APPENDIX C

TRANSPORTATION

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APPENDIX C

TRANSPORTATION

Alternative B and C - regional destination visitor center at Hemphill Knob

A peak day for the regional destination visitor center at the Hemphill Knob site is assumed to be an October weekend day. The regional destination visitor center is not predicted to have special events that would take place during the regular hours of the regional destination visitor center and the October visitation is generally the highest at the parkway. The average length of stay of a visitor is expected to be approximately one hour. The parking requirement for this scenario is 180 spaces (See Table C-1). This would result in 180 vehicles leaving the site and 180 vehicles entering the site each hour. Traffic associated with the headquarters building is expected to be negligible on a weekend.

Peak day weekend background traffic on the parkway is 2,350 vehicles per day near the sites (National Park Service, 2002a). Projected 2010 traffic on the parkway in the Asheville area is 2,710 vehicles per day. Traffic counts for October versus other months of the year were not available. The interpolated 2007 traffic in the Asheville area would be 2,575 vehicles per day. If a 12 percent peak hour ratio is assumed, the traffic would be **309 vehicles** per hour. This traffic is assumed to be split **50% northbound and 50% southbound**, resulting in **155 vehicles per hour in each direction**.

Since this is a typical weekend October day with no special events occurring at the regional destination visitor center, assume that 80 percent of the visitors to the regional destination visitor center are currently traveling the parkway, and only 20 percent or 36 vehicles are coming to the regional destination visitor center as a destination. Assume that 70 percent of the new trips are arriving from the south and 30 percent are arriving from the north. The total traffic at the Hemphill Knob driveway during this peak hour is shown in below in Figure C-1.

The Highway Capacity Manual, developed by the Transportation Research Board, is the standard for determining levels of service that highways are experiencing. Levels of service are generally described in a range from level of service A (free-flowing conditions) to level of service F (bumper to bumper congestion). Using Highway Capacity Software 2000, the software that replicates the latest version of the Highway Capacity Manual intersection analyses, levels of service at the driveway would range from level of service A for the northbound to westbound left turn to level of service B for the eastbound to northbound left turn and the eastbound to southbound right turn. Other movements at the intersection would be operating at level of service A. A new northbound to westbound left turn lane will be constructed as part of Alternative B and C. The Highway Capacity Software analyses are included in this appendix.

