

MEMORANDUM

Date: February 26, 2020

Project #:
20548 Task 4

To: Pete Rigby, P.E.
Arlington County Department of Environmental Services
2100 Clarendon Boulevard, Suite 813
Arlington, VA 22201

From: Jon Crisafi, P.E., Ed Myers, P.E., Lauren Hunt

Project: Military Road Safety Project

Subject: Military-Nelly Custis Roundabout Review - DRAFT

Arlington County (County) is proposing a reconfiguration of the Military Drive/Nelly Custis Drive intersection as part of the Military Road Safety Project. The reconfiguration proposed is a single-lane or mini-roundabout with bicycle and pedestrian facilities integral to the design. After an initial peer review of the proposed roundabout operations in 2018 (Reference 1), the County has authorized a follow-up analysis using more recent turning movement data (collected February 13, 2019) for multiple analysis hours. This additional analysis is intended to provide a more comprehensive understanding of the anticipated operations at the Military Road/Nelly Custis Drive intersection configured as a roundabout.

This analysis has produced the following findings:

- Though the roundabout is anticipated to operate at LOS A during the AM peak hour (8:00 AM-9:00 AM), SIDRA Standard shows a v/c of 0.93, approaching capacity.
- Current conceptual design shows the truck apron does not encompass the entirety of the central island. It is likely subsequent geometric review will require most of the central island to be traversable (potential mini-roundabout configuration).

These findings have generated the following recommendations:

- Conduct comprehensive geometric review including fastest path checks and design vehicle truck turns.
- Safety benefits of roundabout installation (not reviewed as part of this effort) should be considered in addition to any anticipated operations as justification for the project.

Operations Review

Similar to the original analysis (Reference 1), operations analyses were consistent with assumptions and procedures outlined in the VDOT Traffic Operations and Safety Manual (TOSAM) (Reference 2). The SIDRA Standard capacity model is the required model by TOSAM to analyze roundabout capacity.

To provide a range of results, including the use of a model developed based on United States data (SIDRA Standard is a proprietary model developed by Akcelik and Associates Pty Ltd.), Kittelson also performed the roundabout capacity analysis using the Highway Capacity Manual (HCM 6) model parameters.

The roundabout analysis assumed a single-lane roundabout. However, based on the 90 feet. Inscribed Circle Diameter (ICD) shown in the concept design. It is likely the single-lane roundabout will be a "mountable" roundabout, which is a type of single-lane roundabout with a traversable central island to accommodate trucks turns. Mountable roundabouts operate similar to full-scale roundabouts and are typically considered in areas that are physically constrained like the Military Road/Nelly Custis Drive intersection.

Roundabouts approaching 90 feet in diameter may reflect operational characteristics of what is referred to as a mini-roundabout. By definition, according to NCHRP Report 672, a mini-roundabout has an ICD of 90 feet or less, while a single-lane roundabout has an ICD of 90 feet or more, putting the proposed roundabout on the cusp of being a mini-roundabout (Reference 3). While the operational capacities of mini-roundabouts have not been clearly defined within the United States, several analysis models based on microsimulation have been developed for such intersections, though none have been calibrated to real-life traffic conditions. These models, along with additional recent research, consistently demonstrate that mini-roundabouts have lower capacity than a typical single-lane roundabout (Reference 4). Consequently, the proposed roundabout may experience greater vehicular delay, longer queue lengths, and have less available capacity than is shown in the HCM 6 model outputs. As such, we recommend the mountable roundabout be increased in size to the extent possible within the available physical constraints.

Table 1 summarizes SIDRA analysis results using the SIDRA Standard and HCM 6 methodologies for the proposed roundabout from February 13, 2019 traffic volumes.

