Final Report

Hal Greer Boulevard Corridor Study

Huntington, WV

KYOVA Interstate Planning Commission

Kimley-Horn and Associates, Inc.

September 2004

Corridor Study

for

Hal Greer Boulevard

Huntington, West Virginia

Prepared for:

KYOVA Interstate Planning Commission
City of Huntington, West Virginia
West Virginia Department of Transportation
Ohio Department of Transportation
United States Department of Transportation
Federal Highway Administration
Federal Transit Authority

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CHAPTER 1

Introduction

Hal Greer Boulevard represents the history of Huntington, and provides an opportunity to drive back in time. Starting at the Ohio River and heading south toward the Cabell Huntington Hospital, you pass through a kaleidoscope of history and architecture that represents the heart of Huntington's history. This concept is best expressed in an editorial comment featured in *Landscape Architecture* magazine:

> *"In every town there's a universal type of Great Old Street that we all know… once and perhaps still the single street which unfolds for the visitors the most knowledge about a city. It offers a cross section of the city's history, poses object lessons in urban decay and revival…"*

The editorial continues, making the point that is perhaps most important in thinking about Hal Greer Boulevard:

> *"More than just an exercise in nostalgia… {this street} is a potential civic asset, yet to be saved and built upon as a special district with rare qualities for urban life."*

Hal Greer Boulevard is the "people street". This is one of the few places in Huntington where people walk instead of drive — they walk to Marshall University, downtown, Cabell Huntington Hospital, the clinics, the doctors' offices, the community centers, and neighborhoods near Hal Greer Boulevard.

Hal Greer Boulevard holds a key role in several initiatives, including the revitalization of downtown; the growth of Marshall University and Cabell-Huntington Hospital as those institutions serve our community; the construction of the KineticPark technology and business center, and in the businesses that have chosen a Hal Greer Boulevard address to serve Huntington.

It is important that Hal Greer Boulevard is able move people between these important places, and to function as a lifeline for the many citizens who live nearby. This boulevard will continue to demonstrate the history of Huntington and deserves a much-needed facelift beyond the widening currently under construction.

BACKGROUND

Hal Greer Boulevard is one of the major corridors making up the transportation network of Huntington, West Virginia. Also known as WV 10, and formerly known as 16th Street, Hal Greer Boulevard provides one of the primary routes into downtown Huntington. It stretches from I-64 south of Huntington to westbound US 60 (3rd Avenue) along the Ohio River. As developments such as Pullman Square in downtown Huntington and Kinetic Park near I-64 are constructed, and as Marshall University and Cabell Huntington

Hospital continue to grow, traffic demand along Hal Greer Boulevard will continue to increase.

This study was commissioned by the KYOVA Interstate Planning Commission, the Metropolitan Planning Organization (MPO) covering Huntington, West Virginia, which retained Kimley-Horn and Associates to conduct the study. It is the second phase of a two-part project. The first phase of the study was prepared by the West Virginia Department of Transportation (WVDOT), and as a result of that study, Hal Greer Boulevard is currently being widened to five lanes from Washington Boulevard to Charleston Avenue. Because the current study of the north section of Hal Greer Boulevard has overlapped with the construction of the south section, comments and discussion about the first phase necessarily became an integral part of this study.

The study area for this project includes Hal Greer Boulevard between Charleston Avenue and 3rd Avenue. This study's purpose is to recommend ways in which the Hal Greer Boulevard corridor can be improved. These recommendations have been developed with input from local stakeholders, as well as the public.

PUBLIC INVOLVEMENT

Public involvement is an important component of a successful corridor study. Even the most well-conceived recommendations are destined to fail if the community to be affected is not consulted in the development stages.

Citizens have an intimate knowledge of the places they live and travel, as well as problems they encounter along the way. To ensure that the Hal Greer Boulevard Corridor Study considered these important issues while simultaneously keeping the community's best interests in mind, a Study Advisory Group was formed and engaged early in the planning process. In order to make sure the community was adequately represented, citizens from a broad range of backgrounds were invited to participate in the Advisory Group.

The Advisory Group met three times during the planning process. The first was an initial meeting where the project was introduced and impressions, concerns, and ideas about the corridor were gathered. At the second meeting, proposed improvements to the corridor were presented to the stakeholder group, who gave their reactions to the potential improvements. At the third meeting, final recommendations were presented to stakeholders.

The initial set of potential improvements was also presented at a public meeting. At this meeting, the project was introduced, a summary of issues raised by stakeholders was provided, and the public was given ample time to ask questions and present their thoughts about Hal Greer Boulevard.

A summary of the comments received from the public throughout the planning process may be found in **Appendix A**.

CHAPTER 2

Existing and Future Conditions

LAND USE INVENTORY

Kimley-Horn conducted a site visit to the Hal Greer Boulevard Corridor in April 2004. During this site visit, land uses for property abutting the corridor were identified. These land uses are shown in **Figure 1**. The corridor comprises a variety of land uses, from Cabell Huntington Hospital and associated medical-related uses at the southern end of the study area, to Marshall University and associated university-related land uses at the northern end. Between these locations, the corridor consists mainly of single-family and multi-family residential properties, with a limited number of commercial uses. The corridor is separated into two sections by the CSX Railroad, which crosses Hal Greer Boulevard between 8th and 9th Avenues.

Hal Greer Boulevard near 4th Avenue

EXISTING TRAFFIC LEVEL OF SERVICE

Level of service (LOS) is a term used by traffic engineers to describe the operating conditions people experience when traveling on a transportation facility. Level of service can be defined for intersections, highways, and even sidewalks. To describe the LOS of a facility, it is given a letter designation. LOS A indicates ideal operation conditions. For an intersection, that means the average driver passing through the intersection stops for only a very short time. LOS F is the worst level of service, and generally translates into long delays and stop-and-go traffic.

Level of Service A

For the Hal Greer Boulevard Corridor Study, WVDOT provided peak period intersection turning movement counts that were conducted on a weekday in March 2004, which did not coincide with Marshall University's spring break. Counts were taken at six intersections along Hal Greer Boulevard: 3rd Avenue, 4th Avenue, 5th Avenue, 7th Avenue, 8th Avenue, and Charleston Avenue. These traffic counts are shown in **Figure 2**. Based on these traffic counts, LOS was determined for several intersections

Figure 1
Land Use Map

KYOVA Interstate Planning Commission

Kimley-Horn and Associates, Inc.