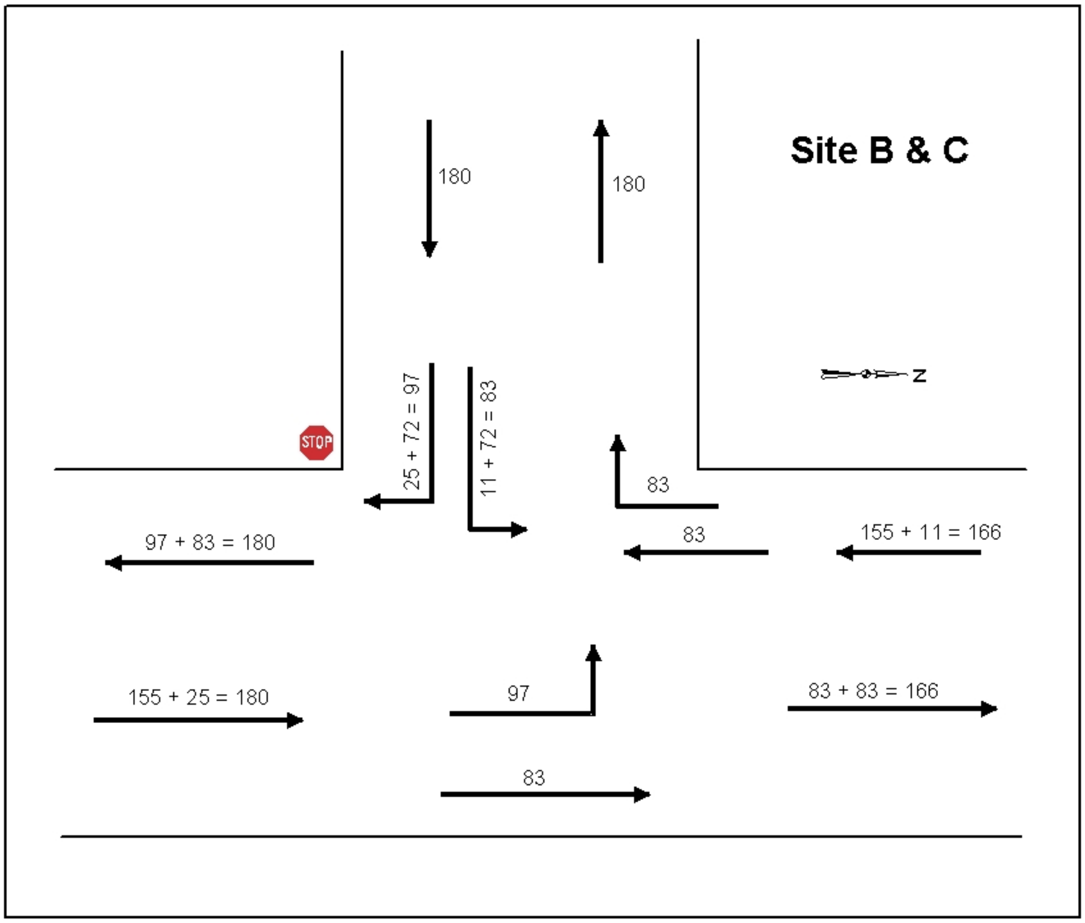

FIGURE C-1 – PROJECTED TRAFFIC AT BLUE RIDGE PARKWAY / HEMPHILL DRIVE

Alternative D and E - regional destination visitor center at Folk Art Center

An average peak day for the regional destination visitor center at the Folk Art Center site is assumed to be a summer day when an event is occurring at the Folk Art Center. The regional destination visitor center is not predicted to have special events that would take place during the regular hours of the regional destination visitor center and the number of trips generated by the regional destination visitor center is anticipated to be lower in July than in October. However, the overall traffic entering and leaving the regional destination visitor center/Folk Art Center site would be higher as both the regional destination visitor center and the Folk Art Center would be using the same driveway. As there are two attractions at this site, the average length of stay of a visitor is expected to be approximately 75 minutes. The parking requirement for this scenario is 338 spaces (see Table C-2). This would result in 270 vehicles leaving the site and 270 vehicles entering the site each hour.

Peak day weekend background traffic on the parkway is 2,350 vehicles per day near the sites (National Park Service, 2002a). Projected 2010 traffic on the parkway in the Asheville area is 2,710 vehicles per day. Traffic counts for July versus other months of the year were not available. The interpolated 2007 traffic in the Asheville area would be 2,575 vehicles per day. If a 12 percent peak hour ratio is assumed, the traffic would be 309 vehicles per hour. This traffic is assumed to be split 50% northbound and 50% southbound, resulting in 155 vehicles per hour in each direction.

Since this is a July day with a special event occurring at the Folk Art Center, but no special event occurring a the regional destination visitor center, assume that 90 percent of the visitors to the regional destination visitor center are currently traveling the parkway, and only 10 percent or 14 vehicles are coming to the regional destination visitor center as a destination. Also, assume that only 40 percent of the Folk Art Center traffic is already traveling the parkway and 60 percent or 117 vehicles are new trips that are destined to the Folk Art Center. This results in 131 new vehicle trips that would be added to the parkway traffic volumes. Assume that 70 percent of these new vehicle trips are arriving from the south and 30 percent are arriving from the north. The total traffic at the Folk Art Center driveway during this peak hour is shown in Figure C-2.

