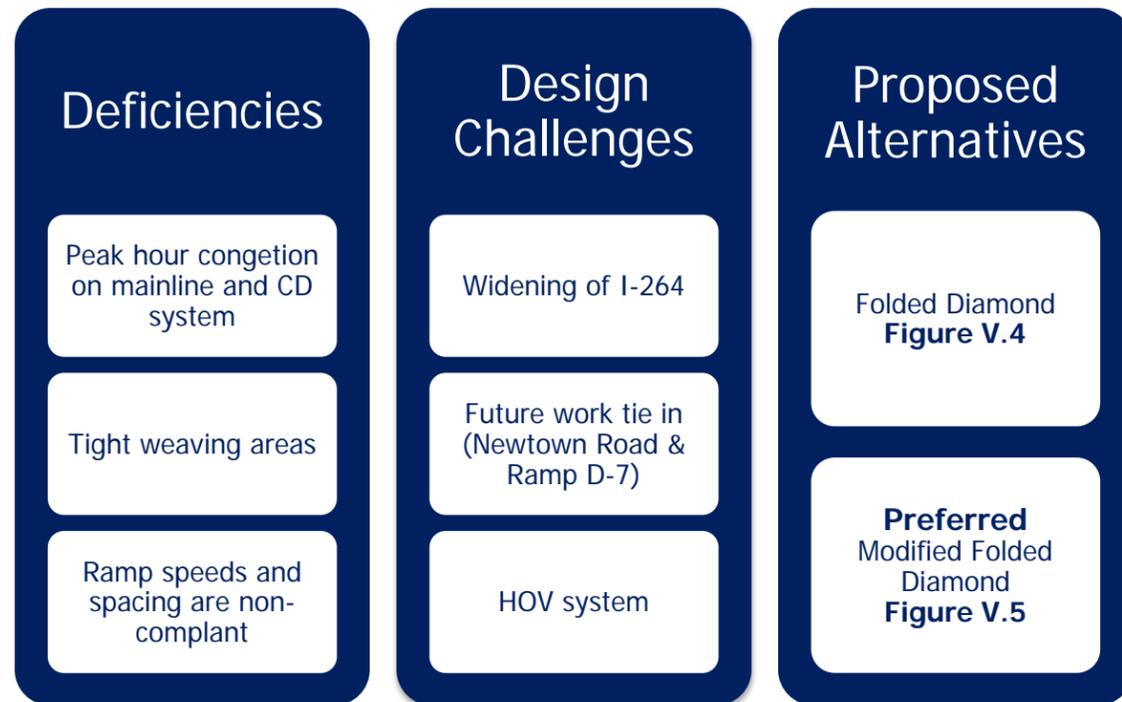


V. Newtown Road Interchange



V.1 Existing Conditions

This section provides the current existing conditions present at the Newtown Road interchange. These conditions are described through the discussion of the existing geometry and volumes, capacity analysis, and crash history.

V.1.1 Geometry, Speeds, Lanes, Traffic Control

Figure V.1 displays a summary of the existing conditions roadway geometry at the interchange of Newtown Road and I-264. The Newtown Road interchange is configured as a partial cloverleaf interchange with collector-distributor (CD) lanes running through the interchange. The CD lanes that run through Newtown Road continue to the west through the I-64 and Military Highway interchanges. Concurrent flow HOV lanes – located immediately adjacent to the median barrier – are provided in each direction through the interchange on the mainline freeway lanes. The more notable geometric deficiencies include:

- Ramp speeds are non-compliant at 3 locations
- Ramp gores are non-compliant at 3 locations
- Ramp spacing is non-compliant at 3 locations

Additional details on the existing conditions geometry at the Newtown Road interchange can be found in the Technical Appendix.

V.1.2 Volumes & Operations

Figure V.2: Existing Volumes displays the existing volumes for the Newtown Road interchange for the year 2014. Traffic counts were conducted during early December 2014, with counts conducted on Tuesdays, Wednesdays and/or Thursdays. The peak hour counts document the typical commuter pattern on I-264, with heavier volumes in the westbound direction during the AM peak period and in the eastbound direction during the PM peak period. On Newtown Road, the heavier volumes are in the northbound direction in the AM peak period and in the southbound direction in the PM peak period.

Table 5.1 displays a summary of the results of the HCS capacity analysis of the existing conditions at the interchange of Newtown Road and I-264. A few of the movements are currently operating with LOS F conditions in at least one peak hour. The weave segment on the eastbound I-264 CD between I-64 and Newtown Road is operating with LOS F conditions in both peak hours.

Movement (Type)	AM Peak Hour		PM Peak Hour	
	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS
EB I-264 ML between I-64 and Newtown Rd (Freeway)	18.6	C	33.3	D
WB I-64 to EB I-264 CD & EB I-264 CD to SB Newtown Rd (Weave)	V/C = 1.086	F	V/C = 1.006	F
NB/SB Newtown Rd & EB I-264 CD (Weave)	27.4	C	25.8	C
EB I-264 between Newtown Rd and Witchduck Rd (Freeway)	25.7	C	36.8	E
WB I-264 between Newtown Rd and Witchduck Rd (Freeway)	33.1	D	21.5	C
SB Newtown Rd to WB I-264 CD & WB I-264 CD to WB I-64 (Weave)	23.8	B	25.6	C
WB I-264 ML between I-64 and Newtown Rd (Freeway)	80.2	F	19.2	C

Based on field observations, the westbound I-264 CD weave movement with I-64 to the west exhibits congestion during both peak hours. However, limitations in the HCS methodology do not consider the causes or produce results that indicate the poor service levels. To position for downstream maneuvers, motorists do not use the two lanes in the weave section uniformly. The inside lane is heavily used, resulting in congestion, which is not reflected in the HCS analysis results.

