB Off-ramp (Signalized)**											
	WB (I-95/I-495 NB Off-ramp)	L	24.6	C				34.3	C			
	WB (I-95/I-495 NB Off-ramp)	R	26.3	C				31.1	C			
	WB Overall (I-95/I-495 NB Off-ramp)		**25.4**	**C**				**32.8**	**C**			
	NB (Kenilworth Ave)	T	11.1	B				5.4	A			
	NB Overall (Kenilworth Ave)		**11.1**	**B**				**5.4**	**A**			
	SB (Kenilworth Ave)	T	7.7	A				3.4	A			
	SB Overall (Kenilworth Ave)		**7.7**	**A**				**3.4**	**A**			
	Overall		**16.7**	**B**	**868**	**A**	**Pass**	**13.3**	**B**	**779**	**A**	**Pass**
9	**Kenilworth Avenue (MD 201) & Crescent Road/Maryland SHA Office (Signalized)**											
	EB (Maryland SHA Office)	LTR	26.0	C				36.1	D			
	EB Overall (Maryland SHA Office)		**26.0**	**C**				**36.1**	**D**			
	WB (Crescent Rd)	LT	43.2	D				47.8	D			
	WB (Crescent Rd)	R	26.6	C				36.3	D			
	WB Overall (Crescent Rd)		**38.0**	**D**				**43.0**	**D**			
	NB (Kenilworth Ave)	L	47.4	D				61.5	E			
	NB (Kenilworth Ave)	T	13.3	B				10.4	B			
	NB (Kenilworth Ave)	R	8.5	A				5.9	A			
	NB Overall (Kenilworth Ave)		**13.9**	**B**				**10.2**	**B**			
	SB (Kenilworth Ave)	L	67.1	E				53.3	D			
	SB (Kenilworth Ave)	T	4.7	A				5.8	A			
	SB (Kenilworth Ave)	R	12.0	B				4.9	A			
	SB Overall (Kenilworth Ave)		**9.3**	**A**				**11.1**	**B**			
	Overall		**15.1**	**B**	**962**	**A**	**Pass**	**12.9**	**B**	**796**	**A**	**Pass**
10	**Kenilworth Avenue (MD 201) & Ivy Lane (Signalized)**											
	EB (Ivy Ln)	R	0.1	A				0.7	A			
	EB Overall (Ivy Ln)		**0.1**	**A**				**0.7**	**A**			
	NB (Kenilworth Ave)	L	18.6	B				25.8	C			
	NB (Kenilworth Ave)	T	0.3	A				0.2	A			
	NB Overall (Kenilworth Ave)		**3.4**	**A**				**1.7**	**A**			
	SB (Kenilworth Ave)	T	0.7	A				1.2	A			
	SB (Kenilworth Ave)	R	0.0	A				0.0	A			
	SB Overall (Kenilworth Ave)		**0.7**	**A**				**1.2**	**A**			
	Overall		**2.3**	**A**	**784**	**A**	**Pass**	**1.3**	**A**	**761**	**A**	**Pass**

Table 4-24: No-build Condition AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV		Check	HCM 2000		CLV		Check
			Delay (sec/ veh)	LOS	Critical Lane Volume	LOS		Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	
11	**Kenilworth Avenue/Edmonston Road (MD 201) & Cherrywood Lane (Signalized)**											
	EB (Cherrywood Ln)	L	46.7	D				39.4	D			
	EB (Cherrywood Ln)	R	40.7	D				33.8	C			
	EB Overall (Cherrywood Ln)		**45.7**	**D**				**37.5**	**D**			
	NB (Kenilworth Ave)	L	27.0	C				13.8	B			
	NB (Kenilworth Ave)	T	1.1	A				1.2	A			
	NB Overall (Kenilworth Ave)		**11.1**	**B**				**3.5**	**A**			
	SB (Edmonston Rd)	T	22.6	C				13.9	B			
	SB (Edmonston Rd)	R	17.5	B				10.0	B			
	SB Overall (Edmonston Rd)		**21.2**	**C**				**13.2**	**B**			
	Overall		**18.8**	**B**	**1,212**	**C**	**Pass**	**14.7**	**B**	**990**	**A**	**Pass**
12	**Edmonston Road (MD 201) & Sunnyside Avenue (Signalized)**											
	EB (Sunnyside Ave)	L	108.9	F				113.0	F			
	EB (Sunnyside Ave)	R	66.9	E				62.0	E			
	EB Overall (Sunnyside Ave)		**77.9**	**E**				**80.1**	**F**			
	NB (Edmonston Rd)	L	102.8	F				98.0	F			
	NB (Edmonston Rd)	T	4.4	A				18.3	B			
	NB Overall (Edmonston Rd)		**29.6**	**C**				**33.3**	**C**			
	SB (Edmonston Rd)	T	41.1	D				48.1	D			
	SB (Edmonston Rd)	R	5.0	A				3.8	A			
	SB Overall (Edmonston Rd)		**35.6**	**D**				**41.4**	**D**			
	Overall		**40.1**	**D**	**1,486**	**E**	**Pass**	**46.7**	**D**	**1,692**	**F**	**Fail**

Table 4-24: No-build Condition AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV		Check	HCM 2000		CLV		Check
			Delay (sec/ veh)	LOS	Critical Lane Volume	LOS		Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	
13	**Edmonston Road (MD 201) & Powder Mill Road (Signalized)**											
	EB (Powder Mill Rd)	L	47.3	D				45.2	D			
	EB (Powder Mill Rd)	T	62.8	E				81.1	F			
	EB (Powder Mill Rd)	R	48.7	D				44.7	D			
	EB Overall (Powder Mill Rd)		**52.8**	**D**				**60.5**	**E**			
	WB (Powder Mill Rd)	L	57.0	E				84.1	F			
	WB (Powder Mill Rd)	T	41.8	D				38.4	D			
	WB (Powder Mill Rd)	R	35.6	D				34.1	C			
	WB Overall (Powder Mill Rd)		**46.9**	**D**				**53.4**	**D**			
	NB (Edmonston Rd)	L	48.5	D				76.7	E			
	NB (Edmonston Rd)	T	12.8	B				23.2	C			
	NB (Edmonston Rd)	R	8.4	A				12.5	B			
	NB Overall (Edmonston Rd)		**29.7**	**C**				**41.3**	**D**			
	SB (Edmonston Rd)	L	40.5	D				54.5	D			
	SB (Edmonston Rd)	TR	52.5	D				60.4	E			
	SB Overall (Edmonston Rd)		**52.0**	**D**				**59.8**	**E**			
	Overall		**42.5**	**D**	**1,593**	**E**	**Pass**	**50.9**	**D**	**1,867**	**F**	**Fail**
14	**Greenbelt Metro Drive & Site North Access (TWSC)** [b]											
	EB (Greenbelt Metro Dr)	TR	N/A	N/A				N/A	N/A			
	EB Overall (Greenbelt Metro Dr)		**N/A**	**N/A**				**N/A**	**N/A**			
	WB (Greenbelt Metro Dr)	L	N/A	N/A				N/A	N/A			
	WB (Greenbelt Metro Dr)	T	N/A	N/A				N/A	N/A			
	WB Overall (Greenbelt Metro Dr)		**N/A**	**N/A**				**N/A**	**N/A**			
	NB (Site North Access)	LR	N/A	N/A				N/A	N/A			
	NB Overall (Site North Access)		**N/A**	**N/A**				**N/A**	**N/A**			
	Overall		**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Table 4-24: No-build Condition AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV			HCM 2000		CLV		
			Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	Check	Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	Check
15	**Greenbelt Station Bus Bays/Greenbelt Metro Drive & Greenbelt Station Parkway (Signalized)**											
	EB (Greenbelt Sta Bus Bays)	LT	75.7	E				54.0	D			
	EB (Greenbelt Sta Bus Bays)	R	-	-				-	-			
	EB Overall (Greenbelt Sta Bus Bays)		**75.7**	**E**				**54.0**	**D**			
	WB (Greenbelt Metro Dr)	L	56.6	E				45.2	D			
	WB (Greenbelt Metro Dr)	T	35.7	D				31.7	C			
	WB (Greenbelt Metro Dr)	R	36.0	D				31.5	C			
	WB Overall (Greenbelt Metro Dr)		**52.1**	**D**				**41.6**	**D**			
	NB (Greenbelt Sta Pkwy)	L	-	-				-	-			
	NB (Greenbelt Sta Pkwy)	T	14.3	B				8.4	A			
	NB (Greenbelt Sta Pkwy)	R	13.8	B				21.4	C			
	NB Overall (Greenbelt Sta Pkwy)		**14.0**	**B**				**16.2**	**B**			
	Overall		**31.4**	**C**	**644**	**A**	**Pass**	**23.3**	**C**	**603**	**A**	**Pass**
16	**Greenbelt Station Parkway & North Core Development/Site Northwest Access (Signalized)**											
	EB (North Core Dev)	L	69.2	E				42.1	D			
	EB (North Core Dev)	TR	66.5	E				35.0	C			
	EB Overall (North Core Dev)		**68.8**	**E**				**40.7**	**D**			
	NB (Greenbelt Sta Pkwy)	L	3.9	A				3.6	A			
	NB (Greenbelt Sta Pkwy)	TR	2.2	A				3.4	A			
	NB Overall (Greenbelt Sta Pkwy)		**2.7**	**A**				**3.4**	**A**			
	SB (Greenbelt Sta Pkwy)	TR	0.1	A				0.1	A			
	SB Overall (Greenbelt Sta Pkwy)		**0.1**	**A**				**0.1**	**A**			
	Overall		**5.4**	**A**	**600**	**A**	**Pass**	**11.0**	**B**	**460**	**A**	**Pass**
17	**Greenbelt Station Parkway & Residential Access to 500 Units (TWSC)**											
	EB (Residential Access)	R	9.8	A				9.3	A			
	EB Overall (Residential Access)		**9.8**	**A**				**9.3**	**A**			
	Overall		**0.6**	**-**	**N/A**	**N/A**	**Pass**	**0.2**	**-**	**N/A**	**N/A**	**Pass**

Table 4-24: No-build Condition AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV			HCM 2000		CLV		
			Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	Check	Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	Check
18	**Greenbelt Station Parkway & I-95/I-495 Off-ramps/Site South Access/Kiss & Ride (Signalized)**											
	EB (I-95 Off-ramps)	L	71.7	E				44.8	D			
	EB (I-95 Off-ramps)	LTR	56.3	E				31.2	C			
	EB Overall (I-95 Off-Ramps)		**61.7**	**E**				**36.1**	**D**			
	EB (Kiss and Ride)	L	55.9	E				37.5	D			
	EB Overall (Kiss and Ride)		**55.9**	**E**				**37.5**	**D**			
	WB (Site South Access)	R	37.0	D				35.7	D			
	WB Overall (Site South Access)		**37.0**	**D**				**35.7**	**D**			
	NB (Greenbelt Sta Pkwy)	L	81.8	F				33.4	C			
	NB (Greenbelt Sta Pkwy)	T	30.9	C				23.5	C			
	NB Overall (Greenbelt Sta Pkwy)		**32.7**	**C**				**24.3**	**C**			
	SB (Greenbelt Sta Pkwy)	L	2.9	A				84.5	F			
	SB (Greenbelt Sta Pkwy)	TR	6.6	A				76.4	E			
	SB Overall (Greenbelt Sta Pkwy)		**5.7**	**A**				**77.7**	**E**			
	Overall		**40.0**	**D**	**950**	**A**	**Pass**	**36.9**	**D**	**1,103**	**B**	**Pass**
19	**Greenbelt Station Parkway & WMATA Garage (Signalized)**											
	EB (WMATA Garage)	L	76.3	E				51.0	D			
	EB (WMATA Garage)	R	72.4	E				37.8	D			
	EB Overall (WMATA Garage)		**74.9**	**E**				**49.3**	**D**			
	NB (Greenbelt Sta Pkwy)	LT	65.7	E				51.5	D			
	NB (Greenbelt Sta Pkwy)	TR	3.0	A				4.6	A			
	NB Overall (Greenbelt Sta Pkwy)		**34.7**	**C**				**28.3**	**C**			
	SB (Greenbelt Sta Pkwy)	T	18.8	B				20.5	C			
	SB (Greenbelt Sta Pkwy)	R	38.5	D				12.9	B			
	SB Overall (Greenbelt Sta Pkwy)		**25.5**	**C**				**20.3**	**C**			
	Overall		**31.4**	**C**	**429**	**A**	**Pass**	**27.8**	**C**	**524**	**A**	**Pass**
20	**Greenbelt Station Parkway & Residential Access to 300 Units (TWSC)**											
	EB (Residential Access)	LR	21.1	C				20.8	C			
	EB Overall (Residential Access)		**21.1**	**C**				**20.8**	**C**			
	NB (Greenbelt Sta Pkwy)	LT	0.2	A				0.8	A			
	NB Overall (Greenbelt Sta Pkwy)		**0.1**	**-**				**0.3**	**-**			
	Overall		**1.5**	**-**	**N/A**	**N/A**	**Pass**	**0.6**	**-**	**N/A**	**N/A**	**Pass**

Table 4-24: No-build Condition AM and PM Peak Hour Operations Analysis (continued)

#	Intersection and Approach	Lane Group	AM Peak Hour					PM Peak Hour				
			HCM 2000		CLV		Check	HCM 2000		CLV		Check
			Delay (sec/ veh)	LOS	Critical Lane Volume	LOS		Delay (sec/ veh)	LOS	Critical Lane Volume	LOS	
21	**Greenbelt Road (MD 193) & Greenbelt Station Parkway (Signalized)**											
	EB (Greenbelt Rd)	L	63.6	E				70.0	E			
	EB (Greenbelt Rd)	T	3.2	A				8.0	A			
	EB Overall (Greenbelt Rd)		**11.5**	**B**				**12.6**	**B**			
	WB (Greenbelt Rd)	T	3.6	A				4.9	A			
	WB (Greenbelt Rd)	R	0.1	A				1.8	A			
	WB Overall (Greenbelt Rd)		**3.2**	**A**				**4.5**	**A**			
	SB (Greenbelt Sta Pkwy)	L	67.1	E				59.9	E			
	SB (Greenbelt Sta Pkwy)	R	46.0	D				47.4	D			
	SB Overall (Greenbelt Sta Pkwy)		**57.5**	**E**				**54.1**	**D**			
	Overall		**11.1**	**B**	**988**	**A**	**Pass**	**12.7**	**B**	**1,100**	**B**	**Pass**

Notes:

AWSC = All-way STOP-Controlled intersection

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LTR = left / through / right lanes

LOS = Level of Service

TWSC = Two-way STOP-Controlled unsignalized intersection (TWSC intersections do not have an overall LOS)

Delay is Measured in Seconds Per Vehicle.

Red cells denote intersections or approaches operating at unacceptable conditions.

^ Highway Capacity Manual was unable to report accurate delay using default gap acceptance values.

[a] Highway Capacity Software 2010 Roundabout results

[b] Intersection would be included under the Build Condition, but was included as part of the No-build Condition design provided by Renard Development Company, LLC.

4.8.7 No-Build Condition Queuing Analysis

Synchro™ was used to calculate the 50th percentile queue lengths, and SimTraffic™ was used to calculate the 95th percentile queue lengths. The SimTraffic simulations have a statistical accuracy of plus or minus 5.0 percent error for the AM and PM peak hour simulations. Based on the Synchro™ and SimTraffic™ analysis, the following signalized intersection approaches would experience failing queue lengths in Synchro™ or SimTraffic™ (queue exceeds available lane storage). The lane group within the approach that is operating under unacceptable conditions is noted in parentheses Note that intersections with an asterisk (*) are included in the No-build Condition, but not the Existing Condition.

- Greenbelt Road (MD 193) and Cherrywood Lane/60th Avenue (Intersection #1)
    - Northbound 60th Avenue (all movements) during the PM peak hour
- Kenilworth Avenue/Edmonston Road (MD 201) and Cherrywood Lane (Intersection #11)
    - Southbound Edmonston Road (right turns) during the AM peak hour
- Edmonston Road (MD 201) and Sunnyside Avenue (Intersection #12)
    - Eastbound Sunnyside Avenue (right turns) and southbound Edmonston Road (right turns and through movements) during the AM peak hour
    - Eastbound Sunnyside Avenue (all movements), northbound Edmonston Road (all movements), and southbound Edmonston Road (all movements) during the PM peak hour
- Edmonston Road (MD 201) and Powder Mill Road (Intersection #13)
    - Northbound Edmonston Road (left turns) during the PM peak hour
- Greenbelt Station Bus Bays/Greenbelt Metro Drive and Greenbelt Station Boulevard* (Intersection #15)
    - Westbound Greenbelt Metro Drive (left turns) during the AM peak hour
- Greenbelt Station Parkway and I-95/I-495 Off-ramps/Site South Access/Kiss & Ride* (Intersection #18)
    - Eastbound Kiss & Ride (left turns) during the AM peak hour
- Greenbelt Station Parkway and WMATA Garage* (Intersection #19)
    - Eastbound WMATA garage (left turns) during the PM peak hour
- Greenbelt Road (MD 193) and Greenbelt Station Parkway* (Intersection #21)
    - Eastbound Greenbelt Road (left turns), westbound Greenbelt Road (right turns), and southbound Greenbelt Station Parkway (right turns) during the PM peak hour

Five of the six unsignalized intersections would not experience failing queue lengths for the 95th percentile, but the intersection of Cherrywood Lane and Ivy Lane (Intersection #5) would experience 95th percentile failing queues on southbound Ivy Lane (all movements) during the PM peak hour.

The remaining intersections in the study area would all have acceptable No-build Condition queue lengths.

4.8.7.1 Complete Intersection Queuing Analysis

This section summarizes the differences in queuing impacts between the Existing Condition and the No-build Condition by quantifying the change in intersection queuing failures. Following the summary, this section also includes the complete results of the queuing analysis.