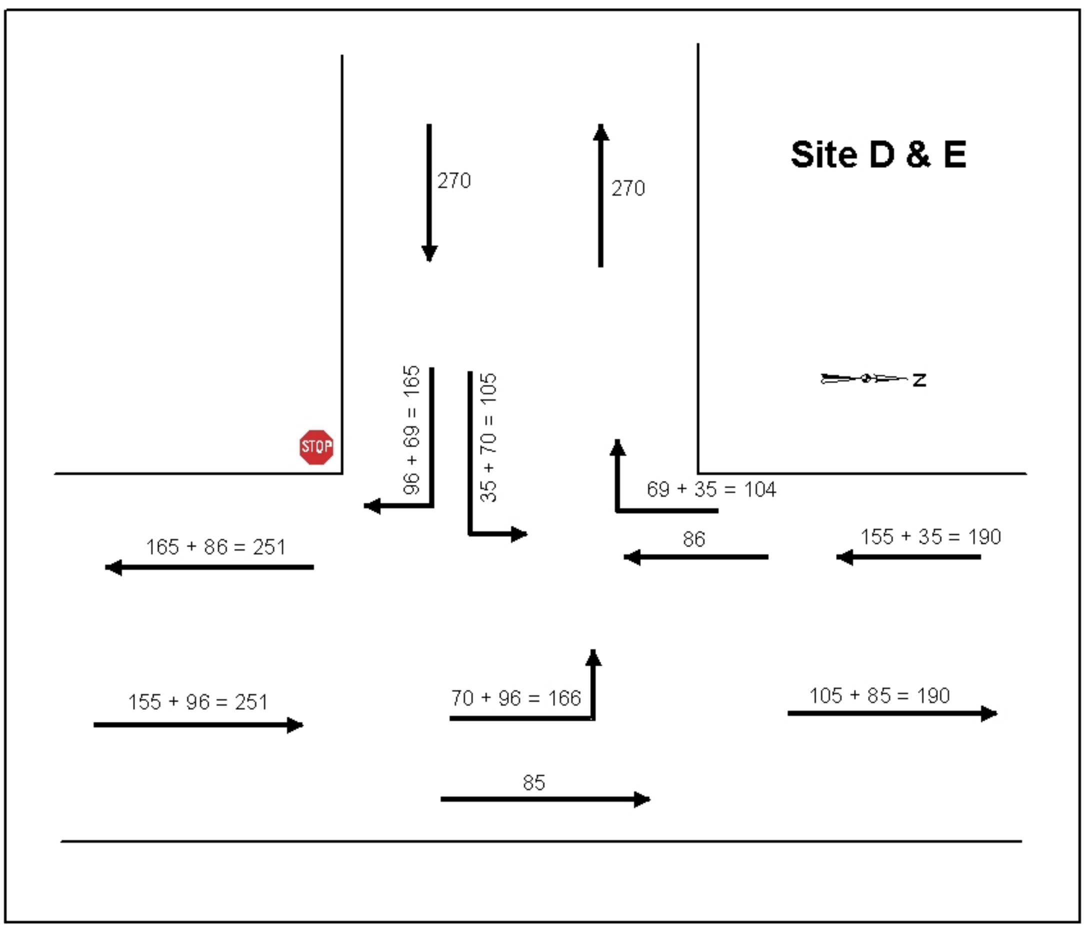

FIGURE C-2 – PROJECTED TRAFFIC AT BLUE RIDGE PARKWAY / FOLK ART CENTER

The Highway Capacity Manual, developed by the Transportation Research Board, is the standard for determining levels of service that highways are experiencing. Levels of service are generally described in a range from level of service A (free-flowing conditions) to level of service F (bumper to bumper congestion). Using Highway Capacity Software 2000, the software that replicates the latest version of the Highway Capacity Manual intersection analyses, levels of service at the driveway would range from level of service A for the northbound to westbound left turn to level of service C for the eastbound to northbound left turn and the eastbound to southbound right turn. Other movements at the intersection would be operating at level of service A. There is an existing 250 foot northbound to westbound left turn lane that separates this traffic movement from the through movement and helps to provide this level of service at the intersection. The Highway Capacity Software analyses are included in this appendix.