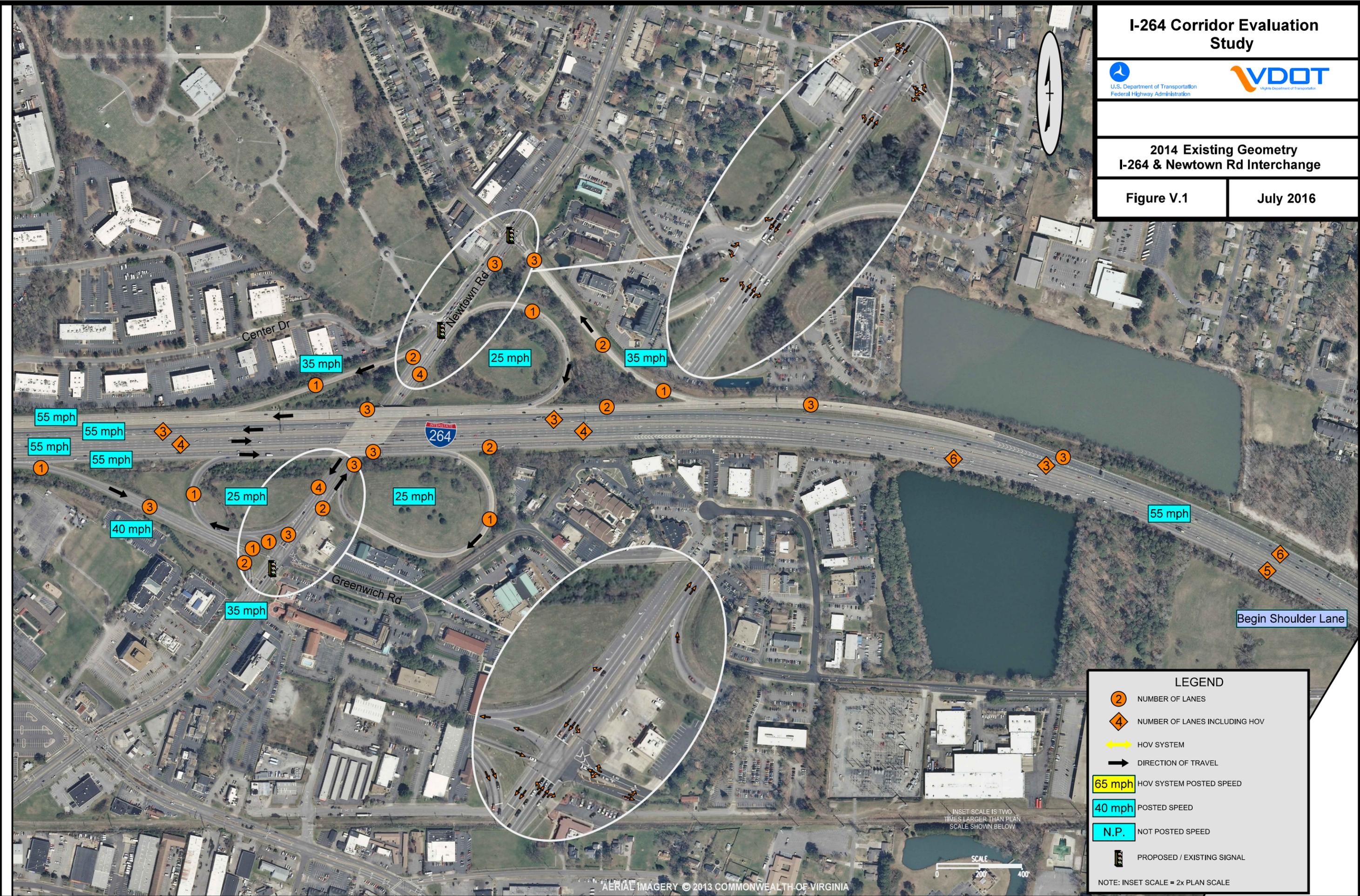
I-264 Corridor Evaluation Study



2014 Existing Geometry I-264 & Newtown Rd Interchange

Figure V.1

July 2016



LEGEND

- 2 NUMBER OF LANES
- 4 NUMBER OF LANES INCLUDING HOV
- HOV SYSTEM
- DIRECTION OF TRAVEL
- 65 mph HOV SYSTEM POSTED SPEED
- 40 mph POSTED SPEED
- N.P. NOT POSTED SPEED
- PROPOSED / EXISTING SIGNAL

