



SEP 23 2015

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
Division of Highways

1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0430 • (304) 558-3505

Earl Ray Tomblin
Governor

Paul A. Mattox, Jr., P. E.
Secretary of Transportation/
Commissioner of Highways

September 21, 2015

Mr. Robert E. Goetz, P. E.
Principal
TransAssociates
Twin Towers, Suite 400
4955 Steubenville Pike
Pittsburgh, Pennsylvania 15205

Dear Mr. Goetz:

The West Virginia Division of Highways (WVDOH) has completed its review of the revised Traffic Impact Study (TIS) received on August 12, 2015, regarding the proposed Standard at Morgantown development to be located adjacent to US 19 (University Avenue) and Walnut Street in Morgantown, Monongalia County. The results of our review indicate that you have adequately addressed our previous comments and the WVDOH hereby provides conditional approval of this revised TIS, subject to the following stipulations:

- WVDOH desires additional narrative or analyses, which may be submitted as a supplement to the TIS but that would not require a revised TIS to be submitted, concerning a previous WVDOH comment questioning whether consideration had been given to retiming of the signals in the study area not already mentioned in the TIS. Your response stated that since the retiming of the two intersections (University Avenue/Walnut Street and High Street/Willey Street) did not affect the cycle lengths (only phasing), it did not appear retiming would provide any benefit at the other intersections. The WVDOH intent was to determine to what extent consideration had been given concerning the potential for retiming the system (or intersections) which could include changing the cycle lengths in addition to the phase timings. Although the project isn't expected to result in much additional queuing to what is the background queues, the queues are significant and some extend beyond what is stated to be available storage, with some extending beyond minor side streets and not truly exceeding what is "available". To what extent is there potential for a system retiming to aid in reducing these queues as much as feasible?
- Developer should be aware that if more traffic utilizes the left-turn movement from University Avenue to Walnut Street to enter the Development than currently is

Mr. Robert E. Goetz, P. E.
September 21, 2015
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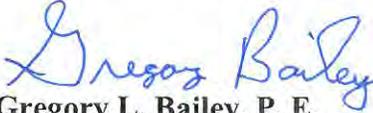
anticipated, and the WVDOH feels that such additional traffic causes undue burden for University Avenue, the WVDOH reserves the right to restrict this movement in order to preserve the progression of University Avenue.

- Developer's plans should include installation of tubular markers along University Avenue associated with the right-in/right-out access.

The recommendations of the TIS are to be incorporated appropriately into the construction plans prepared concerning the development. Please provide this office with *two* digital (CD or USB) versions of the approved TIS reflecting the stipulations above. Additionally, please transmit to David.E.Cramer@wv.gov a PDF of the full TIS.

Thank you for your assistance with this matter. Should you require additional information, please contact Mr. David E. Cramer, P. E., of our Commissioner's Office of Economic Development, at 304-558-9211.

Very truly yours,


Gregory L. Bailey, P. E.
State Highway Engineer

GLB:Cb

JUL 10 2015



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Earl Ray Tomblin
Governor

Paul A. Mattox, Jr., P. E.
Secretary of Transportation/
Commissioner of Highways

July 8, 2015

Mr. Robert E. Goetz, P. E.
Principal
TransAssociates
Twin Towers, Suite 400
4955 Steubenville Pike
Pittsburgh, Pennsylvania 15205

Dear Mr. Goetz:

The West Virginia Division of Highways (WVDOH) has completed its review of the Traffic Impact Study (TIS) received on June 2, 2015, regarding the proposed "Standard at Morgantown" development to be located adjacent to US 19 (University Avenue) and Walnut Street in Morgantown, Monongalia County. The results of our review indicate that certain issues need to be addressed before the WVDOH can provide approval of the TIS. To that end, please review and address, as appropriate, each of the following comments regarding the TIS:

- There appears to be an issue with the intersection of University Avenue at Beechurst Avenue and Fayette Street that will not allow the Sim Traffic Software to run properly. In the simulation, motorists at this intersection do not move and essentially appear to gridlock University Avenue.
- The access on Walnut Street that is intended to be only 50 feet from University Avenue causes concern. How do motorists actually access the property? Is this a gated access or free flow into the property from Walnut Street? If there is any type of gated system (such as keycard) that would slow motorists upon entrance, this could quickly cause Walnut Street to queue onto University Avenue if multiple vehicles were trying to access at the same time. This distance also could cause queuing from the University Avenue signal back into the development approach if multiple vehicles are trying to exit at the same time, which potentially could block Walnut Street for inbound motorists going beyond this development. To what extent can consideration be given to moving this access farther from University Avenue?
- The recommended mitigation includes signal timing adjustments at some intersections. To what extent did you review the effect that timing changes could have if all the study area signals had timing adjustments?
- Since the second through lane doesn't begin on University Avenue NB until just prior to Walnut Street, to what extent did you review the effect of changing this lane to a left-turn only onto Walnut Street EB and keeping the through vehicles in one lane until after the Walnut Street intersection?

Mr. Robert E. Goetz, P. E.

July 8, 2015

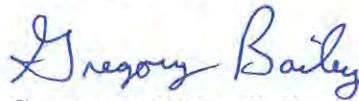
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- The WVDOH provided signal timing data; why weren't these data included in at least the appendices? This would provide insight as to what has been programmed into the controller versus what is being observed in the field.
- Based on the size (number of floors, beds, etc.), it may be more appropriate to compare the Spack Consulting report to High Rise Apt rather than the standard apartment land use code.

Please address each of these comments, as appropriate, then submit to this office five printed copies and two electronic versions (CD or USB) of the full revised study (report and analyses). Additionally, please provide information concerning the submission and any subsequent review results received from the Morgantown/Monongalia Metropolitan Planning Organization (MPO); the Monongalia County Commission; and the City of Morgantown, in accordance with the executed project agreement.

Thank you for your assistance with this matter. Should you require additional information, please contact Mr. David E. Cramer, P. E., of our Commissioner's Office of Economic Development, at (304) 558-9211.

Very truly yours,



Gregory L. Bailey, P. E.
State Highway Engineer

GLB:Cb

May 2015
Revised August 2015
With October 2015 Supplement

TRAFFIC IMPACT STUDY FOR
STANDARD AT MORGANTOWN
STUDENT APARTMENT DEVELOPMENT
City of Morgantown, West Virginia



Transportation Solutions for Today and Tomorrow

Prepared for:

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Robert Goetz

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**SUPPLEMENTAL INFORMATION
TRAFFIC IMPACT STUDY
STANDARD AT MORGANTOWN STUDENT APARTMENT DEVELOPMENT**

As a result of the West Virginia Division of Highways (WVDOH) review contained in a letter dated September 21, 2015 of the Traffic Impact Study for the Standard of Morgantown Student Apartment Development (TIS) revised August 2015, Trans Associates (TA) is providing supplemental information and stipulations to obtain approval of the TIS for the subject development. This section provides the subject supplemental information while the recommendations in the TIS have been revised to include those items stipulated in the WVDOH's letter.

Concerning the extent of the retiming of the University Avenue signals and the other signalized study intersections to determine if the cycle length could be optimized to reduce queues (1st bullet in WVDOH letter), TA reran the analysis letting *Synchro* optimize the cycle length during the study peak hours along University Avenue and the other study intersections. It was determined that the optimum cycle length calculated by *Synchro* was 115 seconds for the University Avenue signals which is the same cycle length observed during those peak hours. For the remaining signalized study intersections along High Street and Spruce Street, a 65 second optimum cycle was calculated by *Synchro* for the AM peak hour while an 80 second optimum cycle length was calculated for the PM peak hour. The current cycle length for these intersections during the AM and PM peak hours is 85 seconds. The *Synchro* printouts with the cycle optimization are included in a separate Appendix at the back of this report.

Based on the *Synchro* output including the 95th percentile queue lengths, it does not appear that significant reductions in the queue length would result by optimizing the cycle lengths. With the 65 second optimized cycle during the AM peak hour, several of the queues were observed to be shorter by one car length. Since several of these signals have three vehicular phases plus an actuated exclusive pedestrian phase, such a short cycle length would not be practical. Therefore, TA believes that the recommendation to maintain the existing cycle lengths and optimize green time for the intersections of University Avenue / Walnut Street and Willey Street / High Street during the study peak hours provides adequate mitigation for the Standard at Morgantown Student Apartment development.

**TRAFFIC IMPACT STUDY
STANDARD AT MORGANTOWN STUDENT APARTMENT DEVELOPMENT
City of Morgantown, West Virginia**

EXECUTIVE SUMMARY

General Overview of the Development

- Site bounded by University Avenue, Walnut Street, the PRT and a parking lot in downtown Morgantown, West Virginia.
- Development to consist of an 11 level student apartment complex containing 870 beds, 17,000 square feet of specialty retail and 735 parking spaces.
- Access proposed via Walnut Street and a right-in, right-out driveway along University Avenue (US 19/WV 7).
- Development proposed to be completed and initially occupied in 2017.

List of Study Intersections

- University Avenue (US 19/WV 7) / Pleasant Street (US 119) / Westover Bridge (US 19)
- University Avenue (US 19/WV 7) / Walnut Street
- Walnut Street / Site Access
- University Avenue (US 19/WV 7) / Wall Street / Proposed Site Access
- University Avenue (US 19/WV 7) / Beechurst Avenue (US 19/WV 7) / Fayette Street
- Pleasant Street (US 119) / Chestnut Street
- Pleasant Street (US 119) / High Street (US 119)
- Pleasant Street (US 119) / Spruce Street
- Spruce Street (US 119) / Walnut Street
- Spruce Street (US 119) / Fayette Street
- Spruce Street (US 119) / Willey Street (US 119)
- Willey Street (US 119) / High Street (US 119)
- Willey Street / Chestnut Street
- Willey Street / University Avenue

Trip Generation and Distribution

- Vehicle trip generation for apartments determined from *Trip Generation Study – Private Student Housing Apartments* by Spack Consulting based on the number of beds. Pedestrian trip generation determined from the difference between trips generated using the Institute of Transportation Engineers (ITE) publication *Trip Generation Manual, 9th Edition* for apartments (Land Use 220) and vehicle trips determined from the Spack Consulting study.
- Trip generation for the retail component determined from the Institute of Transportation Engineers (ITE) publication *Trip Generation Manual, 9th Edition* for specialty retail (Land Use 826) based on square feet.

- Peak hour trip generation is as follows:

Average Weekday:	1,988 Vehicle Trips & 634 Pedestrian Trips
AM Peak Hour:	Vehicle Trips – 82 Entering / 95 Exiting / 177 Total Pedestrian Trips – 3 Entering / 79 Exiting / 82 Total
PM Peak Hour:	Vehicle Trips – 108 Entering / 90 Exiting / 198 Total Pedestrian Trips – 53 Entering / 8 Exiting / 61 Total
- Vehicle trips distributed to and from the study area based on desired destinations on the West Virginia University (WVU) campuses and existing traffic volumes and patterns.
- Pedestrian trip distribution based on principal destinations such as the WVU Downtown campus and the PRT station.

Recommended Site Access and Mitigation Measures to Accommodate Development

- Provide a driveway along Walnut Street approximately 50 feet west of University Avenue;
- Provide a right-in, right-out driveway along University Avenue approximately 260 feet north of Walnut Street;
- Install tubular markers along the centerline of University Avenue to reinforce the right turn in, right turn out driveway;
- Retime the University Avenue and Walnut Street traffic signal to provide additional green time for the westbound Walnut Street approach while reducing green time on the University Avenue approaches during the PM peak hour;
- Install a 4 section signal head for the eastbound Walnut Street approach at University Avenue to confirm the split phase operation of the Walnut Street approaches;
- Restripe the westbound approach of Willey Street at High Street to provide 10 foot wide through and left turn lanes;
- Retime the Willey Street and High Street traffic signal to provide additional green time to the High Street and westbound Willey Street left turn phases while reducing green time on the eastbound Willey Street approach; and
- Install “Do Not Block Intersection” signs on the Walnut Street driveway exit.

Also, the WVDOH reserves the right to restrict left turns from northbound University Avenue onto Walnut Street to enter the development should more traffic utilize this movement than is currently anticipated.

**TRAFFIC IMPACT STUDY
STANDARD AT MORGANTOWN STUDENT APARTMENT DEVELOPMENT
City of Morgantown, West Virginia**

Trans Associates (TA) has completed a traffic impact study (TIS) for a proposed student apartment development located along the west side of University Avenue in downtown Morgantown, West Virginia. This TIS has been prepared in accordance with West Virginia Division of Highways (WVDOH) Traffic Engineering Directive (TED) 106-2 and a scope of study discussed with representatives of the WVDOH and the City of Morgantown. The following sections of this report contain: project description / existing roadway geometry / data collection; 2015 existing traffic conditions; site traffic generation and distribution; projected 2017 base traffic conditions without development; projected 2017 combined traffic conditions with development; other analysis; and conclusions / recommendations.

PROJECT DESCRIPTION / EXISTING ROADWAY GEOMETRY / DATA COLLECTION

Project Description

The proposed development is bounded by University Avenue, Walnut Street, the PRT and a parking lot in downtown Morgantown. A site location map is presented on **Figure 1**.

The proposed development will consist of an 11 level student apartment complex containing 870 beds, 17,000 square feet of specialty retail and 735 parking spaces. The development is projected to be completed and initially occupied in 2017. Access to the site is proposed via a driveway along Walnut Street (aka Water Street) and a right-in, right-out driveway along University Avenue. A site plan is presented on **Figure 2**.

In accordance with a scope of study determined through discussions with representatives of the WVDOH and the City of Morgantown, the following intersections and driveways were selected for analysis:

- University Avenue (US 19/WV 7) / Pleasant Street (US 119) / Westover Bridge (US 19)*
- University Avenue (US 19/WV 7) / Walnut Street*
- Walnut Street / Site Access
- University Avenue (US 19/WV 7) / Wall Street / Proposed Site Access
- University Avenue (US 19/WV 7) / Beechurst Avenue (US 19/WV 7) / Fayette Street*
- Pleasant Street (US 119) / Chestnut Street
- Pleasant Street (US 119) / High Street (US 119)*
- Pleasant Street (US 119) / Spruce Street*
- Spruce Street (US 119) / Walnut Street*
- Spruce Street (US 119) / Fayette Street*
- Spruce Street (US 119) / Willey Street (US 119)*
- Willey Street (US 119) / High Street (US 119)*
- Willey Street / Chestnut Street
- Willey Street / University Avenue

* Indicates signalized intersection

The study intersections, with respect to the site, and distances between them are illustrated in **Figure 3**.

Existing Roadway Geometry

A field reconnaissance of the study area was conducted by TA to obtain information on intersections, roadway widths, lane configurations, roadway grades, and posted speed limits. In addition, traffic signal plans for the signalized study intersections within Morgantown's CBD signal system were obtained. Lastly, TA obtained phase and cycle timings from the WVDOH and during the course of the data collection and study peak periods. A description of the study roadways follows.

University Avenue (US 19/WV7) – Between Beechurst Avenue/Fayette Street and Pleasant Street/Westover Bridge, University Avenue provides a five lane section, 50 to 52 feet wide. At the Pleasant Street/Westover Bridge intersection there is a left turn lane, two through lanes and a right turn lane on the southbound approach with a single northbound lane. On the northbound approach to this intersection there is a left turn lane, a through lane and a right turn lane, and two southbound lanes. The intersection of University Avenue/Pleasant Street/Westover Bridge is controlled with a signal providing protected/permitted left turns in both directions for University Avenue. At the Walnut Street intersection there are two southbound through lanes and a through/right lane and on the northbound approach there is a left/through lane and a through lane. The intersection of University Avenue and Walnut Street is controlled with a four phase signal including split phasing for Walnut Street and an actuated exclusive pedestrian phase. At the Beechurst Avenue/Fayette Street intersection there are left and right turn lanes on the northbound approach and a left turn lane, a through lane and a through/right lane on the southbound approach. University Avenue is one way southbound with parking on one or both sides between Willey Street and the Beechurst Avenue/Fayette Street intersection. The University Avenue/Beechurst Avenue/Fayette Street intersection is controlled with a four phase signal providing protected/permitted left turns from Beechurst Avenue. The posted speed limit is 35 mph.

Pleasant Street (US 119) and Westover Bridge (US 19) – Pleasant Street is one way eastbound between University Avenue and Spruce Street providing two lanes in a 28 foot wide cartway. The intersection of Pleasant Street and High Street is controlled with a three phase signal including an actuated exclusive pedestrian phase. At its intersection with Spruce Street there are left and left/through lanes on the eastbound approach and a right turn only lane on the westbound approach. The Pleasant Street/Spruce Street intersection is controlled with a four phase signal providing split phasing for the Pleasant Street approaches and an exclusive actuated pedestrian phase. There is no posted speed on Pleasant Street. The Westover Bridge approach to University Avenue/Pleasant Street provides exclusive left, through and right turn lanes. The posted speed on the Westover Bridge is 25 mph.

Walnut Street – Between Spruce Street and University Avenue Walnut Street is one way westbound providing two lanes and parking on both sides in a 39 foot wide cartway. The westbound approach to University Avenue provides a left turn lane, a left/through lane and a right turn lane without parking. The Walnut Street/Spruce Street intersection is controlled with a three phase signal including an actuated exclusive pedestrian phase. Walnut Street east of Spruce Street is two way with exclusive through and right turn lanes on the westbound approach without parking. Walnut Street west of University Avenue, also known as Water Street, has a 22 foot wide cartway and is two way undelineated without parking. There is no posted speed within the study area.

Spruce Street (US 119) – Spruce Street from Pleasant Street to Willey Street is one-way northbound providing three lanes without parking in a 27 foot wide cartway. The northbound approach at Willey Street provides exclusive left, through and right turn lanes. North of Willey Street the cartway narrows to 22 feet and there is on street parking with a single northbound lane. The intersection of Spruce Street/Fayette Street is controlled with a two phase signal while the Spruce Street/Willey Street intersection is controlled with a three phase signal including an actuated exclusive pedestrian phase. There is no posted speed within the study area.

Willey Street (US 119 & Local) – Willey Street provides one lane in each direction in a 24 to 26 foot wide cartway except between Spruce Street and High Street where two westbound lanes are provided including an exclusive 9 foot wide left turn lane and a 9 foot wide through lane at High Street and an eastbound lane in a 30 foot wide cartway. The intersection of Willey Street and High Street is controlled with a four phase signal including a protected/permitted westbound left turn phase and an actuated exclusive pedestrian phase. There is no posted speed and no parking along Willey Street within the study area.

High Street (US 119) – High Street is one-way southbound within the study area providing two travel lanes and on street parking on both sides. The cartway varies from 37 to 43 feet with curb bump outs. High Street north of Willey Street is 22 feet wide and provides a right only lane and a through/left lane on its approach to Willey Street. There is no posted speed within the study area.

Beechurst Avenue (US 19/WV 7) – The Beechurst Avenue leg of the University Avenue/Fayette Street intersection has dual right turn lanes, an exclusive left turn lane and a single northbound lane in a 42 foot wide cartway. The posted speed is 35 mph.

Fayette Street - Has a 23 foot wide cartway and is one-way eastbound within the study area. There is parking along the south side of Fayette Street between High Street and Spruce Street. There is no posted speed within the study area.

Chestnut Street – Is a one-way street with one northbound lane and parking between Pleasant Street and Willey Street. The northbound approach at Pleasant Street is controlled with a stop sign. The cartway is 16 feet in width between Pleasant Street and Walnut Street, and 22 feet in width between Walnut Street and Willey Street. The approach to Willey Street has separate left and right turn lanes controlled with a stop sign. There is no posted speed within the study area.

Wall Street – Is a narrow, 12 foot wide alley open to vehicular traffic between Chestnut Street and the Monongahela River.

Photographs along with signal plans and sketches of the study intersections, and both the signal timing information obtained from the WVDOH and through filed reconnaissance are included in the Appendix to this report.

Data Collection

Manual turning movement counts were performed at the existing study intersections from 7:00 AM to 9:00 AM and from 3:00 PM to 6:00 PM on successive Fridays in April 2015 when the West Virginia University (WVU) and Monongalia County Schools were in session. These time periods were selected because they typically include the AM and PM peak hours of adjacent street traffic. The counts were summarized in 15-minute intervals and included heavy vehicles and pedestrians.

The AM and PM peak hours selected for this study were the highest four consecutive 15-minute periods selected. These periods are as follows:

- AM Peak Hour – 7:15 to 8:15
- PM Peak Hour – 4:15 to 5:15

The observed AM and PM peak hour traffic volumes were balanced between intersections. The existing AM and PM peak hour vehicle volumes are presented in **Figure 4**. The pedestrian counts were also summarized for the aforementioned peak hours and are presented on **Figure 5**. Summaries of the manual turning movement count data are included in the Appendix to this report.

The latest available average daily traffic volumes (2014) for the study area were obtained from the WVDOH and are presented on **Figure 6**.

2015 EXISTING TRAFFIC CONDITIONS

Capacity and queuing analyses were performed using the existing 2015 traffic volumes shown in Figure 4 for each of the study intersections for the AM and PM peak hours. This analysis was performed using the *Synchro* software. The capacity analysis is quantified in terms of levels of service (LOS) based on average delay. An LOS A represents relatively short delays while an LOS F represents long delays or a failure condition. Definitions of LOS are included in the Appendix. It is noted that exclusive pedestrian phases, where provided, were assumed to have been actuated for the signalized intersections.

The results of the capacity calculations are summarized on **Table 2A** and **2B** for the AM and PM peak hours, respectively. The capacity analysis revealed the following intersections have movements or approaches that operate at an LOS E during one or both peak hours:

- EB Walnut Street approach at University Avenue
- EB Fayette Street approach at University Avenue/Beechurst Avenue
- SB University Avenue through/right and approach at Beechurst Avenue/Fayette Street
- SB High Street left/through and approach at Willey Street

The results of the queuing analysis are summarized on **Table 3A** and **3B** for the AM and PM peak hours, respectively. As shown, the following queues exceed available capacity during one or both peak hours:

- NB University Avenue left at Pleasant Street
- WB Walnut Street left and left/through at University Avenue

Synchro printouts are included in the Appendix to this report.

SITE TRAFFIC GENERATION AND DISTRIBUTION

Due to the lack of data for student housing developments in the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, vehicle trip generation for the proposed development was determined from the publication entitled *Trip Generation Study – Private Student Housing Apartments* by Spack Consulting dated April 12, 2012, based on the number of beds/bedrooms. The ITE *Trip Generation Manual, 9th Edition* Land Use 220, Apartment, was used to determine the total trips (pedestrian and vehicle) for the apartments, with the vehicle trips from the Spack Consulting study deducted to determine the pedestrian trips. Trip generation for the 17,000 square foot (sf) retail component was determined from the Institute of Transportation Engineers (ITE) publication *Trip Generation Manual, 9th Edition* for specialty retail (Land Use 826) based on square feet.

Peak hour trip generation for the development is projected as follows:

Average Weekday:	1,988 Vehicle Trips & 634 Pedestrian Trips
AM Peak Hour:	Vehicle Trips – 82 Entering / 95 Exiting / 177 Total Pedestrian Trips – 3 Entering / 79 Exiting / 82 Total
PM Peak Hour:	Vehicle Trips – 108 Entering / 90 Exiting / 198 Total Pedestrian Trips – 53 Entering / 8 Exiting / 61 Total

A summary of the projected weekday and peak hour vehicle trips is provided in **Table 1**.

The distribution of vehicle trips to and from the development in the study area was based on desired destinations on the WVU campuses and existing traffic volumes and patterns. Due to one way streets “away” from the Downtown campus, i.e. University Ave. & High St., the distribution is dispersed on Beechurst to Campus Drive, Chestnut Street and Spruce Street. Also, the Downtown campus is close enough that it was assumed a higher percentage of students would walk versus

drive. Conversely, a higher proportion was assumed to drive towards the Evansdale campus or take the PRT. There is also a percentage of vehicle trips destined towards neither the Downtown nor Evansdale campuses, i.e. towards shopping, restaurants, entertainment.

The vehicle trip distribution is shown in **Figure 7**. The distribution of pedestrian trips was based on principal destinations such as the WVU Downtown campus and the PRT station. The pedestrian trip distribution is shown on **Figure 8**.

Peak hour site trip assignments were determined by applying the aforementioned distributions to the site generated vehicle and pedestrian trips. The site generated AM and PM peak hour vehicle trips are shown on **Figure 9**. The site generated AM and PM peak hour pedestrian trips are shown on **Figure 10**.

PROJECTED 2017 BASE TRAFFIC CONDITIONS WITHOUT DEVELOPMENT

The development is projected to be completed and occupied in 2017. Therefore, traffic volumes were projected for the study intersections for 2017 base conditions without development. In order to estimate the 2017 base traffic volumes, a background traffic growth rate of 2.0 percent per year, compounded, was applied to the existing 2015 traffic volumes shown in Figure 4. This background traffic growth rate was obtained from the Morgantown Monongalia Metropolitan Planning Organization (MMMPO) for the study area. The 2017 background traffic volumes with this growth rate are shown in **Figure 11**.

Traffic volumes from three approved, but uncompleted developments (at the time the traffic counts were performed) within the study area were included in the projected 2017 opening year base traffic volumes. A description of the three developments, the source of their site generated volumes, and the figure the volumes are presented as follows:

- Sheetz Convenience Store with 10 fueling positions along University Avenue between Kirk Street and Foundry Street. Site volumes extracted from Revised Traffic Impact Assessment for the University Avenue Development dated September 2013 by Dennis Corporation. Site volumes are shown in **Figure 12**.
- 494 Spruce Street, a student housing development containing 368 bedrooms and 3,500 sf of retail/commercial space located on the southeast corner of the Spruce Street/Willey Street intersection. Site volumes extracted from Traffic Impact Study Proposed Mixed-Use Residential Commercial Development at 494 Spruce Street dated May 28, 2014 by Gannett Fleming. Site volumes are shown in **Figure 13**.
- Central Place, a 120 unit apartment complex located immediately adjacent 494 Spruce Street with access located along Willey Street opposite Price Street. Site volumes extracted from Traffic Impact Study Proposed Mixed-Use Residential Commercial Development at 494 Spruce Street dated May 28, 2014 by Gannett Fleming. Site volumes are shown in **Figure 14**.

Since the intersections included in the aforementioned studies were limited in scope, site volumes for each development were projected through the remaining study intersections based on existing traffic volumes and patterns.

The 2017 base AM and PM peak hour traffic volumes were derived by adding the 2017 background volumes shown in Figure 11, and site volumes from the aforementioned developments shown in Figures 12, 13 and 14. The 2017 base traffic volumes are shown in **Figure 15**.

The results of the capacity calculations using the volumes from Figure 15 are summarized on **Table 2A** and **2B** for the AM and PM peak hours, respectively. The capacity analysis revealed the following intersections have movements or approaches that operate at an LOS E or F during one or both peak hours:

- EB Pleasant Street (bridge) through movement at University Avenue
- NB University Avenue left at Pleasant Street
- WB Walnut Street left at University Avenue
- EB Fayette Street approach at University Avenue/Beechurst Avenue
- SB University Avenue through/right and approach at Beechurst Avenue/Fayette Street
- SB High Street left/through and approach at Willey Street
- NB Chestnut Street left at Willey Street

The results of the queuing analysis are summarized on **Table 3A** and **3B** for the AM and PM peak hours, respectively. As shown, the following locations have queues that exceed available capacity during one or both peak hours:

- NB University Avenue left at Pleasant Street
- WB Walnut Street left and left/through at University Avenue
- NB University Avenue through (to Beechurst) at Beechurst Avenue/Fayette Street
- WB Willey Street left at High Street

Synchro printouts are included in the Appendix to this report.

PROJECTED 2017 COMBINED TRAFFIC CONDITIONS WITH DEVELOPMENT

The forecasted 2017 combined with development traffic volumes for the AM and PM peak hours were determined by adding the projected vehicle trips generated by the proposed Standard at Morgantown development (Figure 9) to the forecasted 2017 base traffic volumes (Figure 15) resulting in the 2017 combined volumes shown on **Figure 16**.

Per TED 106-2, the LOS of all intersections affected by a proposed development should be no worse than the LOS before the new facility opens. Capacity and queuing analyses were performed using forecasted 2017 combined conditions traffic volumes at each of the study intersections for the AM and PM peak hours.

The results of the capacity calculations are summarized in **Table 2A** and **2B** for the AM and PM peak hours, respectively. The capacity analysis revealed the following intersections have movements or approaches that operate at an LOS E or F during one or both peak hours:

- EB Pleasant Street (bridge) through movement at University Avenue
- NB University Avenue left at Pleasant Street
- WB Walnut Street left and left/through at University Avenue
- EB Fayette Street approach at University Avenue/Beechurst Avenue
- SB University Avenue through/right and approach at Beechurst Avenue/Fayette Street
- SB High Street left/through and approach at Willey Street
- NB Chestnut Street left at Willey Street

The aforementioned movements and approaches already operate at LOS E or F in 2017 base conditions with the following exception:

- WB Walnut Street left/through at University Avenue degrades from a LOS D to a LOS E

LOS F with longer delays are incurred with the addition of site traffic at the following location:

- SB High Street left/through and approach at Willey Street

The results of the queuing analysis are summarized on **Table 3A** and **3B** for the AM and PM peak hours, respectively. As shown, the following intersections have queues that exceed available capacity during one or both peak hours:

- EB Walnut Street at University Avenue
- NB University Avenue left at Pleasant Street
- SB University Avenue through at Pleasant Street
- WB Walnut Street left and left/through at University Avenue
- NB University Avenue through (to Beechurst) at Beechurst Avenue/Fayette Street
- WB Willey Street left at High Street

Except for the eastbound Walnut Street queue at University Avenue and the southbound University Avenue through queue at Pleasant Street, these queues already exceed available capacity in 2017 base conditions. The Walnut Street queue may back beyond the site driveway (not a public street) and the University Avenue queue slightly exceeds available capacity by 20 feet.

Synchro printouts are included in the Appendix to this report.

Since the LOS for the westbound Walnut Street left/through lane degrades to a LOS E in 2017 combined conditions, mitigation in the form of signal retiming was assumed during the PM peak hour. Also, signal retiming along with restriping the westbound approach of Willey Street at High Street to provide 10 foot wide left turn and through lanes resulted in a LOS F with less delay for the southbound High Street approach during the PM peak hour.

The results of the capacity calculations performed assuming the aforementioned mitigation is presented in **Table 2A** and **2B** for the AM and PM peak hours, respectively. With the mitigation, the aforementioned movements at the University Avenue/Walnut Street and the Willey Street/High Street intersections operate at the same or improved LOS with less delay as they do in the 2017 base conditions during the peak hours. In addition, queue lengths for the westbound Walnut Street left and left/through lanes are reduced during the PM peak hour to less than those in the 2017 base conditions, as presented in **Table 3A** and **3B** for the AM and PM peak hours, respectively.

Copies of the *Synchro* analysis performed assuming the mitigation at each of the study intersections are included in the Appendix to this report.

In addition to vehicular volumes, projected pedestrian volumes generated by the development shown in Figure 8 were added to the existing pedestrian volumes shown in Figure 5. The combined pedestrian volumes with development are shown in **Figure 17**. As shown, there is a significant increase in the number of pedestrians crossing University Avenue at Walnut Street and at Fayette Street. There is an exclusive actuated pedestrian phase at the University Avenue / Walnut Street intersection, but not at the University Avenue / Beechurst Avenue / Fayette Street intersection. The addition of an exclusive pedestrian phase at this intersection would further degrade LOS.

OTHER ANALYSIS

The need for a traffic signal at the intersection of Willey Street and Chestnut Street was evaluated per the warrant criteria in the 2009 edition of the *Manual on Uniform Traffic Control Devices* (MUTCD). Warrant 2, Four-Hour Vehicular Volume and Warrant 3, Peak Hour, were evaluated for this intersection. It was determined that neither Warrant 2 nor Warrant 3 are satisfied for any condition. Traffic signal warrant charts and evaluation are included in the Appendix.

A queuing analysis was performed for vehicles entering the site driveways from Walnut Street and University Avenue during the peak hours. The purpose of the analysis was to determine if at any time the queue of vehicles waiting to enter the parking garage at the card-actuated gate would back onto either Walnut Street or University Avenue. Based on information from the architect, the Walnut Street entry driveway will have one lane with a gate located 60 feet (i.e. 3 car lengths) from Walnut Street. The University Avenue entry driveway will have one lane with a gate located 50 feet (i.e. 2 car lengths) from University Avenue. Based on a service rate of 225 vehicles per hour, the probability of queues exceeding the provided storage assuming random arrivals is less than 1 percent during the critical PM peak hour. Queue calculations are included in the Appendix.

CONCLUSIONS / RECOMMENDATIONS

This study concluded that the proposed Standard at Morgantown student apartment development will have minimal traffic impact on the surrounding intersections if appropriate mitigation is provided.

The results of the capacity calculations performed for each of the study intersections revealed that the westbound Walnut Street left/through lane at University Avenue degrades from a LOS D to a LOS E between 2017 base and 2017 combined conditions, with longer queues. Also, the southbound High Street left/through lane and approach at Willey Street operates at LOS F with longer delays with the addition of site traffic.

To mitigate the LOS and queues with the site development, signal retiming at the University Avenue and Walnut Street intersection was assumed for the PM peak hour. Also, signal retiming along with restriping the westbound approach of Willey Street at High Street to provide 10 foot wide left turn and through lanes resulted in a LOS F with less delay than the 2017 base conditions for the southbound High Street approach during the PM peak hour.

Therefore TA recommends the following site access and mitigation to accommodate site traffic:

- Provide a driveway along Walnut Street approximately 50 feet west of University Avenue;
- Provide a right-in, right-out driveway along University Avenue approximately 260 feet north of Walnut Street;
- Install tubular markers along the centerline of University Avenue to reinforce the right turn in, right turn out driveway;
- Retime the University Avenue and Walnut Street traffic signal to provide additional green time for the westbound Walnut Street approach while reducing green time on the University Avenue approaches during the PM peak hour;
- Install a 4 section signal head for the eastbound Walnut Street approach at University Avenue to confirm the split phase operation of the Walnut Street approaches;
- Restripe the westbound approach of Willey Street at High Street to provide 10 foot wide through and left turn lanes; and
- Retime the Willey Street and High Street traffic signal to provide additional green time to the High Street and westbound Willey Street left turn phases while reducing green time on the eastbound Willey Street approach; and
- Install "Do Not Block Intersection" signs on the Walnut Street driveway exit.

A schematic diagram with these recommendations is included on **Figure 18**.

Also, the WVDOH reserves the right to restrict left turns from northbound University Avenue onto Walnut Street to enter the development should more traffic utilize this movement than is currently anticipated.

This concludes TA's traffic impact study for a proposed student apartment development located along University Avenue located in Morgantown, West Virginia.

Included in the Appendix to this report are copies of all counts, analysis and calculations.

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September 23, 2015

Standard at Morgantown
Walnut Street and University Avenue
Morgantown, WV 26505

Attention: Mike Greenlee

Mike,

Mark Osborne the District Manager with Republic Services has looked at the attached diagrams for trash service at the corner of Walnut Street and University Avenue for the Standard at Morgantown and has given his approval on this for the compactor to be serviced at this complex. If you have any questions please let us know.

Sincerely,

A handwritten signature in black ink, appearing to read "Roger Huffman".

Roger Huffman
Sales Rep
Republic Services