The Blue Ridge Parkway and U.S. 70 / U. S. 74 A raw counts provided by David Evans and Associates as support for their Transportation Data Collection (National Park Service, 2002a), indicated that on Sunday, August 4, 2002, the afternoon traffic at the parkway ramp #1 at U.S. 74 A (eastbound U.S. 74 A to parkway and parkway to U.S. 74 A westbound), averaged 219 vehicles per hour. At parkway ramp #2 at U.S. 74 A (westbound U. S. 74 A to parkway and parkway to U.S. 74 A eastbound), the afternoon traffic averaged 197 vehicles per hour. The afternoon traffic at parkway ramp #1 at U.S. 70 (westbound U. S. 70 to parkway and parkway to U.S. 70 eastbound), averaged 167 vehicles per hour. At parkway ramp #2 at U.S. 70 (eastbound U.S. 70 to parkway and parkway to U.S. 70 westbound), the afternoon traffic averaged 264 vehicles per hour. Therefore, the U.S. 74 A ramps totaled 416 vehicles per hour and the U.S. 70 ramps totaled 431 vehicles per hour. If all of the estimated 131 “new” trips that would be coming to the regional destination visitor center / Folk Art Center were to access the parkway from either U.S. 70 or U.S. 74 A, and they were to do so in proportion to the existing traffic at each ramp, there would be 262 additional trips distributed onto those four ramps during the peak hour. As ramp #2 at U.S. 70 had the highest existing traffic counts, (264 of 416+431 total vehicles, or 31 percent of the total), we would assume that 31 percent of the new trips would also access this ramp, oor 81 trips, an addition of approximately 30 percent. However, as this intersection is projected to operate at level of service A and B conditions until 2020 (National Park Service, 2004b), this is not expected to create unacceptable levels of service on that facility.

TABLE C-1

REVISED TRANSPORTATION ASSUMPTIONS FOR BLRI RDVC - ONE HOUR

9-Dec-04

AVERAGE OCTOBER PEAK SEASON PEAK DAY VISITATION					
Projected annual visitation (1)	325,000				
Average peak months (2)	13.4%				
Average time spent in RDVC (3)	1 hour				
Average peak visitors in VC at one time - 1 hour (4)	436				
During peak season it is assumed that 91 percent of the visitors will be arriving by private auto and the avg. auto occupancy would be 2.8 for autos, 49 for tour bus, 4 for RV, 2 for MC and 1 for bicycle.(5) (6) (7)	AUTO	BUS (8)	RV	MC	BICYCLE
Parking requirement for 1 hour avg. visitation	142	1.0	3	4	2

AVERAGE JULY PEAK DAY VISITATION					
Projected annual visitation (1)	325,000				
Assumed July visitation percentage (12)	11.0%				
Average time spent in RDVC (3)	1 hour				
Average peak visitors in VC at one time - 1 hour (4)	358				
During peak season it is assumed that 91 percent of the visitors will be arriving by private auto and the avg. auto occupancy would be 2.8 for autos, 49 for tour bus, 4 for RV, 2 for MC and 1 for bicycle.(5) (6) (7)	AUTO	BUS (8)	RV	MC	BICYCLE
Parking requirement for 1 hour avg. visitation	116	1	3	4	2

SPECIAL EVENT VISITATION (11)		
Special NPS weekend events (example: mountain music or clogging) - generally are held after hours from 6:00 to 9:00 pm. Assume 300 persons maximum with 2.0 auto occupancy.	150	
Special general public weekday events - citizen rents out the RDVC after hours from 6:00 to 10:00 pm. Assume 300 persons maximum with 2.0 auto occupancy.	150	
Public meetings - weekdays - generally are held after hours from 6:00 to 9:00 pm. Assume a maximum of 200 persons with 1.25 auto occupancy.	160	
School groups visiting the learning center. Assume 90 to 150 students arriving in 3 to 5 buses per week or a maximum of 1 bus per day with 30 students. Length of stay is 2 hours during the day.		1
Adult workshops in the learning center. Assume 30 people with 1.8 auto occupancy. Length of stay is 4 hours. This would not occur simultaneous with the school groups, but would occur during the day.	17	