NOTE: INSET SCALE = 2x PLAN SCALE

I-264 Corridor Evaluation Study

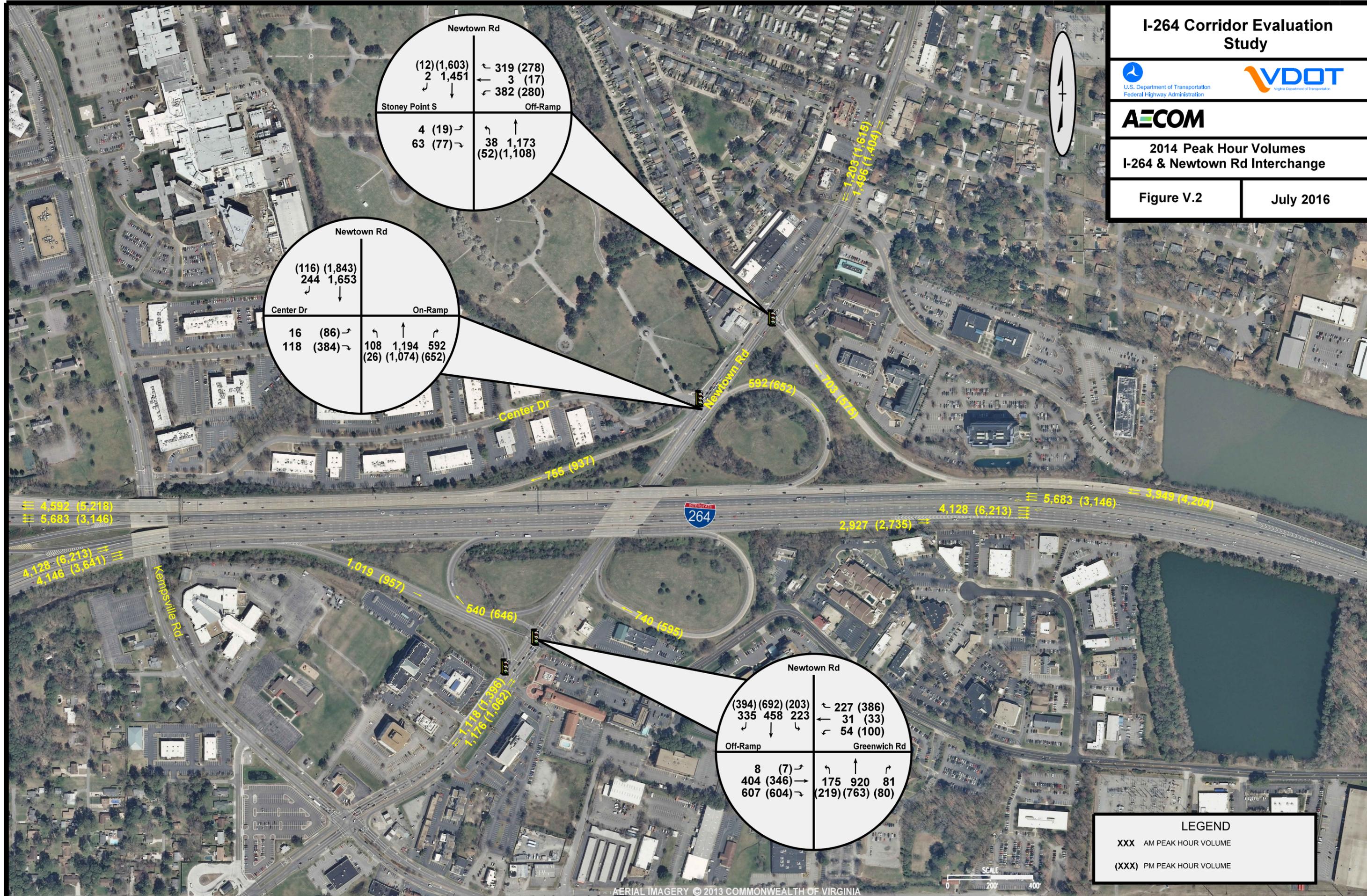


AECOM

2014 Peak Hour Volumes
I-264 & Newtown Rd Interchange

Figure V.2

July 2016



LEGEND
 XXX AM PEAK HOUR VOLUME
 (XXX) PM PEAK HOUR VOLUME



Table 5.2 summarizes the results of the CORSIM analysis of the existing conditions analysis. CORSIM analysis provided similar results to the HCS 2010 analysis. Several of the movements operate with LOS D or E conditions. The eastbound mainline operates with LOS C conditions in the AM peak hour and LOS D in the PM peak hour between Newtown Road and Witchduck Road. The merge of the eastbound CD road into the mainline east of Newtown Road operates with LOS E conditions in the PM peak hour. CORSIM replicates the congestion found on westbound I-264 between Witchduck Road and the mainline/CD road split with LOS E conditions in the AM peak hour.

Movement (Type)	AM Peak Hour		PM Peak Hour	
	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS
EB I-264 ML between I-64 and Newtown Rd (Freeway)	17.6	B	27.2	D
WB I-64 to EB I-264 CD & EB I-264 CD to SB Newtown Rd (Weave)	20.8	B	23.1	B
NB/SB Newtown Rd & EB I-264 CD (Weave)	23.5	C	20.7	C
EB I-264 CD to EB I-264 ML (Merge)	23.1	C	37.7	E
EB I-264 between Newtown Rd and Witchduck Rd (Freeway)	24.7	C	33.0	D
WB I-264 between Newtown Rd and Witchduck Rd (Freeway)	27.1	D	22.4	C
SB Newtown Rd to WB I-264 CD & WB I-264 CD to WB I-64 (Weave)	20.8	B	23.1	B
WB I-264 CD to NB Newtown Road (Diverge)	23.5	C	24.4	C
NB Newtown Rd to WB I-264 CD (Merge)	22.5	C	24.8	C
WB I-264 ML between I-64 and Newtown Rd (Freeway)	40.3	E	16.9	B

Capacity Analysis indicates that several movements at the Newtown Road interchange are currently operating with inadequate capacity.

Table 5.3 displays a summary of the SimTraffic results of the existing conditions for the Newtown Road corridor. All three study area intersections are operating with LOS D or better overall intersection levels of service, except the intersection at Stoney Point/I-264 Westbound CD Off-Ramp and Witchduck Road which displays LOS F in the PM peak hour.

Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec.)	LOS	Delay (sec.)	LOS
Stoney Point S/I-264 WB CD Off-Ramp	47.2	D	133.7	F
Center Drive/I-264 WB CD On-Ramp	10.1	B	19.9	B
Greenwich Road/I-264 EB CD Ramps	31.8	C	31.9	C

Table 5.4 presents a summary of the SimTraffic queueing analysis, and the results show that vehicle queues extending from the traffic signals are currently accommodated by the storage available on the respective off-ramps.

Intersection	Ramp Length (feet)	AM Peak Hour		PM Peak Hour	
		Average (feet)	95th % (feet)	Average (feet)	95th % (feet)
WB I-264 CD Off-Ramp to Newtown Rd	1,300	178	255	172	251
EB I-264 CD Off-Ramp to SB Newtown Rd.	1,200	234	371	217	497

V.1.3 Crashes

Figure V.3 displays the 4-year crash history at Newtown Road for the period 2009-2012, and it illustrates a large number of crashes throughout the interchange in both directions of travel and on both the mainline lanes and the CD lanes. The density of crashes dissipates slightly to the east of the interchange area. Crashes can be largely attributed to both geometric deficiencies (primarily weave segments) and capacity deficiencies. Crashes in both directions of travel along the CD lanes and mainline lanes appear to be evenly distributed. Another contributor to the high crash rate is the frequency of lane change maneuvers, which is likely

higher between Newtown Road to I-64 than found on any other segment of I-264. This is due to the various ramp movements associated with the proximity of the I-264/I-64 interchange.

Table 5.5 summarizes the crash history at the Newtown Road interchange by direction and type of freeway facility (C-D, mainline, or ramp) for the period 2009-2012. A total of 605 crashes occurred in the vicinity of the Newtown Road interchange over the period 2009-2012. Indicative of the frequency of lane change maneuver and congestion documented above, the majority (384) were rear end crashes. Crash severity is documented with 224 injury crashes and 1 fatal crash.

Location	Type of Crash					Total	Severity		
	Rear End	Angle	Sideswipe - Same Dir.	Fixed Object Off Road	Misc.		Property Damage Only	Injury	Fatal
EB CD	53	5	3	6	4	71	43	28	0
WB CD	49	9	4	9	2	73	53	20	0
EB Mainline	112	16	18	28	5	179	110	69	0
WB Mainline	139	17	24	39	8	227	143	83	1
EB Ramp	23	1	1	7	2	34	17	17	0
WB Ramp	8	5	1	5	2	21	14	7	0
Total	384	53	51	94	23	605	380	224	1

V.2 Forecasted Conditions

The analysis of forecasted conditions includes the development and evaluation of future volumes and operations for the year 2040. The No Build Alternative and two improvement alternatives are described, followed by an explanation of the basis for the selection of the preferred alternative. Cost and impacts for the preferred alternative are listed at the end of this section as well.

