CENTURY ENGINEERING

CONSULTING ENGINEERS

January 2, 2018

Mr. Paul DeBotton
Marple Associates, L.P.
1604 Walnut Street, 4th Floor
Philadelphia, PA 19103

RE: Langford Run Road Traffic Analysis
Proposed Mid-County Shopping Center
Marple Township, Delaware County, Pennsylvania

Dear Mr. DeBotton:

Century Engineering has conducted a traffic analysis for Langford Run Road which is located in the proposed Mid-County Shopping Center in Marple Township, Delaware County, Pennsylvania. The proposed land use and lane assignments used in the analysis was obtained from a site plan, prepared by Landcore Engineering Consultants (dated November 20, 2017). Century was tasked with developing proposed trip generation volumes to be generated by Lot 1 of the development and redistribute the site-generated traffic to/from West Chester Pike and Lawrence Roads. The overall projected trip distribution used in the analysis was obtained from the Traffic Impact Study, prepared by Orth-Rodgers & Associates, Inc. (last revised January 6, 2014).

Trip Generation

The proposed land use has changed since the TIS was submitted and approved. The TIS projected a mixed-use development including residential condominiums, general office, a day care center, and 260,000 sf of retail. However, the revised concept plan indicates the site has changed considerably, with no residential units and substantially less retail than previously anticipated. A comparison of the land uses is shown below:

Land Use		Proposed Land Use per TIS	Per Revised Concept Plan
Residential Condo/Townhouse	LU 230	147 du	n/a
Hotel	LU 310	150 rooms	n/a
Health-Fitness Ctr	LU 492	16,000 sf	34,088 sf
Day Care	LU 565	4,000 sf	n/a
General Office	LU 710	40,000 sf	n/a
Retail	LU 820	260,000 sf	92,037 sf*
Drive-in Bank	LU 912	4,000 sf	n/a
Supermarket	LU 850	n/a	74,544 sf

It should be noted that the revised concept plan references 80,000 sf of proposed retail/office space, two future pad sites totaling 9,700 sf, and an existing residence to be converted to commercial use. Since there is uncertainty regarding how much office space and what the future pad sites and commercial use will be, this analysis calculated the projected site generated traffic as all retail to be conservative. In general, the revised land use does not generate as much projected peak hour traffic volumes as the proposed land use per the TIS.

A comparison of the peak hour trip generation is shown below:

Projected AM Peak Hour Site-Generated Traffic Volumes

	Per TIS			Per Concept Plan			Difference		
	In	**Out**	**Total**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Total Trips	355	254	609	273	176	449	(82)	(78)	(160)
Internal Trips	0	0	0	0	0	0	0	0	0
Pass-By Trips	0	0	0	0	0	0	0	0	0
New Trips	**355**	**254**	**609**	**273**	**176**	**449**	**(82)**	**(78)**	**(160)**

Projected PM Peak Hour Site-Generated Traffic Volumes

	Per TIS			Per Concept Plan			Difference		
	In	**Out**	**Total**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Total Trips	822	889	1711	660	654	1314	(162)	(235)	(397)
Internal Trips	50	39	89	0	0	0	(50)	(39)	(89)
Pass-By Trips	175	195	370	224	229	453	49	34	83
New Trips	**597**	**565**	**1253**	**436**	**425**	**861**	**(161)**	**(140)**	**(392)**

Projected Saturday Peak Hour Site-Generated Traffic Volumes

	Per TIS			Per Concept Plan			Difference		
	In	**Out**	**Total**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Total Trips	1020	936	1955	863	823	1686	(157)	(113)	(269)
Internal Trips	34	36	70	0	0	0	(34)	(36)	(70)
Pass-By Trips	243	220	463	159	147	306	(84)	(73)	(157)
New Trips	**743**	**681**	**1423**	**704**	**676**	**1380**	**(39)**	**(5)**	**(43)**

Utilizing the most conservative approach by estimating all retail land use, with the exception of the proposed supermarket and fitness center, the projected peak hour traffic volumes for Lot 1 are less than previously submitted with the previously approved Traffic Impact Study. Due to the Saturday peak hour generating the highest number of projected trips, this analysis will utilize the Saturday peak hour as the most-critical peak.

Trip Distribution

The proposed site currently provides access to both West Chester Pike to the north and Lawrence Road to the south. To distribute the projected site-generated traffic volumes to the existing roadway network, this analysis utilized previously approved trip distribution from the TIS. The majority of the traffic will be entering/exiting to the north via West Chester Pike (84%), with the minority of traffic entering/exiting to the south via Lawrence Road (16%). Similarly for pass-by trips, the previously approved trip distribution from the approved TIS was utilized for the revised land use analysis and comparison.

The revised site plan provides two site access driveways; a right-in/right-out driveway to the north, and a full access driveway to the south. All 84% of the exiting site traffic heading towards West Chester Pike will need utilize the full access driveway to the south.

The proposed site-generated traffic volumes were then distributed to the proposed development and the internal site access driveways along Langford Run Road based on the type of land use. The proposed trip distribution and peak hour traffic volumes are shown in Figures 1 through 5.

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FIGURE 1

Proposed Trip Distribution (New Trips)

Mid-County Traffic Memorandum

MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA

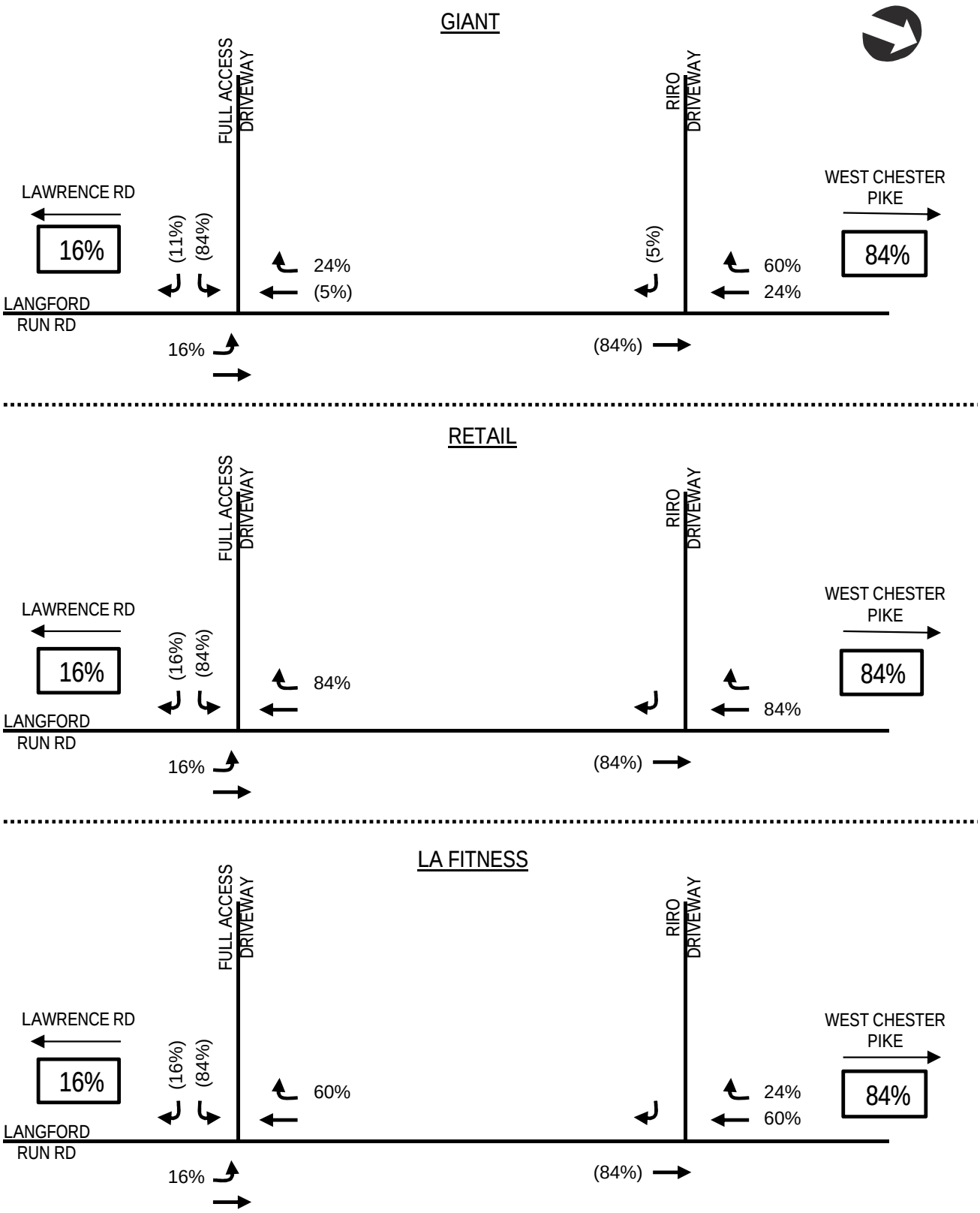

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FIGURE 2

Proposed Trip Distribution (PassBy Trips)

Mid-County Traffic Memorandum

MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA

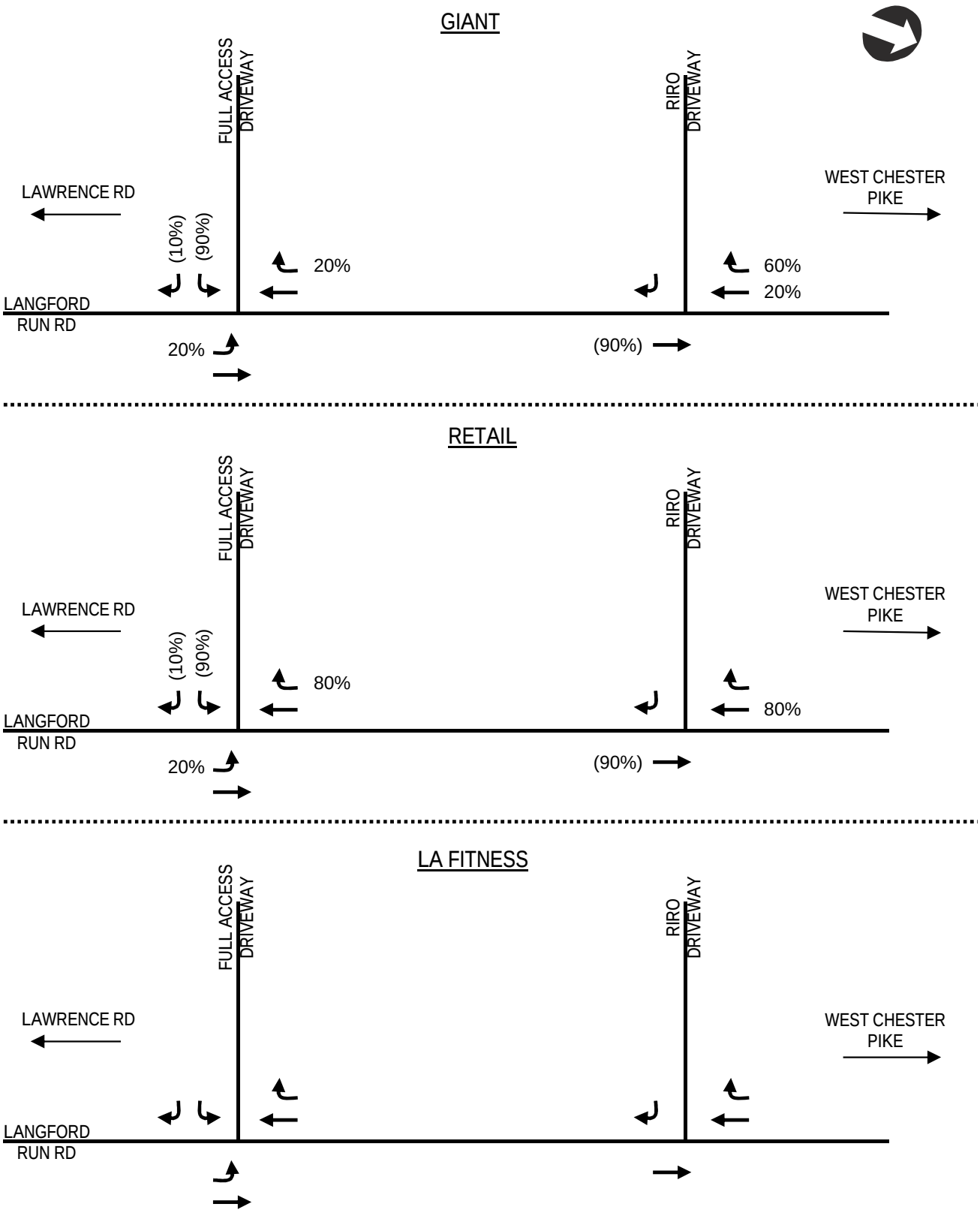

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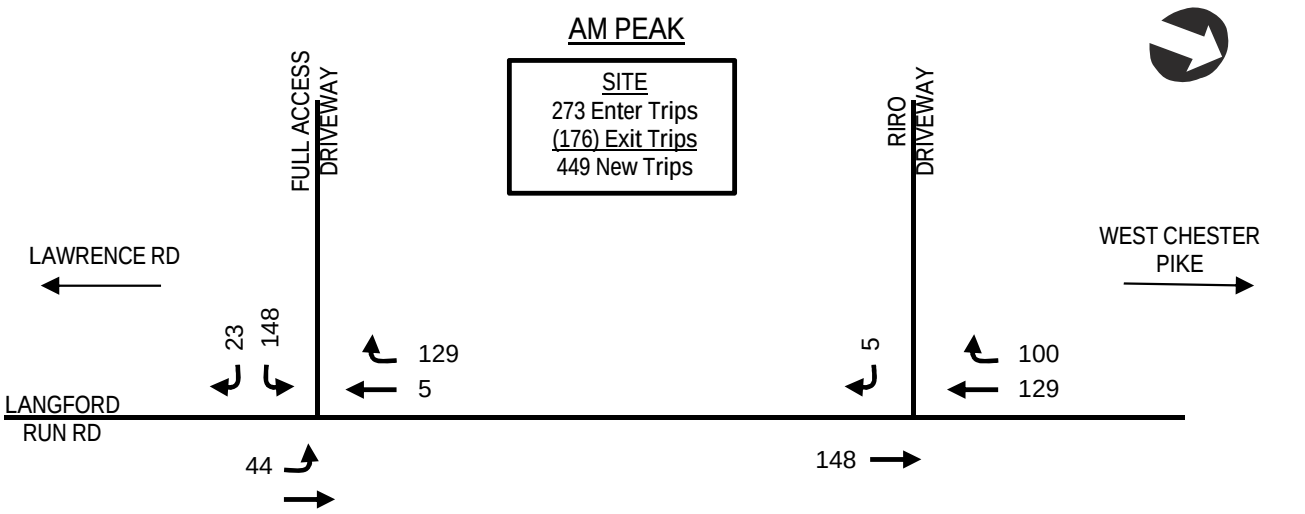
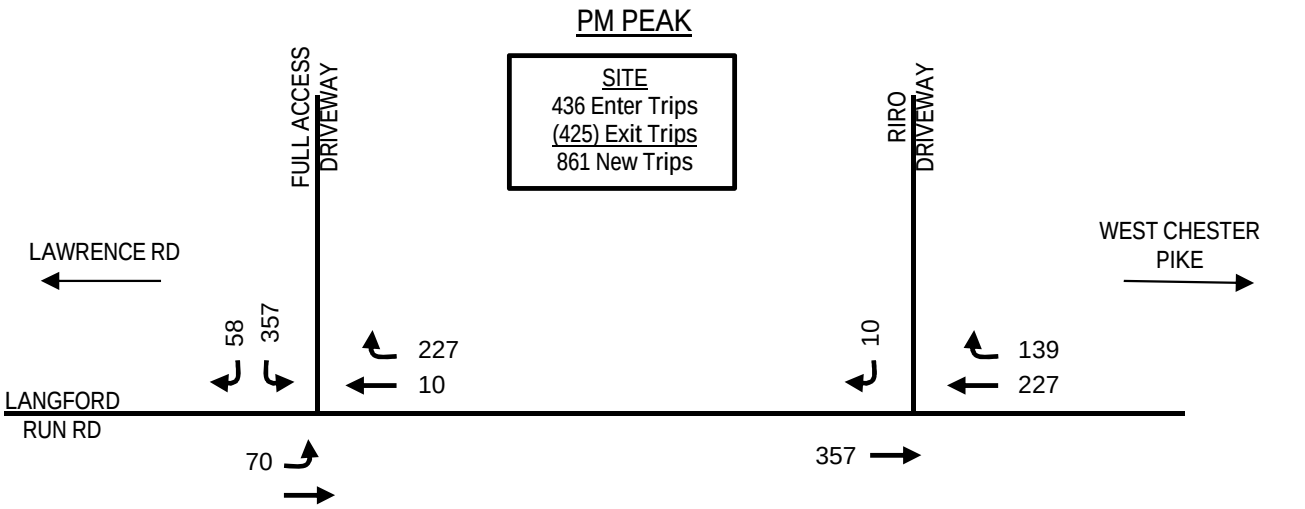
FIGURE 3

Peak Hour Site Traffic Volumes (New Trips)

Mid-County Traffic Memorandum

MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA





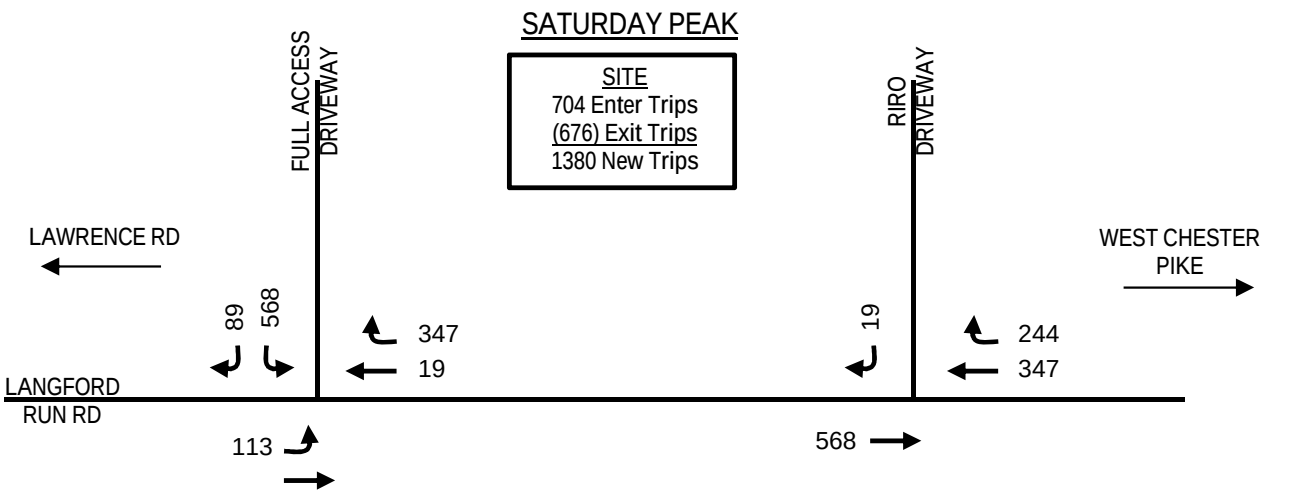


FIGURE 4

Peak Hour Site Traffic Volumes (Passby Trips)

Mid-County Traffic Memorandum

MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA

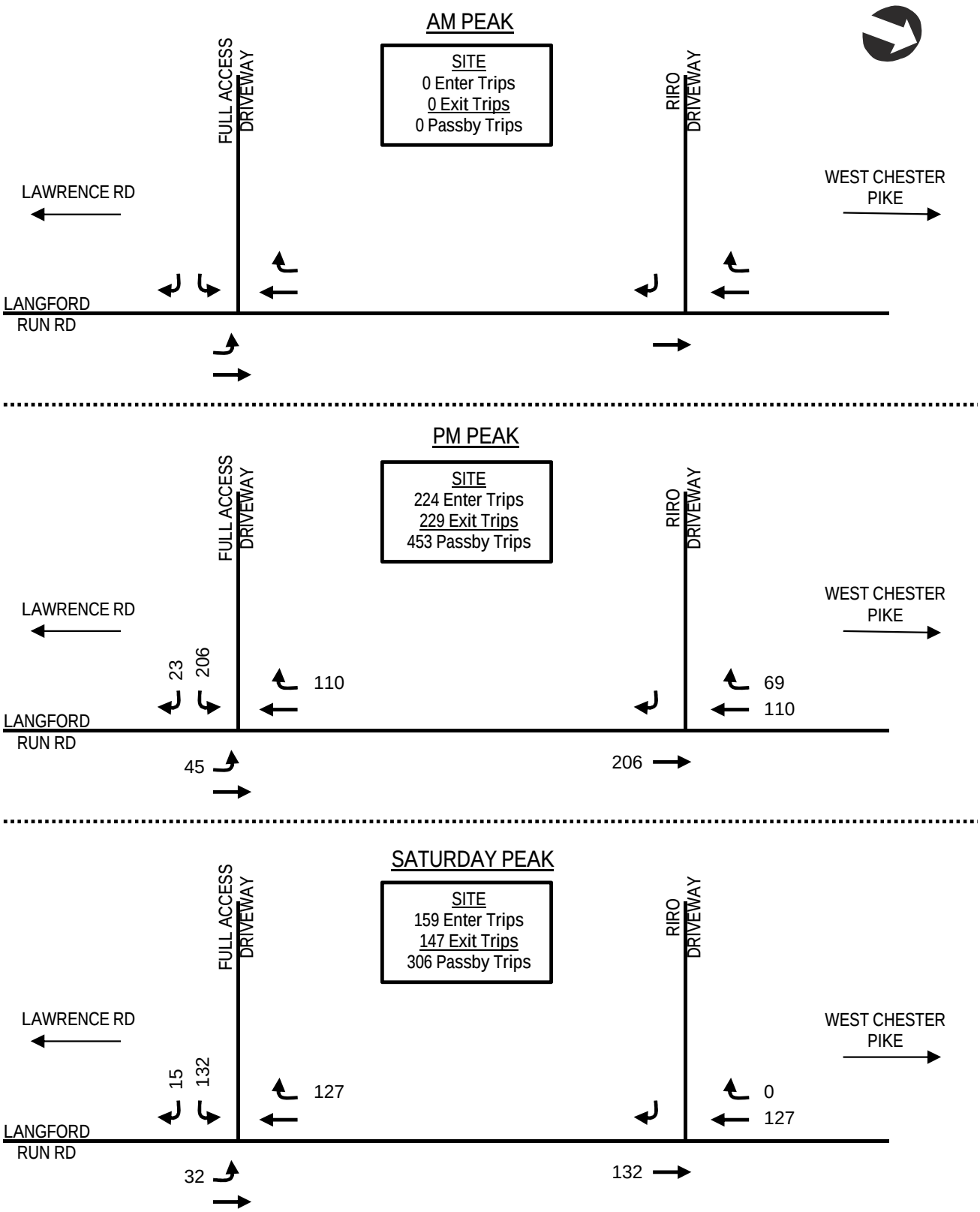
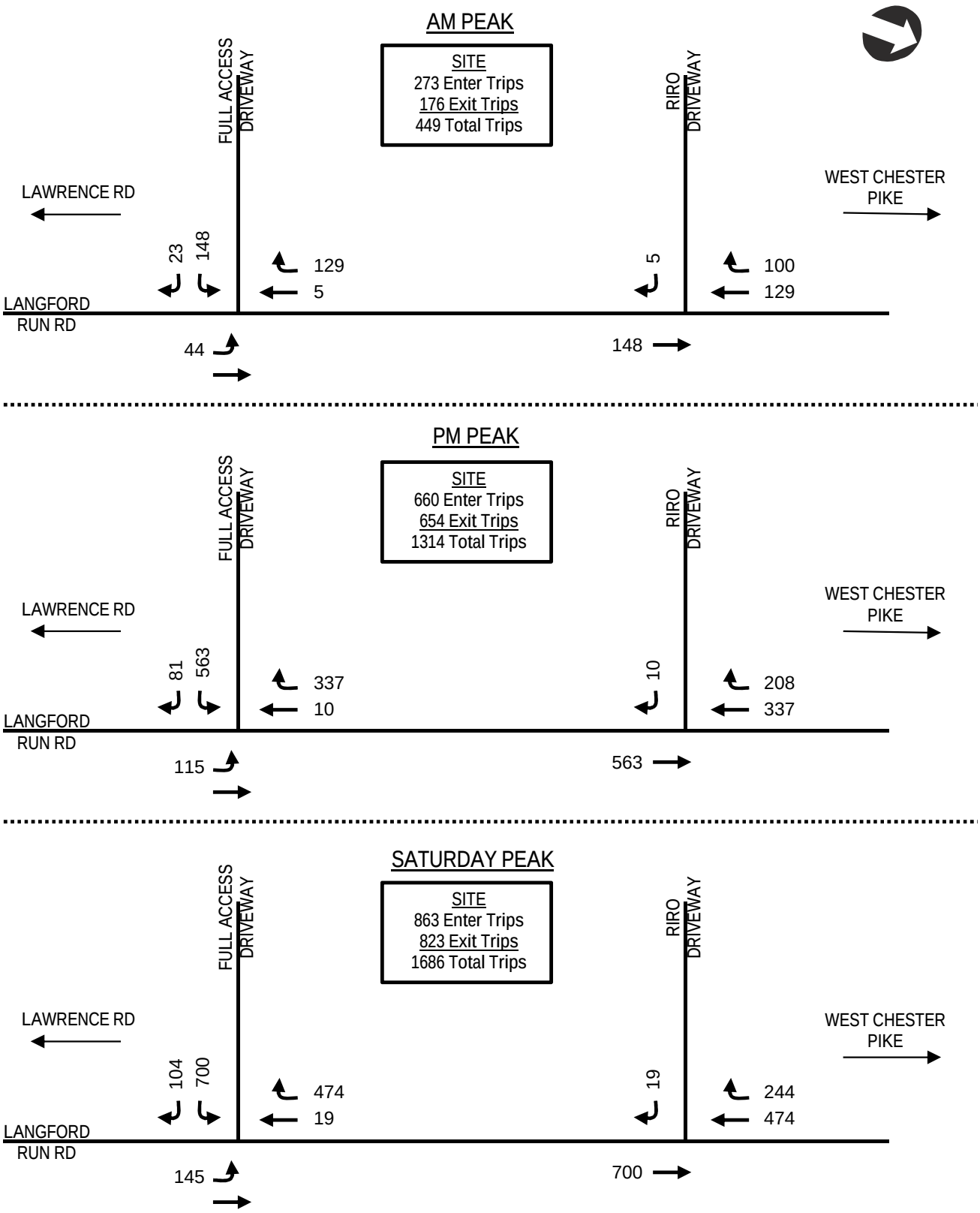


FIGURE 5

Peak Hour Site Traffic Volumes (Total Trips)

Mid-County Traffic Memorandum

MARPLE TOWNSHIP, DELAWARE COUNTY, PENNSYLVANIA



LOS/Queue Analysis

Based on the current Signing & Striping Plan provided by Landcore Engineering and the projected peak hour traffic volumes, we analyzed the projected peak hour levels of service and queuing for the internal site access driveways. The proposed site plan indicates there are two site access driveways; a right-in/right-out driveway to the north and a full access driveway to the south. Since the Saturday peak hour provides the highest peak hour traffic volumes, this analysis will focus on the Saturday peak hour.

As currently proposed per the revised concept plan, the full access driveway is stop-controlled with free-flow traffic along Langford Run Road. Langford Run Road provides a separate northbound left-turn lane entering the site, as well as a separate left and right-turn lanes exiting the site. As currently proposed, there would be extensive queues for site traffic exiting the site turning left to head north towards West Chester Pike during the Saturday peak hour. With the installation of a Langford Run Road southbound right-turn lane entering the site, the exiting queues will decrease but still be over 30 vehicles. The following table indicates the projected LOS and queuing at the full access driveway under several alternatives:

Project Levels of Service Alternative Comparison

Roadway	Movement	Alternative				
		Per Concept Plan	Langford WB RT lane	All-Way Stop*	Signalized	Roundabout*
Langford Run	NB L	A	A	C	B	B
	NB T	-	-	-	-	
Langford Run	SB T	-	-	A	B	A
	SB R		-	E		B
Site Access	EB L	F	F	F	A	B
	EB R	B	A	B	A	A
Overall		F	F	E	B	B

** All-Way Stop and Roundabout alternatives includes a Langford Run SB right-turn for vehicles entering the site*

Project Queuing Alternative Comparison (per vehicle)

Roadway	Movement	Alternative				
		Per Concept Plan	Langford SB RT lane	All-Way Stop*	Signalized	Roundabout*
Langford Run	NB L	0.5	0.3	1.6	3.0	1.0
	NB T	-	-	-	-	
Langford Run	SB T	-	-	0.1	0.3	0.0
	SB R		-	10.3		3.0
Site Access	EB L	51.2	30.3	13.6	11.7	6.0
	EB R	0.5	0.4	0.7	0.0	0.0

** All-Way Stop and Roundabout alternatives includes a Langford Run SB right-turn for vehicles entering the site*

Based on the tables shown above, only the signalized and roundabout alternatives will provide sufficient levels of service. Under the signalized alternative, the exiting queue for the left-turn lane would be approximately 300' (or 12 vehicles), with the queue under the roundabout alternative to be approximately half of that (150' or 6 vehicles). Under the all-way stop alternative, the exiting left-turn lane queue is approximately 50' (2 vehicles) more than that of the signalized alternative with a total queue length of approximately 350' (14 vehicles).

Turn Lane Warrant and Storage Length per PennDOT

PennDOT's Traffic Engineering Manual (Publication 46) provides guidance for turn lane warrants and recommended storage length. The turn lane guidelines provided taken into consideration the amount of volume at the intersection, the proposed speed limit, type of signal control, type of terrain, and intersection control to provide guidance on whether a separate turn lane is needed and the length the lane should be to satisfy the projected queues.

Per PennDOT Publication 46, the separate turn lanes for all turning movements along Langford Run Road are warranted with the recommended storage lengths indicated below:

Turn Lane Warrant and Storage Length Recommended per PennDOT Publication 46

Roadway	Movement	Warrant Met	Recommended Storage Length
Langford Run @ Full Access	NB L	Y	100'
	SB R	Y	325'
Full Access @ Langford Run	EB L	Y	450'
	EB R	Y	100'
Langford Run @ RIRO	SB R	Y	175'

Conclusion

This analysis reviewed the projected site-generated peak hour traffic volumes based on the revised concept plan provided by Landcore Engineering Consultants, Inc. The projected volumes were then distributed to the surrounding roadway network utilizing the previously approved trip distribution from the Traffic Impact Study, prepared by Orth-Rodgers & Associates (dated January 6, 2014). The analysis was completed to determine the peak hour LOS and queueing at the internal site driveways located along Langford Run Road.

The analysis shows that based on the lane configuration as shown on the concept plan, the left-turn exit at the full access site driveway would experience an approximate 1280' queue. Modifying the traffic control at the intersection to provide an all-way stop would reduce the queue to 340'. Signalizing the intersection or installing a roundabout would reduce the queues even further.

According to PennDOT Publication 46, all turning movements to/from the internal site driveways should provide a separate turn lane, including the right-in at the limited access driveway to the north.

Truly yours,

CENTURY ENGINEERING, INC.

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