Table 1. Comparison of SIDRA Standard Model and HCM Model Results

Approach	Capacity Model = SIDRA Standard Delay Model = SIDRA Standard			Capacity Model = HCM 6th Delay Model = HCM Delay		
	Del (s)	LOS	v/c	Del (s)	LOS	v/c
7:00 AM – 8:00 AM						
Military (NB)	8.6	A	0.32	7.0	A	0.29
Nelly Custis (WB)	5.2	A	0.56	9.3	A	0.50
Military (EB)	5.1	A	0.75	9.8	A	0.60
OVERALL	5.7	A	0.75	9.2	A	0.60
8:00 AM – 9:00 AM						
Military (NB)	8.9	A	0.41	8.1	A	0.36
Nelly Custis (WB)	6.3	A	0.59	10.1	B	0.53
Military (EB)	9.7	A	0.98	15.5	C	0.78
OVERALL	8.6	A	0.98	12.7	B	0.78
9:00 AM – 10:00 AM						
Military (NB)	8.1	A	0.25	6.6	A	0.24
Nelly Custis (WB)	4.3	A	0.23	5.0	A	0.20
Military (EB)	5.0	A	0.73	9.4	A	0.58
OVERALL	5.4	A	0.73	8.1	A	0.58
12:00 PM – 1:00 PM						
Military (NB)	6.7	A	0.19	4.9	A	0.17
Nelly Custis (WB)	4.1	A	0.21	4.8	A	0.18
Military (EB)	4.7	A	0.34	5.2	A	0.27
OVERALL	5.0	A	0.34	5.0	A	0.27
2:00 PM – 3:00 PM						
Military (NB)	6.7	A	0.23	5.0	A	0.21
Nelly Custis (WB)	4.4	A	0.27	5.5	A	0.24
Military (EB)	4.7	A	0.30	4.8	A	0.24
OVERALL	5.2	A	0.30	5.1	A	0.24
5:00 PM – 6:00 PM						
Military (NB)	7.2	A	0.30	5.9	A	0.27
Nelly Custis (WB)	4.9	A	0.52	8.7	A	0.47
Military (EB)	4.5	A	0.58	7.5	A	0.47
OVERALL	5.2	A	0.58	7.6	A	0.47

Note: Environment factor used for all SIDRA Standard models is 1.1 per TOSAM guidance.

Consistent with the previous analysis, results using the recommended TOSAM methodology (SIDRA Standard) show the roundabout is anticipated to operate within capacity, although the eastbound approach on Military Drive approaches capacity during the AM peak hour. The analysis using the HCM model’s conservative approach was done for informational purposes but shows the roundabout to operate within capacity during all analysis hours. This differs from the previous HCM analysis where the roundabout was anticipated to exceed capacity during the AM peak hour. The change in findings can be attributed to:

1. HCM6 methodology (the most recent US capacity model available shows greater capacity for roundabouts than the previous HCM 2010 methodology.

2. The turning movement counts from the 2018 analysis were slightly higher during the AM peak than the 2019 counts. However, the variation is minimal and mostly likely attributed to the capacity model.

All analysis worksheets are provided in *Attachment A*.

REFERENCES

1. Crisafi, J., Myers, E. *Military-Nelly Custis Roundabout Review – DRAFT*. Kittelson & Associates, Inc. Memorandum. Submitted November 29, 2018.
2. Virginia Department of Transportation. *Traffic Operations and Safety Analysis Manual (TOSAM) – Version 2.0*. February 2020.
3. Rodegerdts, Lee A, and Bruce W. Robinson. *Roundabouts: An Informational Guide*. Washington, DC: Transportation Research Board, 2010.
4. Lochrane, T., Kronprasert, N, Bared, J, Dailey, D., Zhang, W. *Traffic Capacity Models for Mini-roundabouts in the United States: Calibration of Driver Performance in Simulation*. Transportation Research Board. 2013.

ATTACHMENTS

Attachment A – SIDRA Analysis Worksheets

Attachment A
SIDRA Analysis
Worksheets

LANE SUMMARY



Site: 1 [Military Road and Nelly Custis Drive - 7:00 AM - 8:00 AM - SIDRA Cap/Del]

2019 AM Peak Hour, Environment Factor = 1.1

Site Category: (None)

Roundabout

Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Queue Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec			ft		ft	%	%
South: Military Drive													
Lane 1 d	263	3.9	814	0.323	100	8.6	LOS A	1.9	49.8	Full	1600	0.0	0.0
Approach	263	3.9		0.323		8.6	LOS A	1.9	49.8				
East: Nelly Custis Drive													
Lane 1 d	525	1.8	938	0.560	100	5.2	LOS A	4.5	114.1	Full	1600	0.0	0.0
Approach	525	1.8		0.560		5.2	LOS A	4.5	114.1				
NorthWest: Military Drive													
Lane 1 d	783	1.2	1040	0.753	100	5.1	LOS A	11.3	283.9	Full	1600	0.0	0.0
Approach	783	1.2		0.753		5.1	LOS A	11.3	283.9				
Intersection	1571	1.9		0.753		5.7	LOS A	11.3	283.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