V.2.1 Forecasted Volumes & Operations

Table 5.6 displays the forecasted peak hour volumes for the No Build Alternative (regular font) and Build (**bold font**) Alternatives at the Newtown Road interchange for the year 2040. Existing

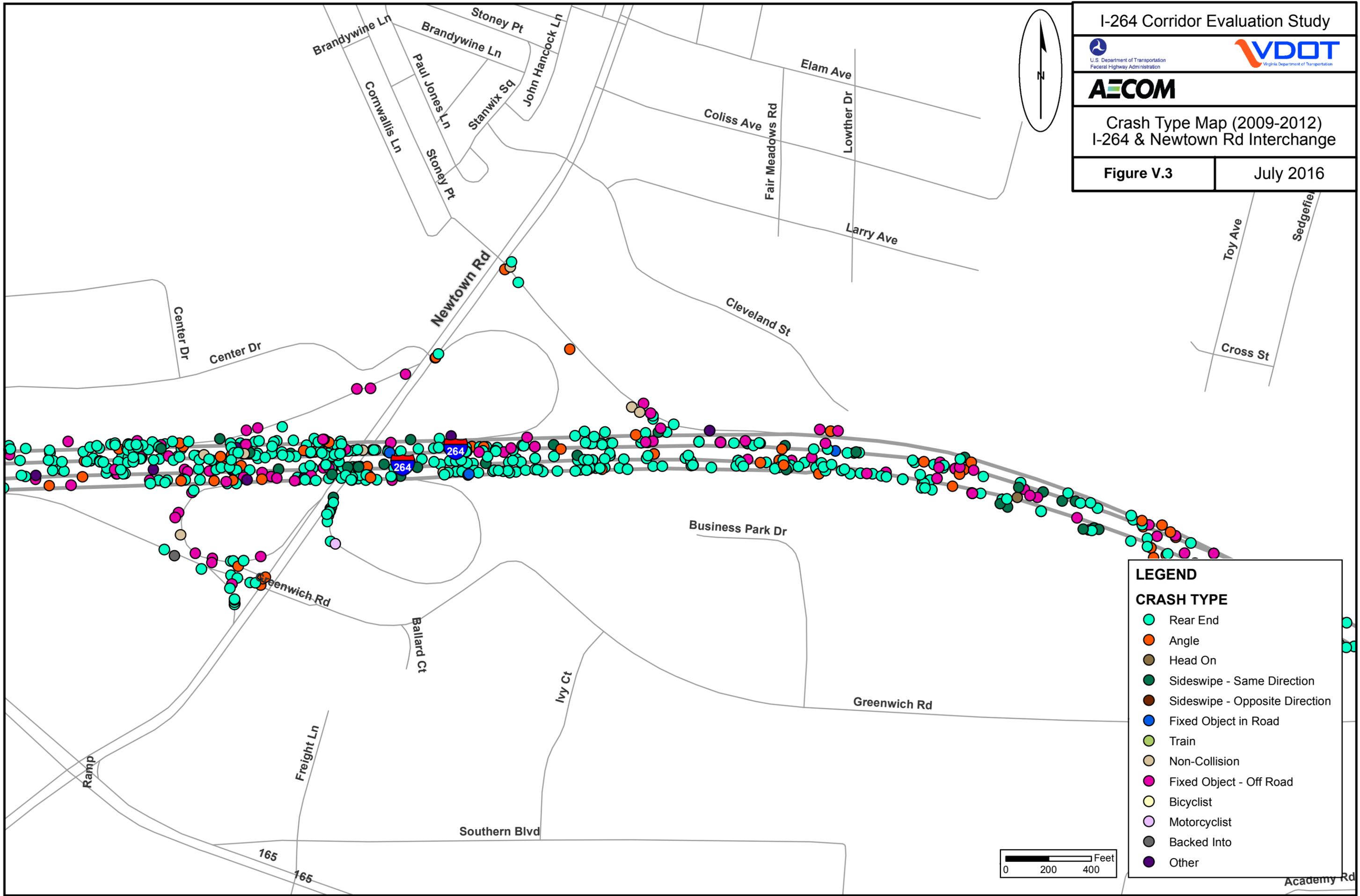
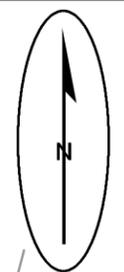
volumes are also listed (*in italics*) in order to provide for comparison. In general, the volumes show moderate growth, approximately 20% over existing conditions volumes. Improvements included in the No Build and Build Alternatives shift volumes between the CD and mainline lanes.

The roadway geometry for the No Build Alternative for this interchange include the programmed improvements on eastbound I-264 associated with the widening of the westbound I-64 off-ramp to eastbound I-264 (Ramp D-7). These improvements (shown in Section II) extend from the I-64 interchange to the Witchduck Road interchange.

Table 5.9 on page V-9 displays a summary of the results of the HCS capacity analysis of the No Build Alternative. Generally, movements deteriorated one letter grade from the existing conditions. Again, several of the movements at this interchange are currently operating with LOS E or F conditions in at least one peak hour. The ramp D-7 improvements make a substantial improvement to the weave between westbound I-64 and southbound Newtown Road along the CD system, improving service levels from LOS F to LOS B. The weave on the westbound I-264 CD road between the I-64 ramps fell from LOS B to LOS F in the PM peak hour as conditions became overcapacity. Conditions on the westbound mainline between I-64 and Newtown Road are forecast to be LOS F in the AM peak hour.

It would be expected that the weave on the westbound I-264 CD road would have sufficient volume by the no build year to cause the weave between the southbound Newtown ramp and the westbound I-64 ramp to fail, however the HCS analysis does not display poor service levels. However, as discussed previously with existing conditions, the HCS methodology limitations do not consider the extremely uneven lane utilization by motorists, and consequently analysis results are better than indicated by field observation.