Based on the Synchro™ and SimTraffic™ analysis, eight signalized intersections and one unsignalized intersection would experience queuing lengths that would exceed the available storage capacity. The remaining intersections in the study area would provide sufficient storage for the anticipated demand. Compared to the Existing Condition, the No-build Condition would have no change in the number of intersections with failing queues during the AM peak hour and would have one more intersection with failing queues during the PM peak hour. In the AM peak hour in the Existing Condition, there would be two intersections with a failing queue approach compared with two in the No-build Condition, an increase of zero. In the PM peak hour in the Existing

Condition, there would be three intersections with a failing queue approach compared with four in the No-build Condition, an increase of one.

Table 4-25, provides a summary of the number of intersections that meet the following criteria for approach lane groups in a queue that would change between the Existing Condition and the No-build Condition:

- New Failing Movement
  - Number of intersections that have a queuing problem in one or more movements that would **NOT** have a queuing problem in the previous condition
- Additional Failing Movement
  - Number of intersections that had at least one queuing movement failure in the previous condition and now would have additional/more queuing movement failures than before
- No Change
  - Number of intersections that would have no change in the number of queuing movement failures or the number of queuing movement failures would be the same as in the previous condition
- Fewer Failing Movements
  - Number of intersections that would have less queuing movement failures than in the previous condition, but still would have some failing movements
- No Failing Movements
  - Number of intersections that had queuing movement failures in the previous condition, but would no longer have queuing movement failures

Table 4-25: Queuing Summary Comparing Existing Condition to No-build Condition

Type of Change Between Conditions	AM	PM
New Failing Movement	1	2
Additional Failing Movement	1	1
No Change	10	8
Fewer Failing Movements	0	1
No Failing Movements	1	1
Total Signalized and Unsignalized Intersections	**13**	**13**

The results of the No-build Condition queuing analysis for both signalized and unsignalized intersections are presented in table 4-26. Note that the percentile values are expressed in feet, and a car occupies about 25 linear feet of roadway, including the space between cars.

Table 4-26: No-build Condition Queuing Analysis

#	Intersection and Approach	Lane Group	Turning Bay/Link Length (feet)	AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
1	**Greenbelt Road (MD 193) & Cherrywood Lane/60th Avenue (Signalized)**						
	EB (Greenbelt Rd)	L	350	132	165	240	250
	EB (Greenbelt Rd)	TR	1,584	148	128	373	294
	WB (Greenbelt Rd)	L	200	43	126	68	137
	WB (Greenbelt Rd)	TR	1,336	598	324	208	296
	NB (60th Ave)	LTR	320	132	217	154	#357
	SB (Cherrywood Ln)	L	350	74	112	172	254
	SB (Cherrywood Ln)	LT	1,300	75	134	178	315
	SB (Cherrywood Ln)	R	1,300	252	259	653	529
2	**Cherrywood Lane & Breezewood Drive (AWSC)**						
	WB (Breezewood Dr)	LR	573	-	86	-	76
	NB (Cherrywood Ln)	T	1,300	-	120	-	162
	NB (Cherrywood Ln)	R	1,300	-	81	-	113
	SB (Cherrywood Ln)	L	175	-	57	-	65
	SB (Cherrywood Ln)	T	2,394	-	73	-	85
3	**Cherrywood Lane & Springhill Drive (TWSC)**						
	WB (Springhill Dr)	LR	620	-	90	-	189
	NB (Cherrywood Ln)	TR	2,394	-	-	-	3
	SB (Cherrywood Ln)	L	350	-	53	-	68
4	**Cherrywood Lane & Greenbelt Metro Drive (Roundabout)**						
	EB (Greenbelt Metro Dr)	L	449	-	59	-	109
	EB (Greenbelt Metro Dr)	R	250	-	25	-	43
	NB (Cherrywood Ln)	LT	111	-	92	-	107
	SB (Cherrywood Ln)	T	1,451	-	42	-	83
	SB (Cherrywood Ln)	R	200	-	13	-	10
5	**Cherrywood Lane & Ivy Lane (TWSC)**						
	EB (Cherrywood Ln)	LTR	1,451	-	156	-	45
	WB (Cherrywood Ln)	L	219	-	35	-	23
	WB (Cherrywood Ln)	TR	219	-	12	-	9
	NB (Ivy Ln)	LT	485	-	81	-	131
	NB (Ivy Ln)	R	485	-	38	-	53
	SB (Ivy Ln)	LTR	223	-	66	-	#287

Table 4-26: No-build Condition Queuing Analysis (continued)

#	Intersection and Approach	Lane Group	Turning Bay/Link Length (feet)	AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
6	**Greenbelt Road (MD 193) & 62 Avenue/Beltway Plaza Driveway (Signalized)**						
	EB (Greenbelt Rd)	L	250	0	27	9	63
	EB (Greenbelt Rd)	TR	1,336	63	56	511	221
	WB (Greenbelt Rd)	L	250	9	53	19	123
	WB (Greenbelt Rd)	T	1,038	190	168	373	291
	WB (Greenbelt Rd)	R	1,038	0	39	3	96
	NB (62th Ave)	LTR	697	25	96	115	202
	SB (Beltway Plaza Drwy)	L	350	16	14	173	238
	SB (Beltway Plaza Drwy)	LT	472	17	69	172	268
	SB (Beltway Plaza Drwy)	R	350	0	23	0	51
7	**Kenilworth Avenue (MD 201) & I-95/I-495 SB Off-ramp (Signalized)**						
	EB (I-95/I-495 SB Off-ramp)	L	531	112	300	97	211
	EB (I-95/I-495 SB Off-ramp)	R	736	0	394	0	2
	NB (Kenilworth Ave)	T	1,263	46	90	66	116
	SB (Kenilworth Ave)	T	574	229	180	56	115
8	**Kenilworth Avenue (MD 201) & I-95/I-495 NB Off-ramp (Signalized)**						
	WB (I-95/I-495 NB Off-ramp)	L	885	223	245	160	222
	WB (I-95/I-495 NB Off-ramp)	R	835	217	152	61	96
	NB (Kenilworth Ave)	T	345	116	131	49	94
	SB (Kenilworth Ave)	T	199	56	154	77	129
9	**Kenilworth Avenue (MD 201) & Crescent Road/Maryland SHA Office (Signalized)**						
	EB (Maryland SHA Office)	LTR	250	1	36	3	48
	WB (Crescent Rd)	LT	441	168	254	79	145
	WB (Crescent Rd)	R	250	0	133	0	71
	NB (Kenilworth Ave)	L	250	28	85	9	36
	NB (Kenilworth Ave)	T	286	234	281	117	160
	NB (Kenilworth Ave)	R	250	9	114	2	35
	SB (Kenilworth Ave)	L	300	64	110	128	201
	SB (Kenilworth Ave)	T	793	45	156	60	446
	SB (Kenilworth Ave)	R	793	0	10	0	194
10	**Kenilworth Avenue (MD 201) & Ivy Lane (Signalized)**						
	EB (Ivy Ln)	R	-	0	-	0	-
	NB (Kenilworth Ave)	L	547	88	134	21	59
	NB (Kenilworth Ave)	T	-	45	64	29	-
	SB (Kenilworth Ave)	T	1,198	4	93	15	101
	SB (Kenilworth Ave)	R	-	0	-	0	-

Table 4-26: No-build Condition Queuing Analysis (continued)

#	Intersection and Approach	Lane Group	Turning Bay/Link Length (feet)	AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
11	**Kenilworth Avenue/Edmonston Road (MD 201) & Cherrywood Lane (Signalized)**						
	EB (Cherrywood Ln)	L	777	68	120	129	165
	EB (Cherrywood Ln)	R	1,304	0	65	0	200
	NB (Kenilworth Ave)	L	750	81	367	18	148
	NB (Kenilworth Ave)	T	1,198	2	59	6	76
	SB (Edmonston Rd)	T	594	307	301	212	204
	SB (Edmonston Rd)	R	250	31	#265	0	89
12	**Edmonston Road (MD 201) & Sunnyside Avenue (Signalized)**						
	EB (Sunnyside Ave)	L	965	182	555	320	#1234
	EB (Sunnyside Ave)	R	350	332	#421	455	#425
	NB (Edmonston Rd)	L	450	362	387	268	#602
	NB (Edmonston Rd)	T	1,381	249	259	809	#1865
	SB (Edmonston Rd)	T	1,554	1336	#1629	1058	#1726
	SB (Edmonston Rd)	R	250	23	#293	14	#336
13	**Edmonston Road (MD 201) & Powder Mill Road (Signalized)**						
	EB (Powder Mill Rd)	L	250	43	124	414	237
	EB (Powder Mill Rd)	T	903	244	269	0	457
	EB (Powder Mill Rd)	R	500	0	83	0	154
	WB (Powder Mill Rd)	L	250	114	156	74	119
	WB (Powder Mill Rd)	T	699	176	214	129	163
	WB (Powder Mill Rd)	R	100	0	100	0	62
	NB (Edmonston Rd)	L	400	513	364	~615	324
	NB (Edmonston Rd)	T	640	274	246	19	297
	NB (Edmonston Rd)	R	275	0	20	64	96
	SB (Edmonston Rd)	L	275	21	104	0	140
	SB (Edmonston Rd)	TR	822	324	301	0	310
14	**Greenbelt Metro Drive & Site North Access (TWSC)** [a]						
	EB (Greenbelt Metro Dr)	T	-	N/A	N/A	N/A	N/A
	WB (Greenbelt Metro Dr)	L	-	N/A	N/A	N/A	N/A
	WB (Greenbelt Metro Dr)	T	-	N/A	N/A	N/A	N/A
	NB (Site North Access)	LR	-	N/A	N/A	N/A	N/A

Table 4-26: No-build Condition Queuing Analysis (continued)

#	Intersection and Approach	Lane Group	Turning Bay/Link Length (feet)	AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
15	**Greenbelt Station Bus Bays/Greenbelt Metro Drive & Greenbelt Station Parkway (Signalized)**						
	EB (Greenbelt Sta Bus Bays)	LT	216	22	59	16	54
	EB (Greenbelt Sta Bus Bays)	R	-	-	-	-	-
	WB (Greenbelt Metro Dr)	L	366	412	#446	169	250
	WB (Greenbelt Metro Dr)	T	366	14	45	15	57
	WB (Greenbelt Metro Dr)	R	-	0	-	0	-
	NB (Greenbelt Sta Pkwy)	L	250	-	-	0	4
	NB (Greenbelt Sta Pkwy)	T	243	100	102	50	84
	NB (Greenbelt Sta Pkwy)	R	243	31	-	12	11
16	**Greenbelt Station Parkway & North Core Development/Site Northwest Access (Signalized)**						
	EB (North Core Dev)	L	178	38	80	121	164
	EB (North Core Dev)	TR	178	0	36	0	63
	NB (Greenbelt Sta Pkwy)	L	544	28	197	33	131
	NB (Greenbelt Sta Pkwy)	TR	544	28	107	67	228
	SB (Greenbelt Sta Pkwy)	TR	261	0	22	0	13
17	**Greenbelt Station Parkway & Residential Access to 500 Units (TWSC)**						
	EB (Residential Access)	R	174	-	59	-	49
	NB (Greenbelt Sta Pkwy)	T	465	-	3	-	302
18	**Greenbelt Station Parkway & I-95/I-495 Off-ramps/Site South Access/Kiss & Ride (Signalized)**						
	EB (I-95 Off-ramps)	L	229	238	223	187	134
	EB (I-95 Off-ramps)	LTR	229	129	222	21	153
	EB (Kiss and Ride)	L	188	229	#258	116	174
	WB (Site South Access)	R	407	6	27	118	160
	NB (Greenbelt Sta Pkwy)	L	375	24	59	35	76
	NB (Greenbelt Sta Pkwy)	T	530	325	86	110	87
	SB (Greenbelt Sta Pkwy)	L	400	0	120	0	54
	SB (Greenbelt Sta Pkwy)	TR	465	0	73	28	93
19	**Greenbelt Station Parkway & WMATA Garage (Signalized)**						
	EB (WMATA Garage)	L	150	7	30	100	#158
	EB (WMATA Garage)	R	290	0	24	0	63
	NB (Greenbelt Sta Pkwy)	LT	330	358	183	157	80
	NB (Greenbelt Sta Pkwy)	TR	330	4	145	48	99
	SB (Greenbelt Sta Pkwy)	T	162	141	68	248	152
	SB (Greenbelt Sta Pkwy)	R	162	23	14	0	2
20	**Greenbelt Station Parkway & Residential Access to 300 Units (TWSC)**						
	EB (Residential Access)	LR	224	-	64	-	44
	NB (Greenbelt Sta Pkwy)	LT	345	-	0	-	0
	SB (Greenbelt Sta Pkwy)	TR	350	-	5	-	6

Table 4-26: No-build Condition Queuing Analysis (continued)

#	Intersection and Approach	Lane Group	Turning Bay/Link Length (feet)	AM Peak		PM Peak	
				50th Percentile (feet)	95th Percentile (feet)	50th Percentile (feet)	95th Percentile (feet)
21	**Greenbelt Road (MD 193) & Greenbelt Station Parkway (Signalized)**						
	EB (Greenbelt Rd)	L	124	95	144	97	#142
	EB (Greenbelt Rd)	T	1,008	84	95	360	233
	WB (Greenbelt Rd)	T	1,584	117	130	165	199
	WB (Greenbelt Rd)	R	150	0	71	19	#167
	SB (Greenbelt Sta Pkwy)	L	524	115	162	125	185
	SB (Greenbelt Sta Pkwy)	R	225	165	209	184	#242

Notes:

~ 50th percentile volume exceeds capacity, queue is theoretically infinite.

95th percentile volume exceeds capacity, queue may be longer.

m Volume for 95th percentile queue is metered by upstream signal. Due to upstream metering, the 95th percentile queue may be less than the 50th percentile queue.

AWSC = All-way STOP-Controlled intersection

EB = Eastbound, WB = Westbound, NB= Northbound, SB = Southbound

LTR = left / through / right lanes

TWSC = Two-way STOP-Controlled intersection

Red cells denote approaches and lane groups whose queuing length exceeds capacity.

[a] Intersection would be included under the Build Condition, but was included as part of the No-build Condition design provided by Renard Development Company, LLC.

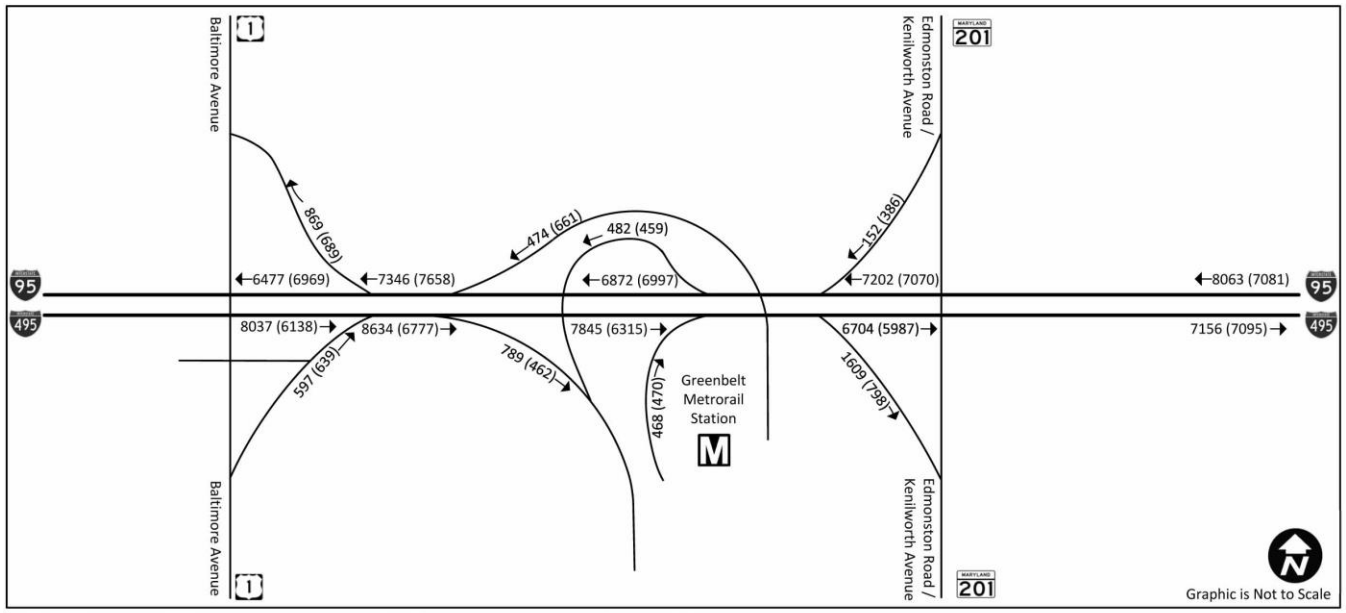
4.8.7.2 Overall Traffic Assessment

Overall, the PM peak hour would experience corridor-based delays along Edmonston Road (MD 201) in the northbound direction beginning at Powder Mill Road and extending to Cherrywood Lane resulting in indirect, long-term, major adverse impacts. There would also be isolated intersection impacts during the AM peak hour at the Edmonston Road and Sunnyside Avenue and during both peak hours at the Cherrywood Lane and Ivy Lane intersection (Ivy Lane approaches only) resulting in indirect, long-term, adverse impacts.

4.8.8 No-build Condition Freeway Volumes

Although freeway analysis was not performed for the No-build Condition, freeway ramp volumes are included in figure 4-16 to allow a comparison to the Existing Condition, Build, and Build with Mitigation Condition freeway ramp volumes presented in Sections 3.7, 5.8, and 6.6, respectively. Full analysis of the freeway volumes is included in the Build with Mitigation Condition, in Section 6.6.