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LANE SUMMARY



Site: 1 [Military Road and Nelly Custis Drive - 7:00 AM - 8:00 AM - HCM Cap/Del]

HCM 6th Edition Capacity Model
 2019 PM Peak Hour
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Lane Dist	Lane Config	Lane Length	Lane Cap. Adj.	Prob. Block.
	Total	HV											
South: Military Drive													
Lane 1 d	263	3.9	908	0.290	100	7.0	LOS A	1.4	35.2	Full	1600	0.0	0.0
Approach	263	3.9		0.290		7.0	LOS A	1.4	35.2				
East: Nelly Custis Drive													
Lane 1 d	525	1.8	1048	0.501	100	9.3	LOS A	3.2	81.4	Full	1600	0.0	0.0
Approach	525	1.8		0.501		9.3	LOS A	3.2	81.4				
NorthWest: Military Drive													
Lane 1 d	783	1.2	1304	0.600	100	9.8	LOS A	5.7	143.2	Full	1600	0.0	0.0
Approach	783	1.2		0.600		9.8	LOS A	5.7	143.2				
Intersection	1571	1.9		0.600		9.2	LOS A	5.7	143.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 6.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY



Site: 1 [Military Road and Nelly Custis Drive - 8:00 AM - 9:00 AM - SIDRA Cap/Del]

2019 PM Peak Hour, Environment Factor = 1.1

Site Category: (None)

Roundabout

Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec			ft		ft	%	%
South: Military Drive													
Lane 1 d	315	3.8	753	0.418	100	8.9	LOS A	2.9	74.0	Full	1600	0.0	0.0
Approach	315	3.8		0.418		8.9	LOS A	2.9	74.0				
East: Nelly Custis Drive													
Lane 1 d	524	2.5	886	0.591	100	6.3	LOS A	5.2	133.7	Full	1600	0.0	0.0
Approach	524	2.5		0.591		6.3	LOS A	5.2	133.7				
NorthWest: Military Drive													
Lane 1 d	1001	2.1	1026	0.975	100	9.7	LOS A	51.4	1301.6	Full	1600	0.0	0.0
Approach	1001	2.1		0.975		9.7	LOS A	51.4	1301.6				
Intersection	1840	2.5		0.975		8.6	LOS A	51.4	1301.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

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LANE SUMMARY



Site: 1 [Military Road and Nelly Custis Drive - 8:00 AM - 9:00 AM - HCM Cap/Del]

HCM 6th Edition Capacity Model
 2019 PM Peak Hour
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Lane Dist	Lane Config	Lane Length	Lane Cap. Adj.	Prob. Block.
	Total	HV											
South: Military Drive													
Lane 1 ^d	315	3.8	883	0.357	100	8.1	LOS A	1.8	45.2	Full	1600	0.0	0.0
Approach	315	3.8		0.357		8.1	LOS A	1.8	45.2				
East: Nelly Custis Drive													
Lane 1 ^d	524	2.5	999	0.525	100	10.1	LOS B	3.9	98.8	Full	1600	0.0	0.0
Approach	524	2.5		0.525		10.1	LOS B	3.9	98.8				
NorthWest: Military Drive													
Lane 1 ^d	1001	2.1	1290	0.776	100	15.5	LOS C	11.5	292.2	Full	1600	0.0	0.0
Approach	1001	2.1		0.776		15.5	LOS C	11.5	292.2				
Intersection	1840	2.5		0.776		12.7	LOS B	11.5	292.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 6.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

LANE SUMMARY



Site: 1 [Military Road and Nelly Custis Drive - 9:00 AM - 10:00 AM - SIDRA Cap/Del]

2019 AM Peak Hour, Environment Factor = 1.1

Site Category: (None)

Roundabout

Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec			ft		ft	%	%
South: Military Drive													
Lane 1 d	208	2.5	834	0.249	100	8.1	LOS A	1.4	35.6	Full	1600	0.0	0.0
Approach	208	2.5		0.249		8.1	LOS A	1.4	35.6				
East: Nelly Custis Drive													
Lane 1 d	228	2.3	1001	0.228	100	4.3	LOS A	1.3	33.2	Full	1600	0.0	0.0
Approach	228	2.3		0.228		4.3	LOS A	1.3	33.2				
NorthWest: Military Drive													
Lane 1 d	758	1.5	1044	0.726	100	5.0	LOS A	9.7	244.3	Full	1600	0.0	0.0
Approach	758	1.5		0.726		5.0	LOS A	9.7	244.3				
Intersection	1193	1.9		0.726		5.4	LOS A	9.7	244.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