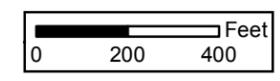
Table 5.9 also summarizes the results of the CORSIM analysis of the No Build Alternative at the Newtown Road interchange with I-264. CORSIM No Build analysis was worse than the existing conditions CORSIM analysis. A few of the movements operate with LOS E or F conditions. The ramp from westbound I-264 mainline to eastbound I-64 is significantly overcapacity causing queueing back towards Witchduck Road on the mainline. The ramp D-7/Witchduck Road improvements provided significant improvement on eastbound I-264 from Newtown Road to Witchduck Road. Conversely, westbound I-264 displays significant congestion issues.



LEGEND

CRASH TYPE

-  Rear End
-  Angle
-  Head On
-  Sideswipe - Same Direction
-  Sideswipe - Opposite Direction
-  Fixed Object in Road
-  Train
-  Non-Collision
-  Fixed Object - Off Road
-  Bicyclist
-  Motorcyclist
-  Backed Into
-  Other



Interstate & Direction	Movement		2014 Existing Conditions		2040 No Build Conditions		2040 Build Conditions	
			AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
	From	To						
I-264 EB	CD Road after I-64		4,146	3,641	2,862	2,646	3,168	2,735
	WB I-64	EB I-264 Mainline	0	0	2,018	1,999	2,303	2,734
	Mainline after I-64		4,128	6,213	4,658	6,609	4,244	6,213
	EB I-264 CD	Newtown Rd	1,019	957	1,274	1,090	1,220	1,010
	Newtown Rd	EB I-264 CD	540	646	568	680	1,054	853
	EB I-264 CD	NB Newtown Rd	740	595	880	753	978	678
	CD Road after Newtown		2,927	2,735	1,276	1,483	2,024	1,900
	Mainline after Newtown and CD Merge		7,055	8,949	7,952	10,091	8,571	10,847
I-264 WB	Mainline before Newtown and CD Split		9,632	7,350	10,873	8,286	11,627	8,893
	Mainline before Newtown after CD Split		5,683	3,146	6,505	3,662	6,804	3,839
	CD before Newtown after CD Split		3,949	4,204	4,368	4,624	4,823	5,054
	WB I-264 CD	Newtown Rd	703	575	703	585	984	806
	NB Newtown Rd	WB I-264 CD	592	652	687	797	592	652
	SB Newtown Rd	WB I-264 CD	755	937	928	1,269	755	1,008
	CD Road after Newtown		4,592	5,218	5,280	6,105	5,186	5,908
Mainline after Newtown		5,683	3,146	6,505	3,662	6,804	3,839	

Table 5.7 displays a summary of the SimTraffic No Build Conditions analysis for the Newtown Road corridor. The Stoney Point/I-264 WB CD Off-Ramp and Witchduck Road intersection has deteriorated from existing conditions to LOS F in both peak hours. The remaining two intersections are forecasted to operate with adequate service levels of D or better.

Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec.)	LOS	Delay (sec.)	LOS
Stoney Point S/I-264 WB CD Off-Ramp	89.3	F	130.4	F
Center Drive/I-264 WB CD On-Ramp	11.3	B	19.7	C
Greenwich Road/I-264 EB CD Ramps	35.9	D	35.0	C

Table 5.8 presents a summary of the 2040 No Build SimTraffic queueing analysis, and the results show that vehicle queues extending from the traffic signals will be accommodated by the storage available on the respective off-ramps.

Intersection	Ramp Length (feet)	AM Peak Hour		PM Peak Hour	
		Average (feet)	95th % (feet)	Average (feet)	95th % (feet)
WB I-264 CD Off-Ramp to Newtown Rd	1,300	79	228	140	219
EB I-264 CD Off-Ramp to SB Newtown Rd.	1,200	235	323	268	365
EB I-264 CD Off-Ramp to NB Newtown Rd.	1,400	0	0	1	27

V.2.2 Improvement Alternatives

The Newtown Road interchange exhibits several geometric and capacity deficiencies. Two programmed projects will correct most of the eastbound deficiencies. The two programmed projects are the Ramp D-7 project (I-64 westbound to I-264 eastbound) as well as the I-264/Witchduck Road interchange project. Each of the alternatives includes the programmed improvements on eastbound I-264. Westbound deficiencies will have to be addressed through new projects. To correct the westbound deficiencies two improvement alternatives have been developed and analyzed. These are shown in **Figures V.4 and V.5**. Geometric compliance has been intentionally provided with all proposed improvements.

The first improvement alternative in **Figure V.4 – Folded Diamond** – consists of eliminating the southbound Newtown Road Ramp to westbound I-264 CD Road. This ramp movement is moved to the existing westbound on-loop which adds approximately 1,500 feet to the existing weave segment with I-64 westbound.

The second improvement alternative in **Figure V.5 – Modified Folded Diamond** – is the same as the Folded Diamond however it differentiated by the westbound off-ramp to Newtown Road. In this scenario the off-ramp splits with one leg intersecting the Center Drive intersection and the other leg intersects the Stoney Point intersection maintaining its current alignment. Splitting the ramps allows for more efficient traffic signal operation on Newtown Road.

The improvement alternatives have been analyzed using the same procedures – HCS and CORSIM – used in the analysis of existing conditions and No Build Alternative. The results of the capacity analysis for all the forecasted year 2040 alternatives (including the No Build Alternative) are shown in **Table 5.9**. In **Table 5.9**, a density listed with a (+) was analyzed as a freeway segment due to HCS limitations for considering add lanes (where an on-ramp creates a continuous additional lane to the freeway) and drop lanes (where a continuous freeway lane drops to an off-ramp). The Newtown Road interchange Build Alternative improvements have locations where the geometry is atypical and is not capable of being appropriately analyzed using HCS 2010 procedures.

In addition, SimTraffic simulation software capacity and queue analysis was conducted for each improvement alternative at signalized intersections and the results for all the year 2040 improvement alternatives are shown in **Table 5.10** and **Table 5.11**.

Folded Diamond

The Folded Diamond makes significant improvements to the existing geometry by extending the weave between the southbound Newtown Road on-ramp and the ramp to westbound I-64. This is accomplished by removing the southbound Newtown Road on-ramp and redirecting this movement to the existing northbound Newtown Road to westbound I-264 CD on-loop.

The results in **Table 5.9** show that all of the movements associated with the interchange ramps exhibit adequate service levels of D or better, except the westbound mainline freeway

segment between I-64 and Newtown Road which exhibits LOS E in the AM peak hour (HCS analysis only).

For the three signalized intersections, the SimTraffic capacity analysis results are summarized in **Table 5.10** and indicate that all intersections will operate with LOS D conditions.