Figure 4-16: No-build Condition Freeway Volumes



5.0 Analysis of Build Condition

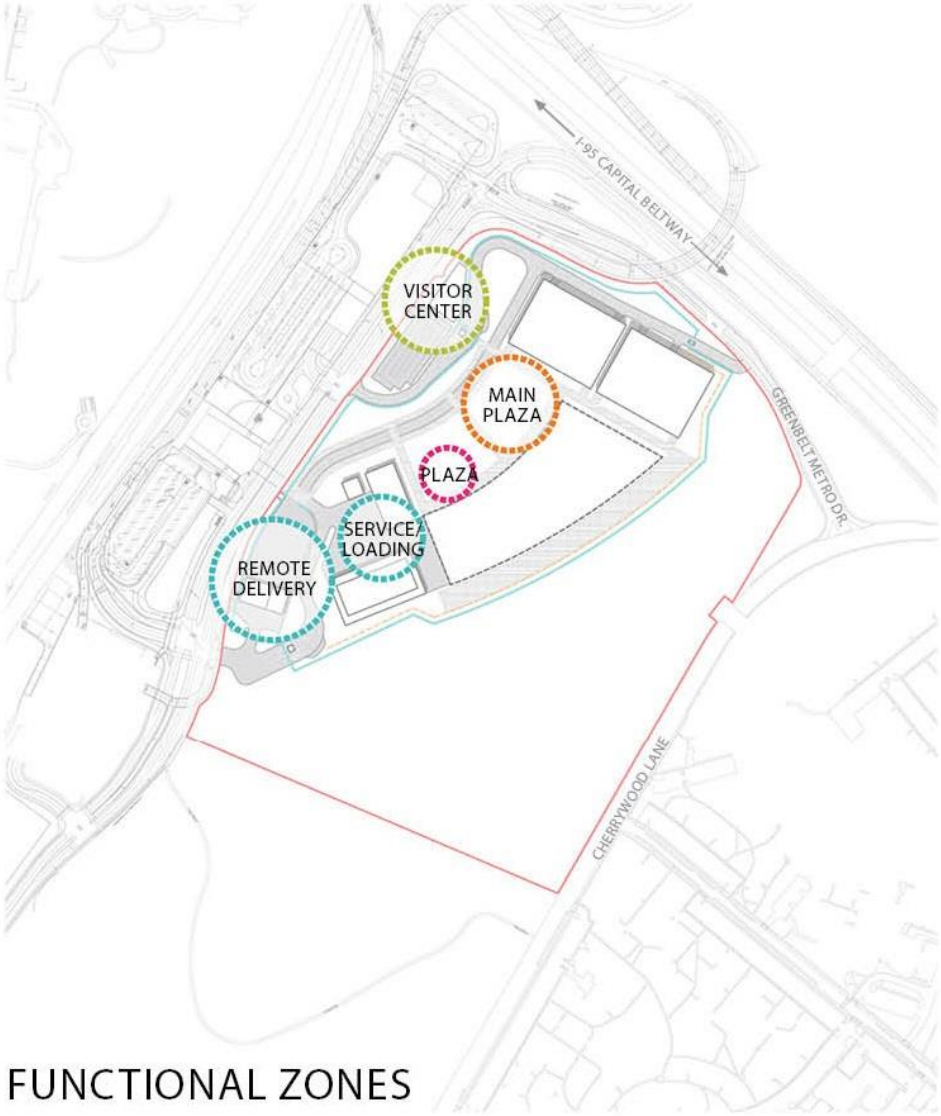
This chapter introduces the Build Condition for the Greenbelt site and summarizes the potential impacts to the pedestrian network, bicycle network, public transit system, parking conditions, truck access, and traffic operations.

Under the Build Condition, GSA would not continue to maintain the FBI HQ building in Washington, D.C., and the Greenbelt site would be selected. The Greenbelt Build Condition is unique from the proposed action described in the FBI HQ Consolidation DEIS because it only analyzes the conditions at the Greenbelt site and does not factor in the impacts from the exchange of the JEH parcel in Washington, D.C.

5.1 Description of Build Condition

Consolidation of the FBI HQ at Greenbelt would include a Main Building or series of buildings of approximately 2.4 million GSF. The main HQ building would house the majority of the approximately 11,000 employees, plus approximately 400 non-seated contractors, such as custodial staff and food service workers. The Main Building would include general office space, collaborative workspaces, the Mission Briefing Center and auditorium (to be used for training and large meetings), a cafeteria/food court, retail spaces, fitness center, credit union, and medical clinic. The building(s) also would include support spaces such as loading docks, workshops, and police/security spaces. In addition to the Main Building, the site would contain plaza areas, parking areas, a Central Utility Plant (CUP), a Remote Delivery Facility (RDF) and truck access, a Visitor Center (VC), and gate and access points. The location of some of these elements is shown in figure 5-1.

Figure 5-1: Greenbelt Site Organization



The remote delivery zone, which would contain the truck screening facility and the RDF, would be located in the southwestern corner of the site, with trucks accessing the site from the Capital Beltway and Greenbelt Station Drive at the southern gate. Adjacent to this zone would be the service and loading zone, located east of the remote delivery zone and adjacent to the southern end of the Main Building. This zone would contain the CUP, stand-by generators, and substation, and would provide access to the Main Building for loading and maintenance. The 4.0-acre developable area for the Main Building would be located in the center of the site, with the southeastern edge of the building aligning with the edge of the existing parking and Capital Beltway ramps. Based on the size and configuration of the developable area, the planning team determined that the Main Building would be up to 17 stories tall. The developable area in front of the Main Building would form the plaza zone. This zone would provide a pedestrian-oriented open space for employees and visitors, as well as a stage for a primary entrance to the Main Building. The visitor zone would be located near the northwestern corner of the site, adjacent to the main gate. It would contain the VC, visitor parking, and bus drop-off. The visitor parking lot would accommodate up to 135 spaces.

Access to the site would be provided primarily along the extension of Greenbelt Station Parkway, the north-south oriented roadway connecting North and South Cores, as shown in figure 5-2. The preliminary conceptual site plan contains three vehicular entry control facilities (ECFs): Note that other resources topics in the EIS based their impact assessment on the revised conceptual site plan describe in the Build with Mitigation (Section 6).

- South Access: This ECF, located along Greenbelt Station Parkway, would contain three lanes, two for inbound employee vehicular traffic only and one for access to the RDF. This ECF would also provide the only access point for truck traffic during non-peak hours. No outbound traffic would be allowed through this gate. A separate exit driveway would be provided from the RDF to Greenbelt Station Parkway to provide a truck exit.

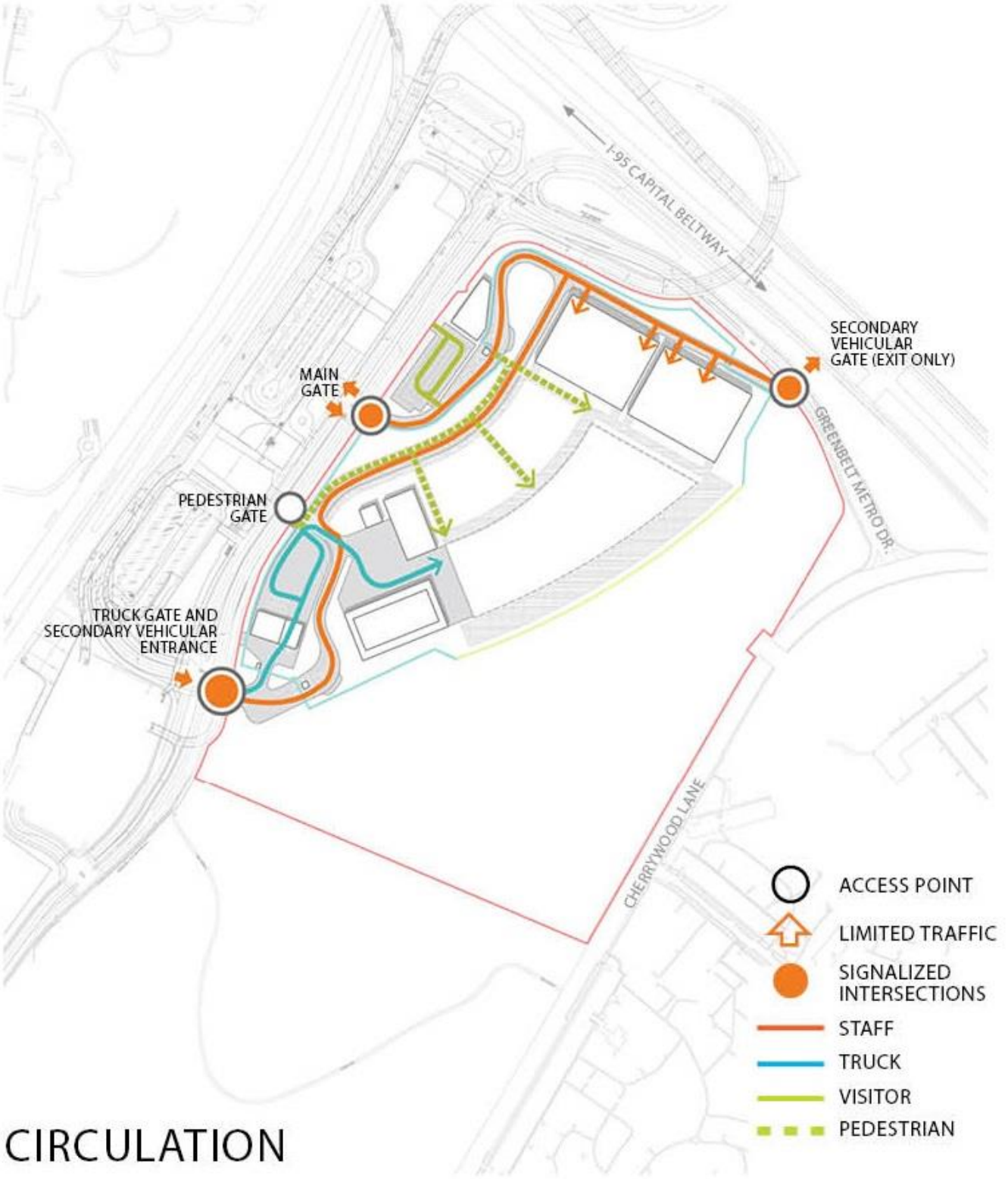
- Northwest Access: This ECF, located along Greenbelt Station Parkway, would contain three lanes for employee vehicular traffic. Employee vehicles would enter the site through two inbound lanes during the AM peak period, and one lane at all other times. Employee vehicles would exit the site through one inbound lane during the AM peak period, and two lanes at all other times.

- North Access: This ECF, located along Greenbelt Metro Drive, would contain three lanes for outbound employee vehicular traffic only. No inbound traffic would be allowed through this gate.

Visitor vehicular traffic would access the site through the visitors' parking lot located along Greenbelt Station Parkway. Visitor pedestrian traffic would enter the site through the VC, adjacent to the visitor parking lot, while employee pedestrian traffic would access the site through a separate pedestrian gate with a direct connection to the Greenbelt Metro Station.

Employee parking garages would be located to the north of the Main Building developable area and adjacent to the northern site boundary. In the conceptual site layout analyzed in the EIS, these spaces would be accommodated in two, eight-story parking structures. The FBI is conducting an internal analysis to support a final determination of the total amount of employee parking for this site. If the final number of employee parking spaces is substantially higher than what is assumed in this analysis, additional NEPA analyses would be conducted. The configuration and layout of the parking structures to accommodate the required employee and fleet vehicle parking would be determined during the design process.

Figure 5-2: Greenbelt Site Circulation



The Greenbelt Build Condition includes the following transportation improvements that would be necessary for the site to function based on the magnitude of trips forecasted to occur:

The key components of the Springfield Build Condition are as follows:

- ADA accessibility and sidewalk and pedestrian access improvements would be made as needed at entry locations, as well as to connect to the sidewalk network.
- No offsite bicycle improvements are included as part of the Build Condition. Bicycle improvements such as bicycle parking and showers or locker rooms may be provided as part of the final design, but are not yet known at this time.
- No shuttle service is proposed as part of the Build Condition, because the Greenbelt site is within a 0.5-mile walk of the nearest transit station.
- All parking supporting the Build Condition would be accommodated onsite. In the conceptual site layout analyzed in the EIS, these spaces would be accommodated in two, eight-story parking structures.
- Truck access would be provided at the South ECF; trucks would be required to access the facility at off-peak hours.
- Four entry driveways leading to ECF facilities would be developed as part of the site. These include a south access from Greenbelt Station Parkway (three-lane entry only, as well as the only truck access location), a truck exit only driveway (one lane) from the RDF to Greenbelt Station Parkway, a northwest access to/from Greenbelt Station Parkway (three-lanes: two inbound, one outbound during AM peak; two outbound, one inbound at all other times), and a north access to Greenbelt Metro Drive (three-lane exit only).

The Greenbelt Build Condition includes the following transportation improvements that would be necessary for the site to function based on the magnitude of trips forecasted. These improvements are mitigation measures, discussed in Section 6, but they are also included in the Build Condition to accommodate trip volumes.

- Greenbelt Metro Drive and site north access (exit only): A traffic signal would be installed at the intersection.
- The traffic signal timing along Greenbelt Station Parkway would be updated by optimizing the timings based on the forecasted FBI vehicle trips and the signals would be coordinated.

The trip generation and modal split assumptions are discussed first, followed by a discussion for each transportation mode.

5.2 Trip Generation and Mode Split

This section covers the trip generation and modal split process and methods used to develop the Build Condition transit and traffic trip volumes.

5.2.1 Trip Generation

The process of trip generation calculation is based on forecasting the number of AM and PM peak hour trips generated by the proposed development. There are several proposed trip generators for the site including an estimated 11,055 FBI employees, a 500-seat Mission Briefing Center, and a fleet of pool cars, according to the FBI. Based on an estimate for commuter-based pool car use, there would be less than five trips produced. It is also assumed that the approximately 400 non-seated contractors providing custodial, food, fitness center, health, and other services would travel outside the peak hours. Therefore, no trips were added to the trip generation calculation for commuter-based pool car use or non-seated contractors. The process for forecasting the FBI employee and Mission Briefing trips is discussed next.

5.2.1.1 FBI Employee Person Trips

Many employees choose to or are scheduled to begin or end work earlier or later than the peak hours to avoid traffic, to schedule shared childcare responsibilities, to take advantage of quiet time at work, and for other reasons. The ITE *Trip Generation Manual*, *9th Edition,* identifies estimates for peak hour trip generation rates for different types of office buildings based on various studies; however, most of these studies are in suburban rather than urban environments, "having little or no transit service, nearby pedestrian amenities, or travel demand management (TDM) programs" (ITE 2012). In addition, FBI employee patterns of arrivals and departures, including the number of employees who will be off-site or on field work at any given time is not typical of most office uses. For these reasons, it was determined that the future FBI trip generation rate is not accurately represented by the ITE *Trip Generation Manual*; therefore, a special study was undertaken to determine appropriate trip generation rates using the current FBI HQ, which houses more than 50 percent of staff. As stated in the Trip Generation Manual, "when practical, the user is encouraged to supplement the data in this document with local data that have been collected at similar sites" (ITE 2012).

Morning peak hour rates were calculated based on FBI turnstile counts obtained from the FBI representing all persons entering the JEH building (current FBI HQ). Following the guidance of the ITE *Trip Generation Handbook, 2nd edition* (ITE 2004), three days of turnstile counts (November 12, 2013 [Tuesday], December 4, 2013 [Wednesday], and January 9, 2014 [Thursday]) were obtained. The sample days for normal operations days were selected by the FBI. The survey results produced a peak hour count of 1,344 on November 12, 2013, 1,361 on December 4, 2013, and 1,324 on January 9, 2014, and a peak hour of 7:15 AM to 8:15 AM. To provide a more conservative forecast, the maximum count from the 3-day turnstile counts (1,361) was used, instead of the average. The turnstile counts only represent the inbound flows, but most organizations have two-way flows of workers, even in peak hours. Therefore the ITE *Trip Generation Manual* Corporate Headquarters land use entering/exiting percentages (AM: 93 percent entering / 7 percent exiting) were used to calculate the morning outbound peak hour flow, based on the maximum count from the survey results. The total person trips (entering and exiting) divided by 5,045 (current number of FBI employees working at the JEH building) was used to develop the AM peak hour rate, which resulted in a 0.29 person trip rate (29.0 percent of employees arrive or leave during the AM peak hour).

Afternoon peak hour rates were calculated based on a JEH building exit-only trip generation survey. Following the ITE guidance (ITE 2004), the trip generation survey was conducted for three days (September 16, 17, and 18, 2014) on a non-holiday week resulting in outgoing trip volumes of 1,174, 1,259, and 1,130, respectively. Based on the PM peak hour occurring between 4:30 PM and 5:30 PM, the PM rate was calculated from the trip generation survey (outbound flow) and the inbound turnstile counts from the inbound survey days.

Based on the turnstile volumes, the highest number of employees entering during the 4:30 to 5:30 PM time slot was 114. The average for the time slot was 73, higher than both the other days' values (68 and 36 respectively) for the same one-hour period. This meant that the 114 value was skewing the values when averaged and was not a good representation of a typical evening inbound flow. Therefore, the next 15-minute slot for an hourly average (4:45 PM-5:45 PM) was examined. The average of the 4:45 PM to 5:45 PM time slot equals the average of the 3 days for the 4:30 to 5:30 PM time slot, and therefore appears to be more typical of a normal operation. To follow the same process as the inbound flow, the highest value of this time slot was used, for a value of 98. Since the values for the inbound PM flows fluctuated between days and one day seemed to at least double the other two, the percent entering and exiting was adjusted to model the outbound flows in a more conservative manner. The calculated split was 7 percent inbound and 93 percent outbound. Instead the split was rounded down and up to a 5 percent inbound and 95 percent outbound split. The outbound split has the greatest impact on traffic; therefore a higher outbound split percentage is more conservative (worse case) than a lower outbound split.

