

Date of Meeting: June 6, 2017

9c

**BOARD OF SUPERVISORS
BUSINESS MEETING
ACTION ITEM**

SUBJECT: **TRANSPORTATION AND LAND USE COMMITTEE
REPORT: Response to Board Member Initiative: Safety
Concerns for Left Hand Turn from Estate Place to
Farmwell Road**

ELECTION DISTRICT: Broad Run

CRITICAL ACTION DATE: At the pleasure of the Board

STAFF CONTACTS: Khattab Shammout, Transportation and Capital Infrastructure
Mark Hoffman, Transportation and Capital Infrastructure
Joe Kroboth III, Transportation and Capital Infrastructure

PURPOSE: To seek approval from the Board of Supervisors (Board) for a design option to address safety concerns associated with left hand turns from Estate Place to Farmwell Road.

RECOMMENDATIONS:

Transportation and Land Use Committee (TLUC): At the TLUC meeting on May 12, 2017, TLUC recommended (5-0) that the Board endorse Alternative 1A that allows left turn movements from eastbound Farmwell Road to Estate Place and right-out turning movements from Estate Place to Farmwell Road and that this alternative be integrated into the design of the Farmwell Road widening project and be constructed concurrently with the road widening.

Staff: Staff recommends that the Board endorse Alternative 1A that provides a median break along Farmwell Road at the intersection with Estate Place to allow only left turns from eastbound Farmwell Road to Estate Place and access from Estate Place to Farmwell Road be limited to right-out movements. These enhancements will be integrated into the design of the Farmwell Road widening project and will be constructed concurrently with the road widening.

BACKGROUND: At the Board Business Meeting on March 17, 2016, the Board approved (9-0) a Board Member Initiative (BMI) directing the Department of Transportation and Capital Infrastructure (DTCI) to evaluate the intersection of Estate Place and Farmwell Road for safety concerns associated with left hand turn movements from Estate Place to eastbound Farmwell Road. The safety study and proposed improvement alternatives were presented to the Board at the Board

Business Meeting on September 22, 2016. The Board directed (7-0-2: Buffington and Randall absent) staff to evaluate additional alternatives to Smith Switch Road off the two exiting cul-de-sacs in the Cameron Chase community, besides the cul-de-sac at Lord Fairfax Place and to conduct a public information meeting with the Cameron Chase community to present the improvement alternatives and solicit feedback. The public information meeting was held on January 26, 2017, and was attended by 29 residents.

Estate Place off of Farmwell Road provides the only access to Section 1 of the Cameron Chase community that consists of 66 single-family dwellings. An access road into the community for emergency vehicles only exists off Smith Switch Road at Lord Fairfax Place. A vicinity map is included as Attachment 1. Concurrent with this evaluation, DTCI is overseeing the design to widen Farmwell Road from two lanes in each direction to three lanes in each direction. Construction funding to widen Farmwell Road is allocated in Fiscal Year (FY) 2019 as outlined in the adopted FY 2018 budget.

DTCI staff tasked the consultant designing the Farmwell Road widening project, Wallace Montgomery, to evaluate the Estate Place and Farmwell Road intersection and present improvement options. To evaluate the intersection, Wallace Montgomery obtained crash history for the three year period from 2013 through 2015, analyzed traffic data collected as part of the Farmwell Road widening project, and reviewed signal warrant analyses for the intersection and several others surrounding the Cameron Chase community. A copy of the Wallace Montgomery study is included as Attachment 2.

Crash history taken from Virginia Department of Transportation (VDOT) and Virginia Department of Motor Vehicles (DMV) records show two crashes during the three year period from 2013 through 2015. Only one of the crashes resulted from a vehicle turning left from Estate Place to eastbound Farmwell Road. Analysis of the traffic volume data shows the southbound Estate Place left turn operating at Level of Service (LOS) F in the peak AM and PM hours under current conditions. A signal warrant study of the intersection concludes a signal is not warranted under current or future conditions.

The design alternative (Alternative 1) presented by DTCI staff at the Board Business Meeting on April 20, 2017, recommended to close the median along Farmwell Road across from Estate Place and restrict access to Estate Place to right-in and right-out movements only.¹ Figure 1 shows Alternative 1. Several Cameron Chase community residents spoke during the public input portion of the Board Business Meeting, and one resident requested the Board to consider a modification to DTCI staff's recommended alternative (Alternative 1) which proposed a total closure of the Farmwell Road median at the Estate Place intersection to limit the entrance at Estate Place to a right-in and out entrance only. The Board forwarded (9-0) the item to the TLUC meeting on May 12, 2017, to review modifications to Estate Place and Farmwell Road suggested by the Cameron

¹ A copy of the April 20, 2017, Board Business Meeting Action Item can be found at the following link: <https://lfportal.loudoun.gov/LFPortalinternet/0/doc/217470/Electronic.aspx>.

Chase community resident which was not included in the alternatives presented at the Board Business Meeting.

Figure 1. Alternative 1



At the TLUC meeting on May 12, 2017, DTCI presented a modified alternative (Alternative 1A) that allows left turn movements from eastbound Farmwell Road to Estate Place and right-out only movements from Estate Place to westbound Farmwell Road. Figure 2 shows Alternative 1A. Wallace Montgomery's evaluation of the modified design alternative (Alternative 1A) is included as Attachment 3. Based on Wallace Montgomery's evaluation, the inclusion of a left turn lane from eastbound Farmwell Road to Estate Place and elimination of left turns out of Estate Place is a viable option and will not negatively impact traffic operations. If the eastbound left turn is allowed, this left turn movement would operate at LOS A with a delay of 8.6 seconds during the AM peak hour. During the PM peak hour, when this left turn would face a much heavier westbound through movement, it would operate at LOS C with a delay of 19.9 seconds, still well in the realm of acceptable. Alternative 1A meets VDOT geometry and site distance standards required as per the design speed of Farmwell Road. TLUC recommended (5-0) that the Board endorse Alternative 1A. In addition, TLUC requested DTCI staff to continue investigating methods to minimize U-turn movement delays from westbound to eastbound Farmwell Road at the Pipeline Plaza entrance.

Figure 2. Alternative 1A



ISSUES: This configuration provides a left turn movement from eastbound Farmwell Road to Estate Place that will operate at an acceptable LOS and will not negatively impact the operation of through traffic on Farmwell Road. In addition, the provided left turn bay meets VDOT geometry and site distance standards as required per the design speed of Farmwell Road

This configuration also removes the left turn movement from Estate Place to eastbound Farmwell Road that presents the most conflict points with through traffic on Farmwell Road. Drivers wishing to access eastbound Farmwell Road from Estate Place would be required to make a right turn onto westbound Farmwell Road and then a U-turn at the entrance to Pipeline Plaza. Farmwell Road will be widened to three lanes in each direction. When this change is implemented, DTCI engineers together with the road designer will ensure that the left turn bay from westbound Farmwell Road to Pipeline Plaza is designed to the required length needed to accommodate the additional queuing anticipated from the U-turn traffic.

The additional U-turn movements from westbound Farmwell Road to eastbound Farmwell Road at Pipeline Plaza resulting from the elimination of left turns from Estate Place to eastbound Farmwell Road will not negatively impact the operation of through traffic on Farmwell Road. Modifications of the left turn bay from westbound Farmwell Road to Pipeline Plaza will meet VDOT geometry and site distance standards as required per the design speed of Farmwell Road.