Table 5.11 presents a summary of the results of the SimTraffic queueing analysis, and the results show that vehicle queues extending from the traffic signals can be accommodated by the storage available on the respective off-ramps. However, while not identified in this analysis, it should be noted that field observations identified frequent periods of congestion on northbound Newtown Road (extending from the Virginia Beach Boulevard intersection) cause lengthy queues to develop on the eastbound I-264 off-ramp to northbound Newtown Road.

Modified Folded Diamond

The Modified Folded Diamond is similar to the Folded Diamond in that it makes significant improvements to the existing geometry by extending the weave between the southbound Newtown Road on-ramp and the ramp to westbound I-64. This is accomplished by removing the southbound Newtown Road on-ramp and redirecting this movement to the existing northbound Newtown Road to westbound I-264 CD on-loop. This alternative improves on the Folded Diamond alternative by splitting the westbound off-ramp to redistribute its traffic to two signals (Stoney Point and Center Drive) thereby improving operations on Newtown Road.

The results in **Table 5.9** show that all of the movements associated with the interchange ramps exhibit adequate service levels of D or better, except the westbound mainline freeway segment between I-64 and Newtown Road which exhibits LOS E in the AM peak hour (HCS analysis only).

For the three signalized intersections, the SimTraffic capacity analysis summarized in **Table 5.10** indicates all intersections will operate with LOS C conditions with the exception of the Greenwich Road traffic signal which operates with LOS D in the AM peak hour. The Modified Folded Diamond reduces traffic signal delay by 20-30 seconds in comparison to the Folded Diamond interchange at the Stoney Point/I-264 westbound off-ramp and Center Drive intersections.

Table 5.11 presents a summary of the SimTraffic queueing analysis, and the results show that vehicle queues extending from the traffic signals can be accommodated by the storage available on the respective off-ramps. This alternative exhibits no queues developing on the eastbound I-264 off-ramp to northbound Newtown Road; this is because traffic flow on Newtown Road is greatly improved in this alternative.

**Table 5.9
Summary of Capacity Analysis Results
Year 2040 Alternatives: Newtown Road & I-264**

Year 2040 Alternative		No Build Alternative				Folded Diamond & Modified Folded Diamond			
Time of Day		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Dir	Movement (Type)	Density	LOS	Density	LOS	Density	LOS	Density	LOS
HCS Analysis Results									
East-bound I-264	EB I-264 ML between I-64 and Newtown Rd (Freeway)	21.0	C	36.5	E	9.2	A	22.2	C
	WB I-64 to EB I-264 CD & EB I-264 CD to SB Newtown Rd (Weave)	19.0	B	17.2	B	23.9	B	19.2	B
	EB I-264 CD to NB Newtown Rd (Diverge)	16.9	B	14.1	B	16.7	B	14.2	B
	NB/SB Newtown Rd to EB I-264 CD (Merge)	10.7	B	10.2	B	16.2	B	15.4	B
	EB I-264 between Newtown Rd and Witchduck Rd (Freeway)	20.7	C	24.2	C	17.3	B	20.9	C
West-bound I-264	WB I-264 between Newtown Rd and Witchduck Rd (Freeway)	40.2	E	29.3	D	24.2	C	17.0	B
	WB I-264 CD to NB Newtown Rd (Diverge)	-	-	-	-	30.7	D	31.6	D
	NB(&SB) Newtown Rd to WB I-264 CD (Merge)	-	-	-	-	18.5 ⁺	C	21.6 ⁺	C
	SB Newtown Rd to WB I-264 CD & WB I-264 CD to WB I-64 (Weave)	27.3	C	31.1	C	-	-	-	-
	WB I-264 ML between I-64 and Newtown Rd (Freeway)	220.6	F	22.3	C	41.9	E	16.5	B
CORSIM Analysis Results									
East-bound I-264	EB I-264 ML between I-64 and Newtown Rd (Freeway)	25.4	C	32.7	D	-	-	-	-
	WB I-64 to EB I-264 CD & EB I-264 CD to SB Newtown Rd (Weave)	28.2	C	34.3	D	18.1	B	20.3	B
	NB/SB Newtown Rd & EB I-264 CD (Weave)	17.3	B	11.6	A	-	-	-	-
	EB I-264 CD to NB Newtown Rd (Diverge)	-	-	-	-	14.1	B	11.6	B
	NB/SB Newtown Rd to I-264 EB CD (Merge)	-	-	-	-	13.2	B	11.9	B
	EB I-264 CD to EB I-264 ML (Merge)	18.5	B	25.0	C	18.6	B	24.4	C
	EB I-264 between Newtown Rd and Witchduck Rd (Freeway)	22.7	C	29.9	D	19.7	C	25.7	C
West-bound I-264	WB I-264 between Newtown Rd and Witchduck Rd (Freeway)	60.9	F	36.0	E	25.2	C	18.9	C
	SB Newtown Rd to WB I-264 CD & WB I-264 CD to WB I-64 (Weave)	28.2	C	34.3	D	-	-	-	-
	WB I-264 CD to NB Newtown Road (Diverge)	28.4	D	33.1	D	25.4	C	25.8	C
	NB(&SB) Newtown Rd to WB I-264 CD (Merge)	27.4	C	32.2	D	18.5	B	20.6	C
	WB I-264 ML between I-64 and Newtown Rd (Freeway)	129.7	F	165.8	F	28.8	D	15.5	B