0 Feet

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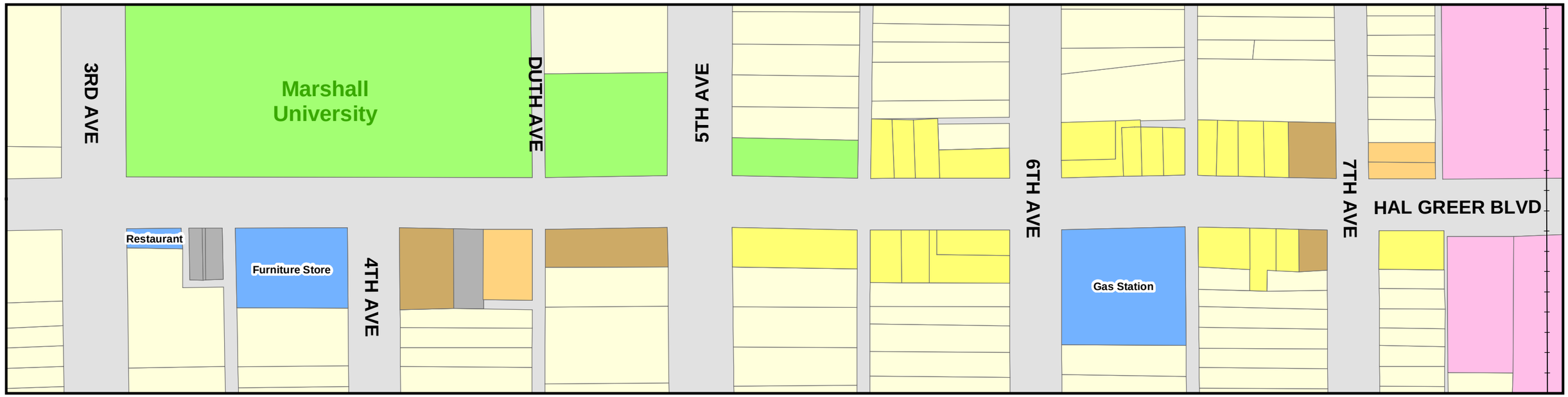
Legend

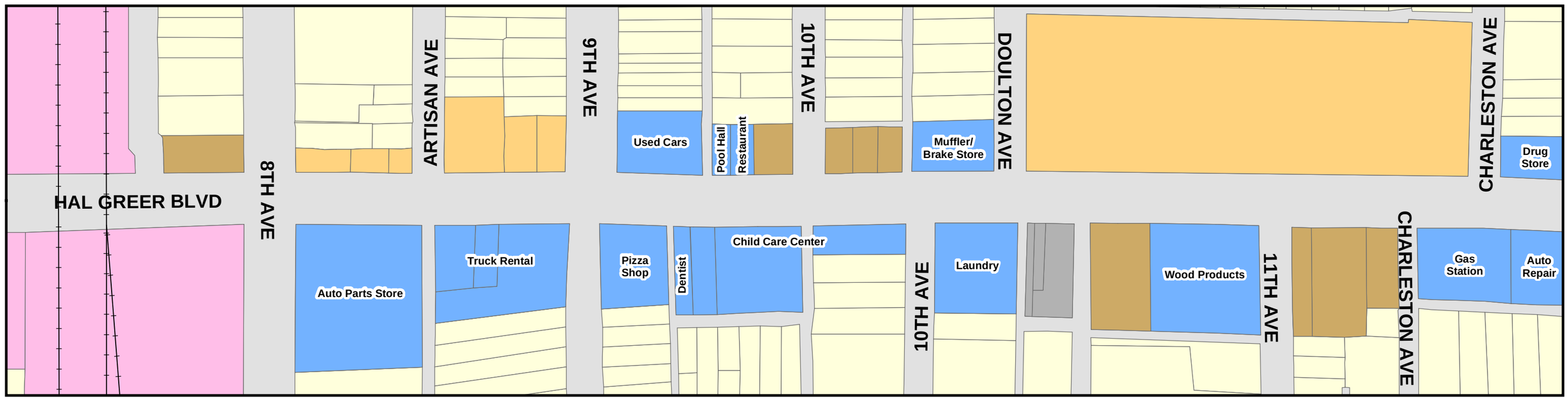
- Railroad
- Multi-Family Residential
- Single-Family Residential
- Commercial
- University-Related
- Railroad
- Parking Lot
- Empty Building/Lot
- Parcels