STAFF AND VOLUNTEER PARKING	AUTO
Staff (1) (9)	8
Volunteers (1) (9)	13

MAXIMUM PARKING NEEDS	AUTO	BUS (8)	RV	MC	BICYCLE	
Average October peak day parking requirement for 1 hour avg. visitation (includes sum of Oct peak season parking requirement plus adult workshop parking plus staff parking plus volunteer parking)	180	2	3	4	2	Note - HQ employee parking not available
Evening event parking (assume 1/2 of the staff and no volunteers would be needed at RDVC) (includes parking for weekday evening public meeting plus 1/2 of staff parking requirement) (10)	164	1				Note - HQ employee parking is available
Average July peak day parking requirement for 1 hour avg. visitation (includes sum of July peak parking requirement plus adult workshop parking plus staff parking plus volunteer parking)	154	2	3	4	2	Note - HQ employee parking not available

(1) Information from BLRI staff
(2) Represents the percentage of annual visitors traveling the Parkway during the average of the highest two months from the NPS Facility Planning Model Report
(3) Upper range of estimate by Van Sickle & Rolleri, Ltd. - 11/16/04
(4) This number was calculated by using the relationship of peak month visitation to average peak visitors in the VC at one time from the NPS model and increasing the value proportionally by the relationship of the increased time spent in the RDVC (1 hour) versus the model standard of 30 minutes.
(5) Vehicle mode characteristics provided by P. Lockamy, BLRI staff
(6) The 2.8 average auto occupancy is based on BLRI studies. Most routine visitors will be traveling by private auto, whiile a few will travel by motor home, motorcyle, and bicycle.
(7) It is assumed that 3.5 % of travelers would arrive by tour bus, 3 % by motor home, 2 % by motorcycle, and 0.5 % by bicycle
(8) As less than 1 tour bus is shown for all length of stay assumptions, assume 1 tour bus for each scenario
(9) Assume auto occupancy equals 1.0 for staff and volunteers
(10) The employee parking at the HQ building would be available to provide 64 spaces toward this requirement for events held during non HQ office hours.
(11) It is assumed that all visitors traveling to these events will use cars or light trucks, except for the students that will use a school bus.
(12) 11 percent was assumed for July visitation, as it is an above average visitaiton month, but not as high as the October peak visitation month. There was little data available along the parkway to obtain this figure, as most of the VCs are closed in winter, with the exception of the FAC, which has special events in July and could not be used as the basis for the estimation. The RDVC will be open in winter.