I-264 Corridor Evaluation Study

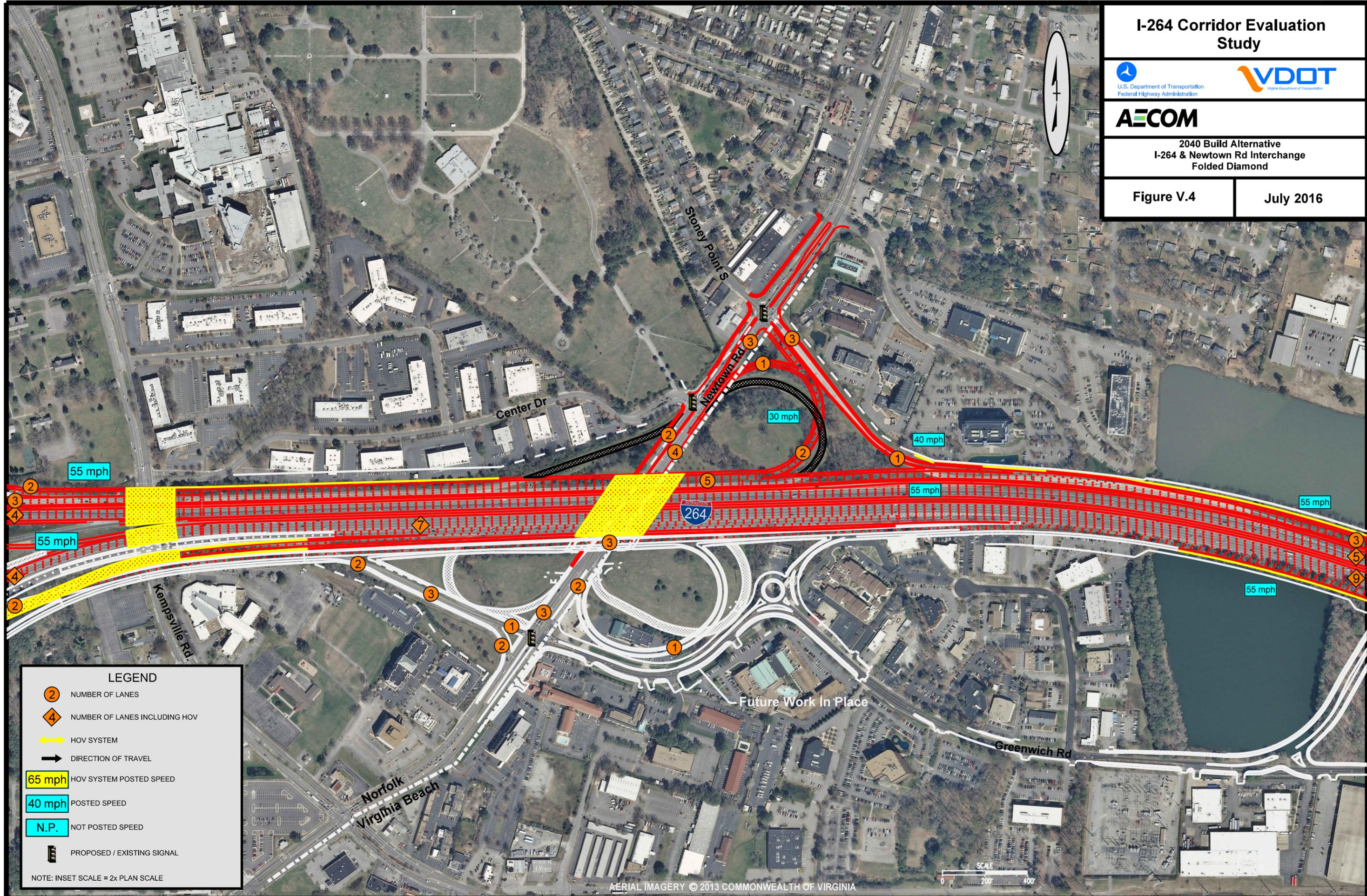


AECOM

2040 Build Alternative
I-264 & Newtown Rd Interchange
Folded Diamond

Figure V.4

July 2016



LEGEND

- NUMBER OF LANES
- NUMBER OF LANES INCLUDING HOV
- HOV SYSTEM
- DIRECTION OF TRAVEL
- 65 mph HOV SYSTEM POSTED SPEED
- 40 mph POSTED SPEED
- N.P. NOT POSTED SPEED
- PROPOSED / EXISTING SIGNAL