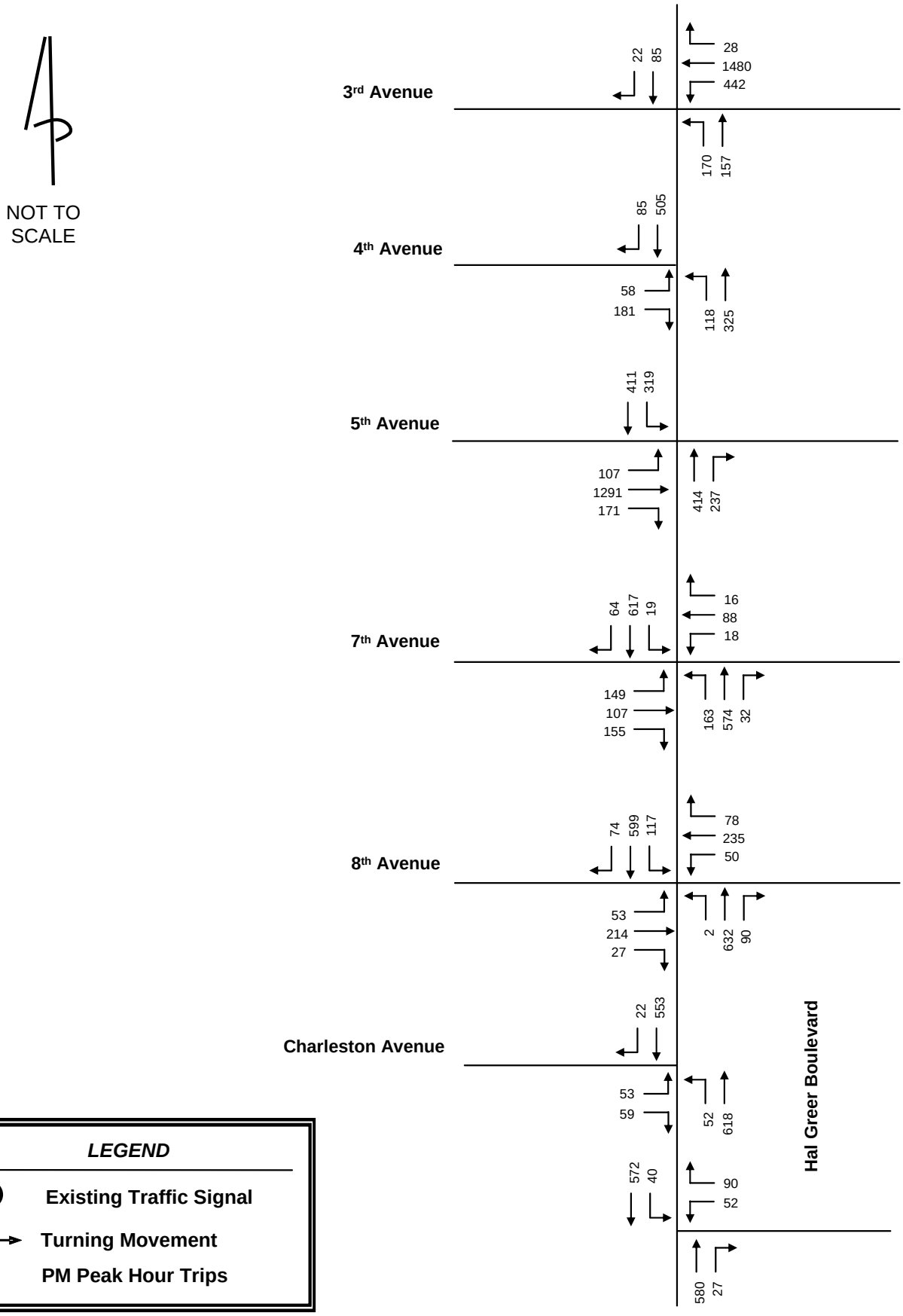
Hal Greer Boulevard Corridor Study

3rd Avenue to 7th Avenue



8th Avenue to Charleston Avenue





Kimley-Horn and Associates, Inc.	**Hal Greer Boulevard Corridor Study**	**Traffic Counts**	**Figure 2**

Level of Service F

along the corridor using Synchro traffic analysis software and methods from the *Highway Capacity Manual 2000*. The results of the LOS analysis can be found in **Table 1**. Detailed Synchro outputs are provided in **Appendix B**.

Table 1
Hal Greer Boulevard
Existing (2004) Level of Service

Intersection	LOS	Delay (sec)
3rd Ave.	C	20
4th Ave.	A	9
5th Ave.	C	27
7th Ave.	B	16
8th Ave.	B	16
Charleston Ave.[1]	C	22

STAKEHOLDER INPUT

The comments of the stakeholders and public were very important in assessing the existing conditions along the corridor. People who travel the corridor on a regular basis, both on foot and in cars, have the best perspective on how the corridor could be improved. Major topics of discussion by the stakeholders included:

- Construction-related issues
- Pedestrian safety
- Aesthetics
- Maintenance
- Drainage problems
- Confusing intersections
- Traffic congestion

FUTURE TRAFFIC LEVEL OF SERVICE

To determine projected future traffic volumes, the existing traffic counts were increased by 2% per year until the year 2030. Future "no-build" level of service and delay, assuming no additional improvements to the corridor, are provided in **Table 2**. Detailed Synchro outputs may be found in **Appendix C**.

Table 2
Hal Greer Boulevard
Future (2030) No-Build Level of Service

Intersection	LOS	Delay (sec)
3rd Ave.	C	30
4th Ave.	A	10
5th Ave.	F	105
7th Ave.	D	46
8th Ave.	D	46
Charleston Ave.	C	29

Compared to the existing levels of service, the intersections of Hal Greer Boulevard with 5th Avenue, 7th Avenue, and 8th Avenue are projected to degrade substantially by the year 2030. The intersections at 3rd Avenue, 4th Avenue, and Charleston Avenue are expected to remain at acceptable levels of service through 2030, even without additional improvements.

[1] The LOS for Charleston Avenue is calculated for the intersection as a whole based on the sum of the average delays for each leg.

CHAPTER 3

Proposed Improvements

RECOMMENDATIONS

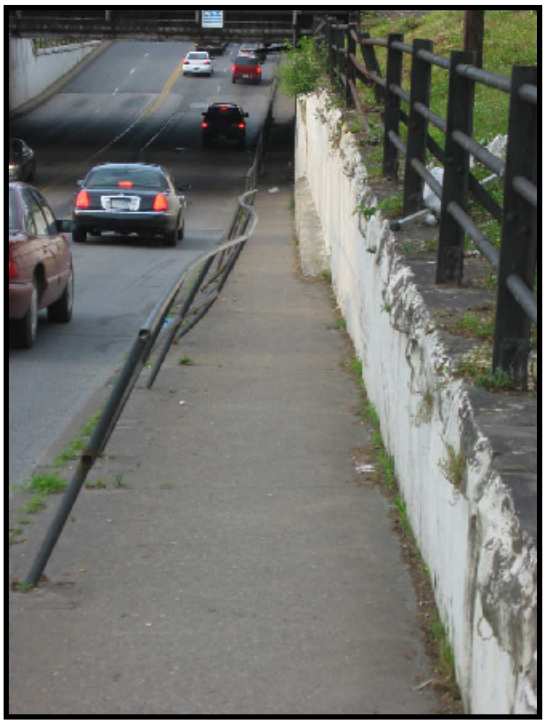
Proposed improvements for Hal Greer Boulevard were divided into four categories by priority of implementation:

1. Immediate (within six months)
2. Near-Term (one to three years)
3. Mid-Term (three to seven years)
4. Long-Term (more than seven years)

PRIORITY 1 RECOMMENDATIONS

Several proposed improvements are recommended for immediate implementation within the next six months. The primary focus of these improvements is on the safety of pedestrians in the Hal Greer Boulevard corridor, especially children. These recommendations also include aesthetic improvements, which can be completed quickly and with minimal expense. The immediate priority recommendations include:

- Straighten pipe railing on viaduct walkway
- Regularly clean and maintain viaduct walkway
- Initiate studies for future improvements
- Submit grant applications for proposed future improvements
- Widen Hal Greer Boulevard to five lanes between Charleston Avenue and 10th Avenue, contingent upon WVDOT approval, funding, and implementation of the following:
  - Install safety barrier between Hal Greer Boulevard and Northcott Court
  - Install traffic signal heads and mast arms at Charleston and 10th Avenues
  - Install pedestrian signals at Charleston and 10th/Doulton Avenues
  - Build ADA ramps and stripe crosswalks at Charleston, Doulton, and 10th/Doulton Avenues
  - Improve aesthetics between Charleston and Artisan Avenues



Bent pipe railing at viaduct walkway

Straighten Pipe Railing on Viaduct Walkway

Currently, the pipe railing along the walkway on the west side of the viaduct is bent severely. The bent railing

reduces the effective width of the walkway from approximately three feet to only two feet, making it nearly impossible for two people to pass each other on the walkway. This railing should be repaired by the City as soon as possible as an interim fix, and should eventually be replaced.

Regularly Clean and Maintain Viaduct Walkway

The walkway under the viaduct had become a depository for trash and other debris. During the course of this study, the City made an effort to clean up the walkway. These efforts need to be continued on a regular basis.