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LANE SUMMARY



Site: 1 [Military Road and Nelly Custis Drive - 9:00 AM - 10:00 AM - HCM Cap/Del]

HCM 6th Edition Capacity Model
 2019 PM Peak Hour
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist	Lane Config	Lane Length	Lane Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec			ft		ft	%	%
South: Military Drive													
Lane 1 d	208	7.6	877	0.237	100	6.6	LOS A	1.0	27.2	Full	1600	0.0	0.0
Approach	208	7.6		0.237		6.6	LOS A	1.0	27.2				
East: Nelly Custis Drive													
Lane 1 d	228	2.3	1125	0.203	100	5.0	LOS A	1.0	24.7	Full	1600	0.0	0.0
Approach	228	2.3		0.203		5.0	LOS A	1.0	24.7				
NorthWest: Military Drive													
Lane 1 d	758	1.5	1304	0.581	100	9.4	LOS A	5.3	133.7	Full	1600	0.0	0.0
Approach	758	1.5		0.581		9.4	LOS A	5.3	133.7				
Intersection	1193	2.7		0.581		8.1	LOS A	5.3	133.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 6.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY



Site: 1 [Military Road and Nelly Custis Drive - 12:00 PM - 1:00 PM - SIDRA Cap/Del]

2019 AM Peak Hour, Environment Factor = 1.1

Site Category: (None)

Roundabout

Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec			ft		ft	%	%
South: Military Drive													
Lane 1 d	182	5.6	956	0.190	100	6.7	LOS A	1.0	25.1	Full	1600	0.0	0.0
Approach	182	5.6		0.190		6.7	LOS A	1.0	25.1				
East: Nelly Custis Drive													
Lane 1 d	210	3.7	1025	0.205	100	4.1	LOS A	1.1	28.6	Full	1600	0.0	0.0
Approach	210	3.7		0.205		4.1	LOS A	1.1	28.6				
NorthWest: Military Drive													
Lane 1 d	352	3.0	1036	0.340	100	4.7	LOS A	2.2	55.7	Full	1600	0.0	0.0
Approach	352	3.0		0.340		4.7	LOS A	2.2	55.7				
Intersection	743	3.8		0.340		5.0	LOS A	2.2	55.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

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LANE SUMMARY



Site: 1 [Military Road and Nelly Custis Drive - 12:00 PM - 1:00 PM - HCM Cap/DeI]

HCM 6th Edition Capacity Model
 2019 PM Peak Hour
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist	Lane Config	Lane Length	Lane Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec			ft		ft	%	%
South: Military Drive													
Lane 1 d	182	5.6	1069	0.170	100	4.9	LOS A	0.8	19.6	Full	1600	0.0	0.0
Approach	182	5.6		0.170		4.9	LOS A	0.8	19.6				
East: Nelly Custis Drive													
Lane 1 d	210	3.7	1141	0.184	100	4.8	LOS A	0.9	22.1	Full	1600	0.0	0.0
Approach	210	3.7		0.184		4.8	LOS A	0.9	22.1				
NorthWest: Military Drive													
Lane 1 d	352	3.0	1291	0.273	100	5.2	LOS A	1.5	38.0	Full	1600	0.0	0.0
Approach	352	3.0		0.273		5.2	LOS A	1.5	38.0				
Intersection	743	3.8		0.273		5.0	LOS A	1.5	38.0				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 6.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY

 **Site: 1 [Military Road and Nelly Custis Drive - 2:00 PM - 3:00 PM - SIDRA Cap/Del]**

2019 AM Peak Hour, Environment Factor = 1.1
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Queue Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec			ft		ft	%	%
South: Military Drive													
Lane 1 d	240	0.5	1040	0.231	100	6.7	LOS A	1.2	30.7	Full	1600	0.0	0.0
Approach	240	0.5		0.231		6.7	LOS A	1.2	30.7				
East: Nelly Custis Drive													
Lane 1 d	264	2.0	995	0.266	100	4.4	LOS A	1.5	38.2	Full	1600	0.0	0.0
Approach	264	2.0		0.266		4.4	LOS A	1.5	38.2				
NorthWest: Military Drive													
Lane 1 d	309	2.7	1037	0.298	100	4.7	LOS A	1.8	46.9	Full	1600	0.0	0.0
Approach	309	2.7		0.298		4.7	LOS A	1.8	46.9				
Intersection	813	1.8		0.298		5.2	LOS A	1.8	46.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY



Site: 1 [Military Road and Nelly Custis Drive - 2:00 PM - 3:00 PM - HCM Cap/Del]

HCM 6th Edition Capacity Model
 2019 PM Peak Hour
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Lane Dist	Lane Config	Lane Length	Lane Cap. Adj.	Prob. Block.
	Total	HV											
South: Military Drive													
Lane 1 d	240	0.5	1157	0.208	100	5.0	LOS A	1.0	25.6	Full	1600	0.0	0.0
Approach	240	0.5		0.208		5.0	LOS A	1.0	25.6				
East: Nelly Custis Drive													
Lane 1 d	264	2.0	1096	0.241	100	5.5	LOS A	1.2	30.1	Full	1600	0.0	0.0
Approach	264	2.0		0.241		5.5	LOS A	1.2	30.1				
NorthWest: Military Drive													
Lane 1 d	309	2.7	1294	0.239	100	4.8	LOS A	1.2	31.8	Full	1600	0.0	0.0
Approach	309	2.7		0.239		4.8	LOS A	1.2	31.8				
Intersection	813	1.8		0.241		5.1	LOS A	1.2	31.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 6.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

LANE SUMMARY



Site: 1 [Military Road and Nelly Custis Drive - 5:00 PM - 6:00 PM - SIDRA Cap/Del]

2019 AM Peak Hour, Environment Factor = 1.1

Site Category: (None)

Roundabout

Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec			ft		ft	%	%
South: Military Drive													
Lane 1 d	285	1.1	965	0.295	100	7.2	LOS A	1.7	43.1	Full	1600	0.0	0.0
Approach	285	1.1		0.295		7.2	LOS A	1.7	43.1				
East: Nelly Custis Drive													
Lane 1 d	510	0.2	975	0.523	100	4.9	LOS A	3.9	97.6	Full	1600	0.0	0.0
Approach	510	0.2		0.523		4.9	LOS A	3.9	97.6				
NorthWest: Military Drive													
Lane 1 d	609	0.7	1042	0.584	100	4.5	LOS A	5.8	145.1	Full	1600	0.0	0.0
Approach	609	0.7		0.584		4.5	LOS A	5.8	145.1				
Intersection	1403	0.6		0.584		5.2	LOS A	5.8	145.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

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Project: H:\20\20548 - Arlington County Engineering On-Call\004 - Military-Nelly Custis Rdbt Review\sidra\2019-02-13 Military Road and Nelly Custis Drive-UpdateLEH.sip8

LANE SUMMARY



Site: 1 [Military Road and Nelly Custis Drive - 5:00 PM - 6:00 PM - HCM Cap/Del]

HCM 6th Edition Capacity Model
 2019 PM Peak Hour
 Site Category: (None)
 Roundabout

Lane Use and Performance													
	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Veh	95% Back of Queue Dist	Lane Config	Lane Length	Lane Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec			ft		ft	%	%
South: Military Drive													
Lane 1 ^d	285	1.1	1074	0.265	100	5.9	LOS A	1.3	33.8	Full	1600	0.0	0.0
Approach	285	1.1		0.265		5.9	LOS A	1.3	33.8				
East: Nelly Custis Drive													
Lane 1 ^d	510	0.2	1075	0.474	100	8.7	LOS A	3.0	75.8	Full	1600	0.0	0.0
Approach	510	0.2		0.474		8.7	LOS A	3.0	75.8				
NorthWest: Military Drive													
Lane 1 ^d	609	0.7	1305	0.466	100	7.5	LOS A	3.5	86.7	Full	1600	0.0	0.0
Approach	609	0.7		0.466		7.5	LOS A	3.5	86.7				
Intersection	1403	0.6		0.474		7.6	LOS A	3.5	86.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).

Roundabout Capacity Model: US HCM 6.

HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach