Draft Report:

Downtown Central Business District (CBD) Circulation Study

Morgantown, West Virginia

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EXECUTIVE SUMMARY

Introduction

This study was initiated to investigate alternatives that would improve the circulation in the downtown Morgantown area, particularly the central business district (CBD). The study area is bounded by Foundry Street to the South, Spruce Street to the East, Willey Street to the North and University/Beechurst Avenue to the West. The alternatives include the conversion of one-way streets to two-way streets, installation of new auxiliary turn lanes, and reconfiguration of intersections. The analysis conducted in this study focused on the collection and analysis of vehicular movements through and within the CBD. Every effort was made to minimize the impact on the number of parking spaces, but analysis of parking and increasing parking was not part of the scope of this study.

Data Collection

Multiple types of traffic data were collected on April 11, 2011 and used as the basis for this study and the modeling efforts. This data collection included turning movement counts at key intersections, continuous machine counts along segments, and origin-destination flows across and within the study area using automated license plate readers. The origin-destination flow data was a critical component to the analysis because it was used to develop a traffic model using TransModeler software, which can conduct dynamic route assignment. Therefore, the software will estimate different optimal routes through the system in response to the alternatives evaluated. Since a major aspect of this study was conversion of one-way streets, the redistribution of traffic was an important component. Once the trip distributions were estimated for the alternatives, the volumes were entered into Synchro software, which enabled the optimization of signal timings and intersection configurations to produce performance measures related to control delay, level-of-service, volume-to-capacity ratios, and 95th percentile queue lengths. Public input was also sought early in the project in order to help identify problem areas and opinions on possible alternatives.

Alternatives

All three alternatives presented in this study include the conversion of High Street (south of Willey Street), Spruce Street (south of Willey Street), Walnut Street, and Pleasant Street from one-way to two-way flow. Alternative 1 was an idealized scenario where most of these newly configured intersections contained left-turn bays, regardless of available right-of-way to construct it. The only movement that was eliminated in this Alternative (and subsequent alternatives) is the southbound left-turn from University Avenue onto Pleasant Street. This movement can instead be served at Walnut Street and eliminating the left-turn bay at Pleasant Street allows two continuous northbound lanes on University Avenue through the Pleasant Street and Walnut Street intersections. The purpose of modeling this alternative is to see if it is feasible to convert to two-way flow on these routes. If this alternative fails, then any subsequent alternatives that are more constrained from a capacity standpoint will not work either.

Alternative 2 was a more realistic scenario, only including left-turn bays at locations where it was feasible. The most significant changes in this alternative were the restriction of left-turns in the southbound direction from Beechurst Avenue onto Fayette Street (to increase capacity for the northbound movement), the restriction of left-turns in the westbound direction from Walnut Street onto University Avenue (because there is no room for a two-lane approach), and the restriction of right-turns in the westbound direction from Pleasant Street onto University Avenue (because there is no room for a two-lane approach). Logically, having a single left/shared westbound lane from Pleasant Street to University Avenue and a single right-turn westbound lane from Walnut Street to University Avenue is the equivalent lane capacity as the existing 3-lane westbound movement from Walnut Street because the vehicles don't currently use all three lanes equally. Trucks straddle the right two lanes to make right turns and drivers turning left tend to not use the inside left lane due to the adjacent PRT pier. Alternative 2 will require additional right-of-way on one or both sides of Willey Street at Spruce Street to provide a 150-foot left-turn bay for the westbound movement. Alternative 2 will also result in the loss of 23 on-street parking spaces to accommodate turn bays.

Alternative 3 is an identical configuration as Alternative 2, except that it additionally includes the conversion of University Avenue between Willey Street and Fayette Street from one-way to two-way flow. This would require significant modifications in the vicinity of the Willey Street and University Avenue intersection and additional right-of-way to form a signalized 3-leg intersection. The benefit of this improvement is that it facilitates the movement of vehicles to Willey Street from the Westover Bridge and University Avenue, which will reduce the volume of traffic on High Street and Spruce Street.

<u>Results</u>

The traffic volumes are much higher during the PM peak hour than the AM peak hour. Alternatives 2 and 3 appear to perform reasonably well during the AM conditions. The delays increased at some intersections and decreased at others, which is expected when converting from one-way to two-way flow. The overall signalized intersections operate at LOS C or better during the AM peak period. There are a few individual movements at intersections that are expected to operate at LOS D and E for each of the alternatives. A few approaches to intersections are also anticipated to experiences queue lengths exceeding 200 feet, but the volume-to-capacity ratios are still in a reasonable range, which indicates the queue should be cleared each cycle. In Alternative 1, the northbound movement from University Avenue to Beechurst Avenue at Fayette Street is estimated to have a v/c ratio of 0.95 and a 95th percentile queue length of 1200 feet. In Alternative 2 and 3 where the opposing left-turn movement is eliminated, the v/c ratio drops to 0.73 and the queue length drops to a range of 287-334 feet. The most significant queue length during the AM for Alternates 2 and 3 is the westbound left/thru lane from Pleasant Street onto University Avenue, which is 431 feet.

During the PM peak, all intersections are expected to operate at LOS D or better for all three alternatives. There are a few movements in some alternatives that are expected to operate at LOS E or F and experience queueing exceeding 200 feet. The most significant queue lengths in Alternative 2 during the PM peak are on the eastbound through/right lane on Walnut Street at High Street, at 728 feet, and the westbound left/thru lane from Pleasant Street onto University Avenue, which is 734 feet. The shift in traffic volumes under Alternative 3 result in these two queue lengths reducing to 275 feet and 567 feet. Even in Alternative 3, the westbound left/thru lane from Pleasant Street is the most problematic, operating at a volume-to-capacity ratio of 0.97.

The two intersections that are most negatively impacted by the conversion from one-way to two-way are University Avenue and Pleasant Street as well as Spruce Street and Walnut Street. The University and Pleasant intersection already experiences delay in the existing conditions, primarily the northbound movements. The reason for the impact when converted to two-way is primarily due to the alignment of the eastbound approach and (new) westbound approach. The offset would require these two approaches to operate independently, which increases delay for the overall intersection. This intersection has the highest v/c ratios during the PM peak for the alternatives and one of the highest delays, but is still at an overall LOS C. The individual movements at this intersection perform worse under Alternative 2 than Alternative 3.

The two intersections that are most positively impacted by the conversion from one-way to two-way are University Avenue and Fayette Street as well as High Street and Willey Street. University and Fayette is currently a choke point for northbound traffic. Removing the opposing left-turn movement will significantly benefit the flow of traffic in the northbound direction from Pleasant Street. High Street and Willey Street benefits through the reduction of the left-turn movements from Willey Street onto High Street because those vehicles are able to turn onto Spruce Street and take a more direct route to their destination.

Unfortunately, there isn't a perfect solution to the congestion problems in downtown Morgantown without a significant investment to improve a few key intersections in the system. The identity of those intersections depends on the alternative being considered. It seems from the results of this study that a two-way conversion is feasible from an operational standpoint, especially if Alternative 3 can be implemented. The performance of the University Avenue and Pleasant Street intersection under Alternative 2 is cause for concern and is marginally better under Alternative 3. Ideally, this intersection could be realigned to either increase capacity for the westbound movement or accommodate concurrent eastbound and westbound movements. There might be a few other problematic intersections during the PM peak period that are as bad as or slightly worse than the existing problematic areas. However, the problematic locations will likely shift to different intersections from the existing ones due to the reconfiguration. If the purpose of implementing a two-way configuration is to fix congestion, this alone is not a solution. If the purpose of implementing a two-way configuration is to improve access to and within the downtown area with congestion staying the same or slightly increasing, Alternative 3 appears to be a viable solution if the deficiencies at Pleasant Street and University Avenue can also be addressed. The modeling conducted for this study estimated the redistribution of traffic in response to these alternatives, but the actual distributions could vary once constructed. Drivers tend to seek the optimal route and the redistributed traffic could end up looking different than what is predicted here. Therefore, the delays, level-of-service, and queue lengths presented here could vary as well.

If future analyses are performed for this study, it is suggested that other volume scenarios be evaluated since this study was based on one day of comprehensive data collection in April 2011. Another beneficial task would be for the project stakeholders to specifically identify the types and scales of acceptable improvements/widening at each intersection. Once the most realistic and feasible network is determined with a finite number of variations, the traffic signal control and left-turn phasing at each intersection can be more deeply investigated. Restricting left-turns at some intersections and providing protected movements at others can help shift the traffic away from problematic intersections, which is quite feasible with a system of two-way streets.