Initiate Studies for Future Improvements

In order to continue the momentum generated by the Hal Greer Boulevard Corridor Study, additional studies should be initiated to further examine some of the proposed future improvements to Hal Greer Boulevard. In particular, a study of potential improvements to the viaduct (both near-term and long-term) and a study of the feasibility of installing countdown pedestrian signals should both be undertaken.

Submit Funding Applications for Proposed Future Improvements

To obtain additional funding toward implementation of proposed future projects, applications should be submitted for federal funding under programs such as Transportation Enhancement (TE) and Congestion Mitigation and Air Quality (CMAQ).

Widen Hal Greer Boulevard to Five Lanes between Charleston Avenue and 10th Avenue

When this study began, it was likely that the construction project completed in mid-June 2004, which extends north just past Charleston Avenue, would be extended to 10th Avenue under the current contract. This would eliminate a four-lane section, which causes a bottleneck between two five-lane sections of roadway. This improvement would provide consistent left-turn lanes between the five-lane section south of Charleston and the five-lane section north of 10th Avenue. Although it is no longer likely that these improvements will be made under the current contract, it is recommended that the improvements be made as soon as feasible. These improvements should be made contingent upon WVDOT approval, funding, and implementation of the additional Priority 1 improvements described below.

Current construction project near Charleston Avenue

Install Safety Barrier between Hal Greer Boulevard and Northcott Court

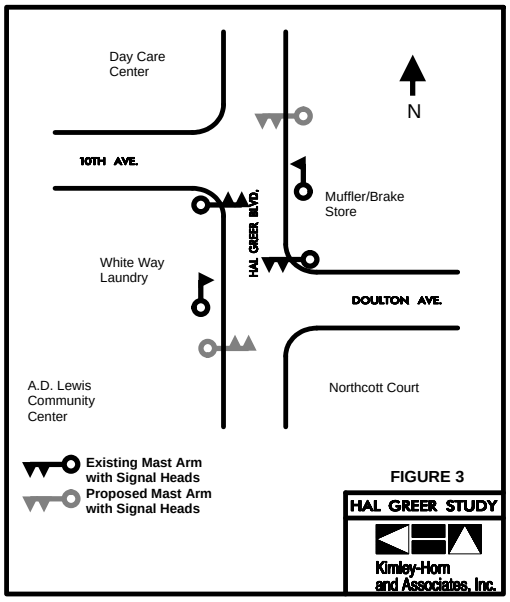
One of the major safety issues brought out during the public involvement process was the concern over the safety of residents of the Northcott Court housing development. When Hal Greer Boulevard is widened, the curb will be only a few feet from the residents' doorsteps. Residents with children were particularly concerned. A treatment similar to that used at Meadows Elementary School is proposed. The WVDOT indicated that it may be possible to install this barrier as part of the ongoing construction project. There are several access points from Hal Greer Boulevard to the interior courtyard of Northcott Court, which would need to remain accessible for emergency access. It is recommended that gates be installed in the safety barrier at these locations. These gates would be locked, but would have a "knox box", or a small safe containing a key to the gate which could be used by emergency responders.

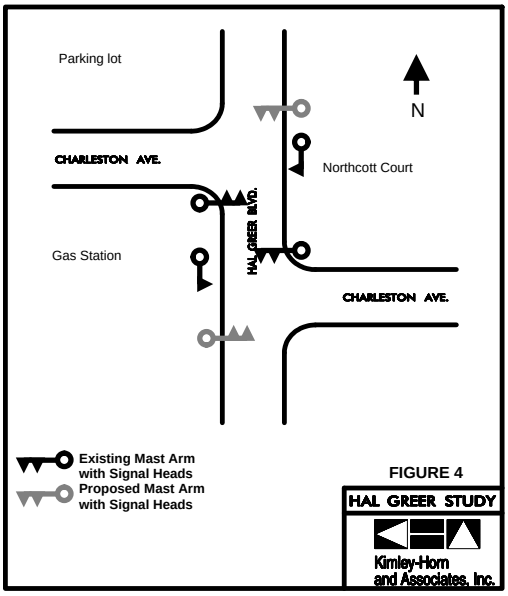
Safety barrier treatment

Install Traffic Signal Heads and Mast Arms at Charleston and 10th/Doulton Avenues

The signalized intersections of Hal Greer Boulevard/Charleston Avenue and Hal Greer Boulevard/10th Avenue/Doulton Avenue are both offset intersections where the minor streets do not line up with each other. The signal phasing and the location of the signal heads can result in confusion among drivers who get "trapped" in the space on Hal Greer Boulevard between the side streets, where they have no indicator showing if their next movement is safe. This can also be hazardous to pedestrians because it is difficult for them to determine when it is safe to cross.

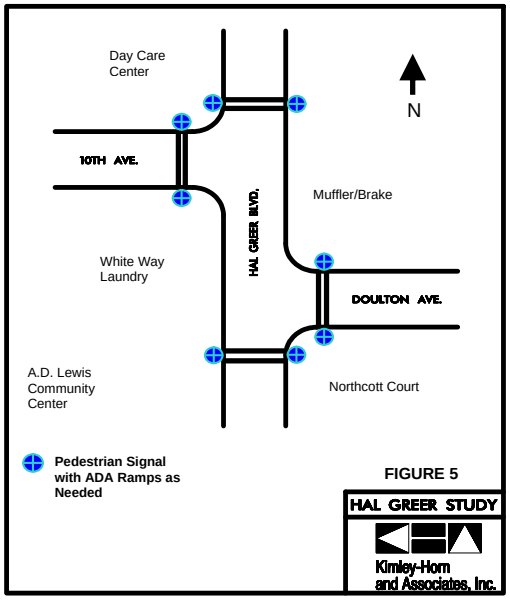
To eliminate the confusion caused by the absence of visible signals between the two legs of the intersection, it is recommended to install additional mast arms with signal heads at two locations within each intersection. These will provide positive indication to drivers that they may complete their maneuvers safely. **Figures 3 and 4** show the proposed locations for these new mast arms and signal heads.

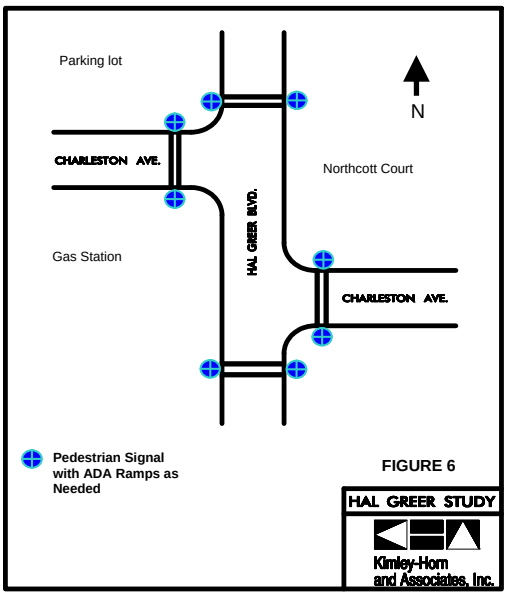




Install Pedestrian Signals at Charleston and 10th/Doulton Avenues

Concurrent with the installation of additional signal heads for vehicles, pedestrian signals should be installed at the intersections of Hal Greer Boulevard/Charleston Avenue and Hal Greer Boulevard/10th Avenue/Doulton Avenue. Currently, regular vehicular signal heads are mounted at these intersections in place of pedestrian signals. This has the potential to cause confusion because it can be difficult to tell whether the pedestrian signal is directed toward the motorist or the pedestrian. **Figures 5 and 6** show proposed locations for installation of pedestrian signals.