This resulted in a 0.269 person PM peak hour trip rate (26.9 percent of employees arrive or leave during the PM peak hour) where 5 percent entered and 95 percent exited the JEH building based on the 5,045 existing employees working at the JEH building. Table 5-1 summarizes the JEH building trip generation rates.

Table 5-1: J. Edgar Hoover Building Existing Peak Hour Person Trips

Source	Independent Variable	Time Period	IN	OUT	TOTAL
Turnstiles (11/12/13, 12/4/13, and 1/9/14) Survey (9/16/14 - 9/18/14)	5,045 employees	AM Peak Hour	1,361	102	1,463
		PM Peak Hour	98	1,259	1,357
Existing number of employees at JEH building		5,045			
AM peak hour trip generation rate		0.290			
PM peak hour trip generation rate		0.269			

5.2.1.2 Mission Briefing Center

The Briefing Center is assumed to have 500 seats, according to the FBI. It is assumed that half (50 percent) of the facility capacity would arrive from offsite and that half would be onsite (walk) trips. The ITE *Trip Generation Manual* does not contain a "Conference Center" land use; therefore, the study followed the trip rates used by the traffic study for the Washington Convention Center published in the Old Post Office (OPO) Redevelopment Transportation Study (GSA in cooperation with NCPC 2013). The AM peak inbound trip generation rate reported by the OPO study was 0.36; the PM peak outbound trip rate was 0.29, assuming that 100 percent would be inbound in the AM peak and 100 percent outbound in the PM peak.

5.2.1.3 Total Site Forecasted Person Trips

The person trip generation representing the total number of estimated employees at the new site used the trip rates calculated through the JEH building trip generation study. The Mission Briefing Center uses the person trip generation rates provided by the OPO Redevelopment Transportation Study. Table 5-2 contains the Landover site forecasted person trip generation and trip generation assumptions.

Table 5-2: Landover Site Forecasted Trip Generation

Future FBI Person Trips	Time Period	Enter/Exit Percentages		Proportion of Trips during the Peak Hour	Future Employee Person Trips		
		IN	OUT		IN	OUT	TOTAL
Employees (based on JEH Turnstile Counts and Surveys)							
11,055	AM Peak Hour	93%	7%	29%	2,982	224	3,206
	PM Peak Hour	5%	95%	26.9%	149	2,825	2,974
Briefing Center (based on the Old Post Office Redevelopment Transportation Study)							
250	AM Peak Hour	100%	--	36%	90	--	90
	PM Peak Hour	--	100%	29%	--	73	73
Total People							
11,305	AM Peak Hour	--	--	--	3,072	224	3,296
	PM Peak Hour	--	--	--	149	2,898	3,046

5.2.2 Modal Split

Modal split is calculated by apportioning person trips to the available transportation modes used to commute. The process begins with calculating the split for carpools/vanpools, followed by single-occupancy vehicles (SOV), and

then works systematically through the other modes. Employees and the Mission Briefing visitors are evaluated separately.

5.2.2.1 Employee Mode Split

Carpool/Vanpool: The number of vehicles is highly dependent on the number of parking spaces available. According to the NCPC Comprehensive Plan Transportation Element (NCPC 2004), the number of parking spaces for a suburban site within 2,000 feet of a Metrorail station is determined by a ratio of one parking space for every three employees, a ratio of 1:3. As the site is projected to have 11,055 employees, the number of parking spaces is therefore assumed to be 3,685***. It should be noted that this number does not reflect the non-seated workers, visitors, and pool fleet, which will require additional parking spaces and will not be subject to NCPC parking policy.*** Based on information from NCPC and project knowledge of carpool/ vanpool mode split at other large Federal sites, the carpool/vanpool mode split was initially estimated at approximately 8 percent. Given the proximity to the Capital Beltway; limited parking at suburban Metrorail stations, long trip times when driving, parking, and using Metrorail; vanpool incentive programs likely including reserved and/or preferred parking spaces for carpools and vanpools; and that onsite Transportation Demand Management programs would likely include a ridematching customized for FBI employees, this initial estimate of carpool/vanpool trips was increased to 11 percent of employees, or 1,216 persons. This is consistent with the carpool/vanpool mode split for several other Federal sites in the region. Based on the Greenbelt Site Transportation Agreement, the average vehicle occupancy would be three persons resulting in 405 vehicle trips. By extension, this removes 405 parking spaces from SOV availability into potentially reserved parking spaces for carpools/ vanpools.

Single-Occupancy Vehicles: The number of SOVs is highly dependent on the number of parking spaces available. After 405 spaces are removed for carpool/vanpool, this leaves 3,280 SOV parking spaces at the site; a 29.7 percent SOV mode share. The FBI and GSA, through the application of a Transportation Management Plan, would implement policies and actions to deter any offsite parking using the proposed new WMATA garage serving the Greenbelt Metro Station. This can be accomplished through aggressive monitoring and punitive actions.

Bicycle: Given the suburban nature of the site, it is assumed that 2 percent of the employees, or 221 people, would bicycle to the site, consistent with the MWCOG *2013 State of the Commute* (MWCOG 2011).

Walk: Given the predominance of low-density single-family residential and open space within walking distance, it is assumed that the walk mode split would be 1 percent of employees, or 110 people. Future residential development in the surrounding area, in line with the vision of the Comprehensive Plan may eventually increase this percentage. Based on existing conditions, 1 percent is the conservative mode split assumption for this site.

Commuter Bus: It is likely that MTA would develop commuter bus service the Greenbelt site because it already has 37 daily runs operating in this area. Commuter buses provide an effective option for long-distance commuters whose schedules may vary from day to day, and who appreciate the flexibility of various arrival and departure times. Commuter buses provide fixed route service that may collect from neighborhoods as well as Park & Ride lots, and distribute riders to varied destinations along high-employment corridors. A 3 percent mode share for commuter bus, equivalent to 332 persons, is estimated for this site due to the factors noted above. It is expected that commuter bus providers would implement new services to meet the demand of employees commuting to this site providing service from Park & Ride locations throughout Maryland directly to the site. Employees in Virginia would likely use other commuter bus services already operating in Virginia to reach Metrorail service in Virginia and DC; they are captured in the Metrorail mode split.

Local Bus: 15 local bus routes directly serve the site, including three operated by Prince George's County and 12 operated by WMATA Metrobus. One regional bus route operated by Central Maryland Regional Transit (CMRT) also serves the site. These buses serve six Metrorail stations on the Green/Yellow, Orange, and Red lines. Together, the local buses cover an area that spans from Wheaton to the northwest to New Carrollton in the

southeast. Consequently, local bus service has a large capture area around the site. Additionally, with limited onsite parking availability, some employees would choose to drive to a location near the site then use local bus for the final leg. However, these factors would be offset by infrequent headways and sometimes circuitous routes potential employees may experience using these services. Nevertheless, it is assumed that 6 percent of employees, or 663 persons, would use local bus service.

Metro/MARC: Once the data points and assumptions for other modes were applied and the number of employees assigned to each was calculated, it is assumed that the remaining employees would travel to/from the site via Metrorail or MARC, by way of the Greenbelt Metro/MARC Station, located adjacent to the site. The sum of all other modes equals 5,822 trips, leaving 5,233 trips, or 47.33 percent of the total, to be made by Metro/MARC. The results of the 2013 Mark Center Transportation/Commuter Survey Report showed 48 percent of employees used public transit in 2013, a trip that requires transferring to a bus at either the Pentagon Metro Station or King Street Metro Station to reach the Mark Center site (City of Alexandria 2014). These results are relevant because it is a large Federal worksite with limited onsite parking and illustrates that a large percentage of employees would use transit when parking is not available. This is higher than the 33 percent reported by NCPC for Federal Employees region-wide (NCPC 2011). However, it is reasonable given the proximity of the site to the Greenbelt Metro Station, and given the expected parking ratio of 1:3 (one space for every three employees) resulting in only 3,280 SOV parking spaces for 11,055 employees.

Table 5-3 summarizes the relevant modal split information sources and percentages referenced in the discussion above.

Table 5-3: Modal Split Summary of Sources

Mode	MWCOG 2020 Percent by Mode for TAZ 897 [a]	MWCOG 2013 State of the Commute [b]	2011 NCPC [c] Federal Employee Commuting Patterns (2008)
Single-Occupancy Vehicles	75.5%	71.5%	54%
Carpool/ Vanpool	12.1%	7.3%	8%
Bicycle	NA	2.4%	2%
Walk	0.0%		3%
Commuter Bus	NA	NA	NA
Local Bus	6.5%	18.8%	33%
Metrorail/ Commuter Rail	5.9%		
Telework/ Compressed Work Schedules	NA	NA	NA
Total	**100%**	**100%**	**100%**

NA = Not Applicable. Percentages do not always equal 100 percent due to unreported modes and/or rounding.

[a] Represents the forecasted 2020 modal split based on a forecast of more than 3,200 total jobs within the MWCOG travel demand model traffic analysis zone (TAZ) 897 located along Cherrywood Lane on the other side of I-95/I-495 (proposed site (TAZ 895) is forecasted for less than 25 total job, thus TAZ 897 is a better sample) (MWCOG 2014a).

[b] MWCOG (2011; 2013)

[c] NCPC (2012)

Table 5-4 summarizes the FBI mode split, as discussed above, and provides the resulting trips by mode.

Table 5-4: FBI Modal Split Summary Results

Mode	FBI Development Percent by Mode	FBI Number of trips by Mode
Single-Occupancy Vehicles	29.7%	3,280
Carpool/ Vanpool	11%	405 trips [a] (1,216 persons)
Bicycle	2%	221
Walk	1%	110
Commuter Bus	3%	11 trips [b] (332 persons)
Local Bus	6%	663
Metrorail/ Commuter Rail	47.33%	5,233
Telework/ Compressed Work Schedules	0%	0
Total	**100%**	**11,055**

[a] Assumes an average occupancy of three persons per carpool//vanpool and equates to 405 vehicle trips.
[b] Assumes an average of 30 persons per commuter bus; 332 people equates to 11 buses.

5.3 Pedestrian Network

Under the Build Condition, because the roadways adjacent to the Greenbelt site would already have sidewalks due to the Greenbelt Station development proposal, only localized pedestrian improvements are anticipated at the locations of the remaining ECFs to provide ADA compliance and pedestrian access, as needed. Within the site, multiple pedestrian pathways would provide access to the Main Building and between elements on the site; the exact location of these pedestrian accommodations would be determined in the final site design process.

Based on the anticipated mode split percentages, a large number of pedestrians would access the Greenbelt site via the surrounding pedestrian network. The large increase in pedestrians would be related to the location of the Greenbelt site (within a 0.5-mile walking distance of several transit options) and because reduced parking was designed per NCPC guidance to encourage employees to access the site via transit. It is anticipated that most transit riders would follow sidewalks or the proposed direct connection between the Greenbelt Metro Station and the pedestrian gate at the western edge of the Greenbelt site. The direct pedestrian connection between the Greenbelt Metro Station and the Greenbelt site would not enter the FBI security perimeter. These sidewalks or the connection would be built with future roadways planned in the No-build Condition.

Therefore, due to the large increase in pedestrians expected to access the site on foot via the pedestrian network, the Build Condition as planned would have direct, long-term, beneficial impacts to the pedestrian network. The pedestrian impacts would overall be beneficial, rather than adverse, because the sidewalks would be designed for the large number of pedestrians anticipated, the sidewalks or direct pedestrian connection would create a safe convenient travel route for pedestrians, and the sidewalk improvements at the ECFs would reduce barriers to accessing the site.

Because there is a plan under the No-build Condition to remove the existing sidewalks serving the Greenbelt Metro Station and construct a new network of sidewalks on both sides of Greenbelt Station Parkway, there would be no measurable direct construction impacts to the pedestrian network. However, there would be direct, short-term, adverse impacts to the proposed pedestrian network during construction if the proposed sidewalks along Greenbelt Station Parkway are constructed before the start of the Greenbelt site construction as a result of construction vehicles crossing the sidewalk and intermittent sidewalk closures.

5.4 Bicycle Network

As noted in the No-build Condition Bicycle Network section (Section 4.4), the Prince George's County Bicycle Master Plan (included in the *Approved Countywide Master Plan of Transportation* [M-NCPPC 2009]) recommends several bicycle facilities within the Greenbelt study area. Because there is no dated implementation plan in the Master Plan, it is unknown whether any of these recommendations would be completed by 2022. However, the bicycle improvements adjacent to roadways and proposed as part of development of the North Core should be complete by 2022. Development of the Build Condition would possibly limit the extent of the proposed mixed-use trail, shown in Section 4.4, on the Greenbelt site. Due to substantial improvements planned with the North Core development, no offsite bicycle improvements are planned as part of the Greenbelt Build Condition.

The overall bicycle mode split to the site is projected to be 2.0 percent, resulting in approximately 226 bicycle roundtrips daily. It is assumed that there would be bicycle facilities onsite to encourage the use of the bicycle mode of travel. Section 5.2 includes more information on modal splits for the Greenbelt Build Condition.

The increase in bicycle trips from the Greenbelt Build Condition would increase overall bicycle volumes in the study area. Given the existing bicycle facilities that serve the site and the study area (including those along Cherrywood Lane and Rhode Island Avenue [U.S. Route 1]) and those expected through development of the North Core (Greenbelt Station Parkway and others), the increase in projected bicycle volumes would have no measurable direct, long-term impact on the study area bicycle network.

Because there is a plan under the No-build Condition to revise the existing multi-use path serving the Greenbelt Metro Station via Greenbelt Metro Drive and construct a new network of bicycle lanes along Greenbelt Station Parkway and Greenbelt Metro Drive, there would be no measurable direct, short-term impacts to the bicycle network during construction of the Build Condition. However, there would be direct, short-term, adverse construction impacts to the proposed bicycle network if the proposed bicycle lanes along Greenbelt Station Parkway and Greenbelt Metro Drive are constructed before the start of the Greenbelt site construction as a result of construction vehicles crossing the lanes and intermittent lane closures.

5.5 Public Transit

The following sections describe the Build Condition for the bus and Metrorail modes within the Greenbelt study area. Similar to the No-build Condition analysis, commuter rail, commuter bus, carsharing, slugging, and private shuttles are not evaluated for the Build Condition because future ridership information or planning documents were not available. It is anticipated that there would be an increase in people commuting to the site via commuter bus or shuttle given the overall increase in total trips in the Build Condition.

5.5.1 Projected Trips

The projected person trips are explained in the Trip Generation and Modal Split section (see Section 5.2).

5.5.2 Metrorail Analysis

The Metrorail analysis was conducted using projected 2022 No-build Condition ridership and the additional passenger trips associated with the Greenbelt Build Condition. The Greenbelt Build Condition passenger trips were assigned to Metrorail peak hours using the Metrorail/commuter rail mode split of 47.33 percent, and a further reduction of passenger trips to account for passengers who could use MARC trains instead of Metrorail to access the site. MARC service operates in both directions to the Greenbelt Metro Station on weekdays. The MARC passenger trip reduction was calculated using the 2014 proportion of daily passengers that use MARC instead of Metrorail to and from the station, as shown in table 5-5.

Table 5-5: Greenbelt MARC/Metrorail Station Weekday Ridership Proportions

Greenbelt Station	Average Weekday Entries	
	Total	Percent of Total
MARC	63	1.0%
Metrorail	6,098	99.0%
Total	**6,161**	**100.0%**

Sources: WMATA (2014g); (2014e); MTA (2015b)

Overall, with a Metrorail/commuter rail mode split of 47.33 percent and the MARC passenger reduction (minus one percent), a total of 1,544 additional AM peak hour passenger trips and 1,427 additional PM peak hour passenger trips are projected. Table 5-6 summarizes the additional Metrorail trips associated with the Greenbelt Build Condition.

Table 5-6: Greenbelt Build Condition Additional Peak Hour Metrorail Passenger Trips

Employees	Time Period	IN	OUT	Proportion of Daily Total	Rail Mode Split	Metro Percent [a]	IN	OUT	TOTAL
11,055	AM Peak Hour	93%	7%	29%	47.33%	99.0%	1,397	105	1,502
	PM Peak Hour	5%	95%	26.9%	47.33%	99.0%	70	1,323	1,393
Briefing Center	**Time Period**	**IN**	**OUT**	**Proportion of Daily Total**	**Rail Mode Split**	**Metro Percent [a]**	**IN**	**OUT**	**TOTAL**
250	AM Peak Hour	100%	-	36%	47.33%	99.0%	42	-	42
	PM Peak Hour	-	100%	29%	47.33%	99.0%	-	34	34
Total People	**Time Period**						**Exits**	**Entries**	**Total**
11,305	**AM Peak Hour**						**1,439**	**105**	**1,544**
	PM Peak Hour						**70**	**1,357**	**1,427**

[a] These figures represent the percentage of passengers who would use Metrorail instead of MARC, and constitute the "MARC Reduction" previously referenced.

Sources: Greenbelt Site Transportation Agreement (Appendix C1)

The additional peak hour Metrorail passenger trips were further disaggregated into AM and PM peak 15-minute periods using existing PHF at the Greenbelt Metro Station. Overall, this resulted in an additional 428 passenger trips during the AM peak 15-minute period and an additional 400 passenger trips during the PM peak 15-minute period, as summarized in table 5-7.