TABLE C-2

TRANSPORTATION ASSUMPTIONS FOR FAC

AVERAGE OCTOBER PEAK SEASON PEAK DAY VISITATION (NO SPECIAL EVENTS)					
Annual visitation to FAC - 2003 (1)	260,634				
Projected annual visitation (2)	NA				
High peak month visitation (October 2003) (1)	46,845				
Average time spent in FAC (3)	0.583 hours				
Average mid-day October weekend peak visitors in FAC at one time assume 35 minute visitation (4)	273				
During peak season it is assumed that 91 percent of the visitors will be arriving by private auto and the avg. auto occupancy would be 2.8 for autos, 49 for tour bus, 4 for RV, 2 for MC and 1 for bicycle. (5)	AUTO	BUS (8)	RV	MC	BICYCLE
Parking requirement for 35 minute avg. visitation	89	0.2	2	3	1
AVERAGE JULY PEAK SEASON PEAK DAY VISITATION					
Annual visitation to FAC - 2003 (1)	260,634				
Projected annual visitation (2)	NA				
Summer peak month visitation (July 2003) (1)	34,332				
Average time spent in FAC (3)	0.583 hours				
Average mid-day July weekend peak visitors in FAC at one time assume 35 minute visitation (4)	200				
During peak season it is assumed that 91 percent of the visitors will be arriving by private auto and the avg. auto occupancy would be 2.8 for autos, 49 for tour bus, 4 for RV, 2 for MC and 1 for bicycle. (5) (6)	AUTO	BUS (8)	RV	MC	BICYCLE
Parking requirement for 35 minute avg. visitation (6)	65	1	2	2	1
SPECIAL EVENT VISITATION					
Special FAC weekend events (example: Clay Day, Fiber Day) - events are generally held between 9:00 am and 6:00 pm Assume 2000 daily visitors that stay approximately 1-1/4 hours. Auto occupancy is 2.8 for autos, 49 for tour bus, 4 for RV, 2 for motorcycle, and 1 for bicycle. Use a factor of 1.25 of evenly distributed attendance to represent a midday peak. These events are normally not held in October (7)	118	3	3	2	1
Lectures in the auditorium generally attract between 75 - 200 persons. These are not scheduled on the same weekend as the special events, They occur usually on weekend afternoons. Assume an auto occupancy of 1.5 and that 100 percent of the visitors would come by car or light truck. These events are normally not held in October.	133				
STAFF AND VOLUNTEER PARKING	AUTO				
Staff (5) (9)	10				
Volunteers (5) (9)	2				
MAXIMUM PARKING NEEDS	AUTO	BUS (8)	RV	MC	BICYCLE
Parking requirement for 35 minute avg. visitation during October peak season (includes October peak season parking requirement plus staff parking plus volunteer parking)	101	1	2	3	1
Parking requirement for 35 minute avg. visitation in July with special event (includes July peak parking requirement plus lecture parking requirement plus staff parking plus volunteer parking)	210	4	5	4	2

(1) Information from FY 00 - FY 03 BLRI Visitor Center Statistics
(2) Projection not available
(3) 0.5 hours is NPS model standard, however BLRI staff (P. Lockamy) estimated 35 minutes (0.583 hours) per average visitation .
(4) Utilized relationship of visitors in VC at one time to monthly visitors at VC from NPS model (0.005)
Also increased the figure by 35/30 to reflect the 35 minute average stay versus the model's 30 minutes
(5) Estimates from P. Lockamy
(6) The 2.8 average auto occupancy is based on BLRI studies. It is assumed that 91 percent of routine visitors will be traveling by private auto,
3.5 percent by motor home, 2 percent by motorcycle, and 0.5 percent by bicycle.
(7) It is assumed that 95 percent of visitor would arrive by auto, 2.0 percent of visitors would arrive by tour bus, 2 perecent by
motor home, and 1 percent by motorcycle.
(8) As less than 1 tour bus is shown for all length of stay assumptions,
assume 1 tour bus for each scenario.
(9) Assume auto occupancy equals 1.0 for staff and volunteers

TABLE C-2 (CONTINUED)

PARKING REQUIREMENT FOR THE JOINT FAC / RDVC FACILITY LOCATED AT THE FAC SITE - ONE HOUR

	AUTO	BUS	RV	MC	BICYCLE
Average RDVC peak day October parking requirement (non event day) - 1 hour visitation (from RDVC sheet)	180	2	3	4	2
Parking requirement at FAC on October peak day (non event day) - 35 minute visitation (from FAC sheet)	101	1	2	3	1
Total parking requirement for October non event peak season day - visitation as shown above (sum of Oct parking requirement at RDVC and at the FAC)	280	3	5	7	3
Revised October joint visitation parking requirement (1)	224	3	4	5	3
Average RDVC July peak day parkiing requirement (event day)	154	2	3	4	2
July event parking requirement at FAC (2)	210	4	5	4	2
Total parking requirement for July event day (sum of July parking requirement at RDVC and at the FAC)	365	6	8	8	4
Revised joint visitation parking requirement (1)	338	6	7	7	3

(1) All calculations thus far have been for independent facilities. As we are calculating the impact of the RDVC, we have been estimating worst case conditions for traffic and parking. If the RDVC and FAC are located at the same site, the regular (non-event) visitation of the combined attraction would not be the sum of the regular visitors to both facilities, but would be the greater of the two. We will assume that the average visitation would increase to 75 minutes from 1 hour to visit both sites, as adding the two visitations (1 hour and 35 minutes) is assumed to be longer than most people will stay at one location while travelling on a vacation.