Considering Wallace Montgomery’s evaluation, DTCI staff recommends Alternative 1A that allows left turn movements from eastbound Farmwell Road to Estate Place and right-out

movements at the Estate Place entrance. DTCI staff feels this alternative will provide for a safer access to and from Estate Place than the full median opening that currently exists at this intersection. It will also provide for a more convenient access to the Cameron Chase community from Farmwell Road than the full median closure as previously recommended with Alternative 1 without negatively impacting the traffic operation of Farmwell Road. Alternative 1A is a cost effective option to integrate into the Farmwell Road widening project.

FISCAL IMPACT: The recommended alternative (Alternative 1A) will add no additional cost to the Farmwell Road widening project.

ALTERNATIVES:

1. The Board could choose to endorse the design alternative (Alternative 1A) that allows left turn movements from eastbound Farmwell Road to Estate Place and right-out turning movement at the Estate Place entrance.
2. The Board could choose to endorse the design alternative that closes the Farmwell Road median break (Alternative 1) and restricts turning movements at Estate Place to right-in and right-out only.
3. The Board could choose to endorse one of the other design alternatives provided in the April 20, 2017, Board Business Meeting Action Item.

DRAFT MOTIONS:

1. I move the Board of Supervisors **endorse** Alternative 1A that allows left turn movements from eastbound Farmwell Road to Estate Place and right-out turning movements from Estate Place to Farmwell Road.

I further move the Board of Supervisors integrate this alternative into the design of the Farmwell Road widening project to be constructed concurrently with the road widening.

OR

2. I move an alternate motion.

ATTACHMENTS:

1. Vicinity Map
2. April 10, 2017, Intersection Alternatives Analysis for Farmwell Road at Estate Place prepared by Wallace Montgomery
3. April 26, 2017, memo prepared by Wallace Montgomery

Vicinity Map – Farmwell Road and Estate Place



ATTACHMENT 1

TO: Mr. Bruce Thornberry
Loudoun County

FROM: Nick Alexandrow
Traffic Engineering Department

DATE: April 10, 2017

RE: Intersection Alternatives Analysis
Farmwell Road at Estate Place

WM Project No.: 215022.0001

INTRODUCTION

As requested by Loudoun County, a traffic analysis was completed for the intersection of Farmwell Road and Estate Place. Loudoun County Broad Run Supervisor Ron Meyer requested on March 21, 2016 at a Business Meeting of the Board of Supervisors that this intersection be studied to address current safety concerns for left-turns out of Estate Place onto Farmwell Road. With the widening of Farmwell Road to six lanes and with more traffic expected along Farmwell Road in the future, it may be more difficult in the future for vehicles to safely negotiate this left turn. Supervisor Meyer requested Loudoun County staff to evaluate options for this intersection, and the County has requested Wallace Montgomery to include this evaluation to the scope of the Farmwell and Waxpool Roads Widening project.

A traffic signal warrant study was completed for the intersection of Farmwell Road and Estate Place, and various other geometric options for access to the Cameron Chase development were analyzed to determine the best solution as design on the widening of Farmwell Road in this vicinity moves forward.

EXISTING CONDITIONS

Study Location

Farmwell Road (Route 640) is located in the Ashburn area of Loudoun County; and the Estate Place intersection is located on the north side of Farmwell Road between Pipeline Plaza and Ice Rink Plaza, west of Smith Switch Road and east of Ashburn Village Boulevard. Estate Place provides the only access to the Cameron Chase development, which consists of 66 single-family dwellings. There is an emergency access passageway via Lord Fairfax Place at Smith Switch Road, only accessible to emergency vehicles if the entrance from Farmwell Road were to become inaccessible. **Figure 1** displays the study intersection and its surroundings.



Figure 1 – Location Map

Intersection Geometry and Control

The following six existing intersections were evaluated for this study:

1. Farmwell Road @ Pipeline Plaza - Un-signalized with only Pipeline Plaza traffic stopping on south leg, with separate left-turn and right-turn lanes along Farmwell Road.
2. Farmwell Road @ Estate Place – Un-signalized with only Estate Place traffic stopping on north leg. There is an eastbound 425 foot left-turn lane and westbound 450 foot right-turn lane along the Farmwell Road approaches. There is a westbound 400 foot left-turn lane along Farmwell Road that can only be used for U-turns, which was constructed to serve possible future development to the south
3. Farmwell Road @ Ice Rink Plaza – Signalized with separate left-turn and right-turn lanes along Farmwell Road, and Ice Rink Plaza intersects Farmwell Road to the north. There is also a westbound left-turn lane for existing U-turns and for possible future use for development to the south.
4. Farmwell Road @ Smith Switch Road - Signalized with separate left-turn and right-turn lanes along both approaches of Farmwell Road. Smith Switch Road is a four-lane divided section at the intersection, though it tapers back to a two lanes north of Farmwell Road. There is a separate southbound left-turn lane, with right-turn movements sharing with the outer through lanes. The northbound approach has separate left-turn and right-turn lanes.



5. Smith Switch Road @ Hastings Drive - Un-signalized with only westbound Hastings Drive traffic stopping on the east leg. Hastings Drive is a four-lane divided section providing access to industrial uses. The intersection is located at the point where the southbound Smith Switch Road through lanes expand from a single lane to two lanes, and there is a single northbound through lane. Westbound Hastings Drive has separate left-turn and right-turn lanes and a superfluous through lane that has no receiving lane west of the intersection.
6. Smith Switch Road @ Chilum Place - Un-signalized with only westbound Chilum Place traffic stopping on the east leg. Chilum Place is a four-lane undivided section providing access to industrial uses and connects to Hastings Drive to the east. Smith Switch Road is a two-lane section at this intersection, and westbound Hastings Drive has separate left-turn and right-turn lanes.

Field Observations

Observations were undertaken during data collection at Smith Switch Road and Hastings Drive and Smith Switch Road and Chilum Place during peak hours as well as during the initial data collection along Farmwell Road completed by Sabra Wang on December, 16 2015. The following observations were made:

1. Traffic along Smith Switch Road north of Farmwell Road was fairly light during both peak hours, and most northbound traffic came in platoons from the signal at Farmwell Road.
2. There were not a large number of turns at the intersections of Smith Switch Road with Hastings Drive or Chilum Place.
3. Queues from the signal at Smith Switch Road never backed up to Hastings Drive.
4. Turning from Estate Place onto Farmwell Road could be problematic during peak hours. While the signal at Ice Rink Plaza provided some spaces, there is currently not a signal at Pipeline Plaza, and there are a lot of turns coming from Ashburn Village Boulevard, making breaks in eastbound traffic rare.
5. Estate Place generally does not generate much traffic during the day, with fewer than 300 vehicles entering and fewer than 300 vehicles exiting from Estate Place over the course of the 13-hour data collection effort.
6. Only 5 pedestrians crossed Estate Place during the 13-hour data collection effort, while no pedestrians crossed Farmwell Road at Estate Place.

Crash History

Crash history was taken from VDOT and Virginia DMV records for the three-year period from 2013-2015. There were no crashes at the intersection of Farmwell Road and Estate Place in either 2013 or 2015, though there were two crashes during 2014. Only one of these involved two vehicles, and this crash did cause an injury.

Despite the fact that the intersection could cause an unsafe condition with vehicles turning left from Estate Place onto Farmwell Road and crossing multiple lanes of traffic, only one reported crash over three years resulted from this action.



TRAFFIC VOLUME DATA AND ANALYSIS

Traffic Data Collection

Thirteen-hour (6 AM to 7PM) counts were collected at all intersections along Farmwell Road from Ashburn Road to Loudoun County Parkway on Wednesday, December 16, 2015. These counts were completed by Sabra Wang as part of the Farmwell Road Widening project. They included the intersections of Farmwell Road with Pipeline Plaza, Estate Place, Ice Rink Plaza, and Smith Switch Road.

The intersections of Smith Switch Road and Hastings Drive and Smith Switch Road and Chilum Place were counted on Wednesday, April 27, 2016 to determine traffic along Smith Switch Road north of Farmwell Road. These were peak hour only counts (7 AM to 9 AM and 4 PM to 6 PM) based on the peak hour determined by the 13-hour counts at Farmwell Road and Smith Switch Road. **Figure 2** shows the existing individual balanced peak hour movements, and **Appendix A** includes the turning movement count worksheets.

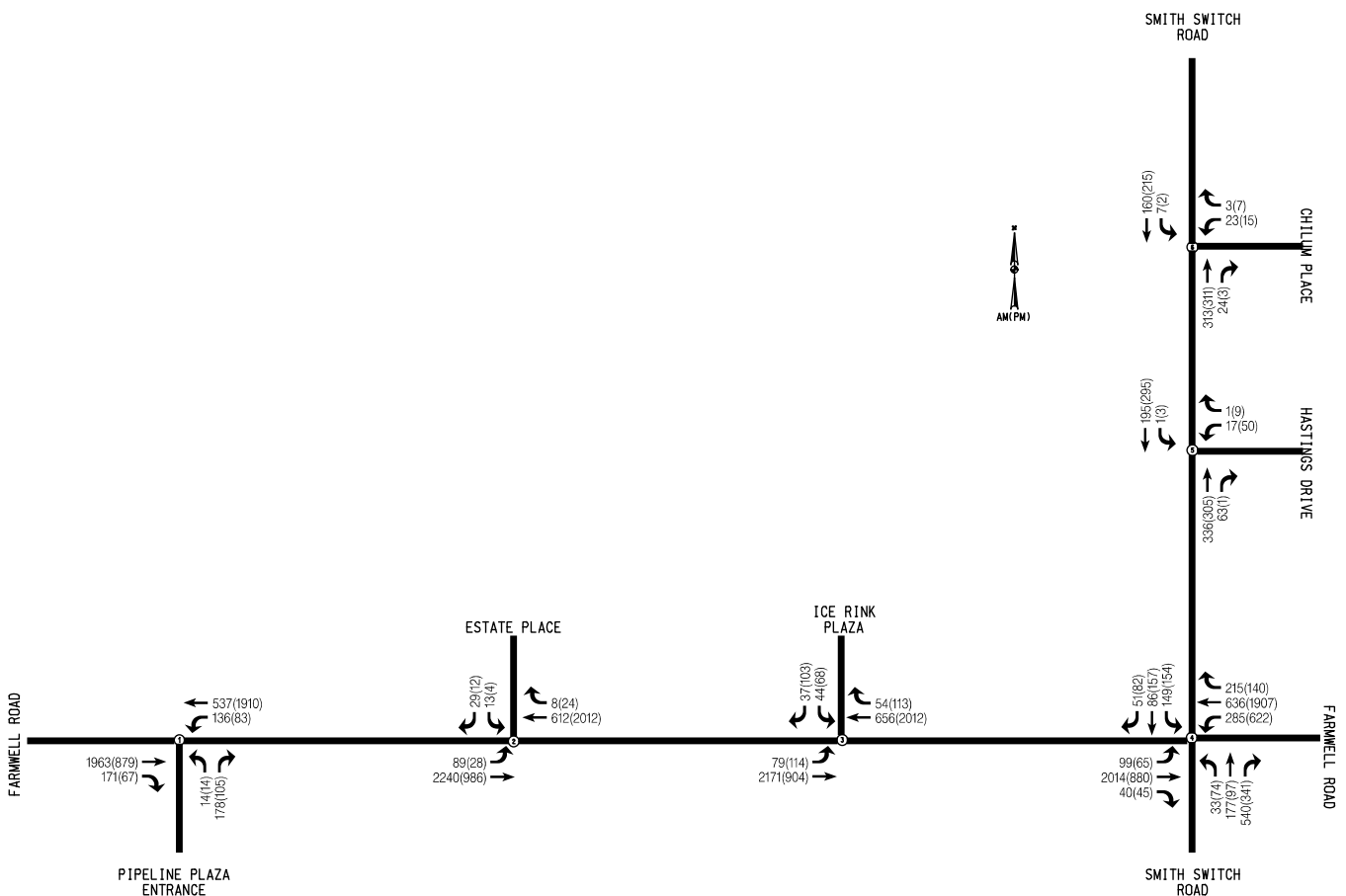


Figure 2 - Existing (2016) Traffic Volumes



Existing Operational Analysis

Operational analyses were performed for the peak hour 2016 volumes in accordance to the Highway Capacity Manual (HCM) methodologies using Synchro 9. **Table 1** presents the resulting Levels of Service (LOS) and delays under existing conditions, and detailed analysis worksheets are included in **Appendix B**.

Table 1 - Existing (2016) Levels of Service and Delays

Intersection	Movement	AM LOS	AM Delay (sec)	PM LOS	PM Delay (sec)
1. Farmwell Road/ Pipeline Plaza	Overall	A	4.7	A	0.9
	EBT	A	0.0	A	0.0
	EBR	A	0.0	A	0.0
	EB	A	0.0	A	0.0
	WBL	D	33.3	B	10.6
	WBT	A	0.0	A	0.0
	WB	A	6.5	A	0.4
	NBL	F	71.0	D	30.9
	NBR	E	49.2	B	12.8
	NB	E	50.8	C	14.9
2. Farmwell Road/ Estate Place	EBL	E	46.1	C	18.7
	EBT	A	0.0	A	0.0
	EB	A	0.2	A	0.3
	WBL	A	0.0	A	0.0
	WBT	A	0.0	A	0.0
	WB	A	0.0	A	0.0
	SB	D	26.6	C	63.7
3. Farmwell Road/ Ice Rink Plaza	Overall	A	7.3	A	6.6
	EBL	A	0.9	F	115.1
	EBT	A	5.9	A	0.6
	EB	A	5.8	B	12.5
	WBL	F	150.0	E	59.8
	WBT	A	2.0	A	3.2
	WBR	A	0.2	A	0.2
	WB	A	2.0	A	4.9
	NB	B	15.9	A	1.3
	SB	F	95.1	A	2.6



Table 1 (Cont.) - Existing (2016) Levels of Service and Delays

Intersection	Movement	AM LOS	AM Delay (sec)	PM LOS	PM Delay (sec)
4. Farmwell Road/ Smith Switch Road	Overall	E	67.5	D	47.1
	EBL	A	7.7	F	85.2
	EBT	D	38.5	D	43.5
	EBR	B	16.7	C	31.2
	EB	D	36.7	D	45.7
	WBL	F	140.8	F	80.8
	WBT	C	25.3	B	17.5
	WBR	F	131.5	A	4.9
	WB	E	74.4	C	31.6
	NBL	E	78.7	F	92.9
	NBT	F	341.9	F	210.0
	NBR	E	74.3	D	51.8
	NB	F	137.6	F	87.7
	SBL	F	96.1	F	100.3
	SBT	E	77.7	F	105.3
SB	F	87.3	F	103.3	
5. Smith Switch Road/ Hastings Drive	WB	B	12.3	A	12.4
	NB	A	0.0	A	0.0
	SB	A	0.1	A	0.1
6. Smith Switch Road/ Chilum Place	WB	B	11.9	B	11.6
	NB	A	0.0	A	0.0
	SB	A	0.4	A	0.1

The minor street approaches to Farmwell Road along Pipeline Plaza, Ice Rink Plaza, and Smith Switch Road (both approaches) operate at a LOS E or worse during the AM peak hour; and the Smith Switch Road approaches also operates at a LOS E or worse during the PM peak hour. There are no operational issues at the intersections of Smith Switch Road and Hastings Drive or Chilum Place, and there are no major queuing issues under existing conditions for any of the study intersections.



FUTURE TRAFFIC VOLUMES AND ANALYSIS

Future Volume Growth

Future traffic volumes along the Farmwell Road corridor were developed in cooperation with VDOT’s Northern Virginia Region Planning Department. VDOT used MWCOG’s latest land use model (Version 8.4) to determine growth rates along Farmwell Road as well as the north-south corridors of Ashburn Road, Ashburn Village Boulevard, Smith Switch Road, and Loudoun County Parkway. For this analysis, only Farmwell Road and Smith Switch Road growth rates were required. Growth along Farmwell Road was assumed at 1.9 percent per year, growth along Smith Switch Road to the south of Farmwell Road was assumed at 1.0 percent per year, and growth to the north of Farmwell Road was assumed at 1.6 percent per year. The existing volumes were grown at these rates to arrive at the 2020 design year volumes.

It was assumed that Pipeline Plaza and Ice Rink Plaza are mature developments that will not experience growth in the future with one exception to be discussed below. However, a 0.2 percent growth rate was applied to turning movements into and out of these shopping centers. This rate was also applied for Estate Place turning movements. Growth at Smith Switch Road and Hastings Drive and Smith Switch Road and Chilum Place was assumed at 1.0 percent per year per VDOT’s assumptions. This included along Hastings Drive and Chilum Place as these lead to developments that were included in the land use model.

In addition to the ambient growth, two developments were assumed. One is the planned addition of an AutoZone store at Ice Rink Plaza, and the other is the RagingWire development of over two million square feet of data center space south of Farmwell Road, with access via a roadway adjacent to Ice Rink Plaza. The trip generation for the AutoZone was developed from ITE’s Trip Generation, 9th Edition, for the AM and PM peak hours for both developments. Trip generation for the RagingWire development was developed by Pennoni as part of the site plan design for the site, and the trip generation for both developments are shown in **Table 2**. These trips were added to the traffic network for each alternative. Plans for these developments are included as **Appendix C**, and detailed trip generation for the data center site can be found in **Appendix D**.

Table 2 – Trip Generation

Land Use	ITE Code	AM In	AM Out	AM Total	PM In	PM Out	PM Total
AutoZone (Automobile Parts Sales)	843	8	7	15	21	20	41
Data Centers (Warehousing)	160/710	206	135	341	51	216	267

Future 2020 traffic volumes are shown in **Figure 3** for the future, assuming no access changes to the intersection of Farmwell Road and Estate Place.



Figure 3 – Future (2020) Traffic Volumes (Base Condition)

Future Operational Analysis

While the intersection of Farmwell Road and Pipeline Plaza warrants a traffic signal under existing conditions, the proximity to the signal at Ashburn Village Boulevard would prohibit a signal under VDOT Access Management guidelines. With the future widening of Farmwell Road, this intersection will remain un-signalized, though left-turns from Pipeline Plaza onto westbound Farmwell Road will no longer be permitted. Westbound left-turns onto Pipeline Plaza will be permitted however.

Operational analyses were performed for the peak hour 2020 volumes in accordance to the HCM methodologies. Resulting LOS and delays are shown in **Table 3**, assuming the intersection of Farmwell Road and Estate Place remains un-signalized, and Synchro worksheets are available in **Appendix E**. Considering Farmwell Road will be widened and that signal modifications will have to take place at all signals, it was assumed that signal timing would change in the future. Signal timings were optimized at each signal for all future analyses.

Due to the widening of Farmwell Road as well as the optimization of the signals, some LOS improved over existing conditions. The northbound and southbound approaches of Farmwell Road at Ice Rink Plaza operate below LOS D during the AM peak hour. In addition, the westbound left-turn operates at LOS F during the AM peak hour at Pipeline Plaza, though the delay is not excessive and the overall approach operates at LOS B. The intersection of Farmwell Road and Estate Place is not included in Table 3, as Synchro cannot calculate an un-signalized LOS for a six-lane highway with turn lanes. It



can be assumed however that southbound Estate Place as well as the northbound approach from the data center site will operate at LOS F, as Estate Place does under existing conditions.

Table 3 – Future (2020) Levels of Service and Delays (Base Condition)

Intersection	Movement	AM LOS	AM Delay (sec)	PM LOS	PM Delay (sec)
1. Farmwell Road/ Pipeline Plaza	EBT	A	0.0	A	0.0
	EBR	A	0.0	A	0.0
	EB	A	0.0	A	0.0
	WBL	F	60.4	B	11.4
	WBT	A	0.0	A	0.0
	WB	B	11.2	A	0.5
	NBR	C	24.7	B	11.4
3. Farmwell Road/ Ice Rink Plaza	Overall	D	40.8	A	6.2
	EBL	F	98.9	F	112.1
	EBT	D	41.5	A	0.3
	EBR	C	20.7	A	1.3
	EB	D	43.0	B	12.9
	WBL	F	135.0	D	51.8
	WBT	A	5.9	A	2.9
	WBR	A	3.4	A	0.6
	WB	C	25.7	A	3.5
	NB	E	74.9	A	3.5
	SBL	F	87.3	A	1.4
	SBL/T/R	F	80.3	A	1.6
	SB	F	83.7	A	1.5



Table 3 (Cont.) – Future (2020) Levels of Service and Delays (Base Condition)

Intersection	Movement	AM LOS	AM Delay (sec)	PM LOS	PM Delay (sec)
4. Farmwell Road/ Smith Switch Road	Overall	D	36.5	D	39.2
	EBL	F	111.6	E	68.7
	EBT	B	12.5	D	41.3
	EBR	C	20.3	C	25.7
	EB	B	17.1	D	52.2
	WBL	F	91.9	E	68.3
	WBT	C	22.9	C	24.7
	WBR	F	85.9	B	14.4
	WB	C	49.2	C	34.2
	NBL	E	61.7	E	57.5
	NBT	E	69.2	E	65.4
	NBR	D	53.2	C	33.6
	NB	E	57.4	D	43.2
	SBL	F	95.1	E	59.1
	SBT/R	E	62.6	E	61.1
	SB	E	79.4	E	60.4
5. Smith Switch Road/ Hastings Drive	WB	B	12.7	B	13.4
	NB	A	0.0	A	0.0
	SB	A	0.1	A	0.1
6. Smith Switch Road/ Chilum Place	WB	B	12.2	B	12.2
	NB	A	0.0	A	0.0
	SB	A	0.4	A	0.1

SIGNAL WARRANT STUDY

A full signal warrant study was completed for the intersection of Farmwell Road and Estate Place in accordance with the Manual on Uniform Traffic Control Devices (MUTCD). Warrants 1 and 2 were analyzed for volumes for existing (2016) and future (2020) conditions, and the volume warrant studies were completed using the 13-hour counts collected in December 2015 for existing conditions. Warrant analyses are included as **Appendix F**, and a detailed explanation of the MUTCD Warrants are included as **Appendix G**.

For future volumes, as stated previously, a small growth rate of 0.2% per year was assumed for Estate Place. The resultant volumes are available as part of Appendix F as well with the warrant analysis for Warrants 1 and 2. Since the speed limit along Farmwell Road is 45 mph, the 70 percent volumes were used for Warrants 1 and 2.



The following are the results of the signal warrant study:

1. Warrant 1: 8-Hour Vehicular Volume was analyzed under existing conditions, and it was found that none of the 8 hours with the heaviest traffic met the conditions of Condition A or Condition B. This warrant can also be met if 80 percent of the total volumes meet both Condition A and Condition B. No hours meet Condition A and only two hours meet Condition B with 80 percent volumes. While all 8 hours are met under all conditions along the major road (Farmwell Road), the low amount of traffic on Estate Place are what keeps this intersection from warranting a signal under existing conditions.

Warrant 1 was again analyzed with future volumes. The results were identical to the existing analysis. As the minor road is the driver behind the failure to meet the warrant, and Estate Place volumes are not expected to increase due to the fact that Cameron Chase is a mature development, this result is expected.

2. Warrant 2: 4-Hour Vehicular Volume was analyzed under existing and future conditions, and it was found that none of the 4 hours with the heaviest traffic fall above the curve for either the 100 percent volumes or 80 percent volumes.
3. Warrant 3: Peak Hour is not applicable to this intersection as this warrant should only be applied in a situation where there is a large discharge of vehicles over a short period of time, such as at an office complex or a high occupancy vehicle facility, such as a FedEx and UPS Shipping Center. The residential development of Cameron Chase does not meet this standard.
4. Warrant 4: Pedestrian Volume is not met at this intersection as it requires large numbers of pedestrians. No pedestrians crossed Farmwell Road during the 13-hours of data collection.
5. Warrant 5: School Crossing is intended for locations where large numbers of schoolchildren are crossing the major street of the intersection. While Discovery Elementary School is located to the south of Farmwell Road, it does not have direct access to Farmwell Road, and as stated previously, no pedestrians crossed Farmwell Road at this location during data collection, a day when school was in session. So, this warrant is also not met.
6. Warrant 6: Coordinated Signal System applies in situations where there are not close adjacent signals to allow for platooning of vehicles. This warrant is not met since there are current signals at Ice Rink Plaza and Ashburn Village Boulevard, and there will likely be a signal at Pipeline Plaza in the future.
7. Warrant 7: Crash Experience is not met as this warrant requires there to be 5 crashes over a 12-month period that could have been avoided with a signal. There was only a single crash over 3 years that may have been avoidable with a signal.
8. Warrant 8: Roadway Network does not apply to this intersection as the entrance to Estate Place is are part of a major route, just an entrance to a residential development.
9. Warrant 9: Railroad Grade Crossing does not apply to this intersection, as there is not a railroad grade crossing nearby.

None of the warrants pass for either existing or future 2020 volumes. Traffic will not increase along Estate Place, as Cameron Chase is a mature development. While traffic along Farmwell Road is expected to increase into the future, the minor street volumes will likely never be high enough to warrant a signal.



Since a signal will likely never be warranted, and it will continue to become more difficult to turn left out of and into Estate Place, alternative access should be considered instead of the intersection remaining a full access median crossover without a traffic signal.

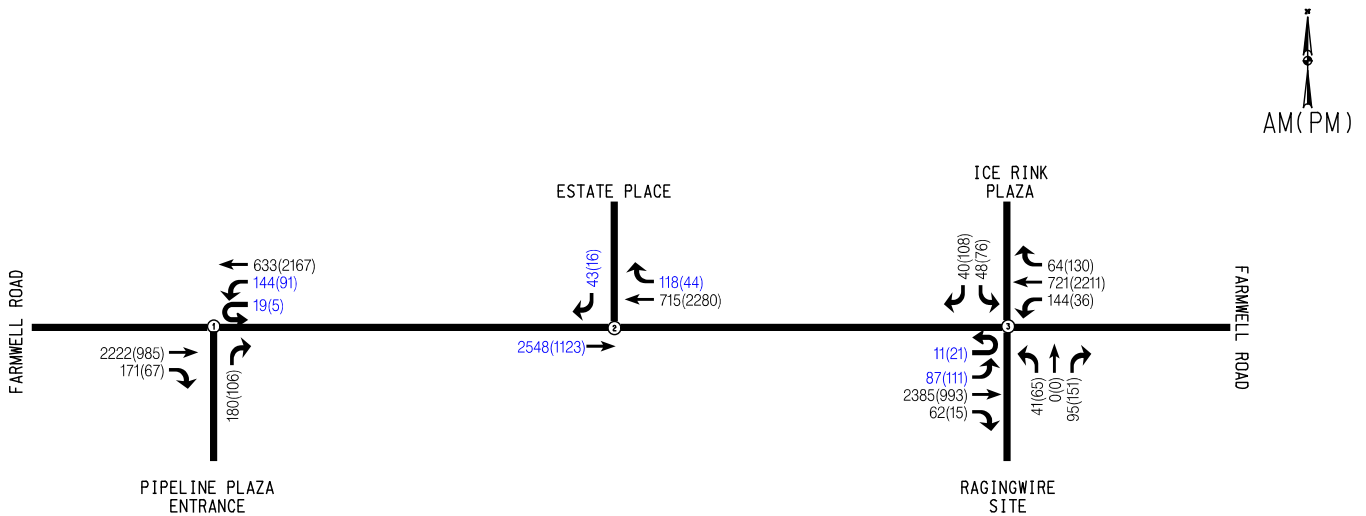
ALTERNATIVE ANALYSIS

Four separate geometric alternatives were analyzed to determine the best un-signalized solution for the intersection of Farmwell Road and Estate Place.

Alternative 1

The first alternative would be to close the median along Farmwell Road at Estate Place and force eastbound traffic wishing to travel onto Estate Place to make a U-turn at Ice Rink Plaza, then turn right onto Estate Place. For traffic wishing to exit the Cameron Chase development from Estate Place and turn left on Farmwell Road, they would be required to turn right onto westbound Farmwell Road, then make a U-turn at Pipeline Plaza.

2020 volumes were developed making the necessary diversions, and these volumes are shown in **Figure 4**, including U-turns. The resulting LOS and delays for each impacted intersection under this scenario are shown in **Table 4**, and Synchro worksheets are included in **Appendix H**. As shown in Table 4, LOS at the adjacent intersections (Pipeline Plaza, Ice Rink Plaza) are mostly not adversely affected by the additional U-turns. While the westbound left-turn at Pipeline Plaza continues to operate at LOS F, the delay is not increased by the increased number of U-turns. The right-turns onto Farmwell Road from Estate Place operate at LOS A.



Future 4 – Future (2020) Traffic Volumes (Alternative 1)



Table 4 – Future (2020) Levels of Service and Delays (Alternative 1)

Intersection	Movement	AM LOS	AM Delay (sec)	PM LOS	PM Delay (sec)
1. Farmwell Road/ Pipeline Plaza	EBT	A	0.0	A	0.0
	EBR	A	0.0	A	0.0
	EB	A	0.0	A	0.0
	WBL	F	60.4	B	11.4
	WBT	A	0.0	A	0.0
	WB	B	11.2	A	0.5
	NBR	C	24.7	B	11.4
2. Farmwell Road/ Estate Place	EB	A	0.0	A	0.0
	WB	A	0.0	A	0.0
	SBR	A	8.7	A	9.2
3. Farmwell Road/ Ice Rink Plaza	Overall	D	40.4	A	6.9
	EBL	F	100.4	F	113.9
	EBT	D	40.2	A	0.3
	EBR	C	20.2	A	1.3
	EB	D	42.0	B	14.7
	WBL	F	137.6	D	51.8
	WBT	A	5.9	A	3.1
	WBR	A	3.4	A	0.6
	WB	C	26.2	A	3.7
	NB	E	78.6	A	3.9
	SBL	F	87.3	A	1.4
	SBL/T/R	F	80.3	A	1.6
SB	F	83.7	A	1.5	



Alternative 2

The second alternative involves alternative access to the future AutoZone at Ice Rink Plaza. An entrance from Estate Place to Ice Rink Plaza would be constructed just north of and parallel to Farmwell Road. This would be an entrance only and would only accommodate one-way traffic, and this roadway can be seen in Appendix C in the AutoZone plans. Eastbound traffic wishing to access Estate Place would still need to make a U-turn at Ice Rink Plaza. However outbound traffic could use this new access road to approach the signal at Ice Rink Plaza and turn left, not requiring to make U-turns at Pipeline Plaza. The median would be closed as with Alternative 1.

2020 volumes were developed making the necessary diversions, and these volumes are shown in **Figure 5** including U-turns. The LOS for each impacted intersection under this scenario are shown in **Table 5**, and Synchro worksheets are included as **Appendix I**. As shown in Table 5, LOS at Ice Rink Plaza are not adversely affected by the additional southbound left-turns. The westbound left-turn at Pipeline Plaza operates identically to the Base Condition and to Alternative 1.

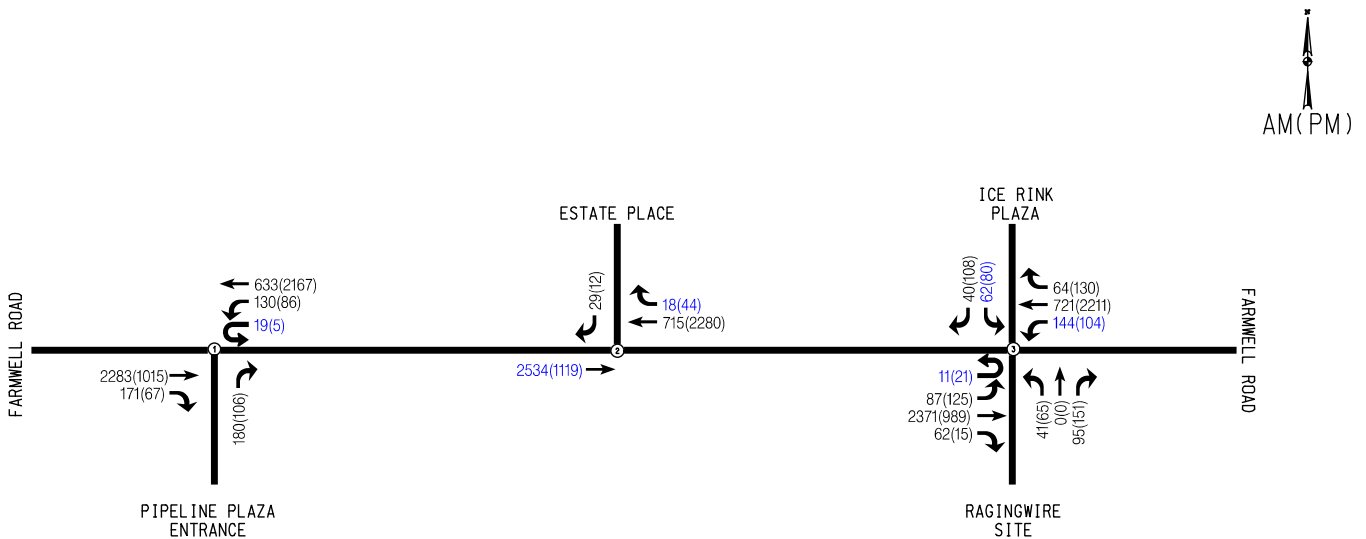


Figure 5 – Future (2020) Traffic Volumes (Alternative 2)



Table 5 – Future (2020) Levels of Service and Delays (Alternative 2)

Intersection	Movement	AM LOS	AM Delay (sec)	PM LOS	PM Delay (sec)
1. Farmwell Road/ Pipeline Plaza	EBT	A	0.0	A	0.0
	EBR	A	0.0	A	0.0
	EB	A	0.0	A	0.0
	WBL	F	60.4	B	11.3
	WBT	A	0.0	A	0.0
	WB	B	11.2	A	0.4
	NBR	C	24.7	B	11.4
2. Farmwell Road/ Estate Place	EB	A	0.0	A	0.0
	WB	A	0.0	A	0.0
	SBR	A	8.6	A	9.2
3. Farmwell Road/ Ice Rink Plaza	Overall	D	40.5	A	6.9
	EBL	F	100.4	F	114.2
	EBT	D	40.0	A	0.3
	EBR	C	20.3	A	1.3
	EB	D	41.9	B	14.8
	WBL	F	137.6	D	51.8
	WBT	A	6.0	A	3.1
	WBR	A	3.4	A	0.6
	WB	C	26.2	A	3.7
	NB	E	78.4	A	3.9
	SBL	F	89.8	A	1.4
	SBL/T/R	F	80.3	A	1.6
	SB	F	85.2	A	1.5



Alternative 3

The third alternative would introduce an alternative access to Cameron Chase along Smith Switch Road. There are three possible locations for this alternative access, all existing cul-de-sacs that run east-to-west within Cameron Chase:

1. Oldetowne Place
2. Lord Fairfax Place, which currently has an emergency access passageway from Smith Switch Road onto the cul-de-sac in the event that Estate Place is blocked
3. St. Germain Court.

This alternative proposes creating a new full access connection for all motorists, with left-turns and right-turns allowed into and out of one of the above roadways from Smith Switch Road. The median would be closed along Farmwell Road at Estate Place, and eastbound traffic along Farmwell Road wishing to enter the Cameron Chase development would turn left at Smith Switch Road and then turn left into Cameron Chase. Traffic wishing to exit Cameron Chase to travel east would turn right from Oldetowne Place, Lord Fairfax Place, or St. Germain Court onto Smith Switch Road, then turn left onto Farmwell Road at the signal.

The 2020 volumes were developed making the necessary diversions, and these volumes are shown in **Figure 6**. The resulting levels of service and delays for each intersection under this scenario are shown in **Table 6**, and Synchro worksheets are included as **Appendix J**. The volumes and capacity at the new intersection would be the same no matter which option for the access is chosen. As shown in Table 6, levels of service at the new access are at acceptable levels, and levels of service at the other intersections in the network are similar to the base condition.

Left-turn lane warrants and right-turn lane warrants were completed for the intersection of Smith Switch Road and the new access in accordance with VDOT Access Management Design Standards, and these worksheets are included as **Appendix K**. The analysis results show that neither a left-turn lane nor a right-turn lane is warranted; and therefore so no additional turn lanes were assumed along Smith Switch Road. Smith Switch Road is planned as a four-lane section through this area according to the Loudoun County Comprehensive Plan, though this section was not assumed for 2020 as it is currently.

The preferred option for the new access would be Lord Fairfax Place because it is the most centrally located between existing intersections along Smith Switch Road, and the current emergency access alignment has minimal impacts to existing vegetation and right-of-way. There would be more grading necessary at the Oldetowne Place location as well as additional tree removal and right-of-way costs to construct the access. It also requires more work to adjust the alignments of existing adjacent driveways to tie into the proposed access roadway alignment. In addition, using this location could invite cut-through traffic as Oldetowne Place connects directly to Estate Place, whereas Lord Fairfax Place does not. The intersection of St. Germain Court is located only 120 feet (centerline-to-centerline) from Chillum Place, which is not acceptable according to VDOT Access Management standards (see VDOT RDM Appendix F, Table 2-2). With the current two-lane Smith Switch Road, these offset intersections could create a safety hazard, especially with turning vehicles. With the future four-lane divided section, only one of these intersections would be permitted a median crossover.

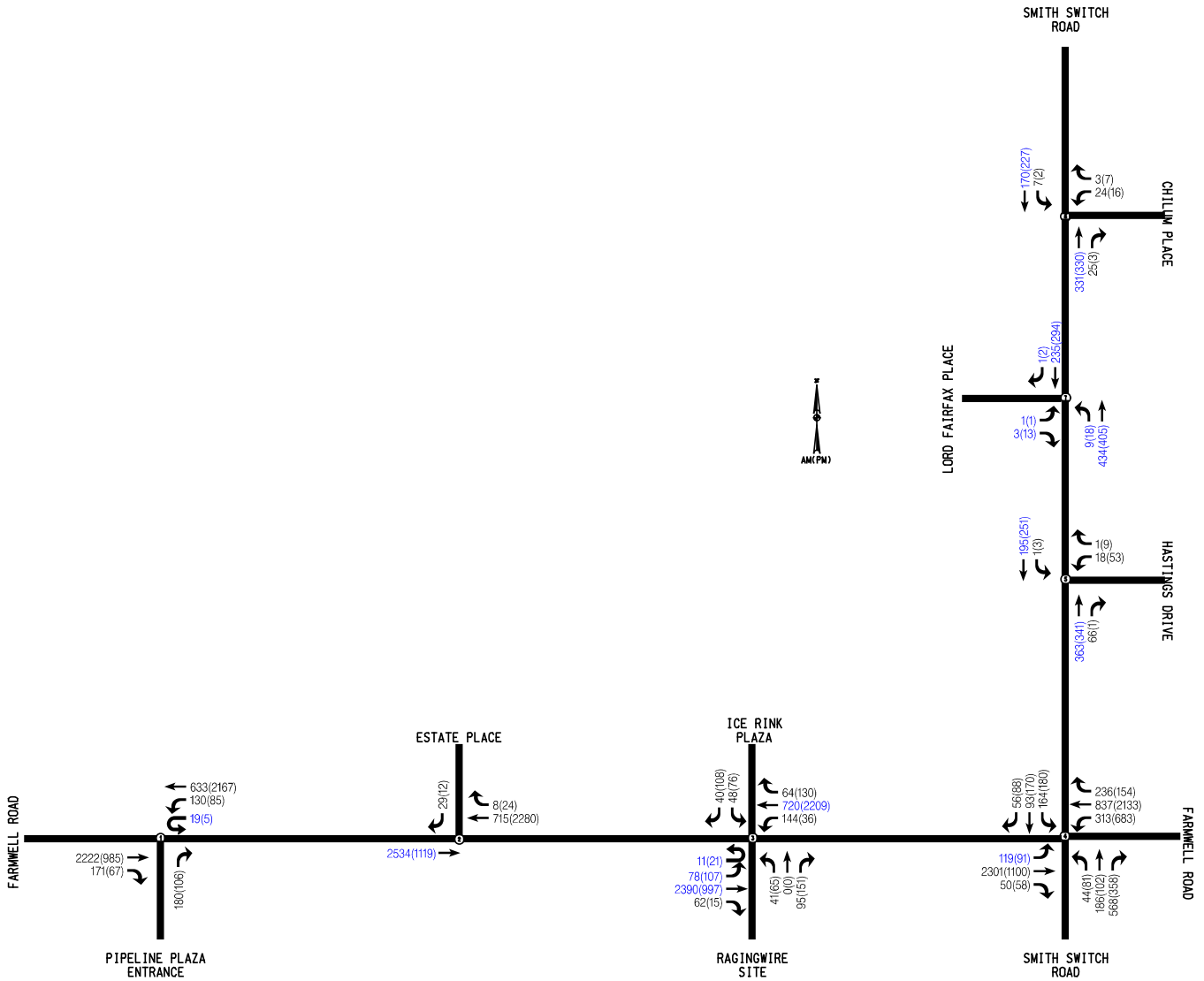


Figure 6 – Future (2020) Traffic Volumes (Alternative 3)



Table 6 – Future (2020) Levels of Service and Delays (Alternative 3)

Intersection	Movement	AM LOS	AM Delay (sec)	PM LOS	PM Delay (sec)
2. Farmwell Road/ Pipeline Plaza	EBT	A	0.0	A	0.0
	EBR	A	0.0	A	0.0
	EB	A	0.0	A	0.0
	WBL	F	60.4	B	11.3
	WBT	A	0.0	A	0.0
	WB	B	11.2	A	0.4
	NBR	C	24.7	B	11.4
2. Farmwell Road/ Estate Place	EB	A	0.0	A	0.0
	WB	A	0.0	A	0.0
	SBR	A	8.6	A	9.4
3. Farmwell Road/ Ice Rink Plaza	Overall	D	39.8	A	6.3
	EBL	F	98.9	F	42.7
	EBT	D	39.4	A	0.3
	EBR	B	19.0	A	1.3
	EB	D	41.0	B	12.9
	WBL	F	142.3	E	48.0
	WBT	A	5.9	A	3.2
	WBR	A	4.0	A	2.0
	WB	C	26.9	A	3.8
	NB	E	76.1	A	3.5
	SBL	F	87.3	A	1.4
	SBL/T/R	F	80.3	A	1.6
	SB	F	83.7	A	1.5



Table 6 (Cont.) – Future (2020) Levels of Service and Delays (Alternative 3)

Intersection	Movement	AM LOS	AM Delay (sec)	PM LOS	PM Delay (sec)
4. Farmwell Road/ Smith Switch Road	Overall	D	37.4	D	41.2
	EBL	F	113.5	E	68.6
	EBT	B	12.6	D	43.9
	EBR	C	21.7	C	27.4
	EB	B	17.7	D	36.8
	WBL	F	82.2	E	67.6
	WBT	C	24.6	C	28.4
	WBR	F	99.8	B	16.4
	WB	D	50.4	D	36.8
	NBL	E	69.4	E	57.2
	NBT	F	82.9	E	68.3
	NBR	E	59.6	C	34.2
	NB	E	65.5	D	44.10
	SBL	E	66.4	D	52.4
	SBT	E	61.3	E	60.0
SB	E	64.0	E	56.9	
5. Smith Switch Road Hastings Drive	WB	B	12.9	B	13.7
	NB	A	0.0	A	0.0
	SB	A	0.1	A	0.1
6. Smith Switch Road/ Chilum Place	NB	A	0.0	A	0.0
	SB	A	0.4	A	0.1
	WB	B	12.4	B	12.6
7. Smith Switch Road/ Lord Fairfax Place	EB	B	10.6	A	0.0
	NB	A	0.2	A	0.5
	SB	A	0.0	B	10.3



Alternative 4

A fourth alternative that was analyzed is what is known as a “Maryland T-Intersection.” This alternative would allow for left-turns from eastbound Farmwell Road onto Estate Place and for left-turns out of Estate Place. The outbound left-turns would cross westbound traffic and enter a merge lane to the left of the eastbound travel lanes. These vehicles would then merge into eastbound traffic, effectively making the turn a two-part maneuver instead of a one-part maneuver (see **Figure 7**).

There are two issues with this alternative.

1. It would require a wider median at this location, which would be costly and which would likely require more acquisition of right-of-way during the widening of Farmwell Road. Based on existing development at Cameron Chase and proposed development to the south, there may not be enough room to construct this option.
2. The merge lane along eastbound Farmwell Road would be relatively short and would flow into the eastbound left-turn lane at Ice Rink Plaza. Traffic that could not merge in time would be forced to turn left into the shopping center.

For these reasons, this alternative was not analyzed further.



Figure 7 – Maryland T Intersection Example

Alternative Analysis

Since there are no alternatives that significantly degrade operations at adjacent intersections along Farmwell Road or Smith Switch Road, all alternatives are acceptable from a capacity standpoint. However, Alternative 1 requires U-turns at two intersections along Farmwell Road, and Alternative 2 requires U-turns at one intersection and access through a shopping center. The access through the shopping center may be unfamiliar to many drivers, as this would be a fairly unique concept. Some drivers may still make the U-turn at Pipeline Plaza to access eastbound Farmwell Road instead of using Ice Rink Plaza. In addition, this does not offer alternative access for eastbound left-turns into Estate Place. For these reasons, Alternative 2 is eliminated from consideration.

Alternative 3 would add an access point to Cameron Chase, making it more convenient for residents depending on the location of their house, but it has its disadvantages as well. At the three possible access points, there could be opposition from the residents of those roadways as their streets are currently lightly-traveled cul-de-sacs. Opening up a cul-de-sac to Smith Switch Road would introduce



more traffic along the roadway chosen and possibly provide a cut-through opportunity, especially along Oldetown Place, which connect directly to Estate Place. It would be less likely from Lord Fairfax Place since there would be multiple turns required within the Cameron Chase development required to cut between Smith Switch Road and Farmwell Road. An access point from St. Germain Court is located too close to Chilum Place for this street to be a viable connection to Smith Switch Road. The costs of Alternative 3 would also be greater than Alternative 1, as it would require earthwork, clearing, and paving.

Smith Switch Road is planned as a four-lane divided roadway, so any access would need to be at a median crossover in the future or the access would become inconvenient and would defeat the purpose of its construction. As there are other access points along Smith Switch Road that would generate a much larger amount of traffic, those roadways would likely have priority for the limited number of median crossovers that will be allowed under VDOT Access Management guidelines. Due to this and to the fact that an additional access point along Smith Switch Road would change the character of the roadway that would provide the connection, Alternative 3 is not the preferred option.

Alternative 1 is the recommended option, as it would be the least expensive and least disruptive option. Drivers are familiar with right-in/right-out scenarios, and adding U-turns to the Pipeline Plaza and Ice Rink Plaza intersections does not significantly degrade operations.

SUMMARY AND RECOMMENDATIONS

Currently, there are operational and safety issues at the intersection of Farmwell Road and Estate Place concerning left-turning traffic from Estate Place turning onto Farmwell Road. The existing level of service for this approach is LOS F. With the widening of Farmwell Road to six lanes under design, there is concern from citizens of Loudoun County that operations to access Estate Place could become worse and less safe. A signal is highly unlikely to ever be warranted at this location, as it is not warranted under existing conditions and traffic should not increase out of Estate Place. This analysis looked at four separate alternative access concepts to the Cameron Chase development.

It is recommended that Alternative 1 be implemented. This alternative would force traffic from the west along Farmwell Road that currently turns left onto Estate Place to make a U-turn at the signal at Ice Rink Plaza before turning right onto Estate Place and would force traffic from Estate Place that currently turns left onto eastbound Farmwell Road to turn right, then make a U-turn at Pipeline Plaza. This option will be the least expensive option, would cause the least disruption to residents at Cameron Chase, and is a typical traffic situation that will be familiar to most drivers.

TO: Mark Hoffman
Loudoun County

CC: Bruce Thornberry
Loudoun County

FROM: Nick Alexandrow
Traffic Engineering Department

DATE: April 26, 2017

RE: Farmwell Road
Estate Place Access

WM Project No.: 215022.0001

Preserving the ability for vehicles to make the left-turn onto Estate Place from eastbound Farmwell Road while not allowing left-turns out of Estate Place is a viable option from an operational standpoint. Our previous analysis showed that operations would work with U-turns at Pipeline Plaza for those who can no longer turn left out of Estate Place. If the eastbound left-turn is allowed, this left-turn movement would operate at level of service A with a delay of 8.6 seconds during the AM peak hour. During the PM peak hour, when this left-turn would face a much heavier westbound through movement, it would operate at LOS C with a delay of 19.9 seconds, still well in the realm of acceptable.

The 95th percentile queues are under one car length for both peak hours, so traffic turning left onto Estate Place will not block eastbound through traffic along Farmwell Road. In addition, westbound through traffic will not be affected, as it is free-flow through the intersection with the eastbound left-turn waiting for adequate gaps to make the turn.

There are many locations within Northern Virginia where left turns in are allowed while left-turns out are not. In addition, this configuration is obviously being proposed to the west at Pipeline Plaza as part of this project.