Build ADA ramps and stripe crosswalks at Charleston, Doulton, and 10th Avenues

The Americans with Disabilities Act (ADA) sets forth specific requirements for sidewalks and ramps to make them accessible to disabled persons. As intersections along Hal Greer Boulevard are upgraded, it is important that these requirements be met so the facilities can be used by all members of the community. At the intersection of Hal Greer Boulevard/Charleston Avenue and Hal Greer Boulevard/10th Avenue/Doulton Avenue, ladder-style crosswalks should be striped on the pavement. This makes the crosswalks more visible to drivers and creates awareness in the motorist community to watch for pedestrians. Striped crosswalks also encourage pedestrians to cross at safer locations rather than at mid-block where motorists do not expect to see them. A good example of ladder-style crosswalks can be found on Hal Greer Boulevard at the 5th Avenue intersection.

Striped crosswalks at Hal Greer/5th Ave.

Improve aesthetics between Charleston and Artisan Avenues

Aesthetically appealing streets can greatly increase the sense of community and neighborhood pride experienced by local residents. By adding plantings and decorative streetlights to Hal Greer Boulevard, the look and feel of the street will improve, and additional lighting will provide safety benefits as well. This is the first step on the way to a more comprehensive streetscape recommendation, which will be discussed under Priority 3. It is recommended that these aesthetic improvements begin with the area between Charleston Avenue and Artisan Avenue because some cost savings could probably be recognized by completing these improvements at the same time as the other Priority 1 recommendations discussed previously.

PRIORITY 2 RECOMMENDATIONS

The next set of proposed improvements is recommended for implementation in the one- to three-year timeframe. They address safety and traffic concerns, but cannot be immediately implemented due to construction cost and design considerations. However, these recommendations will improve the safety and functionality of the corridor and should be implemented as soon as feasibly possible.

The near-term recommendations include:

- Improve viaduct walkway
- Flare viaduct wingwall to build southbound left-turn lane
- Install pedestrian signal heads at 9th, 8th, 7th, and 6th Avenues

- Build ADA ramps and stripe crosswalks at 9th, 8th, 7th, and 6th Avenues
- Install pedestrian countdown signals
- Improve aesthetics between 9th and 6th Avenues
- Implement updated signal timing

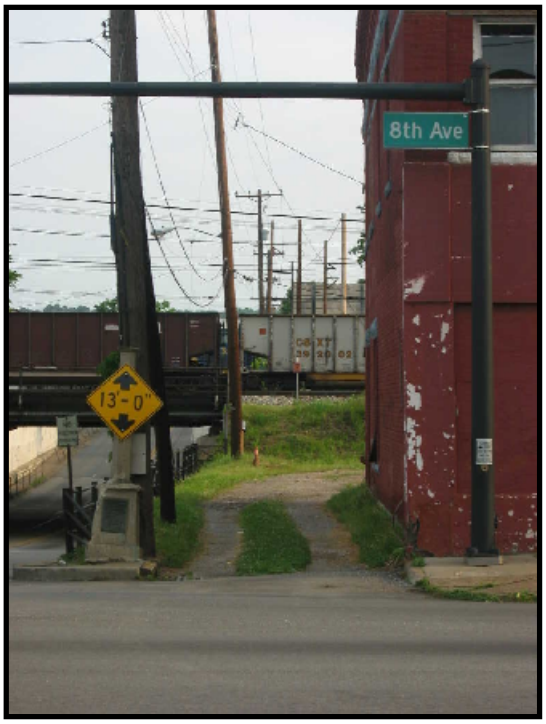
Railroad viaduct

Improve viaduct walkway

Currently, the width of the viaduct is very limited. Along the east side of the viaduct, there is a 2½-foot-wide curb, which pedestrians sometimes use to walk under the viaduct, although this is illegal according to a sign posted on the viaduct. On the right side is a 3-foot-wide sidewalk with a protective railing. We recommend removing 1 foot of width from the curb on the east side, restriping the traffic lanes, and using the width gained by the curb removal to widen the walkway on the west side to 4 feet. At the same time, the elevation of the walkway on the west side should be raised. This will afford pedestrians a sense of safety and separation from the vehicles on the roadway. New pipe railing and fencing should also be installed. Similar to other viaducts in the City, a community art project to paint a mural on the viaducts walls would help instill a sense of community in the neighborhood. The A.D. Lewis Community Center could partner with the art department at Marshall University to make this happen.

Flare viaduct wingwall to build southbound left-turn lane

Adding a southbound left-turn lane under the viaduct would improve the traffic operations at the Hal Greer Boulevard/8th Avenue intersection by removing left-turning vehicles from the through lane, therefore reducing the number of vehicles needing to stop at the signal. In order to have enough width to add the left-turn lane, the wingwall at the southeast side of the viaduct could be reconstructed to flare out on the east side. In order to do this, additional land would need to be acquired on the southeast side of the viaduct. Currently, a vacant building stands on the adjacent lot.



Wingwall on south end of viaduct

Install pedestrian signal heads at 9th, 8th, 7th, and 6th Avenues

Similar to the treatment proposed at the Charleston Avenue and 10th/Doulton Avenue intersections, pedestrian signals should be installed at the 9th, 8th, 7th, and 6th Avenue intersections to improve safety for pedestrians.

Pedestrian countdown signal

Build ADA ramps and stripe crosswalks at 9th, 8th, 7th, and 6th Avenues

Similar to the treatment proposed at the Charleston Avenue and 10th/Doulton Avenue intersections, ADA-accessible ramps should be installed and ladder-style striped crosswalks, similar to those at 5th Avenue should be painted at the 9th, 8th, 7th, and 6th Avenue intersections to improve accessibility for disabled pedestrians and to alert drivers of pedestrian activity.

Install pedestrian countdown signals

Pedestrian countdown signals, in addition to the standard walk/don't walk indicators provided by regular pedestrian signals, provide a countdown informing pedestrians how much longer they have to cross the street before the indication changes. The countdown function improves safety and operations because pedestrians are less likely to begin crossing at the last second, when they don't have enough time to cross before the signal changes. According to WVDOT, this type of signal has previously been implemented in the City of South Charleston, West Virginia.

Improve aesthetics between 9th and 6th Avenues

The aesthetic improvements discussed previously for the area between Charleston Avenue and Artisan Avenue should be extended north on Hal Greer Boulevard through 6th Avenue. The elements chosen should be consistent with the Old Main Corridor Project – Fourth Avenue Streetscape Master Plan that was prepared for KYOVA and the City of Huntington in 2003.

Implement updated signal timing

With the level of construction activity that has occurred on the corridor and the level of construction activity proposed, it will be essential that timing of traffic signals be revised to reflect the traffic conditions that will be in place in the future. It is recommended that a comprehensive signal timing study be performed from 3rd Avenue to Washington Boulevard, aimed at optimizing vehicle and pedestrian movements. This study would include additional turning movement counts and pedestrian counts at select locations. The study would recommend timing and phasing changes and would develop timing plans at a minimum for AM peak, midday, PM peak, off-peak, holiday, stadium event, downtown special event,

and incident response periods. Once developed and approved, the timing and phasing changes would be implemented at designated locations. Improving the signal timing on Hal Greer Boulevard will benefit vehicles traveling on Hal Greer, as well as improving the reliability of transit service and reducing vehicular emissions.

PRIORITY 3 RECOMMENDATIONS

The mid-term recommendations focus on improving the aesthetics of the corridor, as well as improving traffic operations. These improvements are envisioned to occur in the three-to seven-year timeframe. In particular, the operational improvements should be implemented when traffic conditions degrade to the point where additional improvements become necessary.

The mid-term recommendations include:

- Extend 4th Avenue streetscape project to Hal Greer Boulevard
- Prohibit left turns from northbound Hal Greer Boulevard to 7th Avenue
- Add right-turn lanes at 5th Avenue
- Consider building modern roundabout at 3rd Avenue intersection

Extend 4th Avenue streetscape project to Hal Greer Boulevard

KYOVA has already completed the Old Main Corridor Project – Fourth Avenue Streetscape Master Plan for the area west of Hal Greer Boulevard. It is recommended that the streetscape concepts used on 4th Avenue be extended onto Hal Greer Boulevard. This will visually tie the two roads together and beautify Hal Greer Boulevard. The aesthetic elements recommended previously should be chosen to be consistent with this project. Streetscape elements may include:

- Color treatment in crosswalks and driveways
- Street trees with tree grates
- Relocate overhead utility lines
- Ornamental street lights
- New concrete sidewalks with brick banding
- Parking lot screening using plants
- Uniform trailblazing/wayfinding signs
- Improved bus shelters

Prohibit left turns from northbound Hal Greer Boulevard to 7th Avenue

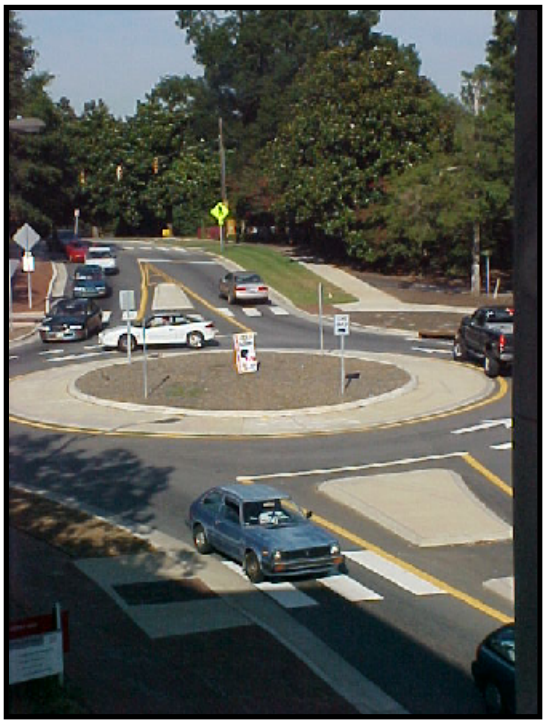
As traffic congestion increases in the vicinity of the viaduct, it may be useful to prohibit left turns from northbound Hal Greer Boulevard to 7th Avenue. This would increase the northbound through capacity at that intersection by avoiding the situation where one lane is blocked by a vehicle waiting to turn left. The left turn lanes would be diverted to 6th Avenue. At 6th Avenue, a protected left-turn phase would be added to the traffic signal, and the left-turn lane would be lengthened to accommodate queuing vehicles.

Streetscape concept at the intersection of Hal Greer Blvd. & 10th/Doulton Ave.

Streetscape concept at the intersection of Hal Greer Blvd. & 7th Ave.

Add right-turn lanes at 5th Avenue

With increasing traffic volumes over time, the intersection of Hal Greer Boulevard and 5th Avenue is likely to become congested in the future. Adding a northbound right-turn lane and an eastbound right-turn lane would help to improve the traffic operations at this intersection. The traffic at this intersection will need to be evaluated as traffic volumes increase to determine when it is necessary to implement this recommendation.



Modern roundabout

Consider building modern roundabout at 3rd Avenue intersection

A modern roundabout can serve as an effective way to move traffic, as well as a gateway to a community. On Hal Greer Boulevard, the intersection at 3rd Avenue may be an ideal location for a modern roundabout. Significant landscaping on the north side of the intersection would help to identify Hal Greer Boulevard as an important location within the City of Huntington. A study should be undertaken to further investigate the desire and feasibility of implementing a roundabout at this location.

PRIORITY 4 RECOMMENDATION

The long-term recommendation should be incorporated in the KYOVA long-range transportation plan for implementation in the seven- to twenty-year timeframe. These improvements will require greater expenditure of funds than the previously-described improvements, but will eventually become necessary if traffic volumes continue to increase.

The long-term recommendation is:

- Widen railroad viaduct

Widen railroad viaduct

The regional long-range transportation plan should state that when CSX determines that the railroad viaduct requires reconstruction for structural stability, a new Hal Greer Boulevard cross-section will be required with:

- Four 12-foot-wide traffic lanes plus left-turn lanes
- 5-foot-wide bicycle lanes on each side
- 10-foot-wide elevated walkways with murals on both sides
- Architectural treatments on facades including bridge face
- Upgrade drainage system to minimize flooding

These improvements will improve the traffic-carrying capacity of the viaduct so that it can effectively serve the City of Huntington for years to come.

In conjunction with the long-range transportation planning process, the widening of the railroad viaduct should also be evaluated as part of the regional modeling process, which is currently underway by KYOVA.

FUTURE TRAFFIC LEVEL OF SERVICE

As a result of the recommended operational improvements, traffic levels of service in 2030 are expected to be

higher than they would be in the 2030 No-Build condition described previously. **Table 3** shows the projected LOS with the recommended operational improvements. Conditions are expected to improve at the intersections with the worst level of service in 2030: Hal Greer Boulevard at 5th Avenue, 7th Avenue, and 8th Avenue. The remaining study intersections are already expected to have acceptable levels of service in 2030, and these remain largely unchanged. The detailed Synchro outputs for the No-Build and Build scenarios may be found in **Appendix D**.

Table 3
Hal Greer Boulevard
Future (2030) Build Level of Service

Intersection	LOS	Delay (sec)
3rd Ave.	C	30
4th Ave.	B	13
5th Ave.	D	49
7th Ave.	C	30
8th Ave.	C	22
Charleston Ave.	C	31

AIR QUALITY CONSIDERATIONS

Air quality is an important issue to consider in recommending transportation improvements. Some of the recommendations made in this report are expected to have no effect on air quality, such as the aesthetic improvements. The operational improvements, such as signal optimization and addition of turn lanes are anticipated, based on prior experience with similar projects, to improve air quality. Projects that improve pedestrian and bicycle flow and access have the potential to result in some mode diversion, thereby reducing the number of vehicle trips and decreasing emissions.

Improving the signal timing on Hal Greer Boulevard is likely to have the most significant impact on air quality. To demonstrate the potential improvements to air quality from signal retiming, an air quality analysis was done. It was assumed that improvements to signal timing would result in a 10% increase in speeds along Hal Greer Boulevard. Based on the average daily traffic (ADT) on the corridor, daily vehicle-miles of travel (VMT) were calculated. MOBILE6.2 was used to develop emission factors for volatile organic compounds (VOC) and nitrous oxides (NOx), which are both ozone precursors. The total emissions on Hal Greer Boulevard were calculated both before and after the improvement in speed. The resulting emissions savings, as shown in **Table 4**, are 1.1 kg/day of VOC and 0.9 kg/day of NOx.

Table 4
Hal Greer Boulevard
Air Quality Benefits of Signal Timing

	Speed (mph)	VMT (mi)	Emission Rate (g/mi)		Emissions (kg/day)	
			VOC	NOx	VOC	NOx
Before	19.6	14,100	1.721	2.283	24.3	32.2
After	21.6	14,100	1.640	2.221	23.1	31.3
				Difference	**1.1**	**0.9**

NEIGHBORHOOD CONSIDERATIONS

Marshall University and Cabell Huntington Hospital are the two major institutional anchors along Hal Greer Boulevard. Each of these great institutions provides a source of jobs and pride for the greater Huntington community and each is growing to meet the needs of the community. The Hal Greer Boulevard improvement concepts identified in this study support the planned progress of the university and hospital. It is anticipated that these expansions would occur with or without improvements to Hal Greer Boulevard.

Marshall University adopted a Campus Facility / Land Use Master Plan that identifies growth to serve its academic mission. The plan identifies the acquisition of specific parcels of land, as opportunities arise, along both sides of Hal Greer Boulevard between Commerce Avenue and Fifth Avenue and along the east side between Fifth Avenue and the railroad viaduct. Excerpts related to outward expansion beyond the current campus follow.

> *"The ... University's leadership [is] sensitive to the potential displacement of neighboring land uses; the intent is to minimize disruption. However, it is equally important to the City of Huntington, its urban character and its economy, to establish and enhance the University district as an asset to the greater community. Planning recommendations suggest that all cooperative development opportunities be pursued. This first-order acquisition zone establishes a basic campus for Marshall. Even with the acquisition of 46.5 acres ..., Marshall University will still have only 35 percent of the average landholding that supports other institutions with similar enrollments and staffing levels.*

The medical community that supports Cabell Huntington with outpatient services and follow-up care visits has intuitive desires to locate near the Hospital. For the most part, such location decisions are not planned far in advance like Marshall University's Master Plan. However, recent experience suggests some expansion of medical-related facilities may continue to encroach on the established Fairfield West neighborhood. While such location decisions are largely outside the control of hospital management, it would be helpful for the City and Hospital to initiate a small-area plan for the Fairfield West neighborhood and adjacent areas. Through such planning efforts, attention and action can be given to the needs of the immediate community. The changes to Hal Greer Boulevard recommended in this study report will aid in attracting national retailers, however additional planning is necessary to explore the specific needs of the community and identify candidate sites that meet the acreage and access requirements of targeted retailers. Additional efforts can also be initiated to secure neighborhood protection measures such as residential permit parking and protective zoning to preserve residential character and avoid unwanted conversion of residential properties to medical, retail or other uses.

CHAPTER 4

Conclusion

SUMMARY OF BENEFITS

A summary of the recommended improvements can be found on **Figure 7**. These recommendations are based on the issues, concerns, and ideas that were raised by the public and the stakeholders group. **Table 5** summarizes the issues that were raised during the public involvement, and shows how these issues have been addressed by the recommendations.

Table 5
Summary of Recommendations

Priority	1										2							3				4
Issues	Straighten pipe railing on viaduct walkway	Regularly clean and maintain viaduct walkway	Initiate studies for future improvements	Submit funding applications for future improvements	Widen to 5 lanes between Charleston and 10th Avenues	Install safety barrier between by Northcott Court	Install mast arms/signals at Charleston, 10th/Doulton Avenues	Pedestrian signals at Charleston, 10th/Doulton Avenues	Ramps/crosswalks at Charleston, 10th/Doulton Avenues	Improve aesthetics - Charleston to Artisan Avenues	Improve viaduct walkway	Flare viaduct wingwall to build southbound left turn lane	Pedestrian signals at 9th, 8th, 7th, 6th Avenues	Ramps/crosswalks at 9th, 8th, 7th, 6th Avenues	Pedestrian countdown signals	Improve aesthetics - 9th to 6th Avenues	Implement updated signal timing	Streetscape on Hal Greer	Prohibit northbound left turns at 7th Avenue	Add right-turn lanes at 5th Avenue	Consider roundabout at 3rd Avenue	Widen railroad viaduct
Construction-related issues					v	v		v	v	v												
Pedestrian safety	v		v	v		v		v	v		v		v	v	v		v					
Aesthetics	v	v	v	v						v						v		v			v	
Maintenance	v	v																				
Drainage problems		v	v	v							v											v
Confusing intersections							v															
Traffic congestion			v	v	v		v					v					v		v	v	v	v

Figure 7
Summary of Recommendations

KYOVA Interstate Planning Commission

Kimley-Horn and Associates, Inc.