Table 5-7: Greenbelt Build Condition Additional Peak 15-Minute Metrorail Passenger Trips

Employees	Time Period	IN	OUT	TOTAL	Peak Hour Factor	Time Period	IN	OUT	TOTAL
11,055	AM Peak Hour	1,397	105	1,502	27.7%	AM Peak 15-Minute	387	29	416
	PM Peak Hour	70	1,323	1,393	28.0%	PM Peak 15-Minute	19	371	390
Briefing Center	**Time Period**	**IN**	**OUT**	**TOTAL**	**Peak Hour Factor**	**Time Period**	**IN**	**OUT**	**TOTAL**
250	AM Peak Hour	42	-	42	27.7%	AM Peak 15-Minute	12	--	12
	PM Peak Hour	-	34	34	28.0%	PM Peak 15-Minute	--	10	10
Total People	**Time Period**	**Exits**	**Entries**	**TOTAL**	**Peak Hour Factor**	**Time Period**	**Exits**	**Entries**	**TOTAL**
11,305	**AM Peak Hour**	**1,439**	**105**	**1,544**	**27.7%**	**AM Peak 15-Minute**	**399**	**29**	**428**
	PM Peak Hour	**70**	**1,357**	**1,427**	**28.0%**	**PM Peak 15-Minute**	**20**	**380**	**400**

Sources: Greenbelt Site Transportation Agreement (Appendix C4); WMATA (2014g); WMATA (2014e)

Overall, the Greenbelt Build Condition would result in an additional 5,296 weekday entries at the Greenbelt Metro Station, bringing the weekday station entry total to 12,752 passengers (see table 5-8). Average weekday exits would theoretically be the same or similar to the average weekday entries.

Table 5-8: Weekday 2022 Projected Metrorail Ridership at Greenbelt

Metro Station	Average Weekday Entries					
	2014	2022 Background Growth	2022 Planned Development Projects	2022 Total No-build	2022 Additional Greenbelt Build Trips	2022 Total Greenbelt Build Trips
Greenbelt	6,098	7,185	271	7,456	5,296	12,752

Source: WMATA (2014g); WMATA (2014e); MWCOG (2015); Greenbelt Site Transportation Agreement (Appendix C1)

5.5.2.1 Metrorail Passenger Loads

Metrorail passenger loads at the Greenbelt Metro Station were calculated based on projected 2022 No-Build Condition ridership (background growth plus planned development passenger trips) plus the additional Greenbelt Build Condition passenger trips disaggregated to peak 15-minute periods. Because Greenbelt is a terminal station, passenger loads are equal to the total number of exiting passengers per train in the outbound direction (trains ending at the station) or the total number of entering passengers per train in the inbound direction (trains beginning at the station). Inbound entering passengers during the PM peak period were the highest overall; therefore, PM peak 15-minute entries were used for this analysis.

No expansion of WMATA's current Metrorail fleet was assumed for this analysis to provide the most conservative estimate of potential capacity issues. The Momentum Plan does call for all eight-car trains on all lines during peak periods by the year 2020; however, this would require significant upgrades to electrical systems and a significant expansion of WMATA's current fleet of railcars (WMATA 2014g). All trains were assumed to have six cars with the exception of Blue line trains, which typically have eight during peak periods (WMATA 2014h).

WMATA has three thresholds for railcar occupancy: less than 100 passengers per car (acceptable), between 100 and 120 passengers per car (crowded), and greater than 120 passenger per car (extremely crowded). Capacity is generally considered to be 120 passengers per car. Projected passenger loads under future development conditions at the station are well below 100 passengers per car, and therefore would be considered acceptable. Table 5-9 summarizes passenger loads per car under future development conditions using PM peak 15-minute exits.

Table 5-9: Greenbelt Build Condition Peak Metrorail Passenger Loads

Measure (PM Peak 15-Minute Entries)	Unit
2014 Maximum Passengers	55
2022 Passengers with Background Growth	65
2022 Passengers with Development Projects	44
2022 Total No-build Passengers	109
2022 Minimum Trains[a]	3
2022 Train Cars[b]	18
2022 Total No-build Passengers Per Car	6
2022 Greenbelt Build Additional Passengers	380
2022 Total Greenbelt Build Passengers	489
2022 Total Greenbelt Build Passengers Per Car	**27**

[a] A 4-minute headway equates to 3.75 trains every 15 minutes. This figure was rounded down to 3 minutes in order to provide the most conservative load estimate.
[b] Assumes all six car trains to provide the most conservative estimate.
Source: WMATA (2014e); WMATA (2014g); MWCOG (2015); Greenbelt Site Transportation Agreement (Appendix C1)

5.5.2.2 Station Capacity Analysis

A capacity analysis was conducted for the vertical elements (escalators and stairs), faregate aisles, fare vending machines, and platforms at the Greenbelt Metro Station. The analysis used 2022 Greenbelt Build Condition peak 15-minute periods of ridership (entries and exits) at the station (see table 5-7).

Volume-to-capacity (v/c) ratios were calculated for the vertical elements and fare elements, and pedestrian LOS was calculated for the platform area. Analysis for vertical elements and faregate aisles used projected ridership from the peak exiting period at the station –the time period when the highest total number of passengers would use each element. Table 5-10 summarizes ridership during the peak exiting period at the Greenbelt Metro Station.

Table 5-10: Greenbelt Build Condition Weekday Peak 15-Minute Entering and Exiting Period Ridership

Metro Station	Time	2014		2022 No-build		2022 Greenbelt Build	
		Entries	Exits	Entries	Exits	Entries	Exits
Greenbelt	5:00 PM – 5:15 PM	55	353	109	456	489	476

Source: WMATA (2014e); WMATA (2014g); MWCOG (2015); Greenbelt Site Transportation Agreement (Appendix C1)

The platform area analysis and fare vending machine analysis used projected Greenbelt Build Condition ridership from the peak entering period at the station – the time period when the highest number of passengers would likely use fare vending machines and the highest number of passengers would be waiting on the platform. With the introduction of the Build Condition passengers, the peak 15-minute entering period at the Greenbelt Metro Station shifts from the 7:15 AM to 7:30 AM period to the 5:00 PM to 5:15 PM period (also the peak exiting period). Table 5-10, above, summarizes ridership during this period.

Overall, vertical elements, faregate aisles, and fare vending machines at the station are projected to operate within capacity, or below a v/c of 0.7. Additionally, platform peak pedestrian LOS (based on the available spacing between passengers) on the busiest platform sections are projected to be at the acceptable LOS B.

Table 5-11 summarizes the results of the Greenbelt Metro Station capacity analysis under the Greenbelt Build Condition, including the vertical elements, fare elements, and platforms. Further details on the station capacity analysis are found in Appendix C3.

Table 5-11: 2022 Greenbelt Build Condition Station Capacity Analysis Summary

Element		Volume to Capacity Ratio (V/C)
Mezzanine/ Platform	Entry Escalators	0.20
	Exit Escalators	-
	Stairs	0.59
Faregate Aisles		0.34
Fare Vending		0.25
Platform Peak LOS		B

Source: WMATA (2014e). WMATA (2014g); Greenbelt Station Site Inventory conducted in December, 2014; Greenbelt Site Transportation Agreement (Appendix C1)

5.5.2.3 NFPA 130 Emergency Evacuation Analysis

An emergency evacuation analysis was conducted to compare evacuation capacity of the Greenbelt Metro Station to standards set by NFPA 130 code (TRB 2013). NFPA 130 requires that station platforms be fully evacuated within 4 minutes and that all passengers reach a “point of safety” within 6 minutes. WMATA Metrorail stations, however, are not required to meet these criteria. Details on the assumptions and calculations necessitated in NFPA 130 are found in Appendix C4. A summary of the emergency evacuation analyses is included below, with further details on the station analysis included in Appendix C4.

The NFPA 130 analysis used the number of entries and exits from the peak 15-minute period under the Greenbelt Build Condition (5:00 PM to 5:15 PM) at the station. Table 5-10 summarizes the volume of passengers entering and exiting the station during this period.

Using the Greenbelt Build Condition peak 15-minute ridership period and NFPA 130 assumptions and guidelines, the platform at the Greenbelt Metro Station could be evacuated in 2.8 minutes, and the entire station could be evacuated to a point of safety within 4.8 minutes.

5.5.3 Bus Analysis

The additional bus trips associated with the Greenbelt Build Condition are summarized in table 5-12. At a local bus mode split of 6.0 percent, approximately 198 additional AM peak hour bus passenger trips and 183 additional PM peak hour bus passenger trips are projected in the study area.

Table 5-12: Greenbelt Build Condition Additional Peak Hour Local Bus Passenger Trips

Employees	Time Period	Proportion of Daily Total	Local Bus Mode Split	TOTAL LOCAL BUS TRIPS
11,055	AM Peak Hour	29%	6.0%	192
	PM Peak Hour	26.9%	6.0%	179
Briefing Center	**Time Period**	**Proportion of Daily Total**	**Local Bus Mode Split**	**TOTAL LOCAL BUS TRIPS**
250	AM Peak Hour	36%	6.0%	6
	PM Peak Hour	29%	6.0%	4
Total People	**Time Period**			**TOTAL LOCAL BUS TRIPS**
11,305	**AM Peak Hour**			**198**
	PM Peak Hour			**183**

Source: Greenbelt Site Transportation Agreement (Appendix C1)

The additional peak hour bus passenger trips associated with the Greenbelt Build Condition were added to the peak hour bus volumes calculated for the study area in the 2022 No-build Condition. The trips were added proportionally to each route within the study area based on No-build Condition ridership. The overall analysis was limited to Metrobus service, as no ridership data was available for TheBus and the Central Maryland RTA Route G only serves the study area on weekends. It can be assumed, however, that TheBus would see some minor increases in ridership on routes that serve the site.

Overall, AM peak hour Greenbelt Build Condition Metrobus volumes are projected to total 1,011 passengers, and PM peak hour volumes are projected to total 985 passengers. These totals are both below the overall capacity of services (see table 5-13) in the study area, meaning the additional passenger trips projected can be adequately handled by current service levels. The capacity of services includes the additional capacity associated with the added bus trips in the No-build Condition (five AM peak hour and eight PM peak hour). Additionally, no individual routes are expected to experience capacity issues, primarily due to the additional bus trips added in the No-build Condition. Appendix C6 has further details on the bus capacity analysis.

Table 5-13: Greenbelt Build Condition Bus Capacity Analysis

Measure	2014		2022 No- build		2022 Build Condition	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Total Volume	671	654	813	803	1,011	985
Total Capacity	1,337	1,273	1,593	1,609	1,593	1,609
Volume to Capacity Ratio (V/C)	0.50	0.51	0.51	0.50	0.63	0.61

Sources: Greenbelt Site Transportation Agreement (Appendix C1); WMATA (2014b); WMATA (2014g); MWCOG (2015)

5.5.4 Level of Impact

The increase in public transit trips from the Greenbelt Build Condition would have the following impacts to transit:

- No individual Metrobus routes would see capacity issues under the Build Condition, due to the additional peak hour bus trips planned under the No-build Condition. Therefore, the overall capacity of bus services in the study area would accommodate the projected ridership.

- Metrorail car passenger loads through the study area are projected to be at acceptable levels.
- Overall, Metrorail vertical elements, faregate aisles, and fare vending machines at the Greenbelt Metro Station are projected to operate below capacity.
- Metrorail platform peak pedestrian LOS (based on the available spacing between passengers) on the busiest platform sections are projected to be at the acceptable LOS B at the Greenbelt Metro Station.
- Platform and station evacuation times would increase slightly over the No-build Condition; however, they would continue to meet NFPA 130 standards.

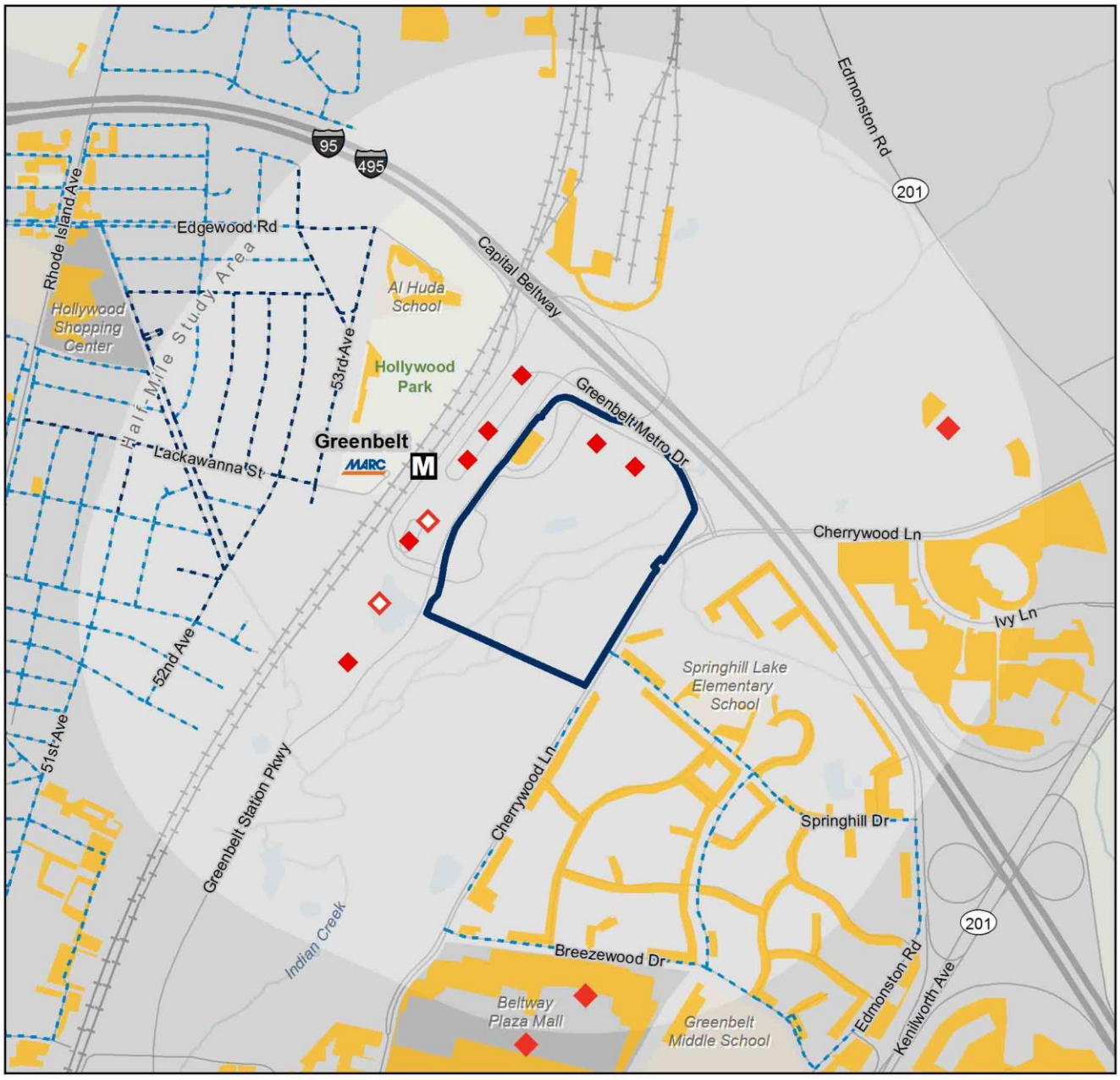
Therefore, the Greenbelt Build Condition would have no measurable direct, long-term impacts to public transit capacity based on the impacts definitions described in Section 2.3. In addition, bus operation delays along Edmonston Road would impact three bus routes, resulting in direct, long-term, major adverse impacts to bus operations. Because buses regularly service Greenbelt Metro Drive, there would be direct, short-term, adverse construction impacts caused by construction vehicles blocking some or all of the lanes and intermittent road closures.

5.6 Parking

Under the Build Condition, employee parking garages would be located to the north of the Main Building developable area along the northern site boundary, adjacent to Greenbelt Metro Drive (figure 5-3). Given the distance to the nearest transit station, and in accordance with NCPC parking policy, a parking ratio of one parking space for every three employees would be maintained, equating to approximately 3,600 spots. In the conceptual site layout analyzed in the EIS, these spaces would be accommodated in two, eight-story parking structures. The final number and layout of the parking structures to accommodate the required employee and fleet vehicle parking would be determined during the design process. Up to 135 visitor parking spaces would be provided near the Visitor Center.

While all employee and visitor parking is envisioned to be accommodated onsite, it is likely that there would be more employee demand for driving than there are parking spaces due to the less than 1:1 ratio of parking spaces to employees (not all employees will have a parking spot) as recommended by NCPC policies. As an “end-of-the-line” station, Metrorail may not seem like the best travel option from other sides of the city. Therefore, some employees may try to park on local streets or park on local residential streets that do not have parking restrictions, and possibly even try to park on those residential streets with parking restrictions. Still others may choose to pay to park in local area parking garages that will be built as part of the Greenbelt Station development. Development and implementation of a Transportation Management Plan (TMP), which includes Transportation Demand Management (TDM) measures that will encourage employees to use transit and discourage employees from driving and parking offsite, will address these issues and reduce any adverse parking impacts anticipated at the Greenbelt site. With implementation, monitoring, and enforcement of a TMP, and revisions as needed, the Build Condition would result in no measurable direct, long-term impacts to local area parking. Assuming all construction equipment and employee parking areas would be contained to the Greenbelt site, there would be no measurable direct, short-term impacts to parking in the study area during the construction period.

Figure 5-3: Greenbelt Site Parking



5.7 Truck Access

Truck access for the Greenbelt site would occur at the southwestern corner of the site off of Greenbelt Station Parkway. Trucks would enter through the South Access and exit through a separate driveway from the RDF to Greenbelt Station Parkway. Trucks would also only be permitted to enter and exit during non-peak hours, therefore peak traffic hours on adjacent roadways would not be impacted. Truck entrance and exit locations and restricted hours would be noted at entrance locations and communicated to those services that would provide regular truck delivery to the site.

Therefore, under the Build Condition, there would be no measurable direct, long-term impacts to truck access given communication of truck access regulations. Assuming the Greenbelt site would have access entrances and exits assigned for construction equipment and general trucks during the construction period, there would be no measureable direct, short-term impacts to truck access.

5.8 Traffic Analysis

The future projected traffic analysis is based on the proposed alternative to consolidate FBI HQ at the Greenbelt site. The next sections describe the process the study followed to project future traffic volumes through three primary assumptions: trip generation, modal split, and trip distribution, followed by the impacts as a result of the proposed alternative.