(2) Note - major events at RDVC are scheduled in the evening after regular RDVC operating hours

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HCS2000: Unsignalized Intersections Release 4.1d

TWO-WAY STOP CONTROL SUMMARY

Analyst: David E. Wagner, P.E.
Agency/Co.: PARSONS
Date Performed: 4/13/2005
Analysis Time Period: Peak Hour
Intersection: BRP/Site B+C
Jurisdiction: NC
Units: U. S. Customary
Analysis Year:
Project ID: Blue Ridge Parkway
East/West Street: Site B+C
North/South Street: BRP
Intersection Orientation: NS   Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	97	83			83	83
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	107	92			92	92
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						No
Lanes	1	1			1	1
Configuration	L	T			T	R
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume				83	0	97
Peak Hour Factor, PHF				0.90	0.90	0.90
Hourly Flow Rate, HFR				92	0	107
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L						LTR	
v (vph)	107						199	
C(m) (vph)	1403						728	
v/c	0.08						0.27	
95% queue length	0.25						1.11	
Control Delay	7.8						11.8	
LOS	A						B	
Approach Delay							11.8	
Approach LOS							B	

Intersection: BRP/Site D+E
Jurisdiction: NC
Units: U. S. Customary
Analysis Year:
Project ID: Blue Ridge Parkway
East/West Street: Site D+E
North/South Street: BRP
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	166	85			86	104
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	184	94			95	115
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	1	1			1	0
Configuration	L	T				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				105	0	165
Peak Hour Factor, PHF				0.90	0.90	0.90
Hourly Flow Rate, HFR				116	0	183
Percent Heavy Vehicles				0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0	1	0
Configuration					LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L						LTR	
v (vph)	184						299	
C(m) (vph)	1373						603	
v/c	0.13						0.50	
95% queue length	0.46						2.75	
Control Delay	8.0						16.7	
LOS	A						C	
Approach Delay							16.7	
Approach LOS							C	

Blue Ridge Parkway

HCS Analysis Results

Results/Measures of Effectiveness	Site B-C NB L	Site B-C EB L/R		Site D-E NB L	Site D-E EB L/R
HCS Analysis Results					
Volume/Capacity Ratio	0.08	0.27		0.13	0.50
Control Delay (sec/veh)	7.8	11.8		8.0	16.7
LOS	A	B		A	C
95% Queue Length (vehicles)	0.25	1.11		0.46	2.75
Queue Analysis					
Design Queue Length (vehicles)	2	2		2	3
Minimum Design Queue (feet)	50	50		50	75
Design Queue (feet)	75	75		75	100
Deceleration Length (feet)	185	0		185	0
Turn Lane Length (feet)	260	75		260	100

Movements:

L/T = Shared Left Turn/Through Lane
L/R = Shared Left Turn/Right Turn Lane
L = Exclusive Left Turn Lane

Assumptions:

PHF = 0.90
0% Heavy Vehicles
0% Grade
0 Pedestrians Per Approach

Side Street, EB, assumed to be single lane, left and right turns shared.
SB right turns assumed sharing a lane with through traffic.

Design Queue Length (vehicles) = 95% Queue Length rounded up to next whole number, minimum 2 vehicles

Minimum Design Queue (feet) = 25 feet per vehicle x Design Queue Length (vehicles)

Design Queue (feet) = Assumes 1 vehicle is recreational vehicle or car pulling camper trailer (30 to 50 feet)
25 feet longer than minimum design queue (feet).

Deceleration Length (feet) = 185 feet for 45 mph (includes taper length)
Deceleration Length is unnecessary for site exit, since its single lane and all vehicles stop.

Turn Lane Length (feet) = Sum of Design Queue and Deceleration Length

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