NOTE: INSET SCALE = 2x PLAN SCALE

I-264 Corridor Evaluation Study

U.S. Department of Transportation
Federal Highway Administration

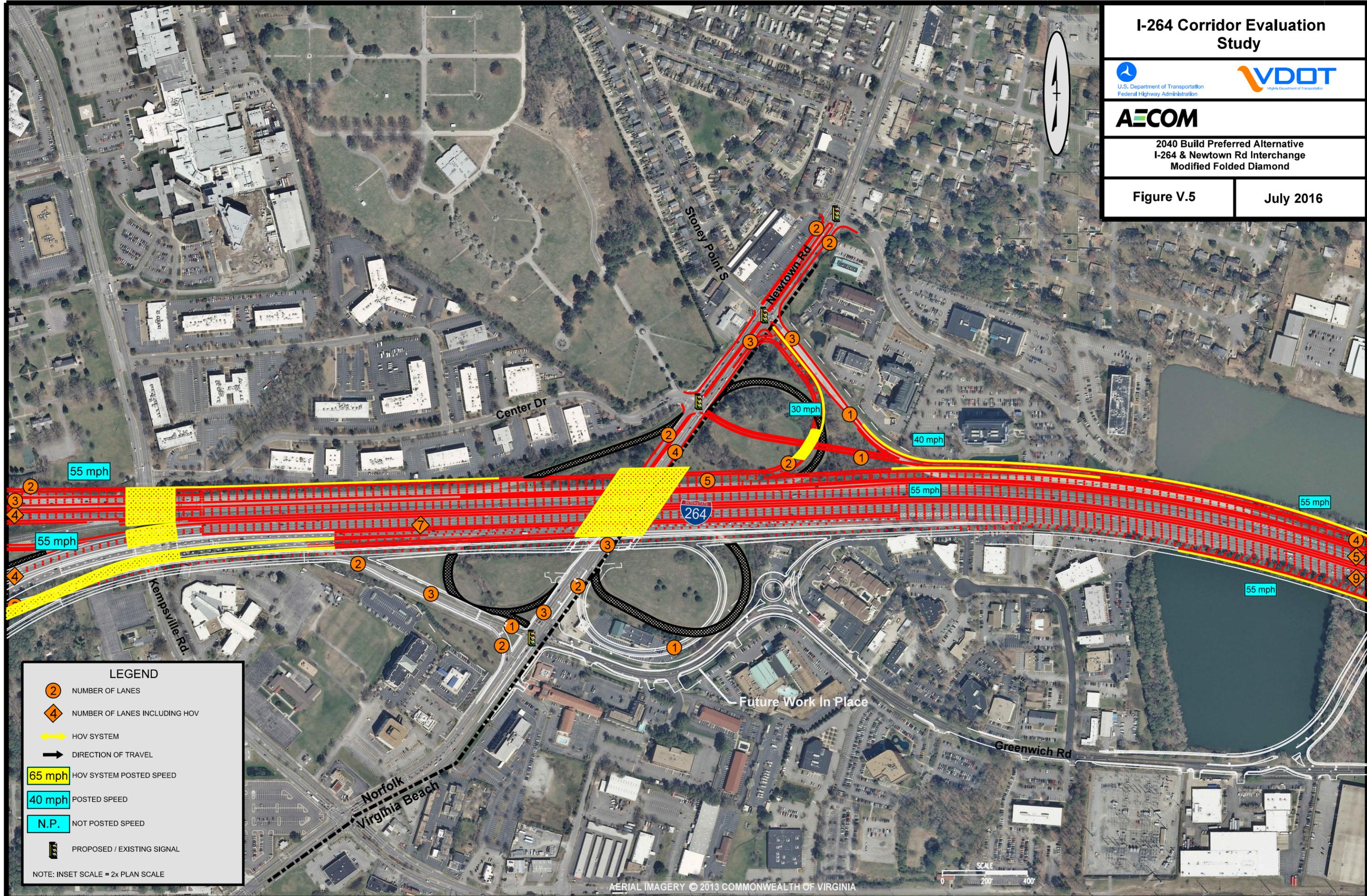


AECOM

2040 Build Preferred Alternative
I-264 & Newtown Rd Interchange
Modified Folded Diamond

Figure V.5

July 2016



LEGEND

- 2 NUMBER OF LANES
- 4 NUMBER OF LANES INCLUDING HOV
- HOV SYSTEM
- DIRECTION OF TRAVEL
- 65 mph HOV SYSTEM POSTED SPEED
- 40 mph POSTED SPEED
- N.P. NOT POSTED SPEED
- [Signal Icon] PROPOSED / EXISTING SIGNAL

NOTE: INSET SCALE = 2x PLAN SCALE

Intersection	AM Peak Hour		PM Peak Hour	
	Delay (sec.)	LOS	Delay (sec.)	LOS
Folded Diamond (Figure V.4)				
Stoney Point S/I-264 WB CD Off-Ramp*	47.6	D	53.6	D
Center Drive/I-264 WB CD On-Ramp	52.1	D	53.8	D
Greenwich Road/I-264 EB CD Ramps	53.3	D	40.4	D
Modified Folded Diamond (Figure V.5)				
Stoney Point S/I-264 WB CD Off-Ramp*	21.9	C	26.6	C
Center Drive/I-264 WB CD On-Ramp	31.8	C	32.7	C
Greenwich Road/I-264 EB CD Ramps	49.3	D	30.8	C

V.2.3 Alternative: Cost

Planning level cost estimates were developed for the two improvement alternatives for the Newtown Road Interchange. Detailed calculations have been included in the Technical Appendix. The main components of costs are structures, right of way and utility relocations. The cost estimates in year 2015 dollars are:

Alternative	Cost (in \$million)
Folded Diamond	\$203.9
Modified Folded Diamond	\$229.6

V.2.4 Stakeholder Coordination

Coordination meetings were held with staff from the City of Norfolk and the City of Virginia Beach. In general, representatives from both agencies were supportive of the evaluation process and the selection of the Modified Folded Diamond as the preferred alternative.

The City of Norfolk expressed concerns with the borderline performance of the Stoney Point/Westbound off-ramp intersection in the Folded Diamond interchange. This concern led to the development of the Modified Folded Diamond interchange and its ultimate selection as the preferred alternative.

Intersection	Ramp Length (feet)	AM Peak Hour		PM Peak Hour	
		Average (feet)	95th % (feet)	Average (feet)	95th % (feet)
Folded Diamond (Figure V.4)					
WB I-264 CD Off-Ramp to Newtown Rd	1,300	244	345	206	332
EB I-264 CD Off-Ramp to Newtown Rd. SB	1,200	242	355	249	339
EB I-264 CD Off-Ramp to Newtown Rd. NB	1,400	339	632	200	550
Modified Folded Diamond (Figure V.5)					
WB I-264 CD Off-Ramp to NB Newtown Rd	1,300	291	467	319	514
WB I-264 CD Off-Ramp to SB Newtown	1,000	283	464	172	261
EB I-264 CD Off-Ramp to Newtown Rd. SB	1,200	240	350	245	333
EB I-264 CD Off-Ramp to Newtown Rd. NB	1,400	0	0	2	49

V.2.5 Impacts

Identification of potential impacts on key resources from construction of the two improvement alternatives was evaluated using desktop GIS mapping analysis. Detailed exhibits are in the Technical Appendix. Summarized in **Table 5.12**, the results show that neither of the two alternatives would impact water resources (wetlands, for example) and they would not potentially impact Section 4(f) properties (public parks, for example). Both of the alternatives are anticipated to impact 4 buildings.

Improvement Alternative	WATER	BUILDINGS	RESIDENTIAL	POTENTIAL SECTION 4F
Folded Diamond	N	4	0	N
Modified Folded Diamond	N	4	0	N

V.3 Recommendation

The future geometry on eastbound I-264 from I-64 to Witchduck Road (including the Newtown Road interchange) has been defined and programmed with the widening of the off-ramp from westbound I-64 to eastbound I-264 (Ramp D-7). These improvements include the removal of the existing weave segment on I-264 at Newtown Road by removing the eastbound on-ramp and replacing it downstream of the existing off-ramp to northbound Newtown Road.

Initially one improvement alternative was developed to improve conditions associated with westbound I-264 at Newtown Road. The first alternative – Folded Diamond Interchange removed the southbound Newtown Road on-ramp to westbound I-264 CD, relocating the movement to the existing northbound Newtown Road on-ramp to westbound I-264 CD. This modification extended the weave segment on westbound I-264 CD to westbound I-64 by approximately 1,500 feet.

A second build alternative was developed once the Folded Diamond Interchange analysis showed borderline performance at the Stoney Point/I-264 westbound off-ramp intersection on Newtown Road. The Modified Folded Diamond interchange was developed to handle heavy volumes on the Newtown Road intersections. This was accomplished by splitting the westbound I-264 off-ramp where northbound traffic was aligned to the Stoney Pont intersection and southbound traffic was aligned to the Center Drive intersection thus spreading out the off-ramp volume and providing adequate service at the signalized intersections on Newtown Road.

The Modified Diamond Interchange was chosen as the preferred alternative because it can improve interstate operations while maintaining adequate service levels on Newtown Road with minimal impacts.