5.8.1.1 Total Vehicle Trips

The projected person trips are explained in the Trip Generation and Modal Split section (see Section 5.2). Based on the trip generation rates combined with the SOV and HOV modal split and persons per carpool, the total vehicle trips are forecasted to be 1,025 inbound and 75 outbound during the AM peak hour and 49 inbound and 966 outbound during the PM peak hour.

Tables 5-14 and 5-15 summarize the vehicle trips based on the trip generation and the mode split.

Table 5-14: AM Peak Hour Vehicle Trips

Calculated Steps	AM Peak Hour (7:45 AM – 8:45 AM)									
	FBI Employees				Briefing Center [a]				Total People	
	Inbound		Outbound		Inbound		Outbound		TOTAL	
	SOV	HOV	SOV	HOV	SOV	HOV	SOV	HOV	In-bound	Out-bound
Employees or Seats	11,055				250					
Trip Generation	29%				36%					
Inbound/ Outbound Split	93%		7%		100%		0%			
Modal Split	29.7%	11.0%	29.7%	11.0%	29.7%	11.0%	29.7%	11.0%		
Total Trips without HOV adjustment	886	328	67	25	27	10	0	0		
HOV Vehicle Occupancy		3		3		3		3		
Total Trips	**886**	**109**	**67**	**8**	**27**	**3**	**0**	**0**	**1,025**	**75**

[a] Assumes a 500-seat facility where external trips represent 50% of attendees.

Table 5-15: PM Peak Hour Vehicle Trips

Calculated Steps	PM Peak Hour (5:00 PM – 6:00 PM)									
	FBI Employees				Briefing Center [a]				Total People	
	Inbound		Outbound		Inbound		Outbound		TOTAL	
	SOV	HOV	SOV	HOV	SOV	HOV	SOV	HOV	In-bound	Out-bound
Employees or Seats	11,055				250					
Trip Generation	26.9%				29%					
Inbound/ Outbound Split	5%		95%		0%		100%			
Modal Split	29.7%	11.0%	29.7%	11.0%	29.7%	11.0%	29.7%	11.0%		
Total Trips without HOV adjustment	44	16	839	311	0	0	22	8		
HOV Vehicle Occupancy		3		3		3		3		
Total Trips	**44**	**5**	**839**	**104**	**0**	**0**	**22**	**3**	**49**	**967**

[a] Assumes a 500-seat facility where external trips represent 50% of attendees.

5.8.2 Trip Distribution

Based on the Greenbelt Site Transportation Agreement, it is assumed that 50 percent of existing FBI employees would be consolidated at the Greenbelt site and the other 50 percent would represent FBI employees who would choose to locate in proximity of the proposed Greenbelt site.

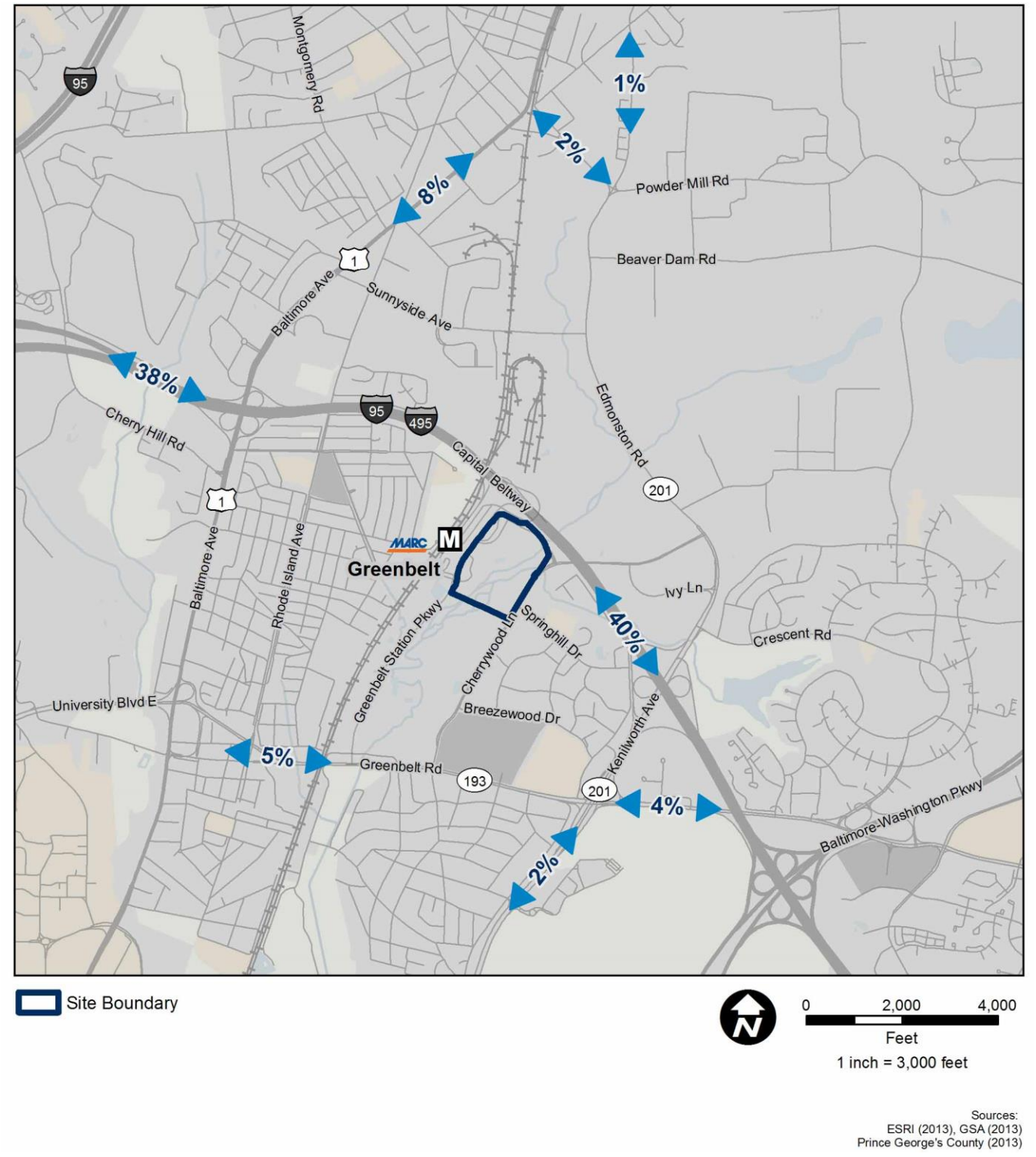
The trip distribution for work trips is composed of two sources, the existing FBI home zip codes and MWCOG travel demand model. The FBI estimates that approximately 50 percent of the existing FBI staff would retire, transfer to another FBI site outside the National Capital Region, or resign once the new HQ is operational; therefore, 50 percent of the distribution is based on the FBI zip code database. The existing FBI home zip codes are used as the home origin and home destination. The other 50 percent of trips are based on distribution patterns in the Greenbelt area from the 2020 MWCOG travel demand model for home-based work trips (MWCOG 2014a), since the model trip tables represent a more local distribution reflecting new employee interest in residing close to the consolidated FBI HQ. The two distribution patterns (home zip code plus MWCOG trip tables) were averaged to form a blended trip distribution. Because the Mission Briefing Center external vehicle trips would most likely not resemble a localized trip pattern, the study used the same blended trip distribution for these vehicle trips.

Table 5-16 shows the Greenbelt Site Transportation Agreement approved blended trip distribution percentages to/from each origin/destination. Figure 5-4 contains the Greenbelt site trip distribution.

Table 5-16: Greenbelt Site Build Condition Trip Distribution Summary

Roadway and Direction	Percentages		AM Trips		PM Trips	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
I-95/I-495 NB	38.0%	38.0%	389	29	19	367
I-95/I-495 SB	40.0%	40.0%	410	30	20	386
U.S. Route 1 NB	8.0%	8.0%	82	6	4	77
Powder Mill Road	2.0%	2.0%	20	2	1	19
MD 193 WB	5.0%	5.0%	51	4	2	48
MD 193 EB	4.0%	4.0%	41	3	2	39
MD 201 NB	1.0%	1.0%	10	1	0	10
MD 201 SB	2.0%	2.0%	20	2	1	19
Total	**100.0%**	**100.0%**	**1,025**	**75**	**49**	**966**

Figure 5-4: Greenbelt Site Build Condition Trip Distribution



5.8.3 Entry Control Facility

The ECF is a security check point for all vehicles to pass through to access the internal roadway serving the parking garages, loading docks, and other components of the Greenbelt site. Each vehicle would be expected to

stop at the facility while FBI security personnel screen the vehicle and occupants before allowing it to proceed. Similar to a tollgate along a highway, the ECF might cause a queue; therefore, part of the analysis must determine if a queue might spill beyond the planned driveway

The ECF has four elements: separate lanes for FBI security personnel to process each vehicle as it arrives at the Greenbelt site; barriers separating each lane; a stop line where each vehicle would be processed; and a merging area after the processing area. Each of these components was coded in the TransModeler™ Traffic Simulation Software (TransModeler™) to best represent the conditions each vehicle would experience as it enters the Greenbelt site. Based on the preliminary conceptual site plan, TransModeler™ allows the ECF components to be situated at their proper location based on the set-back distances already determined through the site plan planning process. Because the preliminary conceptual site plan called for two lanes serving the ECF from each proposed entrance along Greenbelt Station Parkway, five lanes were initially coded to ensure enough capacity. The preliminary conceptual site plan called for two lanes serving the ECF from the southern Greenbelt Station Parkway entrance and two lanes serving the ECF from the northern Greenbelt Station Parkway entrance; however, to avoid any potential delays three-lanes were initially coded for the southern entrance the two lanes were coded for the northern entrance.

The ECF processing times are a critical component of the analysis because the times determine the number of lanes required at each ECF facility to avoid the queue spilling onto the external roadways (Greenbelt Station Parkway in this case). It was determined that existing processing times at the JEH building would provide the best indication of future processing time at the three alternative sites. A special ECF processing study was undertaken on December 4, 2014, between 6:20 AM and 7:50 AM during the AM peak period. Processing times and vehicle occupancy were recorded for each vehicle (78 vehicles) entering the JEH parking garage located under the building. A parking garage guard shift change occurred during the survey midpoint, allowing approximately half the sampling during the first guard and half during the second guard, thereby providing a good cross section of processing times. Processing times ranged from 7 seconds for SOV vehicles up to 103 seconds for vanpools.

Based on the processing times obtained through the survey, a probability triangle was created to develop a range of vehicle processing times to code into TransModeler™. These probabilities range from 10 percent to 90 percent, fitting a triangular distribution (a continuous probability distribution shaped like a triangle defined by three values: the minimum or 10th percentile value, the maximum or 90th percentile value, and the peak or 50th percentile value). Based on the survey, there was an average of 14.1 seconds per vehicle, which includes carpools and vanpools entering. Since the carpool and vanpools represent a small number of vehicles entering and have much higher processing times than SOVs, the average without those vehicles was calculated, resulting in 12.3 seconds per SOV vehicle. The 14.1 second value was assigned the 90th percentile and the 12.3 seconds was assigned the 50th percentile. To be conservative, the 10th percentile was calculated based on the percent difference between 50th percentile value (12.3 seconds) and 90th percentile value (14.1 seconds).The difference of 1.73 percent subtracted from 12.3 seconds resulted in a 10th percentile value of 10.6 seconds per vehicle. Since TransModeler™ requires a percentage assigned to each processing time, the 15th and 85th percentiles were interpolated to fill in the remaining 30 percent in the processing times. Table 5-17 contains the processing probabilities.

Table 5-17: Processing Probabilities

	10th Percentile	15th Percentile	50th Percentile	85th Percentile	90th Percentile
Percentage used in TransModeler™	10	15	50	15	10
Vehicles per Second	10.6	10.8	12.3	13.9	14.1

Once the ECFs were coded, simulations were run to observe how TransModeler™ assigned each vehicle to the available lanes. Calibrations were entered to balance the use of available lanes, thus providing the highest capacity given the available queuing space. The ECF analysis was conducted after all the external roadway mitigation measures (recommended improvements to address failing traffic operations) were determined. This allowed for TransModeler™ to be coded with the recommended lane geometry (number of left-turn, through, and right-turn lanes) and traffic signal timings before testing the ECF queuing, thus the maximum number of inbound FBI vehicles would be entering the Greenbelt site.

The ECF simulation analysis followed a statistical approach. This was performed by running the simulation 25 times to calculate the standard deviation based on the vehicle hours of travel (VHT) metric. VHT provides a good indication of vehicle delays by requiring more simulations given facility operation and queuing issues. Using the calculated standard deviation, the number of simulations required was calculated to be within plus or minus 2 percent at the 95th percentile confidence interval (when all the required simulation runs are averaged, 95 percent of the results will be accurate to within plus or minus two percent).

Once the simulations were completed, three different measures were extracted from TransModeler™ to report the estimated queuing based on the total number of available lanes. These measures included vehicles processed per hour, average queue length (similar to the 50th percentile queue length) and maximum queue length (similar to a 100th percentile queue length). Together, these values provide an indication whether or not the available queue space would provide enough storage or the queue will impact Greenbelt Station Parkway.

Based on the ECF processing time probabilities entered into TransModeler™, the software reported an upper limit of approximately 200 vehicles per hour per entry lane being processed. By comparison, the *Better Military Traffic Engineering Pamphlet 55-17* (SDDCTEA 2011), reports the lowest range of vehicle throughput for manually controlled operations as 300 vehicles per hour per lane. This value represents conditions at a military base under the BRAVO Force Protection alert status or a condition where each vehicle would be required to be inspected as well as each occupant. The ECF processing time therefore represents a reasonable and conservative estimate.

5.8.4 Development of Build Condition

Since there are multiple routes that could be accessed between Greenbelt Road and the site as well as ways to enter and exit from the adjacent roadways, TransModeler™ also performed the selection of which route to assign vehicle trips. Performing the vehicle assignments required validating and calibrating the TransModeler™ developed roadway network. Appendix C9 contains the TransModeler™ validation and calibration process.

Once calibrated and validated based on the existing conditions, the study area intersections (modeled network) were adjusted to match the optimized traffic signal settings calculated through the No-build Condition. This reflects adjusted signal timings based on the No-build Condition projected vehicle volumes because it is assumed that Maryland SHA would revise the traffic signals to improve the vehicle flow over the next 8 years leading to 2022 based on vehicle volumes changing due to the planned developments.

The Greenbelt site internal roadway network was added to the modeled network based on the preliminary conceptual site plan, which included roadway connections to the external network. Because of the magnitude of the proposed development in terms of FBI vehicle trips, the intersections serving the Greenbelt site were designed with traffic signals and optimized to handle an estimate of the future Build Condition traffic volumes. These intersection upgrades are probably mitigation measures and are further analyzed in the Build with Mitigation Condition to determine their final recommended design. Synchro™ was used to develop the traffic signal timing plans and entry and exit driveway lane geometry based on forecasted FBI vehicle volumes. The following potential mitigation measures were coded to reflect necessary upgrades to the intersections serving the site driveways.

- Greenbelt Metro Drive and Site North Access (exit only): Install a traffic signal at the intersection.
- Update the traffic signal timing along Greenbelt Station Parkway by optimizing the timings based on the forecasted FBI vehicle trips and coordinate the signals.

The entry driveways leading to ECF facilities were coded to match or exceed the number of entry lanes designed in the preliminary conceptual site plan to minimize trip assignment (trip redistributions that would occur in the model) based on ECF facility delays. (Note that the revised conceptual site plan shows six total inbound lanes due to the analysis performed in the mitigation section) to minimize trip assignment based on ECF facility delays. These facilities are considered part of the preliminary conceptual site plan and are not mitigation measures. The following two locations were coded in TransModeler™ to serve as entrances leading to the ECFs:

- Greenbelt Station Parkway and Site South Access: Three-lane entry only
- Greenbelt Station Parkway and Site Northwest Access: Two-lane entry and one-lane exit

Following a few more simulation trails using TransModeler™, it became necessary to improve the manner in which the internal roadways were proposed to operate to avoid major queuing issues inside the fence. Thus, the following adjustments were coded in TransModeler™:

- Upgrade the intersection between the roadway accessing the Site South Access (north-south orientation) and the roadway connecting the Site Northwest Access and garages to a traffic signal control to avoid causing a queue along the Site South Access back through the ECF
- Assign the middle lane along the Site Northwest Access as reversible depending on the time of day (eastbound during the AM peak period and westbound at all other times)

Once the modeled network contained the No-build Condition traffic signal timings, connections between the Greenbelt site and external roadway, traffic signals directly serving the proposed site driveways, and internal improvements, TransModeler™ was used to assign vehicle trips to the modeled network through a process called Dynamic Traffic Assignment (DTA). The DTA is a process where vehicle trips are assigned through a testing process during a number of simulation runs. The DTA goal is to develop a trip assignment that provides the best travel times for all vehicles. Once the vehicle travel times are minimized, the number of vehicles assigned to each route where multiple routes between the same origin and destination exist will be balanced. This mimics the activity commuters undertake then they seek alternative routes to avoid traffic delays. Commuters naturally improve traffic conditions where an alternative route has the capacity to handle the increase in vehicle volumes. To allow the software to test a number of options, the software was set for 30 simulation runs. At the conclusion of the simulation runs, the software recorded the version with the best vehicle travel times; these vehicle routes were used to perform the operation and queue analysis using Synchro™. Since there two entrances and exits to the Greenbelt site both resulting in similar travel distances between I-95/I-495 and the proposed parking garages on the site, the DTA result provided a split between the two entrances and two exits. Table 5-18 contains the DTA vehicle assignment. Figure 5-5 shows the Build Condition trip generation turning movement volumes and figure 5-6 contains the Build Condition turning movement volumes, and figure 5-7 contains the Build Condition lane geometry.

Table 5-18: DTA Vehicle Assignments

Route Origin	Primary Route to Site	AM Peak Hour		PM Peak Hour	
		Inbound	Outbound	Inbound	Outbound
I-95/I-495 North	Site South Access	48%	N/A	Closed	N/A
	Greenbelt Station Parkway/Site Northwest Access	52%	100%	100%	100%
I-95/I-495 South	Site South Access	50%	N/A	Closed	N/A
	Greenbelt Station Parkway /Site Northwest Access	50%	0%	100%	0%
	Site North Access/Greenbelt Metro Drive	N/A	100%	N/A	100%
U.S. Route 1 North via I-95 North	Site South Access	44%	N/A	Closed	N/A
	Greenbelt Station Parkway /Site Northwest Access	56%	100%	100%	100%
Powder Mill Road via Cherrywood Drive	Greenbelt Metro Drive/Site South Access	15%	N/A	Closed	N/A
	Greenbelt Metro Drive/Site Northwest Access	85%	0%	No Trips	0%
	Site North Access/Greenbelt Metro Drive	N/A	100%	No Trips	100%
Greenbelt Road West	Greenbelt Station Parkway/Site South Access	60%	N/A	Closed	N/A
	Greenbelt Station Parkway/Site Northwest Access	40%	0%	100%	0%
	Site North Access/Metro Drive/Cherrywood Lane	N/A	100%	N/A	100%
Greenbelt Road East	Greenbelt Station Parkway/Site South Access	60%	N/A	Closed	N/A
	Greenbelt Station Parkway/Site Northwest Access	40%	0%	100%	0%
	Site North Access/Metro Drive/Cherrywood Lane	N/A	100%	N/A	100%
Edmonston Road North via Cherrywood Lane	Greenbelt Metro Drive/Greenbelt Station Parkway/Site South Access	0%	N/A	Closed	N/A
	Greenbelt Metro Drive/Greenbelt Station Parkway/Site Northwest Access	100%	No Trips	100%	0%
	Site North Access/Metro Drive	N/A	No Trips	N/A	100%
Kenilworth Avenue South	Cherrywood Lane/Greenbelt Metro Drive/Greenbelt Station Parkway/Site Northwest Access	40%	N/A	Closed	N/A
	I-95 South/ Site South Access	30%	N/A	Closed	N/A
	I-95 South/Site Northwest Access	30%	0%	100%	0%
	Site North Access/Greenbelt Metro Drive/I-95 South	N/A	100%	N/A	80%
	Site North Access/Greenbelt Metro Drive/Cherrywood Lane	N/A	0%	N/A	20%

Figure 5-5: Build Condition Trip Generation

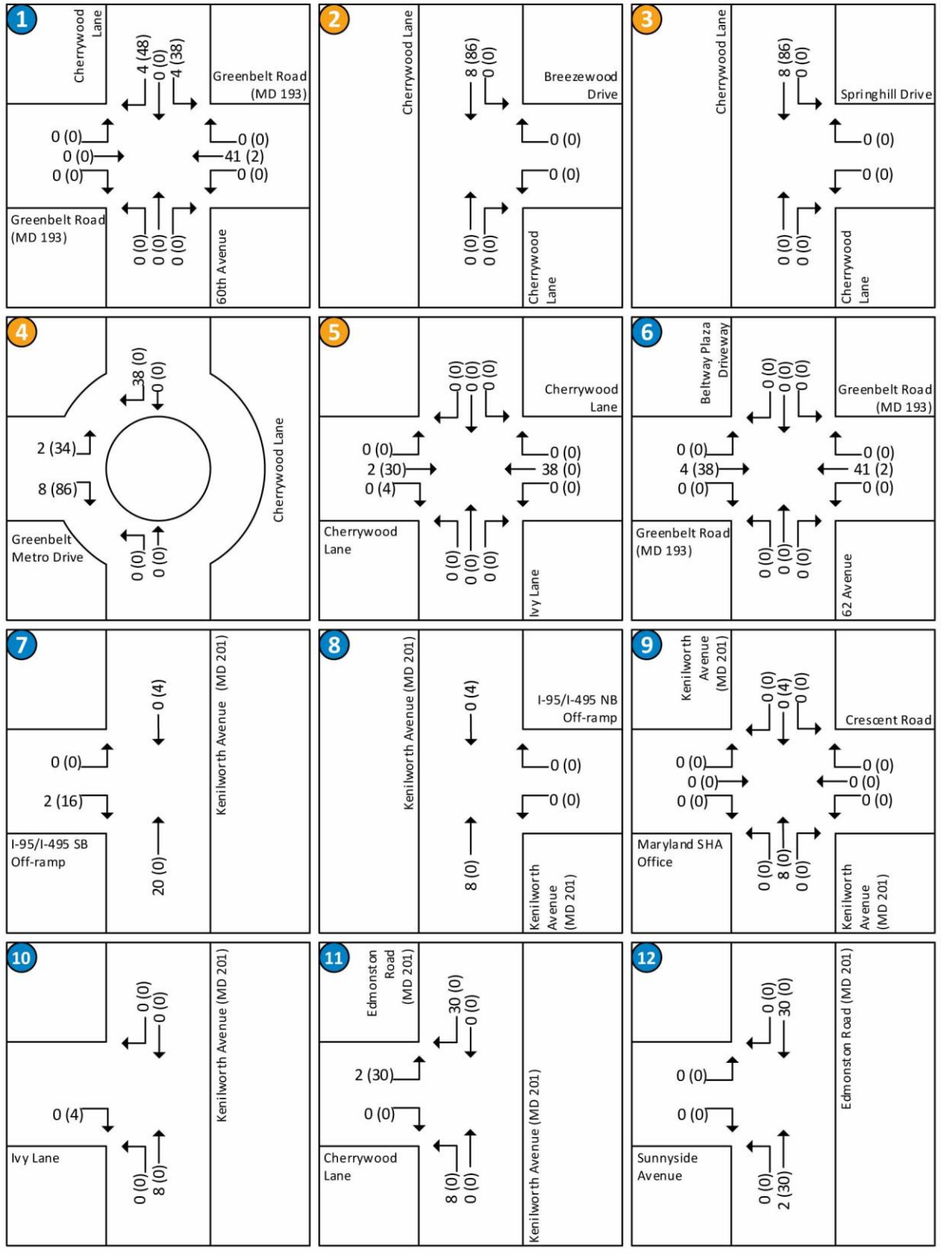
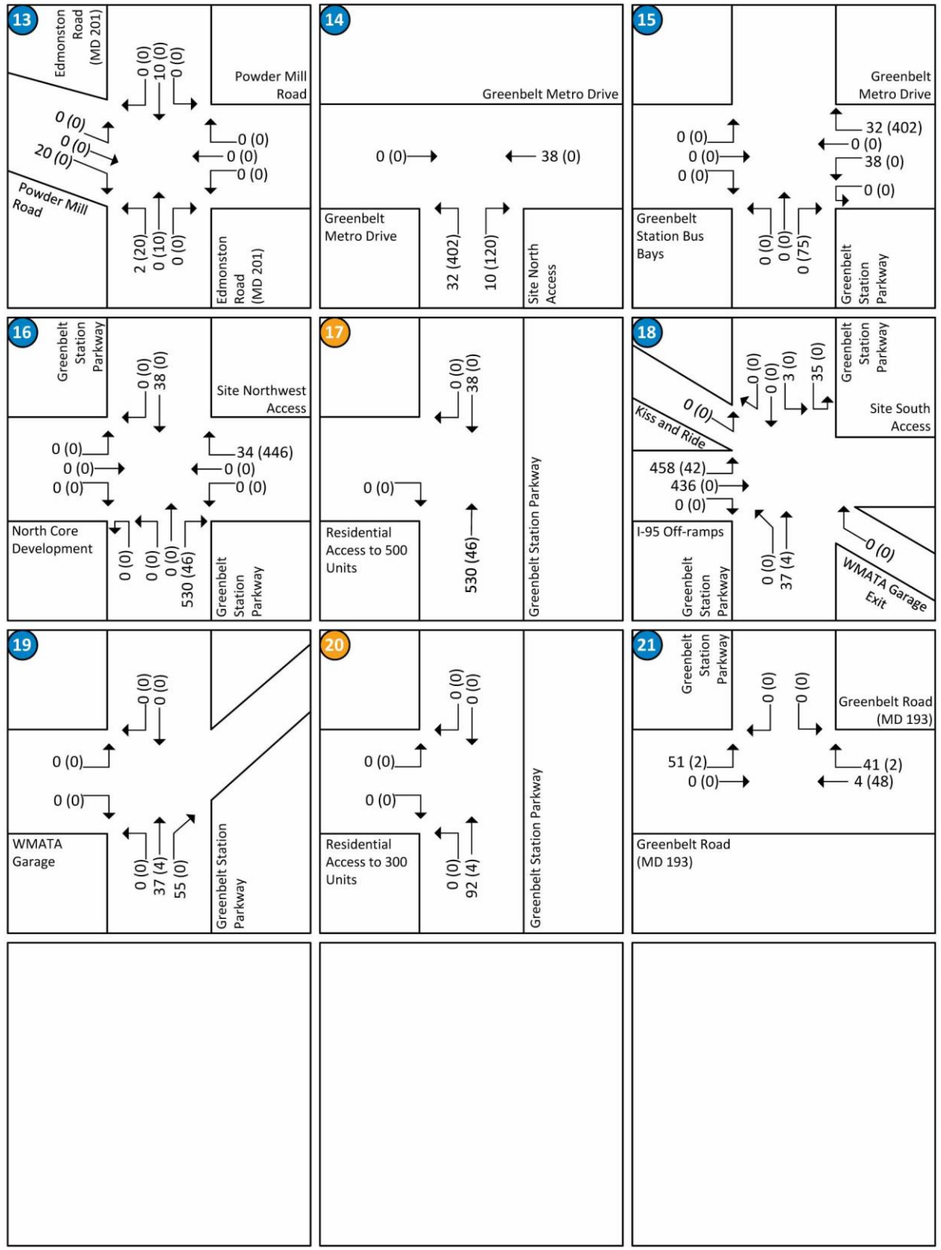


Figure 5-5: Build Condition Trip Generation (continued)



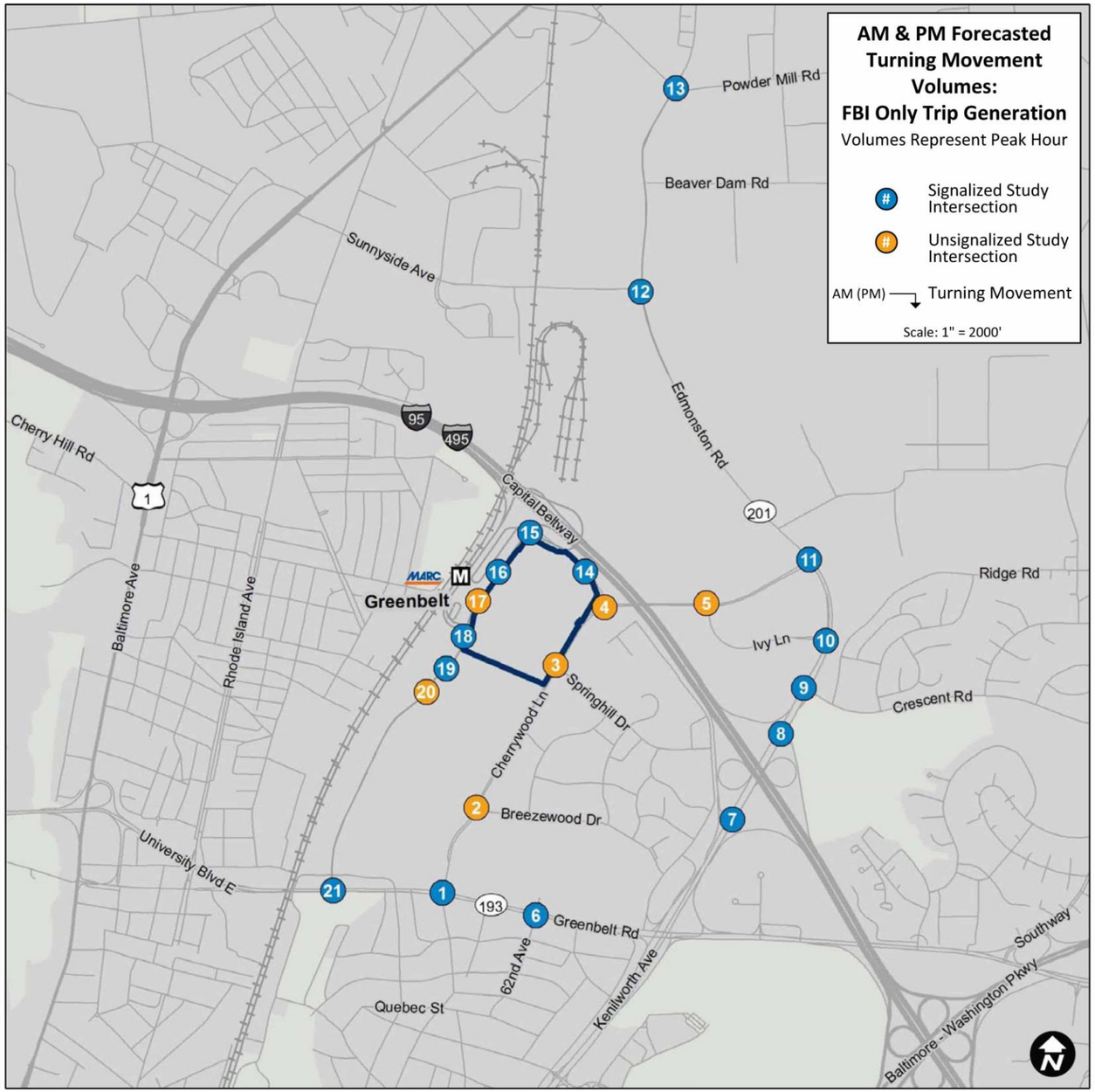


Figure 5-6: Build Condition Turning Movement Volumes

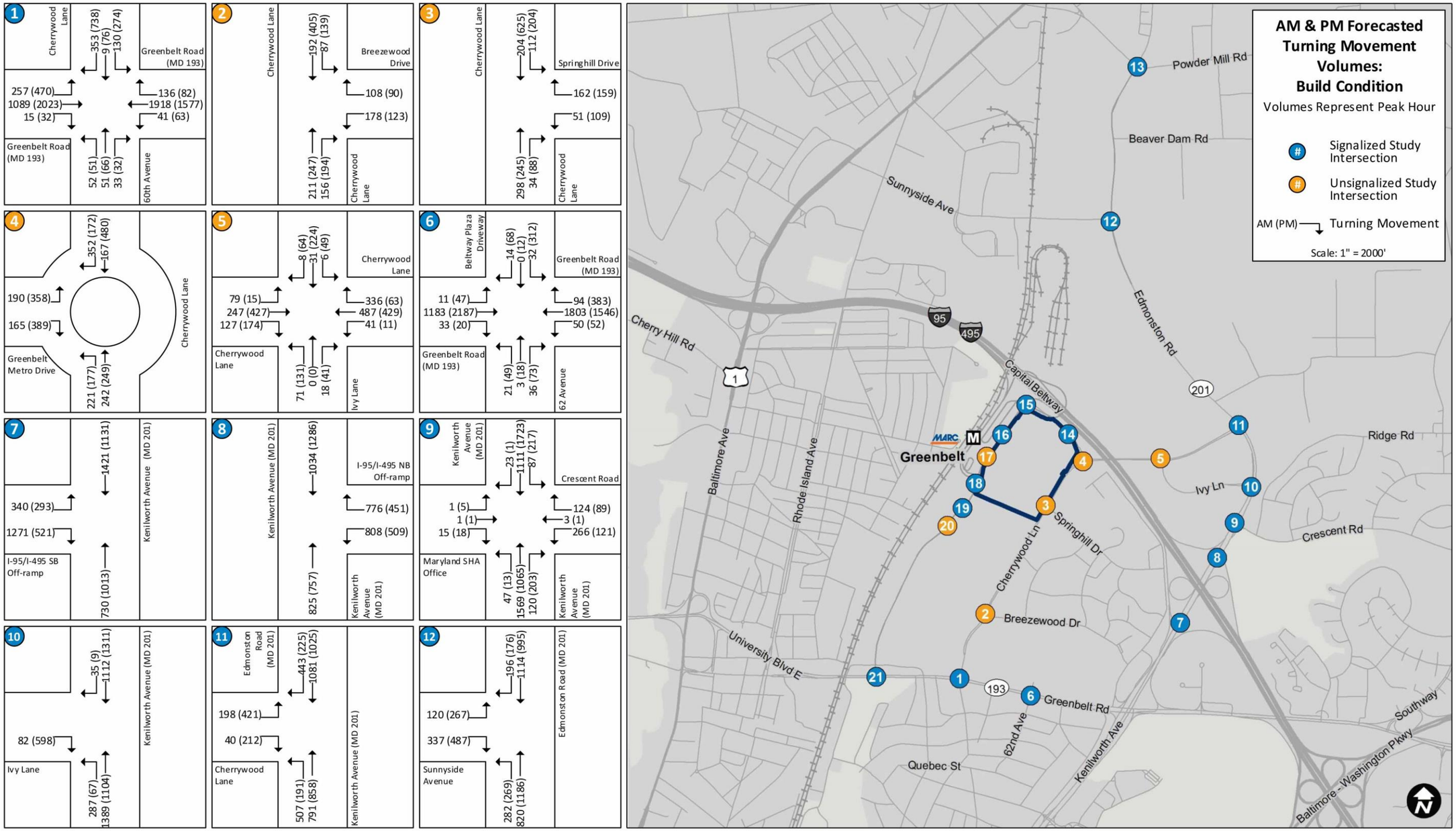


Figure 5-6: Build Condition Turning Movement Volumes (continued)

