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March 15, 2013

Mr. Matthew J. Loeffler, P.E.
Traffic Engineer
Butler County Engineer's Office
1921 Fairgrove Avenue (S.R. 4)
Hamilton, Ohio 45011-1965

Re: Crossing of Beckett TIS
BECO Review Comment Response

Dear Mr. Loeffler,

Bayer Becker (BB) appreciates receiving comments from the Butler County Engineers Office (BCEO) and we submit the following responses:

Comment #1 – Comments pertaining to SR 747 were given by ODOT in a letter dated March 7, 2013.

Response #1 – No Response.

Comment #2 – Proposed Site Drive C as a right in/right out is acceptable on Tylersville Road per Butler County's Access Management Regulations since a full access does not meet the required spacing per our Access Management Regulations. It is very unusual not to allow a full access to align with an existing full access. But based on feedback from the surrounding community and capacity analysis, the right in/right out offers the best access alternative in lieu of other alternatives like an aligned full access with a traffic signal which is not a viable solution in this situation. A traffic signal does not meet the mandated warrants. The right in/right out shall be constructed per BCEO standards.

Response #2 – We Concur.

Comment #3 – The BCEO has determined that proposed Site Drive D is located at the safest location along Beckett Road. As shown in the TIS report, it is located an adequate distance from Tylersville Road to achieve back-to-back left turn storage for NB left turning traffic at Tylersville Road and SB left turn storage for possible future development of the vacant parcel at the southeast corner of Tylersville Road and Beckett Road. At its proposed location of approximately 700 feet from Tylersville Road, proposed Site Drive D upholds the consistent driveway/access spacing from other existing access drives along Beckett Road. It is located approximately midway between Tylersville Road and the next closet existing full access driveway at Park Place Circle. Proposed Site Drive D is also located at an ideal location along Beckett Road to achieve optimum sight distance since it is positioned on the crest of a vertical curve.

Based on acceptable level of service for Site Drive D at Full Build (LOS C), future consideration of opposing access alignment, and best location along Beckett Road in terms of spacing and sight distance, the BCEO approves the location of proposed Site Drive D.

Response #3 – We Concur.

Comment #4 – Overall, the proposed development could be considered too dense causing inadequate levels of service for the existing development traffic in the horizon year 2035. Caution should be used in regards to those land uses that generate high volumes of peak hour new trips such as general office and day care facilities. The general office land use is one of the largest generators of new trips in the peak hours per size of gross floor area.

Response #4 – We understand your comment and offer that the full build of the site (specifically the outlots and Phase 2) is unknown at this time. In an effort to be conservative in our estimates, BB used several land uses, including general offices, which generate large trips. Additionally, the majority of the general office land use that you reference is associated with the "East Parcel" which is a "Background" condition and not under the control of this developer.

Comment #5 – The NB left turn lane on Beckett Road at Tylersville Road requires 425' of storage based on the HCS back of queue calculations at Full Build. Please update report and drawing to show the required 425' of NB storage. This improvement needs to be added to report recommendations.

Response #5 – We Concur. Attached with this letter is a supplement to BB TIS report which includes updates to comments received from BCEO and ODOT.

Comment #6 – Cross access easements must be obtained from "East Parcel" to gain access to Beckett Road and a cross access easement through entire "South Parcel" shall be granted. It is prudent planning to allow cross access so that internal trips can be combined without forcing motorist to travel on the main thoroughfares.

Response #6 – We understand your comment and offer that the property owner agrees to provide a cross access easement to the "East Parcel" (Hutzelman) on Site Drive D and the "adjacent parcel to the south" (Baumhower Properties).

Comment #7 – There shall be no internal drives along Drive A and Drive B between SR 747 and Drive E. There shall be no internal drives along Drive C between Tylersville Road and Drive E.

Response #7 – We Concur.

Comment #8 – The BCEO recommends pedestrian facilities be constructed on both sides of Tylersville Road between Wethersfield Drive and Beckett Road. The existing traffic signal should have pedestrian equipment updated as well. This recommendation is based on the fact that the development contains uses that will likely attract pedestrians. Alternative modes of travel should be encouraged with a safe walking environment.

Response #8 – The burden of the construction of the sidewalk on Tylersville Road is not contiguous with the Crossing of Beckett property. Therefore the burden of the sidewalk construction should not be limited to this developer.

Comment #9 – The BCEO concurs with the recommended improvements along Beckett Road for Site Drive D to be constructed prior to opening day of Phase 1.

Response #9 – We Concur.

Comment #10 – The BCEO concurs with the recommended improvements along Tylersville Road and adds the following improvement:

a. Increasing the WB left turn storage to 500 feet at SR 747 (pavement marking only);

All improvements along Tylersville Road shall be constructed prior to issue of any Final Zoning Certificate within Phase 2. No Certificate of Occupancy shall be granted within Phase 2 as shown on the preliminary development plan in the TIS report until these improvements are constructed.

Response #10 – We Concur.

Enclosed with this letter are 1 hard copy and 1 electronic copy of the supplemental report. Please do not hesitate to contact me at 336-6600, if you have any questions or require additional information.

Sincerely,

Wardell L. Wilcox, P.T.P.
Enclosures
cc: Tim Burgoyne – Silverman and Company
Lisa Ammons – Kroger Corporation
Bryan Behrman – West Chester Township
Tommy Arnold – ODOT, District 8

EXECUTIVE SUMMARY

The proposed Crossings of Beckett mixed use development is situated on approximately 35.669 acres in West Chester Township, Butler County, Ohio. The site is located at the southeast corner of the intersection of S.R. 747 (Princeton-Glendale Road) and Tylersville Road.

At full build out, the development will consist of:

Land Use	Density
Office Building	24,000 Square Feet
Retail Center	37,000 Square Feet
Department Store	50,000 Square Feet
Drive-in Bank	6,000 Square Feet
Gas Station	18 Fueling Positions
Sit-Down Restaurant	20,000 Square Feet
Fast Food Restaurant	4,500 Square feet
Supermarket	133,000 Square Feet
Total Development	274,500 Square Feet/18 Fueling Positions

Construction and completion of the development is expected to occur in 2 phases, 2013 and 2015, respectively.

The roadways that will provide major access to the proposed development are S.R. 747 (Princeton-Glendale Road), Beckett Road and Tylersville Road. Access to the site will be provided at the following locations:

- Proposed Site Drive A, a full movement access on S.R. 747 (Princeton-Glendale Road), opposite the proposed West Chester Village Drive D, approximately 1270' north of Hutzelman Way and approximately 900' south of Proposed Access Drive B (measured from center to center).
- Proposed Site Drive B, a right turn in/right turn out/left turn in on S.R. 747 (Princeton-Glendale Road), approximately 800' south of Tylersville Road and approximately 2170' north of Hutzelman Way (center to center).
- Proposed Site Drive C, a right turn in/right turn out access on Tylersville Road, opposite Wethersfield Drive, approximately 590' west of Beckett Road and approximately 840' east of S.R. 747 (Princeton-Glendale Road) (center to center).

- Proposed Site Drive A and the future West Chester Village Drive D are centrally located between the existing adjacent signalized intersections at S.R 747 (Princeton-Glendale Road)/Tylersville Road and S.R. 747 (Princeton-Glendale Road)/Hutzelman Way; approximately 1270' north of Hutzelman Way and 1700' south of Tylersville Road.
- Driveway aprons are currently constructed at the proposed location on both the east and west sides of S.R. 747 (Princeton-Glendale Road) for future access. The driveway aprons were constructed by ODOT, with the most recent widening of S.R. 747 (Princeton-Glendale Road).
- Safe access on S.R. 747 (Princeton-Glendale Road) is available and will be maintained through the construction of right and left turn lanes at the critical intersection.

Proposed Site Drive B is to be an unsignalized, right turn in/right turn out/left turn in driveway, located approximately 900' north of Proposed Site Drive A and approximately 800' south of Tylersville Road (center to center). Proposed Site Drive B also does not meet the criteria defined in the ODOT *State Highway Access Management Manual*. An access variance is requested for Proposed Site Drive B based on the following reasons:

- Providing multiple points of access on S.R. 747 (Princeton-Glendale Road) to the development will provide options for the motorist to access the development.
- Multiple points of access on S.R. 747 (Princeton-Glendale Road) will allow for balance of traffic entering and exiting the development across several access points and will not result in a single overloaded intersection.
- The overall LOS at the S.R. 747 (Princeton-Glendale Road) /Proposed Site Drive A intersection increases significantly at 69.7 seconds (70.1 to 139.8) in the 2035 Build design year, during the PM Peak, if no access provided on S.R. 747 (Princeton-Glendale Road) at Drive B.
- Providing access on S.R. 747 (Princeton-Glendale Road) at Proposed Site Drive B improves internal site mobility.
- Providing direct site access on S.R. 747 (Princeton-Glendale Road), to the land uses in the north region of the property, will aid in reducing travel time, motorist frustration, fuel consumption and reduce auto emissions.
- It is good land planning practice to provide multiple points of access on major corridors.

- Proposed Site Drive B supports the required turn movement of the fuel trucks to access the fueling station in the southwest corner of the development.
- The proposed spacing can accommodate the recommended turn lane/roadway improvements.

Proposed Site Drive C is to be a right turn in/right turn out driveway, located opposite Wethersfield Drive, approximately 590' west of Beckett Road and approximately 840' east of S.R. 747 (Princeton-Glendale Road) (center to center). Proposed Site Drive C does not meet Butler County's access management intersection spacing requirements for a medium volume driveway from Beckett Road, but does meet the required spacing from S.R. 747 (Princeton-Glendale Road). Proposed Site Drive C is proposed to align directly opposite Wethersfield Drive and it is to be restricted as a right turn in/right turn out driveway. The right turn in/right turn out restriction follow standards outlined in the access management guidelines. Additionally, the capacity analysis included in this study shows that Proposed Site Drive C does not negatively impact Tylersville Road (LOS A and LOS B).

Proposed Site Drive D is to be a full movement access, located approximately 680' south of Tylersville Road and approximately 845' north of Park Place Circle (center to center). Proposed Site Drive D does not meet Butler County's access management spacing requirements from Beckett Road or from Park Place Circle. Capacity analysis results, included in this study, shows that Proposed Site Drive D does not negatively impact Beckett Road (LOS A and LOS B).

The need for improvements was based on the analysis contained within this report. Based on the aforementioned analysis, the following roadway improvements are recommended to accommodate the 2013, 2015 and 2035 design year Build traffic (including site traffic):

2013 Build traffic conditions (including site traffic):

S.R. 747 (Princeton-Glendale Road) and West Chester Village Drive D/Proposed Site Drive A

- Install a traffic signal at the intersection.
- Provide a 175' westbound left turn lane.
- Provide a westbound through/right lane.
- Construct a 364' northbound right turn lane.
- Provide a 489' southbound left turn lane (restriping only).

- Provide a 175' westbound right turn lane.
- Construct a 285' northbound right turn lane.
- Provide a 285' southbound left turn lane (restriping only).

Beckett Road and Proposed Site Drive D

- Provide a 175' eastbound left turn lane.
- Provide a 100' eastbound right lane.
- Construct a 225' northbound left turn lane.
- Construct a 300' southbound right turn lane.

2015 Build traffic conditions (including site traffic):

S.R. 747 (Princeton-Glendale Road) and Tylersville Road

- Construct a 636' westbound right turn lane.
- Provide a 550' westbound left turn lane (restriping only).

Tylersville Road and Wethersfield Drive/Proposed Site Drive C

- Construct a 261' eastbound right turn lane.
- Construct a northbound lane of egress.

2035 Build traffic conditions (including site traffic):

Tylersville Road and Beckett Road

- Construct a 425' eastbound right turn lane.

The recommended turn lane includes storage length, deceleration length and a 50' diverging taper.

Compliance with Applicable Codes

All roadway improvements shall be constructed in accordance with the Ohio Department of Transportation and Butler County Engineer's Office's requirements, as appropriate and applicable.

Based upon engineering judgment and the analysis contained in this report, the proposed S.R. 747 (Princeton-Glendale Road) and Tylersville Road development, with the improvements discussed herein, will not significantly impact operations on the adjacent roadway network.

The roadways that provide access to the proposed site is S.R. 747 (Princeton-Glendale Road), Beckett Road, and Tylersville Road. Access to the site will be provided at the following locations:

- Proposed Site Drive A, a full movement access on S.R. 747 (Princeton-Glendale Road), opposite the proposed West Chester Village Drive D, approximately 1270' north of Hutzelman Way and approximately 900' south of Proposed Access Drive B (measured from center to center).
- Proposed Site Drive B, a right turn in/right turn out/left turn in on S.R. 747 (Princeton-Glendale Road), approximately 900' north of Proposed Access Drive B and approximately 800' south of Tylersville Road (center to center).
- Proposed Site Drive C, a right turn in/right turn out access on Tylersville Road, opposite Wethersfield Drive, approximately 590' west of Beckett Road and approximately 840' east of S.R. 747 (Princeton-Glendale Road) (center to center).
- Proposed Site Drive D, a full movement access on Beckett Road, approximately 680' south of Tylersville Road and approximately 845' north of Park Place Circle (center to center).

It should be noted that an access management plan for S.R. 747 (Princeton-Glendale Road) was prepared and identified the location of West Chester Village Drive D/Proposed Site Drive A for a signalized access to the property on the east and west sides of S.R. 747 (Princeton-Glendale Road).

S.R. 747 (Princeton-Glendale Road), west of the site, is a five-lane roadway providing two lanes of travel in each of the northbound and southbound directions with a center two-way left turn lane. Designated left turn and right turn lanes are provided at critical intersections. According to ODOT's *Rural County Map* for Butler County, S.R. 747 (Princeton-Glendale Road) is classified as a minor arterial to the south of Tylersville Road and a major collector north of Tylersville Road. Based on the Butler County 2007 *Thoroughfare Plan*, S.R. 747 (Princeton-Glendale Road) is classified as a principal arterial. The posted and legal operating speed limit on S.R. 747 (Princeton-Glendale Road) is 55 mph.

Tylersville Road, along the site frontage, is a three-lane roadway providing one lane of travel in each of the eastbound and westbound directions with a center two-way left turn lane. Designated left turn and right turn lanes are provided at critical intersections. According to ODOT's *Rural County Map* for Butler County and the Butler County 2007 *Thoroughfare Plan*, Tylersville Road is

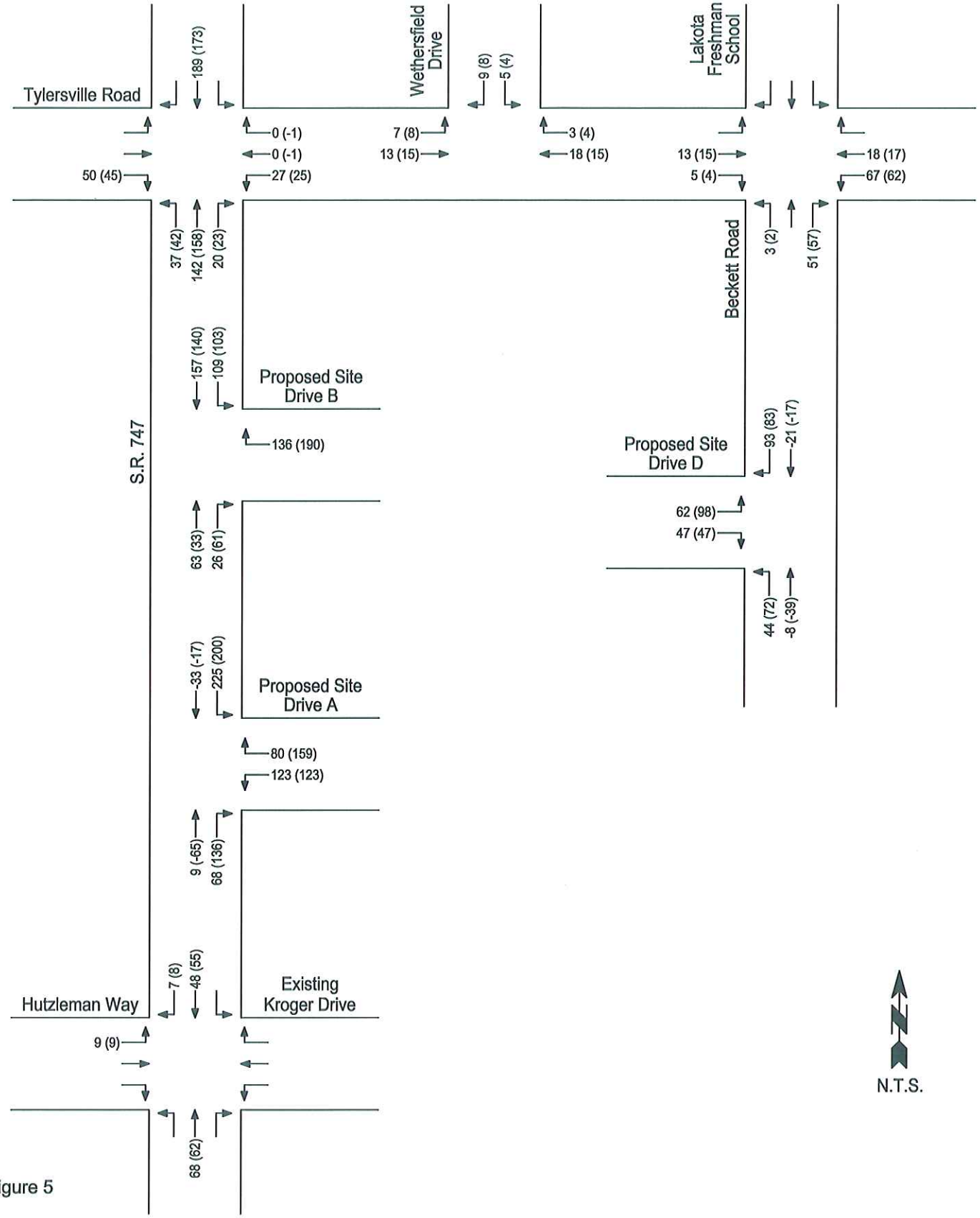


Figure 5

Crossings of Beckett
West Chester Township, Butler County, Ohio

Site Traffic Volumes - Phase 1

xx - AM Peak Hour
(xx) - PM Peak Hour

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www.bayerbecker.com
6900 Tylersville Road, Suite A
Mason, OH 45040 - 513.336.6600

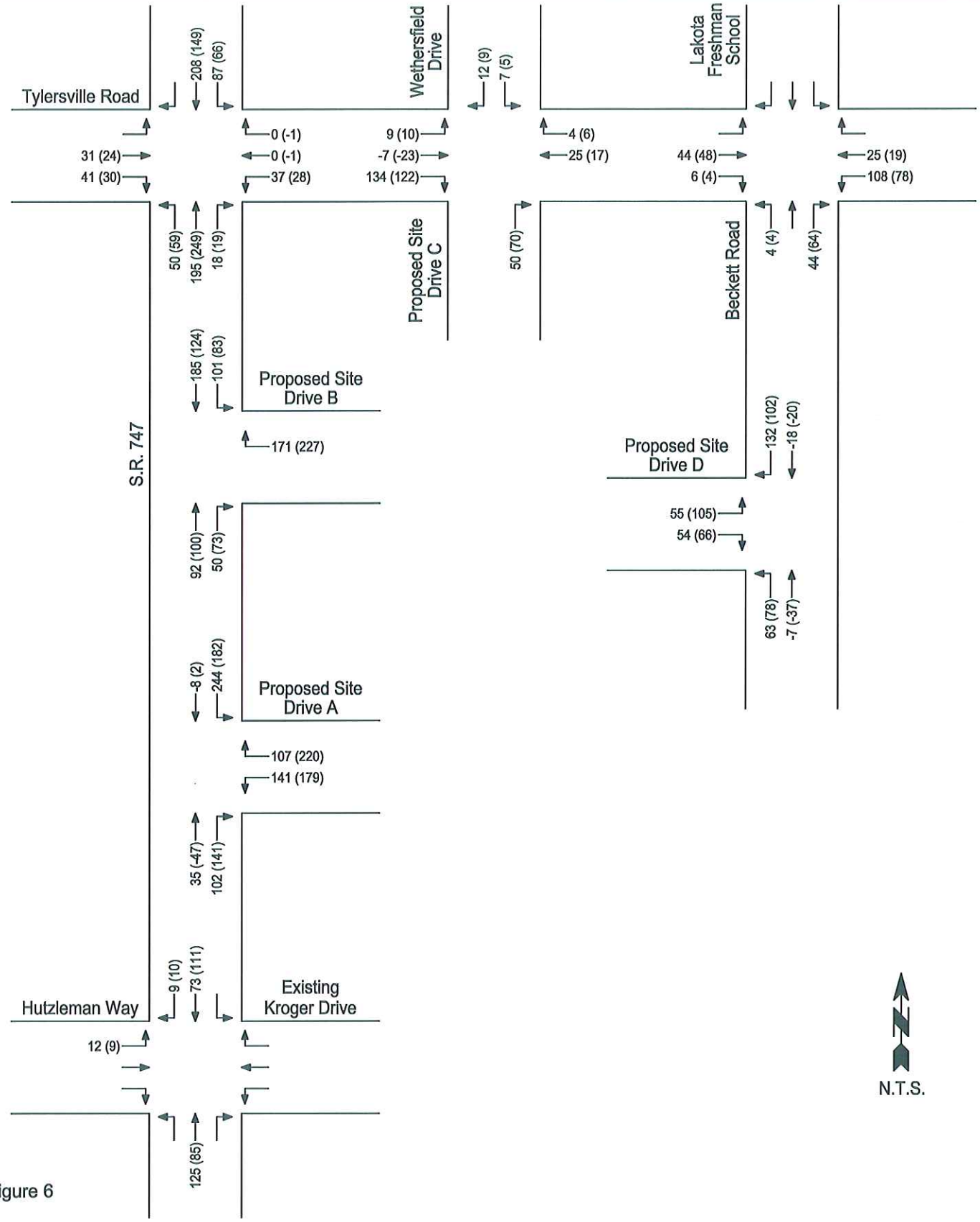


Figure 6

Crossings of Beckett
West Chester Township, Butler County, Ohio

Site Traffic Volumes - Full Build Out + South Parcel

xx - AM Peak Hour
(xx) - PM Peak Hour

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www.bayerbecker.com
6900 Tylersville Road, Suite A
Mason, OH 45040 - 513.336.6600

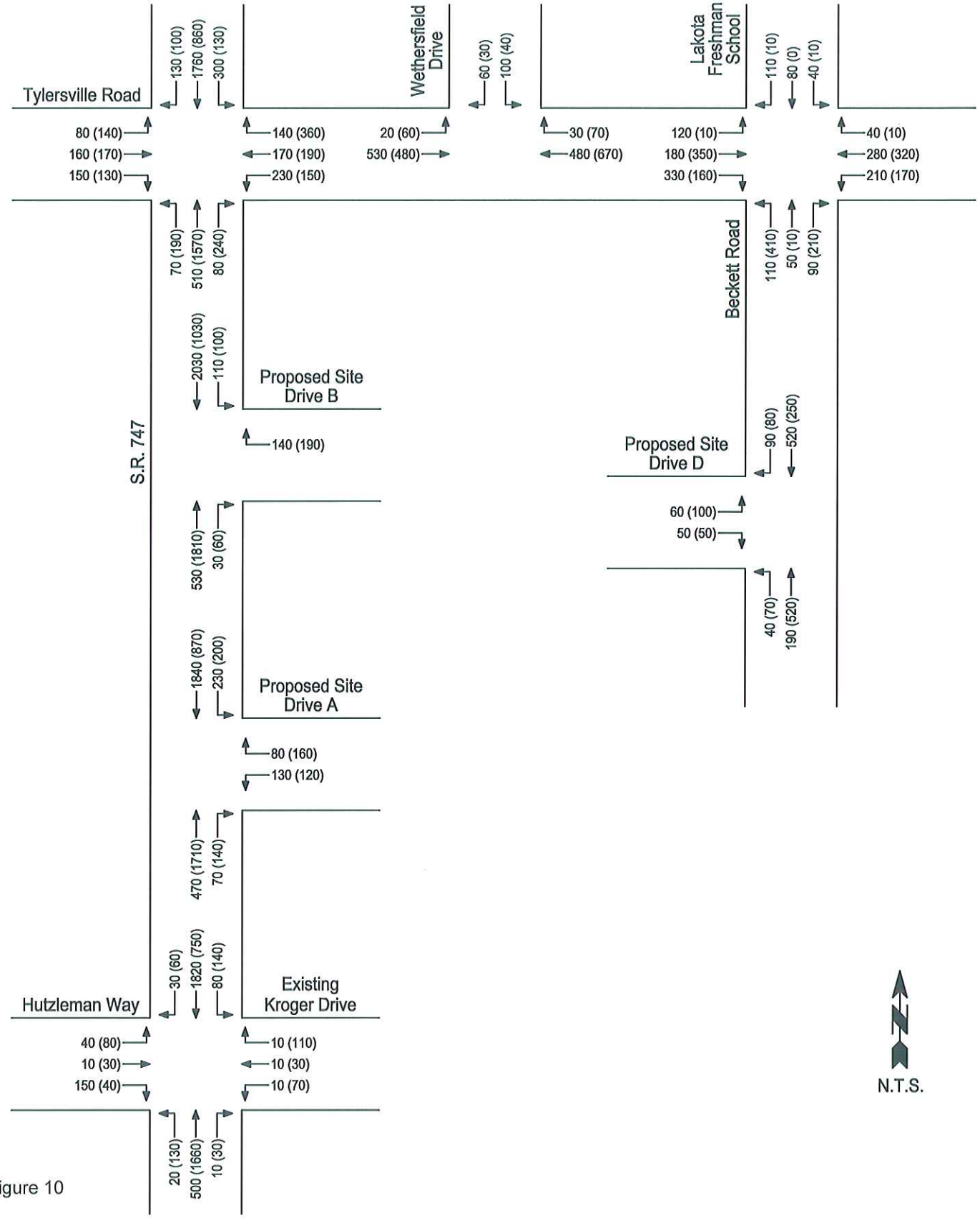


Figure 10

Crossings of Beckett
West Chester Township, Butler County, Ohio

2013 Build Traffic Volumes

xx - AM Peak Hour
(xx) - PM Peak Hour

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6900 Tylersville Road, Suite A
Mason, OH 45040 - 513.336.6600

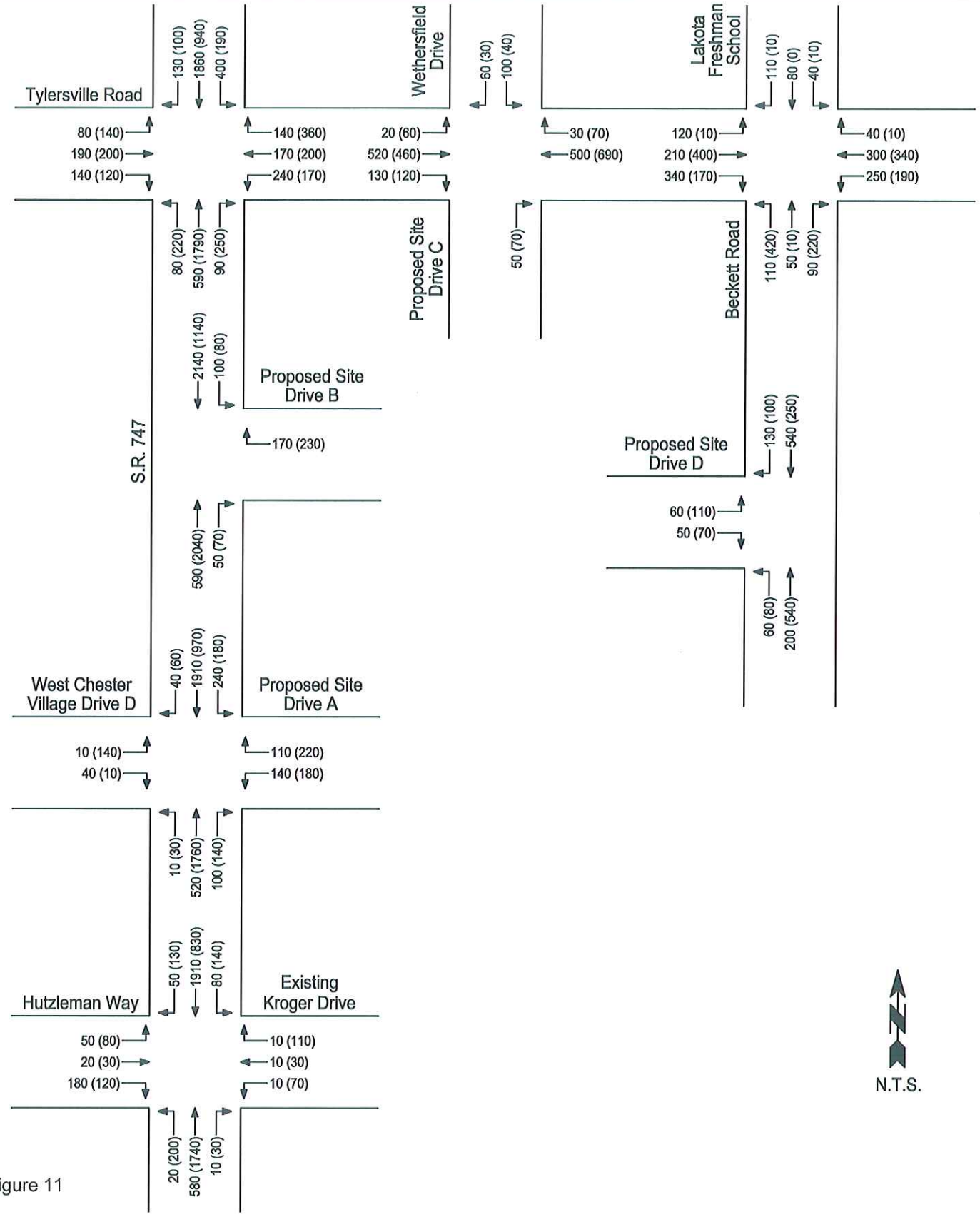


Figure 11

Crossings of Beckett
West Chester Township, Butler County, Ohio

2015 Build Traffic Volumes - Full Build Out + South Parcel

xx - AM Peak Hour
(xx) - PM Peak Hour

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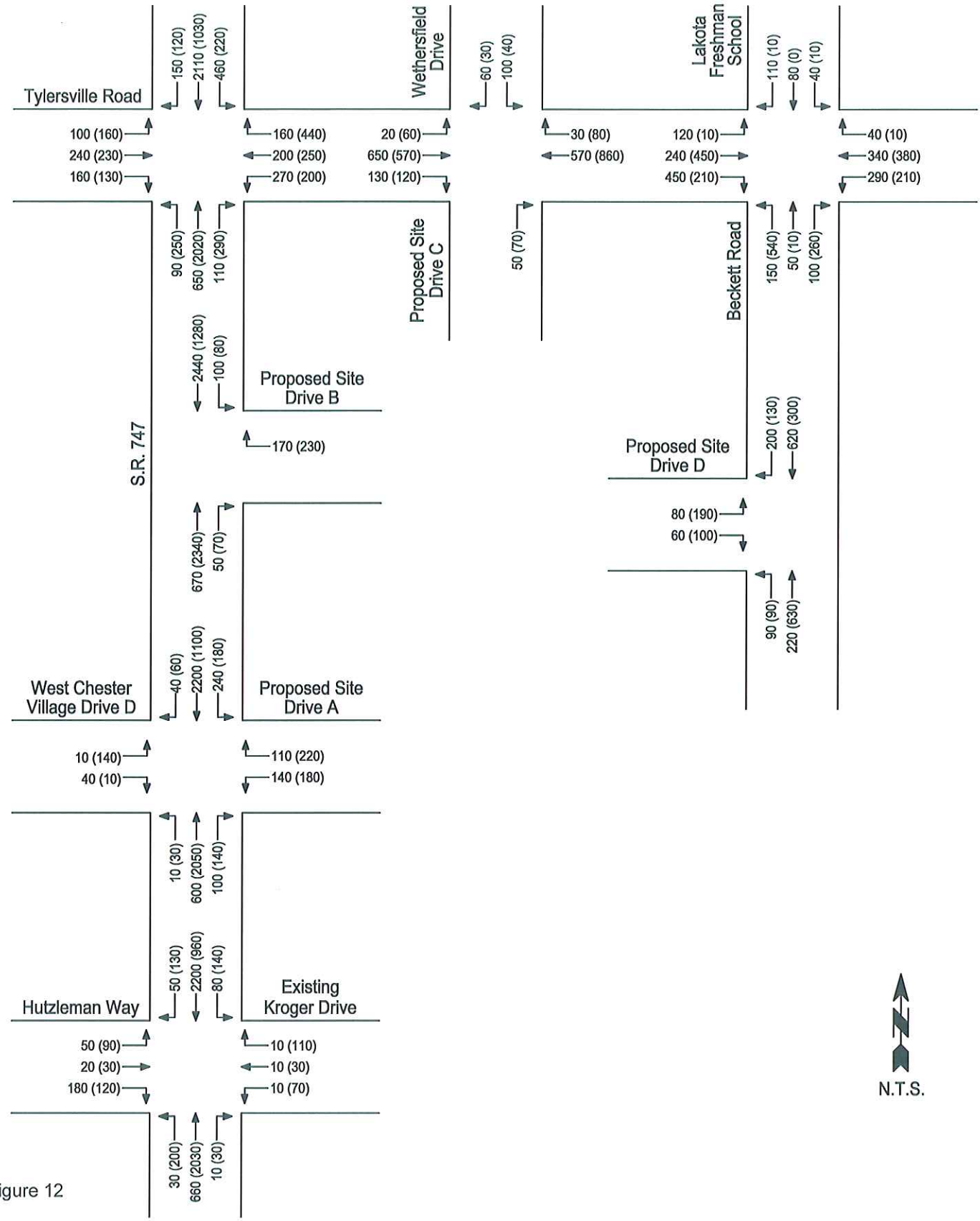


Figure 12

Crossings of Beckett
West Chester Township, Butler County, Ohio

2035 Build Traffic Volumes - Full Build Out + South Parcel

xx - AM Peak Hour
(xx) - PM Peak Hour

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6900 Tylersville Road, Suite A
Mason, OH 45040 - 513.336.6600

Considering the results of the traffic operational/capacity analysis, the best option for the development access on Tylersville Road, opposite Wethersfield Drive, is right turn in/right turn out.

Site Drives

The roadways that will provide access to the proposed site are S.R. 747 (Princeton-Glendale Road), Beckett Road, and Tylersville Road. Access to the site is anticipated to occur at the following locations:

- Proposed Site Drive A, a full movement access on S.R. 747 (Princeton-Glendale Road), opposite the proposed West Chester Village Drive D, approximately 1270' north of Hutzelman Way and approximately 900' south of Proposed Access Drive B (measured from center to center).
- Proposed Site Drive B, a right turn in/right turn out/left turn in access on S.R. 747 (Princeton-Glendale Road), approximately 800' south of Tylersville Road and approximately 2170' north of Hutzelman Way (center to center).
- Proposed Site Drive C, a right turn in/right turn out access on Tylersville Road, opposite Wethersfield Drive, approximately 590' west of Beckett Road and approximately 840' east of S.R. 747 (Princeton-Glendale Road) (center to center).
- Proposed Site Drive D, a full movement access on Beckett Road, approximately 680' south of Tylersville Road and approximately 845' north of Park Place Circle (center to center).

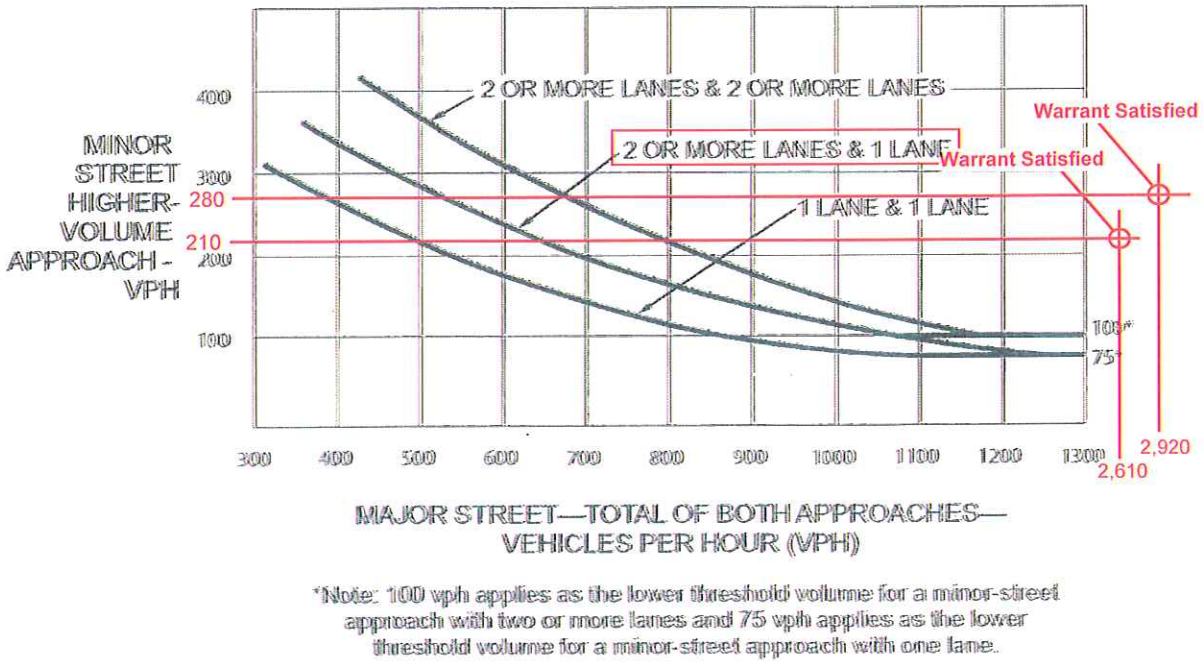
Signal Warrant Analysis

A new traffic signal at the intersection of S.R. 747 (Princeton-Glendale Road) and Proposed Site Drive A/West Chester Village Drive D was investigated to determine if it would be warranted. The determination of the need for a traffic signal at this particular location is based upon whether or not the traffic signalization is warranted. Since traffic signals are considered to be one of the most restrictive of the traditional traffic control devices, they should be used only where less restrictive signage or markings do not provide the required level of control or safety. It is the responsibility of local authorities in their respective jurisdictions to determine whether a location is best served by the installation of traffic signal.

- Warrant 7 – Crash Experience
- Warrant 8 – Roadway Network
- Warrant 9 – Intersection Near a Grade Crossing

Warrant 3 – Peak Hour was evaluated at the proposed intersection of S.R. 747 (Princeton-Glendale Road) and Proposed Site Drive A/West Chester Village Drive D for ***2013 Build conditions***. The 8th highest hour factor warrant is typically evaluated for signalization on State Highways. The Peak Hour Warrant was tested in this report to remain consistent with the process that was used in the approved traffic report for the *West Chester Village Development*, dated 2000.

Figure 13 - Warrant 3, Peak Hour (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 mph ON MAJOR STREET



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

- AM Peak Hour - Major Street - S.R. 747 (Princeton-Glendale Road) - VPH = 2,610
  Minor Street - Proposed Site Drive A - VPH = 210
- PM Peak Hour - Major Street - S.R. 747 (Princeton-Glendale Road) - VPH = 2,920
  Minor Street - Proposed Site Drive A - VPH = 280

Table 8
Levels of Service Results

		2013 No-Build Conditions		2013 Build Conditions		2015 No-Build Conditions		2015 Build Conditions		2035 No-Build Conditions		2035 Build Conditions	
		AM Peak (LOS/Delay)	PM Peak (LOS/Delay)	AM Peak (LOS/Delay)	PM Peak (Delay Sec.)	AM Peak (LOS/Delay)	PM Peak (Delay Sec.)	AM Peak (LOS/Delay)	PM Peak (Delay Sec.)	AM Peak (LOS/Delay)	PM Peak (Delay Sec.)	AM Peak (LOS/Delay)	PM Peak (Delay Sec.)
S.R. 747 (Princeton-Glendale Road) and Hutzelman Way - Signalized													
EB	L	C/32.9	C/33.2	C/34.9	C/34.3	D/38.8	C/34.5	C/27.3	D/40.0	E/56.6	D/50.0	C/34.7	E/56.6
	T	C/32.9	C/33.2	C/34.9	C/34.3	D/38.8	C/34.5	C/27.3	D/40.0	E/56.6	D/50.0	C/34.7	E/56.6
	R	C/32.9	C/33.2	C/34.9	C/34.3	D/38.8	C/34.5	C/27.3	D/40.0	E/56.6	D/50.0	C/34.7	E/56.6
	Approach	**C/32.9**	**C/33.2**	**C/34.9**	**C/34.3**	**D/38.8**	**C/34.5**	**C/27.3**	**D/40.0**	**E/56.6**	**D/50.0**	**C/34.7**	**E/56.6**
WB	L	D/37.1	D/40.8	D/38.8	D/42.0	D/41.1	D/42.2	C/32.6	D/50.4	C/26.3	F/106.8	D/38.9	F/130.2
	T	C/28.5	C/29.8	C/29.2	C/29.8	C/29.0	C/28.7	C/22.8	C/29.4	C/22.7	C/30.9	C/27.0	D/35.6
	R	C/28.5	C/29.8	C/29.2	C/29.8	C/29.0	C/28.7	C/22.8	C/29.4	C/22.7	C/30.9	C/27.0	D/35.6
	Approach	**C/31.4**	**C/33.4**	**C/32.4**	**C/33.9**	**C/33.1**	**C/33.2**	**C/26.0**	**D/36.4**	**C/23.9**	**E/56.2**	**C/31.0**	**E/67.1**
NB	L	B/20.0	B/10.0	C/20.2	B/11.4	C/20.6	B/11.1	D/44.5	B/14.1	D/46.2	B/15.3	D/45.9	C/33.5
	T	C/21.6	C/34.5	C/22.0	D/35.8	C/23.2	D/37.1	C/20.2	D/42.2	D/37.0	F/60.1	C/23.7	F/69.8
	R	C/21.6	D/35.2	C/22.0	D/36.7	C/23.2	D/38.1	C/20.2	D/43.6	D/37.1	F/61.9	C/23.7	F/71.7
	Approach	**C/21.5**	**C/33.0**	**C/22.0**	**C/34.5**	**C/23.1**	**C/34.8**	**C/21.0**	**D/39.9**	**D/37.5**	**E/56.8**	**C/24.7**	**E/67.5**
SB	L	A/6.0	C/21.9	A/6.5	C/24.0	A/6.7	C/25.8	B/10.2	C/28.6	B/10.6	C/28.5	A/8.2	D/41.8
	T	C/34.5	C/26.8	D/36.0	C/28.0	D/40.0	C/23.1	C/29.2	C/31.4	F/57.3	D/37.8	C/34.6	B/15.4
	R	A/9.4	C/21.3	A/9.1	C/21.4	A/9.2	B/19.4	A/7.6	C/23.1	F/59.6	D/38.2	C/36.7	B/11.9
	Approach	**C/33.0**	**C/25.7**	**C/34.4**	**C/27.0**	**D/38.0**	**C/23.1**	**C/27.9**	**C/30.1**	**E/56.8**	**D/36.8**	**C/34.7**	**B/18.0**
Overall Intersection		**C/30.9**	**C/30.9**	**C/32.0**	**C/32.2**	**D/35.4**	**C/31.2**	**C/26.4**	**D/36.6**	**D/52.8**	**D/50.4**	**C/32.5**	**D/51.4**
S.R. 747 (Princeton-Glendale Road) and West Chester Village Drive D/Proposed Site Drive A - Signalized													
EB	L	-	-	-	-	F/84.3	F/1439	C/34.8	D/49.5	F/208.6	F/2538	D/36.8	F/81.9
	T	-	-	-	-	-	-	D/35.5	D/37.1	-	-	D/43.2	D/45.0
	R	-	-	-	-	F/84.3	F/1439	D/35.5	D/37.1	F/208.6	F/2538	D/43.2	D/45.0
	Approach	**-**	**-**	**-**	**-**	**F/84.3**	**F/1439**	**D/35.4**	**D/48.6**	**F/208.6**	**F/2538**	**D/41.9**	**E/79.5**
WB	L	-	-	C/24.7	C/31.9	-	-	C/28.0	C/34.1	-	-	D/40.4	D/44.1
	T	-	-	-	-	-	-	C/25.3	C/33.1	-	-	D/45.7	D/43.4
	R	-	-	B/17.7	C/25.5	-	-	C/25.3	C/33.1	-	-	D/45.7	D/43.4
	Approach	**-**	**-**	**C/22.0**	**C/28.2**	**-**	**-**	**C/26.8**	**C/33.6**	**-**	**-**	**D/42.8**	**D/43.7**
NB	L	-	-	-	-	C/19.5	B/10.9	D/48.2	B/13.9	C/24.5	B/11.8	E/60.1	C/20.2
	T	-	-	B/16.3	C/30.2	-	-	C/24.9	F/52.3	-	-	D/44.1	F/84.7
	R	-	-	A/3.4	A/3.6	-	-	B/16.3	A/9.5	-	-	C/31.1	A/10.0
	Approach	**-**	**-**	**B/14.7**	**C/28.1**	**-**	**-**	**C/23.9**	**D/48.6**	**-**	**-**	**D/42.5**	**E/79.1**
SB	L	-	-	B/10.9	D/38.8	-	-	B/13.4	E/69.8	-	-	B/12.9	E/70.3
	T	-	-	C/23.3	A/5.6	-	-	D/37.1	D/39.5	-	-	D/41.4	E/59.5
	R	-	-	-	-	-	-	D/38.7	D/39.7	-	-	D/43.1	E/60.1
	Approach	**-**	**-**	**C/21.9**	**B/11.8**	**-**	**-**	**D/35.2**	**D/44.1**	**-**	**-**	**D/39.4**	**E/61.2**
Overall Intersection		**-**	**-**	**C/20.5**	**C/22.7**	**-**	**-**	**C/32.3**	**D/45.5**	**-**	**-**	**D/40.3**	**E/69.8**

Table 8
Levels of Service Results *(Continued)*

		2013 No-Build Conditions		2013 Build Conditions		2015 No-Build Conditions		2015 Build Conditions		2035 No-Build Conditions		2035 Build Conditions	
		AM Peak (LOS/Delay)	PM Peak (LOS/Delay)	AM Peak (LOS/Delay)	PM Peak (LOS/Delay)	AM Peak (LOS/Delay)	PM Peak (LOS/Delay)	AM Peak (LOS/Delay)	PM Peak (LOS/Delay)	AM Peak (LOS/Delay)	PM Peak (LOS/Delay)	AM Peak (LOS/Delay)	PM Peak (LOS/Delay)
S.R. 747 (Princeton-Glendale Road) and Proposed Site Drive B - Unsignalized													
SB	L	-	-	A/9.2	D/25.5	-	-	A/9.5	D/30.9	-	-	A/9.9	E/47.9
WB	R	-	-	A/8.3	A/7.4	-	-	A/8.3	A/7.4	-	-	A/8.2	A/7.2
	Approach	**-**	**-**	**A/8.3**	**A/7.4**	**-**	**-**	**A/8.3**	**A/7.4**	**-**	**-**	**A/8.2**	**A/7.2**
S.R. 747 (Princeton-Glendale Road) and Tylersville Road - Signalized													
EB	L	D/42.6	E/73.9	D/52.0	E/76.8	D/35.8	E/68.0	D/38.0	D/39.8	F/98.2	F/106.0	D/44.1	E/75.7
	T	D/37.7	D/54.0	D/44.4	F/84.7	D/43.3	E/55.3	E/79.3	D/51.6	F/80.2	D/50.1	F/159.8	E/59.6
	R	D/36.7	C/28.4	D/38.6	D/37.0	A/8.4	C/28.3	D/42.9	D/36.7	D/43.5	C/28.0	D/48.2	D/35.5
	Approach	**D/38.5**	**E/55.9**	**D/43.7**	**E/68.1**	**C/31.3**	**D/53.7**	**E/58.8**	**D/44.1**	**E/74.0**	**E/64.4**	**F/101.0**	**E/58.6**
WB	L	D/37.3	B/17.0	E/77.8	B/17.6	D/44.6	B/17.9	F/86.4	D/43.7	F/96.3	B/19.0	F/169.2	E/79.7
	T	C/32.1	F/99.9	D/41.0	F/118.4	F/94.8	F/121.5	E/65.4	D/51.6	D/50.4	F/210.9	D/54.2	E/56.6
	R	C/32.1	F/99.9	D/41.0	F/118.4	F/94.8	F/121.5	E/65.0	E/79.9	D/50.4	F/210.9	B/12.7	F/111.4
	Approach	**C/34.1**	**F/85.0**	**E/56.7**	**F/96.8**	**E/74.5**	**F/100.8**	**E/74.5**	**E/63.7**	**E/68.7**	**F/173.4**	**F/92.9**	**F/88.9**
NB	L	E/60.0	C/20.7	C/30.0	C/25.0	D/51.0	C/23.8	C/27.6	C/21.8	C/29.6	C/31.0	D/40.1	E/55.5
	T	C/32.1	F/102.6	C/30.1	F/119.8	B/18.3	F/121.3	C/26.9	F/76.3	C/30.8	F/213.8	E/65.7	F/105.2
	R	C/24.7	B/10.0	C/22.3	A/8.1	B/16.9	A/9.7	B/15.9	B/12.7	C/28.2	B/12.1	C/31.1	A/1.1
	Approach	**C/32.9**	**F/84.8**	**C/29.1**	**F/97.4**	**C/20.1**	**F/99.9**	**C/25.7**	**E/63.9**	**C/30.3**	**F/173.9**	**E/58.5**	**F/88.5**
SB	L	B/19.6	D/48.1	B/13.6	E/58.6	C/31.5	E/56.9	B/18.3	F/89.5	B/15.4	F/114.6	C/26.6	F/233.6
	T	D/39.6	E/59.9	F/60.2	D/51.4	F/77.2	F/82.5	F/81.3	C/22.5	F/79.4	F/90.0	F/110.7	C/25.0
	R	D/43.6	E/60.7	F/67.7	D/51.8	F/86.8	F/83.3	F/90.9	C/22.5	F/90.1	F/91.0	F/122.3	C/25.1
	Approach	**D/38.3**	**E/58.6**	**E/57.1**	**D/52.4**	**E/74.5**	**E/79.6**	**E/74.8**	**C/32.8**	**E/73.9**	**F/93.8**	**F/101.3**	**E/58.5**
Overall Intersection		**D/36.9**	**E/75.4**	**D/50.8**	**F/82.7**	**E/62.4**	**F/90.4**	**E/64.1**	**D/53.8**	**E/66.8**	**F/143.4**	**F/92.4**	**E/78.0**
Tylersville Road and Wethersfield Drive/Proposed Site Drive C - Unsignalized													
EB	L	A/8.4	A/9.6	A/8.6	A/9.7	A/8.5	A/9.7	A/8.7	A/9.9	A/8.7	B/10.5	B/8.9	B/10.9
NB	R	N/A	N/A	N/A	N/A	N/A	N/A	B/10.7	B/10.6	N/A	N/A	B/11.2	B/11.1
	Approach	**-**	**-**	**-**	**-**	**-**	**-**	**B/10.7**	**B/10.6**	**-**	**-**	**B/11.2**	**B/11.1**
SB	L	D/25.6	D/28.2	D/32.0	D/29.4	D/27.2	D/31.1	F/89.4	F/59.9	E/45.1	F/53.0	F/186.7	F/159.3
	R	D/25.6	D/28.2	D/32.0	D/29.4	D/27.2	D/31.1	F/89.4	F/59.9	E/45.1	F/53.0	F/186.7	F/159.3
	Approach	**D/25.6**	**D/28.2**	**D/32.0**	**D/29.4**	**D/27.2**	**D/31.1**	**F/89.4**	**F/59.9**	**E/45.1**	**F/53.0**	**F/186.7**	**F/159.3**

Proposed Site Drive B is an unsignalized, right turn in/right turn out/left turn in driveway, located approximately 900' north of Proposed Site Drive A and approximately 800' south of Tylersville Road (center to center). Proposed Site Drive B meets ODOT access management spacing requirements for a medium volume driveway; however, it is not proposed to be a restricted right-in/right-out driveway. A variance in the requirements outlined in the ODOT *State Highway Access Management Manual* for a high volume driveway intersection spacing requirement (Section 3.4.2.1) and "alternate means of access" (Section 3.4.2.3) is needed to satisfy the requirements of the MR 505 Permit Application.

The Butler County *2007 Thoroughfare Plan* classifies S.R. 747 (Princeton-Glendale Road) as a principal arterial. According to the Butler County *Access Management Regulations*, dated January 1, 2005, BCEO defers to ODOT requirements for principal arterial roadways.

Tylersville Road, according to ODOT's *Rural County Map* for Butler County and the Butler County *2007 Thoroughfare Plan*, is classified as a minor arterial. It has a posted speed limit of 40 mph.

According to the Butler County *Access Management Regulations*, a medium volume driveway has 51 – 200 trip ends and a high volume driveway is defined as having more than 200 trip ends in the peak hour. Proposed Site Drive C is considered a medium volume driveway and Proposed Site Drive D is a high volume driveway. Also according to the Butler County *Access Management Regulations*, a medium volume driveway is permitted on a minor arterial with a 600' minimum spacing. Proposed access points shall be subject to TIS recommendations and when the spacing cannot be met, a right-in/right-out may be permitted. Proposed driveways are to align with existing opposing driveways and roadways whenever possible.

Proposed Site Drive C is to be a right turn in/right turn out driveway, located opposite Wethersfield Drive, approximately 590' west of Beckett Road and approximately 840' east of S.R. 747 (Princeton-Glendale Road) (center to center). Proposed Site Drive C does not meet Butler County's access management intersection spacing requirements for a medium volume driveway from Beckett Road, but does meet the required spacing from S.R. 747 (Princeton-Glendale Road). Proposed Site Drive C is proposed to align directly opposite Wethersfield Drive and it is to be restricted as a right turn in/right turn out driveway. The right turn in/right turn out restriction follow standards outlined in the access management guidelines. Additionally, the capacity analysis included in this study shows that Proposed Site Drive C does not negatively impact Tylersville Road (LOS A and LOS B).

- The future West Chester Village Drive D was previously approved by ODOT for a full movement signalized intersection.
- Proposed Site Drive A and the future West Chester Village Drive D is centrally located between the existing signalized intersections at S.R 747 (Princeton-Glendale Road)/Tylersville Road and S.R. 747 (Princeton-Glendale Road)/Hutzelman Way; approximately 1270' north of Hutzelman Way and 1700' south of Tylersville Road
- Driveway aprons are currently constructed on the east and west sides of S.R. 747 (Princeton-Glendale Road) for future access. The driveway aprons were constructed by ODOT, with the most recent widening of S.R. 747 (Princeton-Glendale Road).
- Safe access on S.R. 747 (Princeton-Glendale Road) is available and will be maintained through the construction of right and left turn lanes at the critical intersection.
- An access management plan for S.R. 747 (Princeton-Glendale Road) was prepared and identified the location of West Chester Village Drive D/Proposed Site Drive A as a signalized intersection.

Proposed Site Drive B is to be an unsignalized, right turn in/right turn out/left turn in driveway, located approximately 900' north of Proposed Site Drive A and approximately 800' south of Tylersville Road (center to center). An access variance is requested for Proposed Site Drive B based on the following reasons:

- Providing multiple points of access on S.R. 747 (Princeton-Glendale Road) to the development will provide options for motorists to access the development.
- Multiple points of access on S.R. 747 (Princeton-Glendale Road) will allow for balance of traffic entering and exiting the development across several access points and will not result in a single overloaded intersection
- Providing access on S.R. 747 (Princeton-Glendale Road) at Site Drive B improves internal site circulation.
- The overall LOS at the S.R. 747 (Princeton-Glendale Road)/Proposed Site Drive A intersection increases significantly by 69.7 seconds (70.1 to 139.8) in the 2035 Build design year, during the critical PM Peak if no access is provided on S.R. 747 (Princeton-Glendale Road) at Drive B. Table 9, on page 54, shows the compared LOS results.

IMPROVEMENT ANALYSIS

Status of Improvements Previously Recommended

At this time, there are no known roadway improvements planned within the study area.

Improvements to Accommodate Base Traffic

Based upon discussions with ODOT District 8, the Butler County Engineer's Office, and the analysis included herein, improvements are not required to accommodate the base traffic.

Improvements to Accommodate Site Traffic

The need for improvements was based on the analysis contained within this report. Based on the aforementioned analysis, the following roadway improvements are recommended to accommodate the 2013, 2015 and 2035 design year Build traffic (including site traffic):

2013 Build traffic conditions (including site traffic):

S.R. 747 (Princeton-Glendale Road) and West Chester Village Drive D/Proposed Site Drive A

- Install a traffic signal at the intersection.
- Provide a 175' westbound left turn lane.
- Provide a westbound through/right lane.
- Construct a 364' northbound right turn lane.
- Provide a 489' southbound left turn lane (restriping only).

S.R. 747 (Princeton-Glendale Road) at Proposed Site Drive B

- Provide a 175' westbound right turn lane.
- Construct a 285' northbound right turn lane.
- Provide a 285' southbound left turn lane (restriping only).

Beckett Road and Proposed Site Drive D

- Provide a 175' eastbound left turn lane.
- Provide a 100' eastbound right lane.
- Construct a 225' northbound left turn lane.
- Construct a 300' southbound right turn lane.

2015 Build traffic conditions (including site traffic):

S.R. 747 (Princeton-Glendale Road) and Tylersville Road

- Construct a 636' westbound right turn lane.
- Provide a 550' westbound left turn lane (restriping only).

Tylersville Road and Wethersfield Drive/Proposed Site Drive C

- Construct a 261' eastbound right turn lane.
- Construct a northbound lane of egress.

2035 Build traffic conditions (including site traffic):

Tylersville Road and Beckett Road

- Construct a 425' eastbound right turn lane.

While the turn lane length identified above was calculated in accordance with the ODOT *Location and Design Manual, Volume One*, Sections 401-9 and 401-10, construction of an eastbound right turn lane of 536' on Tylersville Road at Beckett Road is not possible because the turn lane encroaches approximately 30' into the intersection of Wethersfield Drive and Site Drive C. The ODOT turn lane length of 536' is comprised of 425' of storage length and 111' of deceleration, including 50' of diverging taper length. The HCS 95th percentile back of queue measures 375' for the eastbound right turn. Thus, the traffic that is projected to be stopped at the Tylersville Road and Beckett Road intersection can be stored in a turn bay without blocking any intersections based on the queue length requirement of 375' plus the diverging taper of 50', for a total length of 425'.

The recommended turn lane includes storage length, deceleration length and a 50' diverging taper.

FINDINGS

Site Access

The roadways that will provide major access to the proposed site are S.R. 747 (Princeton-Glendale Road), Beckett Road and Tylersville Road. Access to the site will be provided at the following locations:

- Proposed Site Drive A, a full movement access on S.R. 747 (Princeton-Glendale Road), opposite the proposed West Chester Village Drive D, approximately 1270' north of Hutzelman Way and approximately 900' south of Proposed Access Drive B (measured from center to center).
- Proposed Site Drive B, a right turn in/right turn out/left turn in access on S.R. 747 (Princeton-Glendale Road), approximately 800' south of Tylersville Road and approximately 2170' north of Hutzelman Way (center to center).
- Proposed Site Drive C, a right turn in/right turn out access on Tylersville Road, opposite Wethersfield Drive, approximately 590' west of Beckett Road and approximately 840' east of S.R. 747 (Princeton-Glendale Road) (center to center).
- Proposed Site Drive D, a full movement access on Beckett Road, approximately 680' south of Tylersville Road and approximately 845' north of Park Place Circle (center to center).

According to ODOT's *Rural County Map* for Butler County, S.R. 747 (Princeton-Glendale Road) is classified as a minor arterial to the south of Tylersville Road and a major collector north of Tylersville Road. Based on the District 8 *Access Inventory*, dated December 27, 2001, S.R. 747 (Princeton-Glendale Road) is a Category 3H (high emphasis access management) roadway. It has a posted and legal speed limit of 55 mph.

The ODOT *State Highway Access Management Manual*, dated August 15, 2003, defines a high volume driveway as having 200 or more trip ends in the peak hour and is permitted on a Category 3H roadway with an allowable spacing of 0.5 mile (2640'). If 0.5 mile is not available, then the restrictions of medium volume driveways apply. The allowable spacing for a medium volume driveway is based on stopping sight distance (495' for 55 mph) and the driveway is restricted to right-in/right-out only movements.

Proposed Site Drive A and Proposed Site Drive B are considered high volume driveways, based on the site traffic assignment. Proposed Site Drive A is anticipated to be a signalized, full movement driveway, located approximately 1270' north of Hutzelman Way and approximately 900' south of Proposed Access Drive B (or approximately 1750' south of Tylersville Road) (center to center). Proposed Site Drive A meets ODOT access management spacing requirements for a medium volume driveway; however, it is not proposed to be restricted as a right-in/right-out driveway. Proposed Site Drive A meets OMUTCD traffic signal Warrant 3 – Peak Hour and it aligns with the previously approved full movement signalized Access D for the West Chester Village Development

Proposed Site Drive B is an unsignalized, right turn in/right turn out/left turn in driveway, located approximately 900' north of Proposed Site Drive A and approximately 800' south of Tylersville Road (center to center). Proposed Site Drive B meets ODOT access management spacing requirements for a medium volume driveway; however, it is not proposed to be a restricted right-in/right-out driveway. The proposed spacing can accommodate the recommended turn lane/roadway improvements.

Based on the Butler County *2007 Thoroughfare Plan*, S.R. 747 (Princeton-Glendale Road) is classified as a principal arterial. According to the Butler County *Access Management Regulations*, dated January 1, 2005, ODOT requirements are to be followed for a principal arterial.

Tylersville Road, according to ODOT's *Rural County Map* for Butler County and the Butler County *2007 Thoroughfare Plan*, is classified as a minor arterial. It has a posted speed limit of 40 mph.

According to the Butler County *Access Management Regulations*, a medium volume driveway has 51 – 200 trip ends and a high volume driveway is defined as having more than 200 trip ends in the peak hour. Proposed Site Drive C is considered a medium volume driveway and Proposed Site Drive D a high volume driveway. Also according to the Butler County *Access Management Regulations*, a medium volume driveway is permitted on a minor arterial with a 600' minimum spacing. Proposed access points shall be subject to TIS recommendations and when the spacing cannot be met, a right-in/right-out may be permitted. Proposed driveways are to align with existing opposing driveways and roadways whenever possible.

Bayer Becker developed and submitted traffic count data and trip generation calculations for the proposed development and the known/anticipated potential developments to ODOT for certification. The submittal included the No-Build and Build traffic volumes for the design years 2013, 2015 and 2035. The official approval was received in an ODOT Inter-Office Communication letter dated December 4, 2012.

Need for Improvements

The need for improvements was based on the analysis contained within this report. Based on the aforementioned analysis, the following roadway improvements are recommended to accommodate the 2013, 2015 and 2035 design year Build traffic (including site traffic):

2013 Build traffic conditions (including site traffic):

S.R. 747 (Princeton-Glendale Road) and West Chester Village Drive D/Proposed Site Drive A

- Install a traffic signal at the intersection.
- Provide a 175' westbound left turn lane.
- Provide a westbound through/right lane.
- Construct a 364' northbound right turn lane.
- Provide a 489' southbound left turn lane (restriping only).

S.R. 747 (Princeton-Glendale Road) at Proposed Site Drive B

- Provide a 175' westbound right turn lane.
- Construct a 285' northbound right turn lane.
- Provide a 285' southbound left turn lane (restriping only).

Beckett Road and Proposed Site Drive D

- Provide a 175' eastbound left turn lane.
- Provide a 100' eastbound right lane.
- Construct a 225' northbound left turn lane.
- Construct a 300' southbound right turn lane.

2015 Build traffic conditions (including site traffic):

S.R. 747 (Princeton-Glendale Road) and Tylersville Road

- Construct a 636' westbound right turn lane.
- Provide a 550' westbound left turn lane (restriping only).

Tylersville Road and Wethersfield Drive/Proposed Site Drive C

- Construct a 261' eastbound right turn lane.
- Construct a northbound lane of egress.

2035 Build traffic conditions (including site traffic):

Tylersville Road and Beckett Road

- Construct a 425' eastbound right turn lane.

While the turn lane length identified above was calculated in accordance with the ODOT *Location and Design Manual, Volume One*, Sections 401-9 and 401-10, construction of an eastbound right turn lane of 536' on Tylersville Road at Beckett Road is not possible because the turn lane encroaches approximately 30' into the intersection of Wethersfield Drive and Site Drive C. The ODOT turn lane length of 536' is comprised of 425' of storage length and 111' of deceleration, including 50' of diverging taper length. The HCS 95th percentile back of queue measures 375' for the eastbound right turn. Thus, the traffic that is projected to be stopped at the Tylersville Road and Beckett Road intersection can be stored in a turn bay without blocking any intersections based on the queue length requirement of 375' plus the diverging taper of 50', for a total length of 425'.

The recommended turn lane includes storage length, deceleration length and a 50' diverging taper.

Compliance with Applicable Codes

All roadway improvements shall be constructed in accordance with the Ohio Department of Transportation and Butler County Engineer's Office's requirements, as appropriate and applicable.

Based upon engineering judgment and the analysis contained in this report, the proposed S.R. 747 (Princeton-Glendale Road) and Tylersville Road development, with the improvements discussed herein, will not significantly impact operations on the adjacent roadway network.

RECOMMENDATIONS

Site Access

The roadways that will provide major access to the proposed site are S.R. 747 (Princeton-Glendale Road), Beckett Road and Tylersville Road. Access to the site will be provided at the following locations:

- Proposed Site Drive A, a full movement access on S.R. 747 (Princeton-Glendale Road), opposite the proposed West Chester Village Drive D, approximately 1270' north of Hutzelman Way and approximately 900' south of Proposed Access Drive B (measured from center to center).
- Proposed Site Drive B, a right turn in/right turn out/left turn in access on S.R. 747 (Princeton-Glendale Road), approximately 900' north of Proposed Site Drive A and approximately 800' south of Tylersville Road (center to center).
- Proposed Site Drive C, a right turn in/right turn out access on Tylersville Road, opposite Wethersfield Drive, approximately 590' west of Beckett Road and approximately 840' east of S.R. 747 (Princeton-Glendale Road) (center to center).
- Proposed Site Drive D, a full movement access on Beckett Road, approximately 680' south of Tylersville Road and approximately 845' north of Park Place Circle (center to center).

Roadway Improvements

The following roadway improvements are recommended to accommodate the 2013, 2015 and 2035 design year Build traffic (including site traffic):

2013 Build traffic conditions (including site traffic):

S.R. 747 (Princeton-Glendale Road) and West Chester Village Drive D/Proposed Site Drive A

- Install a traffic signal at the intersection.
- Provide a 175' westbound left turn lane.
- Provide a westbound through/right lane.
- Construct a 364' northbound right turn lane.
- Provide a 489' southbound left turn lane (restriping only).

S.R. 747 (Princeton-Glendale Road) at Proposed Site Drive B

- Provide a 175' westbound right turn lane.
- Construct a 285' northbound right turn lane.
- Provide a 285' southbound left turn lane (restriping only).

Beckett Road and Proposed Site Drive D

- Provide a 175' eastbound left turn lane.
- Provide a 100' eastbound right lane.
- Construct a 225' northbound left turn lane.
- Construct a 300' southbound right turn lane.

2015 Build traffic conditions (including site traffic):

S.R. 747 (Princeton-Glendale Road) and Tylersville Road

- Construct a 636' westbound right turn lane.
- Provide a 550' westbound left turn lane (restriping only).

Tylersville Road and Wethersfield Drive/Proposed Site Drive C

- Construct a 261' eastbound right turn lane.
- Construct a northbound lane of egress.

2035 Build traffic conditions (including site traffic):

Tylersville Road and Beckett Road

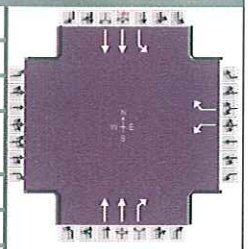
- Construct a 536' eastbound right turn lane.

While the turn lane length identified above was calculated in accordance with the ODOT *Location and Design Manual, Volume One*, Sections 401-9 and 401-10, construction of an eastbound right turn lane of 536' on Tylersville Road at Beckett Road is not possible because the turn lane encroaches approximately 30' into the intersection of Wethersfield Drive and Site Drive C. The ODOT turn lane length of 536' is comprised of 425' of storage length and 111' of deceleration, including 50' of diverging taper length. The HCS 95th percentile back of queue measures 375' for the eastbound right turn. Thus, the traffic that is projected to be stopped at the Tylersville Road and Beckett Road intersection can be stored in a turn bay without blocking any intersections based on the queue length requirement of 375' plus the diverging taper of 50', for a total length of 425'.

UPDATED
INTERSECTION CAPACITY ANALYSIS
SUMMARY REPORTS

HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bayer & Becker			Duration, h	0.25
Analyst	W Wilcox	Analysis Date	11/1/2012	Area Type	Other
Jurisdiction	West Chester Township, Butler County, Ohio	Time Period	AM Peak Hour	PHF	0.92
Intersection	SR 747 & Site Drive A	Analysis Year	2013 Build	Analysis Period	1> 7:00
File Name	08M026-000 SR 747 & Drive A 2013 Build AM.xus				
Project Description	2013 Build AM Peak - No WBLT at Site Drive B				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				130		80		470	70	230	1840	

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	9.1	39.8	26.1	0.0	0.0	0.0	5	6	7	8
Yellow	3.0	3.0	3.0	0.0	0.0	0.0				
Red	2.0	2.0	2.0	0.0	0.0	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				4		6	5	2
Case Number				9.0		7.3	1.0	4.0
Phase Duration, s				31.1		44.8	14.1	58.9
Change Period, (*Y+Rc*), s				5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s				3.2		2.8	2.9	2.8
Queue Clearance Time (g_s), s				7.4		10.3	8.3	46.6
Green Extension Time (g_e), s				0.4		8.6	0.0	0.0
Phase Call Probability				1.00		1.00	1.00	1.00
Max Out Probability				0.00		0.06	1.00	1.00

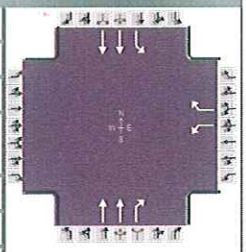
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7		14		6	16	5	2	
Adjusted Flow Rate (*v*), veh/h				141		87		511	76	250	2000	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1610		1809	1610	1810	1809	
Queue Service Time (g_s), s				5.4		3.1		8.3	1.2	6.3	44.6	
Cycle Queue Clearance Time (g_c), s				5.4		3.1		8.3	1.2	6.3	44.6	
Capacity (*c*), veh/h				525		630		1600	1179	558	2167	
Volume-to-Capacity Ratio (*X*)				0.269		0.138		0.319	0.065	0.448	0.923	
Available Capacity (c_a), veh/h				525		630		1600	1179	558	2167	
Back of Queue (*Q*), veh/ln (95th percentile)				4.1		2.0		5.3	0.4	3.6	22.2	
Overflow Queue (Q_3), veh/ln				0.0		0.0		0.0	0.0	0.0	0.0	
Queue Storage Ratio (*RQ*) (95th percentile)				0.00		0.00		0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh				24.6		17.6		16.3	3.4	10.7	16.2	
Incremental Delay (d_2), s/veh				0.1		0.0		0.0	0.0	0.2	7.1	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh				24.7		17.7		16.3	3.4	10.9	23.3	
Level of Service (LOS)				C		B		B	A	B	C	
Approach Delay, s/veh / LOS	0.0			22.0		C	14.7		B	21.9		C
Intersection Delay, s/veh / LOS	20.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.9	C	2.3	B	0.7	A
Bicycle LOS Score / LOS				F	1.0	A	2.3	B

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HCS 2010 Signalized Intersection Results Summary

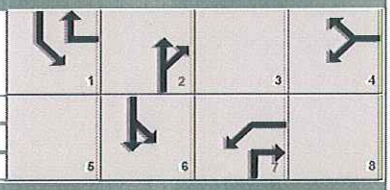
General Information				Intersection Information	
Agency	Bayer & Becker			Duration, h	0.25
Analyst	W Wilcox	Analysis Date	Nov 2, 2012	Area Type	Other
Jurisdiction	West Chester Township, Butler County, Ohio	Time Period	PM Peak Hour	PHF	0.92
Intersection	SR 747 & Site Drive A	Analysis Year	2013 Build	Analysis Period	1> 7:00
File Name	08M026-000 SR 747 & Drive A 2013 Build PM.xus				
Project Description	2013 Build PM Peak - No WBLT at Site Drive B				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				120		160		1710	140	200	870	

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	9.0	48.7	17.3	0.0	0.0	0.0	
Yellow	3.0	3.0	3.0	0.0	0.0	0.0	
Red	2.0	2.0	2.0	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				4		2	1	6
Case Number				9.0		7.3	1.0	4.0
Phase Duration, s				22.3		53.7	14.0	67.7
Change Period, ($Y+R_c$), s				5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s				3.3		2.9	2.9	2.9
Queue Clearance Time (g_s), s				9.7		45.6	7.9	11.7
Green Extension Time (g_e), s				0.4		2.4	0.0	10.5
Phase Call Probability				1.00		1.00	1.00	1.00
Max Out Probability				0.04		0.98	1.00	0.06

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7		14		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				130		174		1859	152	217	946	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1610		1809	1610	1810	1809	
Queue Service Time (g_s), s				5.6		7.7		43.6	2.5	5.9	9.7	
Cycle Queue Clearance Time (g_c), s				5.6		7.7		43.6	2.5	5.9	9.7	
Capacity (*c*), veh/h				348		471		1958	1181	273	2520	
Volume-to-Capacity Ratio (*X*)				0.375		0.370		0.950	0.129	0.796	0.375	
Available Capacity (c_a), veh/h				348		471		1958	1181	273	2520	
Back of Queue (*Q*), veh/ln (50th percentile)				2.4		2.9		17.2	0.5	3.3	2.3	
Overflow Queue (Q_3), veh/ln				0.0		0.0		0.0	0.0	0.0	0.0	
Queue Storage Ratio (*RQ*) (50th percentile)				0.00		0.00		0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh				31.6		25.3		19.5	3.5	24.9	5.6	
Incremental Delay (d_2), s/veh				0.2		0.2		10.7	0.0	14.0	0.0	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh				31.9		25.5		30.2	3.6	38.8	5.6	
Level of Service (LOS)				C		C		C	A	D	A	
Approach Delay, s/veh / LOS	0.0			28.2		C	28.1		C	11.8		B
Intersection Delay, s/veh / LOS	22.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.9	C	2.2	B	0.7	A
Bicycle LOS Score / LOS				F	2.1	B	1.4	A

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*W Wilcox*	Intersection	*S.R. 747 & West Chester D*
Agency/Co.	*Bayer Becker*	Jurisdiction	*West Chester Township*
Date Performed	*Oct 3, 2012*	Analysis Year	*2013 Build*
Analysis Time Period	*AM Peak Hour*		

Project Description *S.R. 747 & Tylersville Road - No WBLT at Site Drive B*

East/West Street: *WC Village Drive/Site Drive B* | North/South Street: *S.R. 747*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*530*	*30*	*110*	*2030*	
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	*0*	*576*	*32*	*119*	*2206*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						*140*
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*0*	*0*	*152*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*1*
Configuration						*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*			*R*			
v (veh/h)		*119*			*152*			
C (m) (veh/h)		*980*			*1250*			
v/c		*0.12*			*0.12*			
95% queue length		*0.41*			*0.41*			
Control Delay (s/veh)		*9.2*			*8.3*			
LOS		*A*			*A*			
Approach Delay (s/veh)	--	--		*8.3*				
Approach LOS	--	--		*A*				

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Generated: 3/15/2013 9:55 AM

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	W Wilcox	Intersection	S.R. 747 & West Chester D
Agency/Co.	Bayer Becker	Jurisdiction	West Chester Township
Date Performed	Oct 3, 2012	Analysis Year	2013 Build
Analysis Time Period	PM Peak Hour		

Project Description: S.R. 747 & Tylersville Road - No WBLT at Site Drive B

East/West Street: WC Village Drive/Site Drive B | North/South Street: S.R. 747

Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		1810	60	100	1030	
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	1967	65	108	1119	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	1	1	2	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						190
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	0	0	0	0	206
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	1
Configuration						R

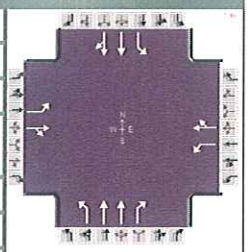
Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L			R			
v (veh/h)		108			206			
C (m) (veh/h)		282			1677			
v/c		0.38			0.12			
95% queue length		1.73			0.42			
Control Delay (s/veh)		25.5			7.4			
LOS		D			A			
Approach Delay (s/veh)	--	--	7.4					
Approach LOS	--	--	A					

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HCS 2010 Signalized Intersection Results Summary

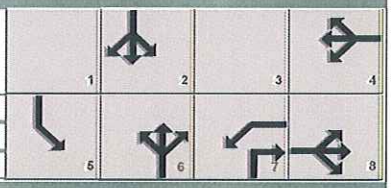
General Information				Intersection Information	
Agency	Bayer & Becker			Duration, h	0.25
Analyst	W Wilcox	Analysis Date	11/1/2012	Area Type	Other
Jurisdiction	West Chester Township, Butler County, Ohio	Time Period	AM Peak Hour	PHF	0.92
Intersection	SR 747 & Site Drive A	Analysis Year	2015 Build	Analysis Period	1> 7:00
File Name	08M026-000 SR 747 & Site Drive A 2015 Build AM - Phase 2+.xus				
Project Description	2015 Build AM Peak - No WBLT at Site Drive B				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	0	40	140	0	110	10	520	100	240	1910	40

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	18.0	35.3	9.7	17.0	0.0	0.0	
Yellow	3.0	3.0	3.0	3.0	0.0	0.0	
Red	2.0	2.0	2.0	2.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4		6	5	2
Case Number		6.3	1.0	4.0		5.3	1.0	4.0
Phase Duration, s		22.0	14.7	36.7		40.3	23.0	63.3
Change Period, (*Y+Rc*), s		5.0	5.0	5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4	3.1	3.4		2.9	2.9	2.9
Queue Clearance Time (g_s), s		4.3	8.5	7.5		37.3	9.5	55.5
Green Extension Time (g_e), s		0.3	0.0	0.2		0.0	0.3	0.0
Phase Call Probability		1.00	1.00	1.00		1.00	1.00	1.00
Max Out Probability		0.00	1.00	0.00		1.00	0.01	1.00

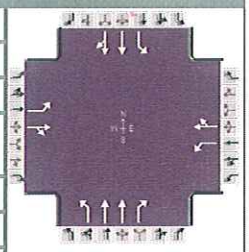
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	11	43		152	120		11	565	109	261	1060	1060
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1292	1610		1810	1610		194	1809	1610	1810	1900	1886
Queue Service Time (g_s), s	0.7	2.3		6.5	5.5		4.8	12.0	4.0	7.5	52.6	53.5
Cycle Queue Clearance Time (g_c), s	0.7	2.3		6.5	5.5		35.3	12.0	4.0	7.5	52.6	53.5
Capacity (*c*), veh/h	292	274		451	510		81	1277	725	579	1108	1100
Volume-to-Capacity Ratio (*X*)	0.037	0.159		0.337	0.234		0.134	0.443	0.150	0.451	0.957	0.964
Available Capacity (c_a), veh/h	292	274		451	510		81	1277	725	579	1108	1100
Back of Queue (*Q*), veh/ln (95th percentile)	0.4	1.6		5.0	3.7		0.5	8.3	2.4	4.7	31.6	32.2
Overflow Queue (Q_3), veh/ln	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio (*RQ*) (95th percentile)	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	34.7	35.4		27.9	25.2		47.9	24.8	16.2	13.1	19.7	19.8
Incremental Delay (d_2), s/veh	0.0	0.1		0.2	0.1		0.3	0.1	0.0	0.2	17.4	18.9
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	34.8	35.5		28.0	25.3		48.2	24.9	16.3	13.4	37.1	38.7
Level of Service (LOS)	C	D		C	C		D	C	B	B	D	D
Approach Delay, s/veh / LOS	35.4	D		26.8	C		23.9	C		35.2	D	
Intersection Delay, s/veh / LOS	32.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.8	C	2.3	B	2.2	B
Bicycle LOS Score / LOS	0.6	A	0.9	A	1.1	A	2.5	B

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HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bayer & Becker			Duration, h	0.25
Analyst	W Wilcox	Analysis Date	11/1/2012	Area Type	Other
Jurisdiction	West Chester Township, Butler County, Ohio	Time Period	PM Peak Hour	PHF	0.92
Intersection	SR 747 & Site Drive A	Analysis Year	2015 Build	Analysis Period	1> 7:00
File Name	08M026-000 SR 747 & Site Drive A 2015 Build PM - Phase 2+.xus				
Project Description	2015 Build PM Peak - No WBLT at Site Drive B				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	140	0	10	180	0	220	30	1760	140	180	970	60

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.3	11.4	35.1	7.0	14.2	0.0	1	2	3	4		
Yellow	3.0	3.0	3.0	3.0	3.0	0.0	5	6	7	8		
Red	2.0	2.0	2.0	2.0	2.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4	1	6	5	2
Case Number		6.3	1.0	4.0	1.1	3.0	1.1	4.0
Phase Duration, s		19.2	12.0	31.2	28.7	56.5	12.3	40.1
Change Period, (*Y+Rc*), s		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.5	3.1	3.5	2.9	2.9	2.9	2.9
Queue Clearance Time (g_s), s		16.0	9.0	14.9	2.4	53.5	9.0	29.5
Green Extension Time (g_e), s		0.0	0.0	0.0	0.0	0.0	0.0	4.0
Phase Call Probability		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00	1.00	1.00	0.00	1.00	1.00	0.83

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	152	11		196	239		33	1913	152	196	566	554
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1159	1610		1810	1610		1810	1809	1610	1810	1900	1861
Queue Service Time (g_s), s	13.1	0.6		7.0	12.9		0.4	51.5	4.3	7.0	27.5	27.5
Cycle Queue Clearance Time (g_c), s	14.0	0.6		7.0	12.9		0.4	51.5	4.3	7.0	27.5	27.5
Capacity (*c*), veh/h	226	229		393	422		540	1863	942	208	667	653
Volume-to-Capacity Ratio (*X*)	0.672	0.048		0.498	0.567		0.060	1.027	0.162	0.940	0.848	0.848
Available Capacity (c_a), veh/h	226	229		393	422		540	1863	942	208	667	653
Back of Queue (*Q*), veh/ln (95th percentile)	7.3	0.4		7.6	8.7		0.6	34.5	2.3	11.7	19.0	18.7
Overflow Queue (Q_3), veh/ln	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio (*RQ*) (95th percentile)	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	43.2	37.1		33.7	32.0		13.9	24.3	9.5	24.7	30.0	30.0
Incremental Delay (d_2), s/veh	6.2	0.0		0.4	1.1		0.0	28.0	0.0	45.0	9.5	9.7
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	49.5	37.1		34.1	33.1		13.9	52.3	9.5	69.8	39.5	39.7
Level of Service (LOS)	D	D		C	C		B	F	A	E	D	D
Approach Delay, s/veh / LOS	48.6	D		33.6	C		48.6	D		44.1	D	
Intersection Delay, s/veh / LOS	45.5						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.8	C	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.8	A	1.2	A	2.2	B	1.6	A

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*W Wilcox*	Intersection	*S.R. 747 & West Chester D*
Agency/Co.	*Bayer Becker*	Jurisdiction	*West Chester Township*
Date Performed	*Oct 3, 2012*	Analysis Year	*2015 Build*
Analysis Time Period	*AM Peak Hour*		

Project Description *S.R. 747 & Tylersville Road - No WBLT at Site Drive B*

East/West Street: *WC Village Drive/Site Drive B* | North/South Street: *S.R. 747*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*590*	*50*	*100*	*2140*	
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	*0*	*641*	*54*	*108*	*2326*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						*170*
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*0*	*0*	*184*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*1*
Configuration						*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*			*R*			
v (veh/h)		*108*			*184*			
C (m) (veh/h)		*910*			*1274*			
v/c		*0.12*			*0.14*			
95% queue length		*0.40*			*0.50*			
Control Delay (s/veh)		*9.5*			*8.3*			
LOS		*A*			*A*			
Approach Delay (s/veh)	--	--	*8.3*					
Approach LOS	--	--	*A*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	W Wilcox	Intersection	S.R. 747 & West Chester D
Agency/Co.	Bayer Becker	Jurisdiction	West Chester Township
Date Performed	Oct 3, 2012	Analysis Year	2015 Build
Analysis Time Period	PM Peak Hour		

Project Description: S.R. 747 & Tylersville Road - No WBLT at Site Drive B

East/West Street: WC Village Drive/Site Drive B | North/South Street: S.R. 747

Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		2040	70	80	1140	
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	2217	76	86	1239	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	1	1	2	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						230
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	0	0	0	0	249
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	1
Configuration						R

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L			R			
v (veh/h)		86			249			
C (m) (veh/h)		223			1762			
v/c		0.39			0.14			
95% queue length		1.71			0.49			
Control Delay (s/veh)		30.9			7.4			
LOS		D			A			
Approach Delay (s/veh)	--	--	7.4					
Approach LOS	--	--	A					

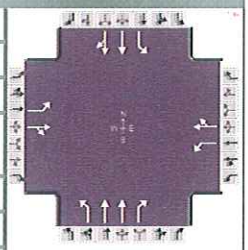
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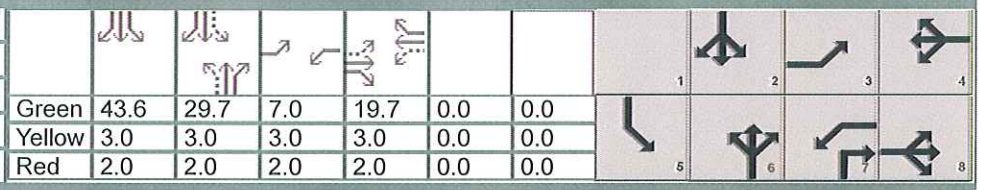
HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bayer & Becker			Duration, h	0.25
Analyst	W Wilcox	Analysis Date	11/1/2012	Area Type	Other
Jurisdiction	West Chester Township, Butler County, Ohio	Time Period	AM Peak Hour	PHF	0.92
Intersection	SR 747 & Site Drive A	Analysis Year	2035 Build	Analysis Period	1> 7:00
File Name	08M026-000 SR 747 & Site Drive A 2035 Build AM - Phase 2+.xus				
Project Description	2035 Build AM Peak - No WBLT at Site Drive B				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	0	40	140	0	110	10	600	100	240	2200	40

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	43.6	29.7	7.0	19.7	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4		6	5	2
Case Number	1.1	4.0	1.1	4.0		5.3	1.0	4.0
Phase Duration, s	12.0	24.7	12.0	24.7		34.7	48.6	83.3
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	3.4	3.1	3.4		2.9	2.9	2.9
Queue Clearance Time (g_s), s	2.6	4.8	9.0	10.0		31.7	9.5	77.7
Green Extension Time (g_e), s	0.0	0.3	0.0	0.2		0.0	0.4	0.0
Phase Call Probability	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Max Out Probability	0.04	0.00	1.00	0.00		1.00	0.00	1.00

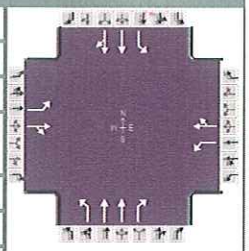
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	11	43		152	120		11	652	109	261	1217	1217
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1610		1810	1610		142	1809	1610	1810	1900	1888
Queue Service Time (g_s), s	0.6	2.8		7.0	8.0		2.5	19.9	6.0	7.5	74.4	75.7
Cycle Queue Clearance Time (g_c), s	0.6	2.8		7.0	8.0		29.7	19.9	6.0	7.5	74.4	75.7
Capacity (*c*), veh/h	291	264		361	264		63	895	492	776	1240	1232
Volume-to-Capacity Ratio (*X*)	0.037	0.164		0.422	0.452		0.173	0.728	0.221	0.336	0.982	0.988
Available Capacity (c_a), veh/h	291	264		361	264		63	895	492	776	1240	1232
Back of Queue (*Q*), veh/ln (95th percentile)	0.5	2.0		7.1	5.8		0.6	13.5	4.0	4.6	42.5	43.4
Overflow Queue (Q_3), veh/ln	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio (*RQ*) (95th percentile)	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	36.8	43.1		40.1	45.3		59.6	41.4	31.0	12.8	20.2	20.4
Incremental Delay (d_2), s/veh	0.0	0.1		0.3	0.5		0.5	2.6	0.1	0.1	21.2	22.7
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	36.8	43.2		40.4	45.7		60.1	44.1	31.1	12.9	41.4	43.1
Level of Service (LOS)	D	D		D	D		E	D	C	B	D	D
Approach Delay, s/veh / LOS	41.9	D		42.8	D		42.5	D		39.4	D	
Intersection Delay, s/veh / LOS	40.3						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.9	C	2.3	B	2.2	B
Bicycle LOS Score / LOS	0.6	A	0.9	A	1.1	A	2.7	B

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HCS 2010 Signalized Intersection Results Summary

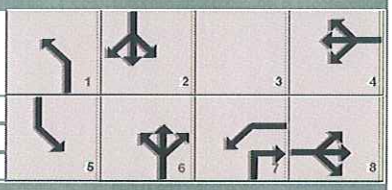
General Information				Intersection Information	
Agency	Bayer & Becker			Duration, h	0.25
Analyst	W Wilcox	Analysis Date	Nov 11, 2012	Area Type	Other
Jurisdiction	West Chester Township, Butler County, Ohio	Time Period	PM Peak Hour	PHF	0.92
Intersection	SR 747 & Site Drive A	Analysis Year	2035 Build	Analysis Period	1> 7:00
File Name	08M026-000 SR 747 & Site Drive A 2035 Build PM - Phase 2+.xus				
Project Description	2035 Build PM Peak - No WBLT at Site Drive B				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	140	0	10	180	0	220	30	2050	140	180	1100	60

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	10.0	19.0		42.5	7.0	16.5	0.0					
Yellow	3.0	3.0		3.0	3.0	3.0	0.0					
Red	2.0	2.0		2.0	2.0	2.0	0.0					



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4	1	6	5	2
Case Number		6.3	1.0	4.0	1.1	3.0	1.1	4.0
Phase Duration, s		21.5	12.0	33.5	39.0	71.5	15.0	47.5
Change Period, ($Y+R_c$), s		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.5	3.1	3.5	2.9	2.9	2.9	2.9
Queue Clearance Time (g_s), s		18.5	9.0	18.0	2.3	68.5	10.7	41.1
Green Extension Time (g_e), s		0.0	0.0	0.0	0.0	0.0	0.0	1.3
Phase Call Probability		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00	1.00	1.00	0.00	1.00	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	152	11		196	239		33	2228	152	196	636	625
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1159	1610		1810	1610		1810	1809	1610	1810	1900	1865
Queue Service Time (g_s), s	12.5	0.7		7.0	16.0		0.3	66.5	4.9	8.7	39.0	39.1
Cycle Queue Clearance Time (g_c), s	16.5	0.7		7.0	16.0		0.3	66.5	4.9	8.7	39.0	39.1
Capacity (*c*), veh/h	181	221		353	382		585	2005	986	213	673	661
Volume-to-Capacity Ratio (*X*)	0.840	0.049		0.554	0.625		0.056	1.112	0.154	0.917	0.945	0.946
Available Capacity (c_a), veh/h	181	221		353	382		585	2005	986	213	673	661
Back of Queue (*Q*), veh/ln (50th percentile)	5.9	0.3		1.9	6.5		0.5	40.6	1.5	5.5	20.8	20.6
Overflow Queue (Q_3), veh/ln	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio (*RQ*) (50th percentile)	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	55.0	44.9		42.9	41.0		20.2	26.8	10.0	31.4	37.6	37.6
Incremental Delay (d_2), s/veh	26.9	0.0		1.1	2.4		0.0	57.9	0.0	38.8	21.9	22.4
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	81.9	45.0		44.1	43.4		20.2	84.7	10.0	70.3	59.5	60.1
Level of Service (LOS)	F	D		D	D		C	F	A	E	E	E
Approach Delay, s/veh / LOS	79.5	E		43.7	D		79.1	E		61.2	E	
Intersection Delay, s/veh / LOS	69.8						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.8	C	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.8	A	1.2	A	2.5	B	1.7	A

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	W Wilcox	Intersection	S.R. 747 & West Chester D
Agency/Co.	Bayer Becker	Jurisdiction	West Chester Township
Date Performed	Oct 3, 2012	Analysis Year	2035 Build
Analysis Time Period	AM Peak Hour		

Project Description	S.R. 747 & Tylersville Road - No WBLT at Site Drive B
East/West Street:	WC Village Drive/Site Drive B
North/South Street:	S.R. 747
Intersection Orientation:	North-South
Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		670	50	100	2440	
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	728	54	108	2652	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	1	1	2	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						170
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	0	0	0	0	184
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	1
Configuration						R

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L			R			
v (veh/h)		108			184			
C (m) (veh/h)		845			1298			
v/c		0.13			0.14			
95% queue length		0.44			0.49			
Control Delay (s/veh)		9.9			8.2			
LOS		A			A			
Approach Delay (s/veh)	--	--	8.2					
Approach LOS	--	--	A					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	W Wilcox	Intersection	S.R. 747 & West Chester D
Agency/Co.	Bayer Becker	Jurisdiction	West Chester Township
Date Performed	Oct 3, 2012	Analysis Year	2035 Build
Analysis Time Period	PM Peak Hour		

Project Description: S.R. 747 & Tylersville Road - No WBLT at Site Drive B

East/West Street: WC Village Drive/Site Drive B | North/South Street: S.R. 747

Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		2340	70	80	1280	
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	2543	76	86	1391	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	1	1	2	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						230
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	0	0	0	0	249
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	1
Configuration						R

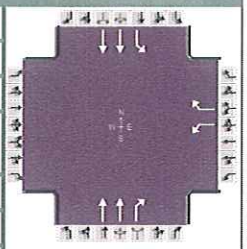
Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L			R			
v (veh/h)		86			249			
C (m) (veh/h)		166			1874			
v/c		0.52			0.13			
95% queue length		2.57			0.46			
Control Delay (s/veh)		47.9			7.2			
LOS		E			A			
Approach Delay (s/veh)	--	--	7.2					
Approach LOS	--	--	A					

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HCS 2010 Signalized Intersection Results Summary

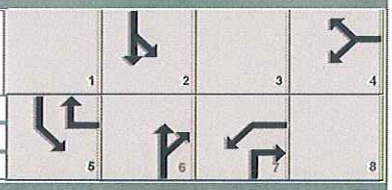
General Information				Intersection Information	
Agency	Bayer & Becker			Duration, h	0.25
Analyst	W Wilcox	Analysis Date	11/1/2012	Area Type	Other
Jurisdiction	West Chester Township, Butler County, Ohio	Time Period	AM Peak Hour	PHF	0.92
Intersection	SR 747 & Site Drive A	Analysis Year	2013 Build	Analysis Period	1> 7:00
File Name	08M026-000 SR 747 & Drive A 2013 Build AM.xus				
Project Description	2013 Build AM Peak - No WBLT at Site Drive B				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				130		80		470	70	230	1840	

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	9.1	39.8	26.1	0.0	0.0	0.0	
Yellow	3.0	3.0	3.0	0.0	0.0	0.0	
Red	2.0	2.0	2.0	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				4		6	5	2
Case Number				9.0		7.3	1.0	4.0
Phase Duration, s				31.1		44.8	14.1	58.9
Change Period, ($Y+R_c$), s				5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s				3.2		2.8	2.9	2.8
Queue Clearance Time (g_s), s				7.4		10.3	8.3	46.6
Green Extension Time (g_e), s				0.4		8.6	0.0	0.0
Phase Call Probability				1.00		1.00	1.00	1.00
Max Out Probability				0.00		0.06	1.00	1.00

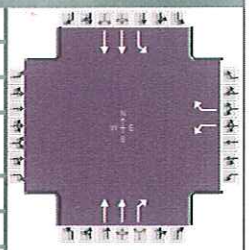
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7		14		6	16	5	2	
Adjusted Flow Rate (*v*), veh/h				141		87		511	76	250	2000	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1610		1809	1610	1810	1809	
Queue Service Time (g_s), s				5.4		3.1		8.3	1.2	6.3	44.6	
Cycle Queue Clearance Time (g_c), s				5.4		3.1		8.3	1.2	6.3	44.6	
Capacity (*c*), veh/h				525		630		1600	1179	558	2167	
Volume-to-Capacity Ratio (*X*)				0.269		0.138		0.319	0.065	0.448	0.923	
Available Capacity (c_a), veh/h				525		630		1600	1179	558	2167	
Back of Queue (*Q*), veh/ln (95th percentile)				4.1		2.0		5.3	0.4	3.6	22.2	
Overflow Queue (Q_3), veh/ln				0.0		0.0		0.0	0.0	0.0	0.0	
Queue Storage Ratio (*RQ*) (95th percentile)				0.00		0.00		0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh				24.6		17.6		16.3	3.4	10.7	16.2	
Incremental Delay (d_2), s/veh				0.1		0.0		0.0	0.0	0.2	7.1	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh				24.7		17.7		16.3	3.4	10.9	23.3	
Level of Service (LOS)				C		B		B	A	B	C	
Approach Delay, s/veh / LOS	0.0			22.0		C	14.7		B	21.9		C
Intersection Delay, s/veh / LOS	20.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.9	C	2.3	B	0.7	A
Bicycle LOS Score / LOS				F	1.0	A	2.3	B

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HCS 2010 Signalized Intersection Results Summary

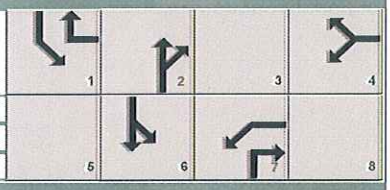
General Information				Intersection Information	
Agency	Bayer & Becker			Duration, h	0.25
Analyst	W Wilcox	Analysis Date	Nov 2, 2012	Area Type	Other
Jurisdiction	West Chester Township, Butler County, Ohio	Time Period	PM Peak Hour	PHF	0.92
Intersection	SR 747 & Site Drive A	Analysis Year	2013 Build	Analysis Period	1> 7:00
File Name	08M026-000 SR 747 & Drive A 2013 Build PM.xus				
Project Description	2013 Build PM Peak - No WBLT at Site Drive B				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				120		160		1710	140	200	870	

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	9.0	48.7	17.3	0.0	0.0	0.0	
Yellow	3.0	3.0	3.0	0.0	0.0	0.0	
Red	2.0	2.0	2.0	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				4		2	1	6
Case Number				9.0		7.3	1.0	4.0
Phase Duration, s				22.3		53.7	14.0	67.7
Change Period, (*Y*+*Rc*), s				5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s				3.3		2.9	2.9	2.9
Queue Clearance Time (g_s), s				9.7		45.6	7.9	11.7
Green Extension Time (g_e), s				0.4		2.4	0.0	10.5
Phase Call Probability				1.00		1.00	1.00	1.00
Max Out Probability				0.04		0.98	1.00	0.06

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7		14		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				130		174		1859	152	217	946	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1610		1809	1610	1810	1809	
Queue Service Time (g_s), s				5.6		7.7		43.6	2.5	5.9	9.7	
Cycle Queue Clearance Time (g_c), s				5.6		7.7		43.6	2.5	5.9	9.7	
Capacity (*c*), veh/h				348		471		1958	1181	273	2520	
Volume-to-Capacity Ratio (*X*)				0.375		0.370		0.950	0.129	0.796	0.375	
Available Capacity (c_a), veh/h				348		471		1958	1181	273	2520	
Back of Queue (*Q*), veh/ln (50th percentile)				2.4		2.9		17.2	0.5	3.3	2.3	
Overflow Queue (Q_3), veh/ln				0.0		0.0		0.0	0.0	0.0	0.0	
Queue Storage Ratio (*RQ*) (50th percentile)				0.00		0.00		0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh				31.6		25.3		19.5	3.5	24.9	5.6	
Incremental Delay (d_2), s/veh				0.2		0.2		10.7	0.0	14.0	0.0	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh				31.9		25.5		30.2	3.6	38.8	5.6	
Level of Service (LOS)				C		C		C	A	D	A	
Approach Delay, s/veh / LOS	0.0			28.2		C	28.1		C	11.8		B
Intersection Delay, s/veh / LOS	22.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.9	C	2.2	B	0.7	A
Bicycle LOS Score / LOS				F	2.1	B	1.4	A

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	W Wilcox	Intersection	S.R. 747 & West Chester D
Agency/Co.	Bayer Becker	Jurisdiction	West Chester Township
Date Performed	Oct 3, 2012	Analysis Year	2013 Build
Analysis Time Period	AM Peak Hour		

Project Description: S.R. 747 & Tylersville Road - No WBLT at Site Drive B

East/West Street: WC Village Drive/Site Drive B | North/South Street: S.R. 747

Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		530	30	110	2030	
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	576	32	119	2206	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	1	1	2	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						140
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	0	0	0	0	152
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	1
Configuration						R

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L			R			
v (veh/h)		119			152			
C (m) (veh/h)		980			1250			
v/c		0.12			0.12			
95% queue length		0.41			0.41			
Control Delay (s/veh)		9.2			8.3			
LOS		A			A			
Approach Delay (s/veh)	--	--	8.3					
Approach LOS	--	--	A					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*W Wilcox*	Intersection	*S.R. 747 & West Chester D*
Agency/Co.	*Bayer Becker*	Jurisdiction	*West Chester Township*
Date Performed	*Oct 3, 2012*	Analysis Year	*2013 Build*
Analysis Time Period	*PM Peak Hour*		

Project Description *S.R. 747 & Tylersville Road - No WBLT at Site Drive B*

East/West Street: *WC Village Drive/Site Drive B* | North/South Street: *S.R. 747*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*1810*	*60*	*100*	*1030*	
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	*0*	*1967*	*65*	*108*	*1119*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						*190*
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*0*	*0*	*206*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*1*
Configuration						*R*

Delay, Queue Length, and Level of Service

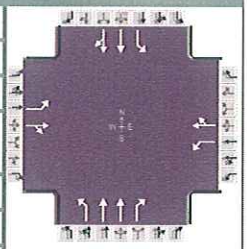
Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*			*R*			
v (veh/h)		*108*			*206*			
C (m) (veh/h)		*282*			*1677*			
v/c		*0.38*			*0.12*			
95% queue length		*1.73*			*0.42*			
Control Delay (s/veh)		*25.5*			*7.4*			
LOS		*D*			*A*			
Approach Delay (s/veh)	--	--	*7.4*					
Approach LOS	--	--	*A*					

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HCS 2010™ Version 6.40 Generated: 3/15/2013 9:56 AM

HCS 2010 Signalized Intersection Results Summary

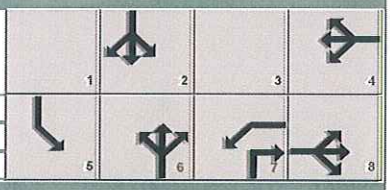
General Information				Intersection Information	
Agency	Bayer & Becker			Duration, h	0.25
Analyst	W Wilcox	Analysis Date	11/1/2012	Area Type	Other
Jurisdiction	West Chester Township, Butler County, Ohio	Time Period	AM Peak Hour	PHF	0.92
Intersection	SR 747 & Site Drive A	Analysis Year	2015 Build	Analysis Period	1> 7:00
File Name	08M026-000 SR 747 & Site Drive A 2015 Build AM - Phase 2+.xus				
Project Description	2015 Build AM Peak - No WBLT at Site Drive B				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	0	40	140	0	110	10	520	100	240	1910	40

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	18.0	35.3	9.7	17.0	0.0	0.0	
Yellow	3.0	3.0	3.0	3.0	0.0	0.0	
Red	2.0	2.0	2.0	2.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4		6	5	2
Case Number		6.3	1.0	4.0		5.3	1.0	4.0
Phase Duration, s		22.0	14.7	36.7		40.3	23.0	63.3
Change Period, ($Y+R_c$), s		5.0	5.0	5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4	3.1	3.4		2.9	2.9	2.9
Queue Clearance Time (g_s), s		4.3	8.5	7.5		37.3	9.5	55.5
Green Extension Time (g_e), s		0.3	0.0	0.2		0.0	0.3	0.0
Phase Call Probability		1.00	1.00	1.00		1.00	1.00	1.00
Max Out Probability		0.00	1.00	0.00		1.00	0.01	1.00

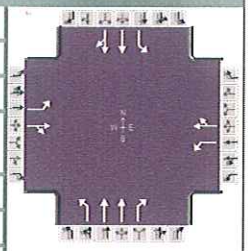
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	11	43		152	120		11	565	109	261	1060	1060
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1292	1610		1810	1610		194	1809	1610	1810	1900	1886
Queue Service Time (g_s), s	0.7	2.3		6.5	5.5		4.8	12.0	4.0	7.5	52.6	53.5
Cycle Queue Clearance Time (g_c), s	0.7	2.3		6.5	5.5		35.3	12.0	4.0	7.5	52.6	53.5
Capacity (*c*), veh/h	292	274		451	510		81	1277	725	579	1108	1100
Volume-to-Capacity Ratio (*X*)	0.037	0.159		0.337	0.234		0.134	0.443	0.150	0.451	0.957	0.964
Available Capacity (c_a), veh/h	292	274		451	510		81	1277	725	579	1108	1100
Back of Queue (*Q*), veh/ln (95th percentile)	0.4	1.6		5.0	3.7		0.5	8.3	2.4	4.7	31.6	32.2
Overflow Queue (Q_3), veh/ln	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio (*RQ*) (95th percentile)	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	34.7	35.4		27.9	25.2		47.9	24.8	16.2	13.1	19.7	19.8
Incremental Delay (d_2), s/veh	0.0	0.1		0.2	0.1		0.3	0.1	0.0	0.2	17.4	18.9
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	34.8	35.5		28.0	25.3		48.2	24.9	16.3	13.4	37.1	38.7
Level of Service (LOS)	C	D		C	C		D	C	B	B	D	D
Approach Delay, s/veh / LOS	35.4	D		26.8	C		23.9	C		35.2	D	
Intersection Delay, s/veh / LOS	32.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.8	C	2.3	B	2.2	B
Bicycle LOS Score / LOS	0.6	A	0.9	A	1.1	A	2.5	B

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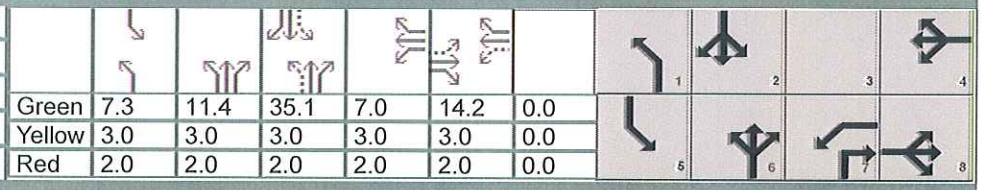
HCS 2010 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Bayer & Becker			Duration, h	0.25
Analyst	W Wilcox	Analysis Date	11/1/2012	Area Type	Other
Jurisdiction	West Chester Township, Butler County, Ohio	Time Period	PM Peak Hour	PHF	0.92
Intersection	SR 747 & Site Drive A	Analysis Year	2015 Build	Analysis Period	1> 7:00
File Name	08M026-000 SR 747 & Site Drive A 2015 Build PM - Phase 2+.xus				
Project Description	2015 Build PM Peak - No WBLT at Site Drive B				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	140	0	10	180	0	220	30	1760	140	180	970	60

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	7.3	11.4	35.1	7.0	14.2	0.0		
Yellow	3.0	3.0	3.0	3.0	3.0	0.0		
Red	2.0	2.0	2.0	2.0	2.0	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4	1	6	5	2
Case Number		6.3	1.0	4.0	1.1	3.0	1.1	4.0
Phase Duration, s		19.2	12.0	31.2	28.7	56.5	12.3	40.1
Change Period, ($Y+R_c$), s		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.5	3.1	3.5	2.9	2.9	2.9	2.9
Queue Clearance Time (g_s), s		16.0	9.0	14.9	2.4	53.5	9.0	29.5
Green Extension Time (g_e), s		0.0	0.0	0.0	0.0	0.0	0.0	4.0
Phase Call Probability		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00	1.00	1.00	0.00	1.00	1.00	0.83

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	152	11		196	239		33	1913	152	196	566	554
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1159	1610		1810	1610		1810	1809	1610	1810	1900	1861
Queue Service Time (g_s), s	13.1	0.6		7.0	12.9		0.4	51.5	4.3	7.0	27.5	27.5
Cycle Queue Clearance Time (g_c), s	14.0	0.6		7.0	12.9		0.4	51.5	4.3	7.0	27.5	27.5
Capacity (*c*), veh/h	226	229		393	422		540	1863	942	208	667	653
Volume-to-Capacity Ratio (*X*)	0.672	0.048		0.498	0.567		0.060	1.027	0.162	0.940	0.848	0.848
Available Capacity (c_a), veh/h	226	229		393	422		540	1863	942	208	667	653
Back of Queue (*Q*), veh/ln (95th percentile)	7.3	0.4		7.6	8.7		0.6	34.5	2.3	11.7	19.0	18.7
Overflow Queue (Q_3), veh/ln	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio (*RQ*) (95th percentile)	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	43.2	37.1		33.7	32.0		13.9	24.3	9.5	24.7	30.0	30.0
Incremental Delay (d_2), s/veh	6.2	0.0		0.4	1.1		0.0	28.0	0.0	45.0	9.5	9.7
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	49.5	37.1		34.1	33.1		13.9	52.3	9.5	69.8	39.5	39.7
Level of Service (LOS)	D	D		C	C		B	F	A	E	D	D
Approach Delay, s/veh / LOS	48.6	D		33.6	C		48.6	D		44.1	D	
Intersection Delay, s/veh / LOS	45.5						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.8	C	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.8	A	1.2	A	2.2	B	1.6	A

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*W Wilcox*	Intersection	*S.R. 747 & West Chester D*
Agency/Co.	*Bayer Becker*	Jurisdiction	*West Chester Township*
Date Performed	*Oct 3, 2012*	Analysis Year	*2015 Build*
Analysis Time Period	*AM Peak Hour*		

Project Description *S.R. 747 & Tylersville Road - No WBLT at Site Drive B*

East/West Street: *WC Village Drive/Site Drive B* | North/South Street: *S.R. 747*

Intersection Orientation: *North-South* | Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		*590*	*50*	*100*	*2140*	
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	*0*	*641*	*54*	*108*	*2326*	*0*
Percent Heavy Vehicles	*0*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*2*	*1*	*1*	*2*	*0*
Configuration		*T*	*R*	*L*	*T*	
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						*170*
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	*0*	*0*	*0*	*0*	*0*	*184*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*1*
Configuration						*R*

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*L*			*R*			
v (veh/h)		*108*			*184*			
C (m) (veh/h)		*910*			*1274*			
v/c		*0.12*			*0.14*			
95% queue length		*0.40*			*0.50*			
Control Delay (s/veh)		*9.5*			*8.3*			
LOS		*A*			*A*			
Approach Delay (s/veh)	--	--	*8.3*					
Approach LOS	--	--	*A*					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	W Wilcox	Intersection	S.R. 747 & West Chester D
Agency/Co.	Bayer Becker	Jurisdiction	West Chester Township
Date Performed	Oct 3, 2012	Analysis Year	2015 Build
Analysis Time Period	PM Peak Hour		

Project Description: S.R. 747 & Tylersville Road - No WBLT at Site Drive B

East/West Street: WC Village Drive/Site Drive B | North/South Street: S.R. 747

Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		2040	70	80	1140	
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	2217	76	86	1239	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	1	1	2	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						230
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	0	0	0	0	249
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	1
Configuration						R

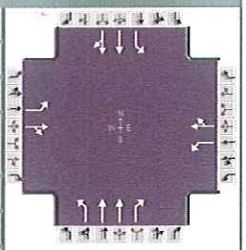
Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L			R			
v (veh/h)		86			249			
C (m) (veh/h)		223			1762			
v/c		0.39			0.14			
95% queue length		1.71			0.49			
Control Delay (s/veh)		30.9			7.4			
LOS		D			A			
Approach Delay (s/veh)	--	--	7.4					
Approach LOS	--	--	A					

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HCS 2010 Signalized Intersection Results Summary

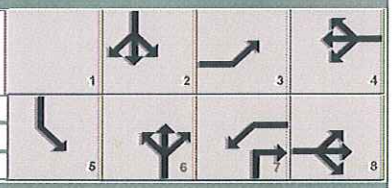
General Information				Intersection Information	
Agency	Bayer & Becker			Duration, h	0.25
Analyst	W Wilcox	Analysis Date	11/1/2012	Area Type	Other
Jurisdiction	West Chester Township, Butler County, Ohio	Time Period	AM Peak Hour	PHF	0.92
Intersection	SR 747 & Site Drive A	Analysis Year	2035 Build	Analysis Period	1> 7:00
File Name	08M026-000 SR 747 & Site Drive A 2035 Build AM - Phase 2+.xus				
Project Description	2035 Build AM Peak - No WBLT at Site Drive B				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	10	0	40	140	0	110	10	600	100	240	2200	40

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	43.6	29.7	7.0	19.7	0.0	0.0	
Yellow	3.0	3.0	3.0	3.0	0.0	0.0	
Red	2.0	2.0	2.0	2.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	3	8	7	4		6	5	2
Case Number	1.1	4.0	1.1	4.0		5.3	1.0	4.0
Phase Duration, s	12.0	24.7	12.0	24.7		34.7	48.6	83.3
Change Period, (*Y+Rc*), s	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	3.4	3.1	3.4		2.9	2.9	2.9
Queue Clearance Time (g_s), s	2.6	4.8	9.0	10.0		31.7	9.5	77.7
Green Extension Time (g_e), s	0.0	0.3	0.0	0.2		0.0	0.4	0.0
Phase Call Probability	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Max Out Probability	0.04	0.00	1.00	0.00		1.00	0.00	1.00

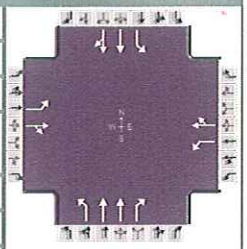
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	11	43		152	120		11	652	109	261	1217	1217
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1610		1810	1610		142	1809	1610	1810	1900	1888
Queue Service Time (g_s), s	0.6	2.8		7.0	8.0		2.5	19.9	6.0	7.5	74.4	75.7
Cycle Queue Clearance Time (g_c), s	0.6	2.8		7.0	8.0		29.7	19.9	6.0	7.5	74.4	75.7
Capacity (*c*), veh/h	291	264		361	264		63	895	492	776	1240	1232
Volume-to-Capacity Ratio (*X*)	0.037	0.164		0.422	0.452		0.173	0.728	0.221	0.336	0.982	0.988
Available Capacity (c_a), veh/h	291	264		361	264		63	895	492	776	1240	1232
Back of Queue (*Q*), veh/ln (95th percentile)	0.5	2.0		7.1	5.8		0.6	13.5	4.0	4.6	42.5	43.4
Overflow Queue (Q_3), veh/ln	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio (*RQ*) (95th percentile)	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	36.8	43.1		40.1	45.3		59.6	41.4	31.0	12.8	20.2	20.4
Incremental Delay (d_2), s/veh	0.0	0.1		0.3	0.5		0.5	2.6	0.1	0.1	21.2	22.7
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	36.8	43.2		40.4	45.7		60.1	44.1	31.1	12.9	41.4	43.1
Level of Service (LOS)	D	D		D	D		E	D	C	B	D	D
Approach Delay, s/veh / LOS	41.9	D		42.8	D		42.5	D		39.4	D	
Intersection Delay, s/veh / LOS	40.3						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.9	C	2.3	B	2.2	B
Bicycle LOS Score / LOS	0.6	A	0.9	A	1.1	A	2.7	B

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HCS 2010 Signalized Intersection Results Summary

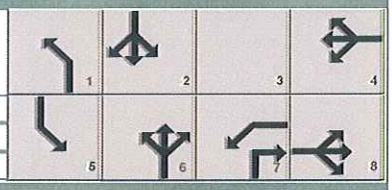
General Information				Intersection Information	
Agency	Bayer & Becker			Duration, h	0.25
Analyst	W Wilcox	Analysis Date	Nov 11, 2012	Area Type	Other
Jurisdiction	West Chester Township, Butler County, Ohio	Time Period	PM Peak Hour	PHF	0.92
Intersection	SR 747 & Site Drive A	Analysis Year	2035 Build	Analysis Period	1> 7:00
File Name	08M026-000 SR 747 & Site Drive A 2035 Build PM - Phase 2+.xus				
Project Description	2035 Build PM Peak - No WBLT at Site Drive B				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	140	0	10	180	0	220	30	2050	140	180	1100	60

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	10.0	19.0	42.5	7.0	16.5	0.0		
Yellow	3.0	3.0	3.0	3.0	3.0	0.0		
Red	2.0	2.0	2.0	2.0	2.0	0.0		



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8	7	4	1	6	5	2
Case Number		6.3	1.0	4.0	1.1	3.0	1.1	4.0
Phase Duration, s		21.5	12.0	33.5	39.0	71.5	15.0	47.5
Change Period, ($Y+R_c$), s		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.5	3.1	3.5	2.9	2.9	2.9	2.9
Queue Clearance Time (g_s), s		18.5	9.0	18.0	2.3	68.5	10.7	41.1
Green Extension Time (g_e), s		0.0	0.0	0.0	0.0	0.0	0.0	1.3
Phase Call Probability		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00	1.00	1.00	0.00	1.00	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	152	11		196	239		33	2228	152	196	636	625
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1159	1610		1810	1610		1810	1809	1610	1810	1900	1865
Queue Service Time (g_s), s	12.5	0.7		7.0	16.0		0.3	66.5	4.9	8.7	39.0	39.1
Cycle Queue Clearance Time (g_c), s	16.5	0.7		7.0	16.0		0.3	66.5	4.9	8.7	39.0	39.1
Capacity (*c*), veh/h	181	221		353	382		585	2005	986	213	673	661
Volume-to-Capacity Ratio (*X*)	0.840	0.049		0.554	0.625		0.056	1.112	0.154	0.917	0.945	0.946
Available Capacity (c_a), veh/h	181	221		353	382		585	2005	986	213	673	661
Back of Queue (*Q*), veh/ln (50th percentile)	5.9	0.3		1.9	6.5		0.5	40.6	1.5	5.5	20.8	20.6
Overflow Queue (Q_3), veh/ln	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Queue Storage Ratio (*RQ*) (50th percentile)	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	55.0	44.9		42.9	41.0		20.2	26.8	10.0	31.4	37.6	37.6
Incremental Delay (d_2), s/veh	26.9	0.0		1.1	2.4		0.0	57.9	0.0	38.8	21.9	22.4
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	81.9	45.0		44.1	43.4		20.2	84.7	10.0	70.3	59.5	60.1
Level of Service (LOS)	F	D		D	D		C	F	A	E	E	E
Approach Delay, s/veh / LOS	79.5	E		43.7	D		79.1	E		61.2	E	
Intersection Delay, s/veh / LOS	69.8						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.0	C	2.8	C	2.3	B	2.3	B
Bicycle LOS Score / LOS	0.8	A	1.2	A	2.5	B	1.7	A

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	W Wilcox	Intersection	S.R. 747 & West Chester D
Agency/Co.	Bayer Becker	Jurisdiction	West Chester Township
Date Performed	Oct 3, 2012	Analysis Year	2035 Build
Analysis Time Period	AM Peak Hour		

Project Description S.R. 747 & Tylersville Road - No WBLT at Site Drive B

East/West Street: WC Village Drive/Site Drive B	North/South Street: S.R. 747
Intersection Orientation: North-South	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		670	50	100	2440	
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	728	54	108	2652	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	1	1	2	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						170
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	0	0	0	0	184
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	1
Configuration						R

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L			R			
v (veh/h)		108			184			
C (m) (veh/h)		845			1298			
v/c		0.13			0.14			
95% queue length		0.44			0.49			
Control Delay (s/veh)		9.9			8.2			
LOS		A			A			
Approach Delay (s/veh)	--	--	8.2					
Approach LOS	--	--	A					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	W Wilcox	Intersection	S.R. 747 & West Chester D
Agency/Co.	Bayer Becker	Jurisdiction	West Chester Township
Date Performed	Oct 3, 2012	Analysis Year	2035 Build
Analysis Time Period	PM Peak Hour		

Project Description: S.R. 747 & Tylersville Road - No WBLT at Site Drive B

East/West Street: WC Village Drive/Site Drive B | North/South Street: S.R. 747

Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)		2340	70	80	1280	
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	2543	76	86	1391	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	2	1	1	2	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)						230
Peak-Hour Factor, PHF						
Hourly Flow Rate, HFR (veh/h)	0	0	0	0	0	249
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	1
Configuration						R

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L			R			
v (veh/h)		86			249			
C (m) (veh/h)		166			1874			
v/c		0.52			0.13			
95% queue length		2.57			0.46			
Control Delay (s/veh)		47.9			7.2			
LOS		E			A			
Approach Delay (s/veh)	--	--	7.2					
Approach LOS	--	--	A					

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Prop. NB LTL
Total Storage=425'

BECKETT ROAD

Prop. NB LTL
Total Storage=225'

Prop. SB RTL
Storage=300'

Secondary Lakota
Freshman School Drive

Prop. EB LTL
Storage=225'

Prop. EB RTL
Storage=425'

DRIVE D

DRIVE C (PRIVATE)

Prop. EB RTL
Storage=261'

Prop. WB LTL
Storage=550'

Prop. WB RTL
Storage=636'

TYLERSVILLE ROAD

DRIVE E (PRIVATE)

DRIVE B (PRIVATE)

TRUCK TURNAROUND

Kroger Marketplace

TOTAL KROGER PARKING
= 604 SPACES
4.64 SPACES/1000 S.F.

OUTDOOR SALES

DRIVE A (PRIVATE)

DRIVE E (PRIVATE)

Residence

Greater Hamilton
Church of Christ

ACCESS TO BE PROVIDED TO THE PARCEL TO THE SOUTH FROM SITE DRIVE (A). FUTURE LOCATION OF THE DRIVE SHALL BE A MINIMUM OF 370' FROM THE EASTERN RIGHT OF WAY LINE OF SR 747.

Prop. WB LTL
Required Storage=175'

Prop. NB RTL
Storage=285'

Prop. NB RTL
Storage=364'

Install Traffic
Signal

S.R. 747/PRINCETON-GLENDALE ROAD

Prop. SB LTL
Storage=285'

Prop. SB LTL
Storage=489'

Note: All Storage Lengths
include 50' Diverging Taper

LEGEND:

PHASE 1 - 2013

PHASE 2 - 2015

PHASE 3 - 2035

GRAPHIC SCALE
100 0 50
1 inch = 100 ft.

Item	Revision Description	Date	Drwn:	Chk:
1	ISSUED FOR SUBMITTAL	08-11-12	MJM	RLG
2	REVISED PLAN AS PER COMMENTS REQUEST		CJM	RLG

PRELIMINARY

CROSSINGS OF BECKETT

SECTION 5, TOWN 2, RANGE 2
WEST CHESTER TOWNSHIP
BUTLER COUNTY, OHIO

RECOMMENDED ROADWAY IMPROVEMENTS

bayer becker
www.bayerbecker.com
6900 Tylersville Road, Suite A
Mason, OH 45040 - 513.336.6600

FIGURE 14

Drawing: 08M026-000 LANE USAGES
Drawn by: LWB
Checked By: WW
Issue Date: 02-12-2013

Sheet: PL01

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Plot time: Mar 15, 2013 - 1:36pm
Drawing name: J:\2008\08M026-000\TR\DWG\08M026-000 Lane Usages.dwg - Layout Tab: Lane Usages