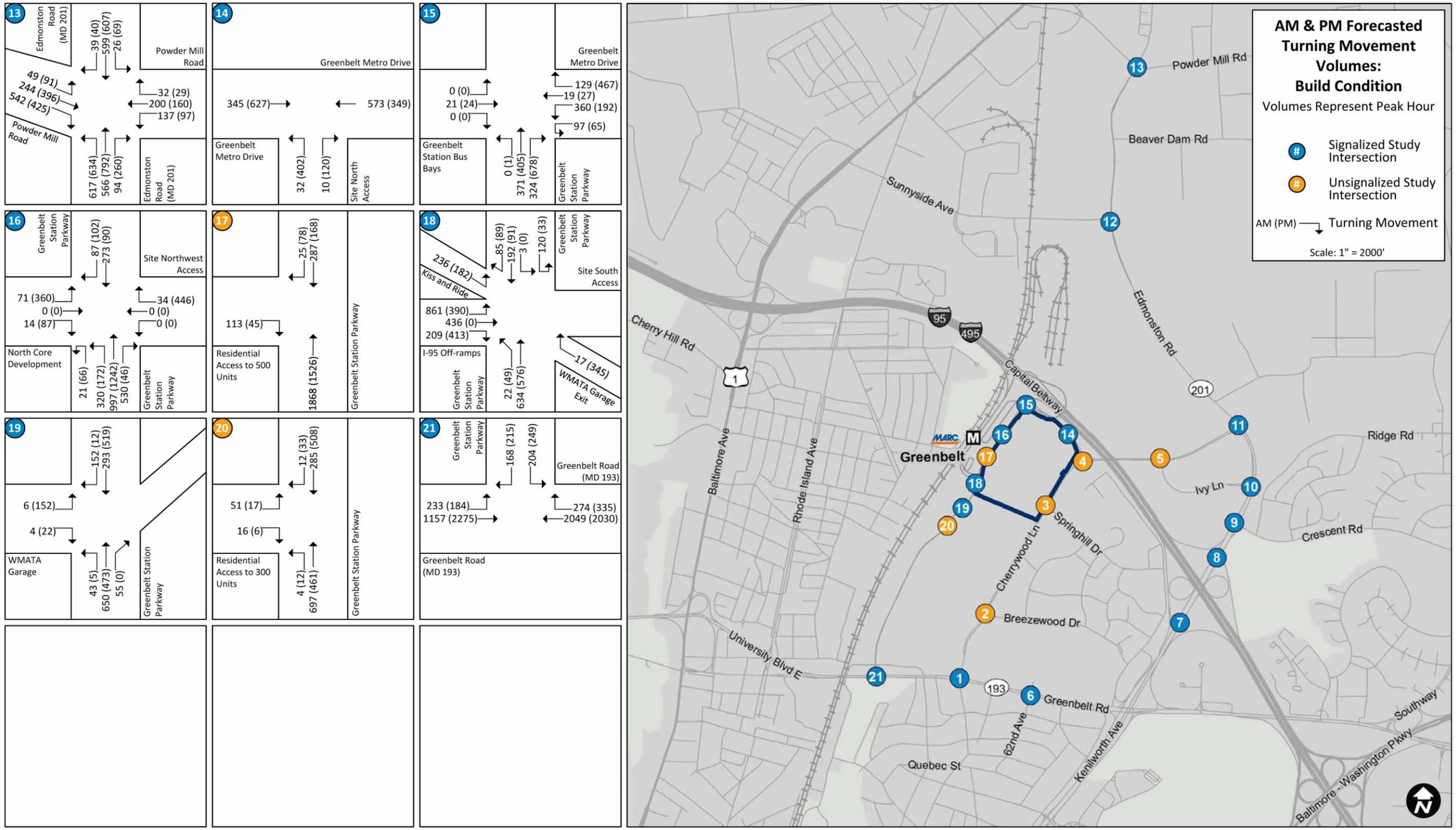
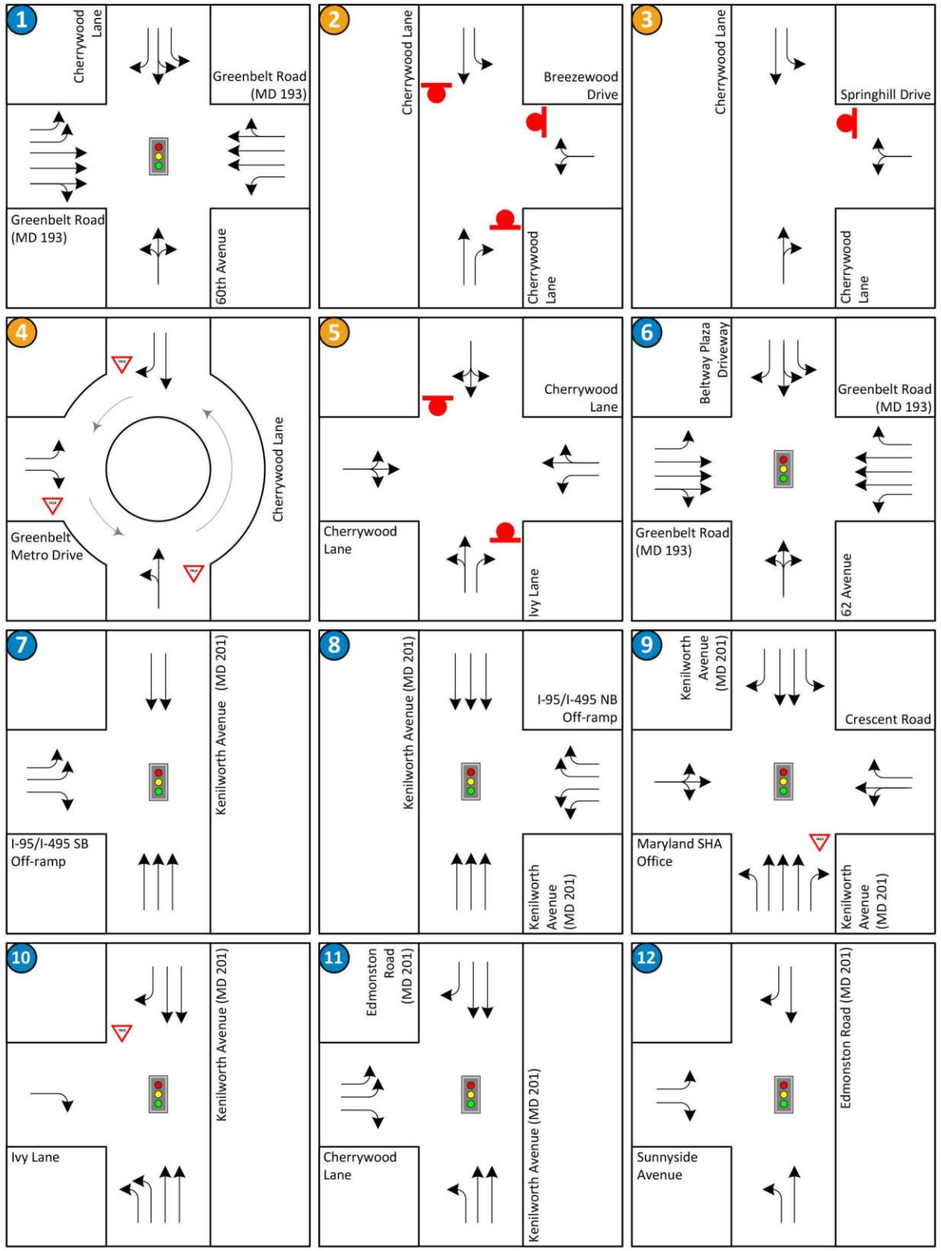


Figure 5-7: Build Condition Lane Geometry



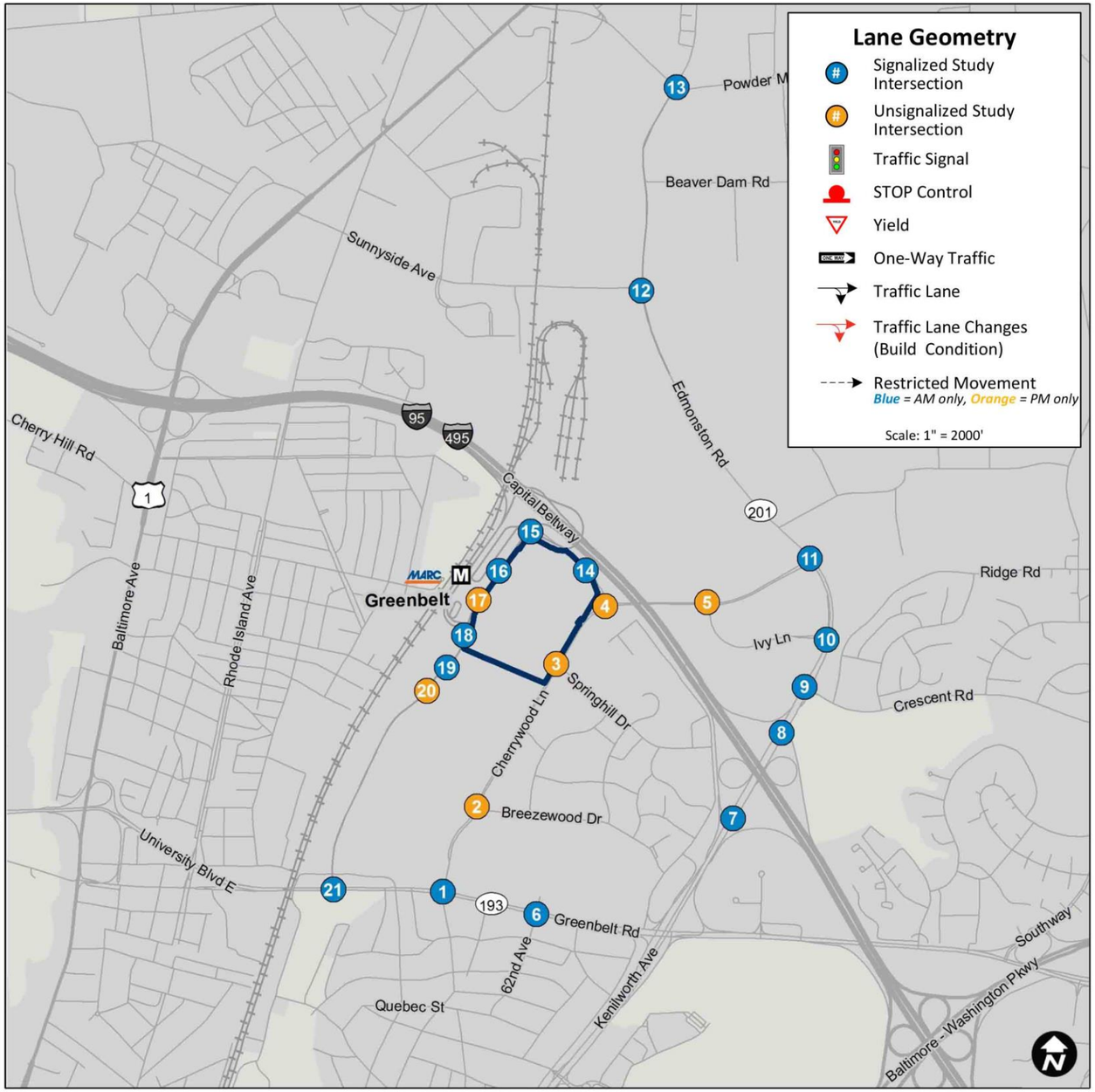


Figure 5-7: Build Condition Lane Geometry (continued)

5.8.5 Build Condition Operations Analysis

Synchro™ was used to calculate the vehicle delay and LOS operation based on the HCM 2000 method for each study area intersection. Custom-designed Excel sheets were used to calculate the LOS operation based on the CLV method. Based on the Synchro™ and CLV-based Excel worksheet analysis, many of the signalized study area intersections would operate at acceptable overall conditions during the morning and afternoon peak hours. However, the following intersections in the study area would operate with overall unacceptable conditions, which includes LOS E or LOS F using the HCM 2000 method or LOS F using the CLV method:

- Edmonston Road (MD 201) and Sunnyside Avenue (Intersection #12) would operate at CLV LOS F during the PM peak hour (same failure in No-build Condition)
- Edmonston Road (MD 201) and Powder Mill Road (Intersection # 13) would operate at CLV LOS F during the PM peak hour (same failure in No-build Condition)

Greenbelt Station Parkway I-95/I-495 Off-ramps/Site South Access/Kiss & Ride would operate at HCM LOS F during the AM peak hour (Intersection # 18).

Based on the Synchro™ analysis, the following individual signalized intersection lane groups or overall approaches would operate under unacceptable conditions (LOS E or LOS F) during the morning or afternoon peak hours. The lane group within the approach that would operate under unacceptable conditions is noted in parentheses; when “overall” is noted, the overall approach movements would operate under unacceptable conditions.

- Greenbelt Road (MD 193) and Cherrywood Lane/60th Avenue (Intersection #1)
    - Eastbound Greenbelt Road (left turns), during the AM peak hour
    - Westbound Greenbelt Road (left turns), northbound 60th Avenue (overall) and southbound Cherrywood Lane (overall) for the AM and PM peak hours
- Greenbelt Road (MD 193) and 62nd Avenue/Beltway Plaza Driveway (Intersection #6)
    - Northbound 62nd Ave (overall) and southbound Beltway Plaza Driveway (overall) during AM and PM peak hours
- Kenilworth Avenue (MD 201) and Crescent Road/Maryland SHA Office (Intersection #9)
    - Southbound Kenilworth Avenue (left turns) during AM peak hour
    - Northbound Kenilworth Avenue (left turns) during the PM peak hour
- Edmonston Road (MD 201) and Sunnyside Avenue (Intersection #12)
    - Eastbound Sunnyside Avenue (overall) and northbound Edmonston Road (left turns) during the AM and PM peak hours
- Edmonston Road (MD 201) and Powder Mill Road (Intersection #13)
    - Eastbound Powder Mill Road (through movements) and westbound Powder Mill Road (left turns) during the AM peak hour
    - Eastbound Powder Mill Road (overall), westbound Powder Mill Road (left turns), northbound Edmonston Road (left turns) and southbound Edmonston Road (overall) during the PM peak hour
- Greenbelt Station Bus Bays/Greenbelt Metro Drive & Greenbelt Station Boulevard (Intersection #15)
    - Eastbound Greenbelt Station bus bays (overall) during the AM peak hour
- Greenbelt Station Parkway and North Core Development/Site Northwest Access (Intersection #16)
    - Eastbound North Core Development (overall), and westbound Site Northwest Access (overall) during the AM peak hour
- Greenbelt Station Parkway and I-95/I-495 Off-ramps/Site South Access/Kiss & Ride (Intersection #18)

    - Eastbound I-95 off-ramps (overall), eastbound kiss and ride (overall) and northbound Greenbelt Station Parkway (left turns) during the AM peak hour
    - Southbound Greenbelt Station Parkway (overall) during the PM peak hour
- Greenbelt Station Parkway and WMATA Garage (Intersection #19)
    - Eastbound WMATA garage (overall) and northbound Greenbelt Station Parkway (combined left and through movements) during the AM peak hour
- Greenbelt Road (MD 193) and Greenbelt Station Parkway (Intersection #21)
    - Eastbound Greenbelt Road (left turns) and southbound Greenbelt Station Parkway (overall) during the AM peak hour
    - Eastbound Greenbelt Road (left turns) and southbound Greenbelt Station Parkway (left turns) during the PM peak hour

5.8.5.1 Unsignalized Intersection Operations Analysis

Based on the unsignalized intersection analysis, only the intersection of Cherrywood Lane and Ivy Lane (Intersection #5) would operate at overall unacceptable conditions during Condition. All other unsignalized intersections in the study area would operate at acceptable overall conditions during the AM and PM peak hours.

The following individual unsignalized intersection lane groups or overall approaches also would operate under unacceptable conditions (LOS E or LOS F) during the morning or afternoon peak hours:

- Westbound Springhill Drive (overall) at the intersection of Cherrywood Lane and Springhill Drive during the PM peak hour (Intersection #3)

- In addition to the overall intersection failing at Cherrywood Lane and Ivy Lane during the PM peak hour, the northbound (left and through movement) and southbound (all movements) approaches on Ivy Lane would fail during the AM peak hour (Intersection #5)

5.8.5.2 Complete Intersection Operations Analysis

This section summarizes the differences in LOS impacts between the Build Condition and the No-build Condition by quantifying the change in intersection operation failures. Following the summary, this section also includes the complete results of the operations analysis in both figures and a table.

Based on the Synchro™ analysis, a total of 10 signalized and 2 unsignalized intersections would experience unacceptable conditions for one or more turning movements. Compared to the No-build Condition, the Build Condition would have one more intersection failing during the AM peak hour and there would be no change in the number of intersections failing during the PM peak hour. In the AM peak hour, compared to the No-build Condition, one intersection that passed overall but now fails, 20 that have not changed, and zero that were failing but now pass. In the PM peak hour there are zero intersections that passed overall but are now failing, 21 that have not changed, and zero that were failing but now pass.

Table 5-19 provides a summary of the number of intersections that meet the following criteria for the overall directional approach that would change between the No-build and the Build Conditions:

Table 5-19: Intersection Operations Summary Comparing No-build Condition to Build Condition

Type of Change Between Conditions	AM	PM
New Failing Approach	0	0
Additional Failing Approaches	1	0
No Change	20	21
Fewer Failing Approaches	0	0
No Failing Approaches	0	0
Total Signalized and Unsignalized Intersections	**21**	**21**

The average LOS for the various approaches to the intersections and the overall intersection LOS grades for the Build Condition are depicted in figures 5-8 and 5-9 for the AM and PM peak hours, respectively. Table 5-20 shows the results of the LOS capacity analysis and the intersection projected delay under the No-build Condition compared to the Build Condition during the AM and PM peak hours.

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