0 150 Feet

N

Legend

Railroad

Parcels

Priority

Immediate

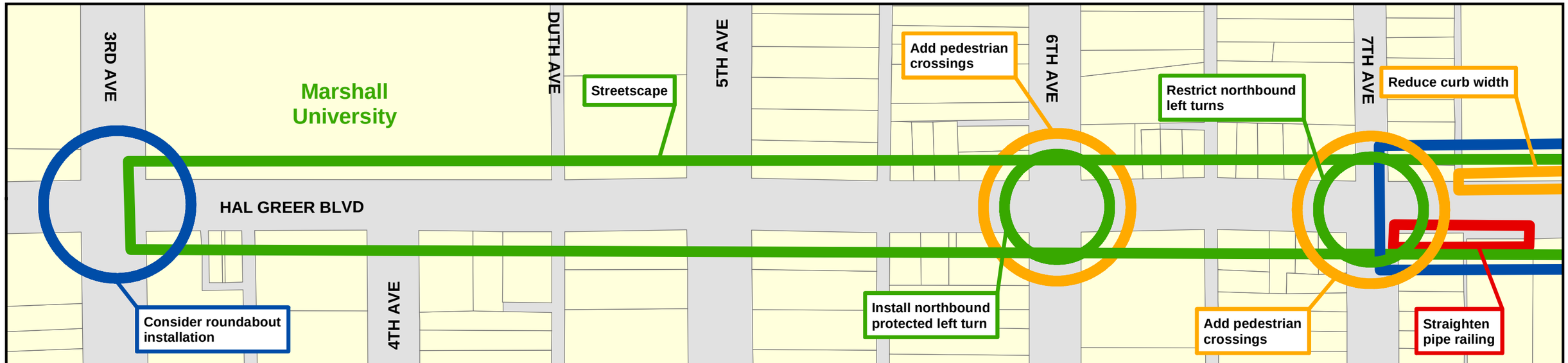
Near-Term

Mid-Term

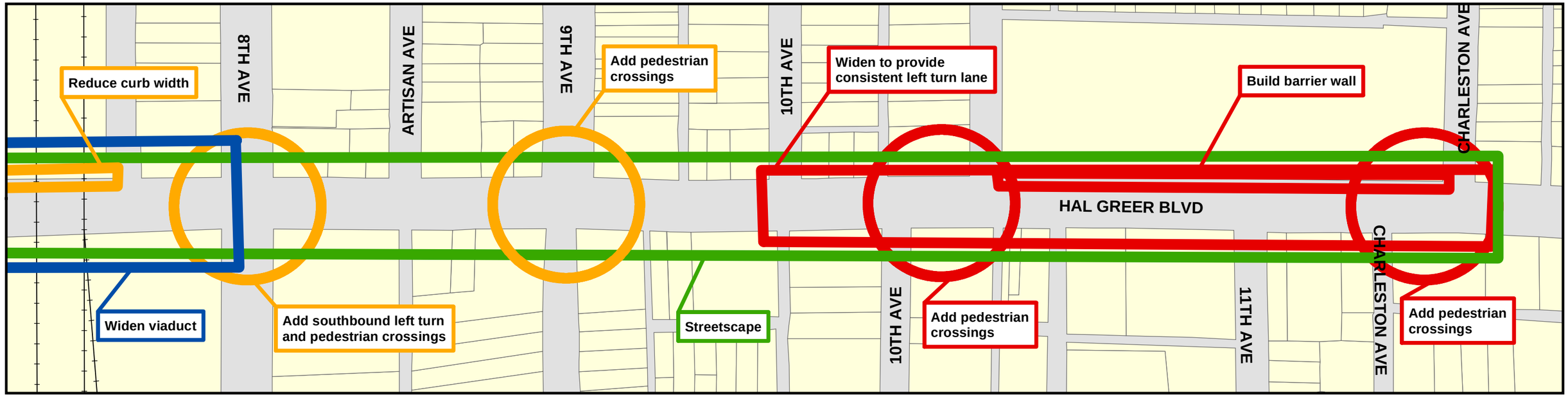
Long-Term

Hal Greer Boulevard Corridor Study

3rd Avenue to 7th Avenue



8th Avenue to Charleston Avenue



PLANNING LEVEL COST OPINION

Planning level cost opinions for the Hal Greer Boulevard Study were developed in most cases based on similar experiences with similar projects. These estimates were then checked against bid averages from the West Virginia Department of Transportation Contractor Resource Center Website http://www.wvdot.com/10_contractors/. The bid averages were used as a reasonability check. In most cases, the cost opinions err on the higher end because in total, the volume of work and materials are relatively low for the corridor in question and will even be lower if the projects are done individually. A lower total volume of materials could result in a higher per unit cost of materials. Also, for projects where there was not good direct data (such as the railroad viaduct widening and the flaring of the viaduct wing wall), estimates were developed based on typical costs experienced for projects that resembled these projects, considering that the projects themselves will present unique challenges and features. None of the estimates consider right-of-way costs. Lastly, for many of the streetscape elements, since the streetscape themes proposed in the 4th Street Study are assumed to be continued from northern portion pf the study area, the enhancement costs for these elements were carried forward from the 4th Street study by assuming that the total cost of the streetscape elements would remain similar over a similar length of roadway.

Table 6 provides planning level cost opinions for the recommendations given in this report. These cost opinions are preliminary in nature and are not intended to be used as construction estimates. They should be used as guidelines for funding purposes only.

Table 6
Planning Level Opinion of Cost

Priority	Improvement	Opinion of Cost
1	Straighten pipe railing on viaduct walkway	n/a
	Regularly clean and maintain viaduct walkway	n/a
	Initiate studies for future improvements	n/a
	Submit grant applications for proposed future improvements	n/a
	Widen to 5 lanes between Charleston and 10th Avenues	Determined by WVDOT
	Install safety barrier between Hal Greer & Northcott Court	$5/LF
	Install signals/mast arms at Hal Charleston, 10th/Doulton	$50,000
	Pedestrian signals at Charleston, 10th/Doulton	$24,000
	ADA ramps/striped crosswalks at Charleston, 10th/Doulton	$6,000
	Improve aesthetics - Charleston to Artisan Avenues[1]	$300,000
2	Improve viaduct walkway	$30,000
	Flare viaduct wingwall to build SB left turn lane	$500,000-$750,000
	Pedestrian signals at 9th, 8th, 7th, 6th Avenues	$48,000
	ADA ramps/striped crosswalks at 9th, 8th, 7th, 6th Avenues	$12,000
	Pedestrian countdown signals[2]	$2,000/pair
	Improve aesthetics - 9th to 6th Avenues[1]	$470,000
	Implement updated signal timing[3]	$3,500/intersection
3	Streetscape on Hal Greer[4]	$2,300,000
	Prohibit northbound left turns at 7th Avenue	$10,000
	Add right-turn lanes at 5th Avenue	$50,000
	Consider roundabout at 3rd Avenue	$150,000
4	Widen railroad viaduct	$7,000,000-$10,000,000

Notes:

1. Assumes 25% of total streetscape cost for this segment
2. Includes integration and potential controller and cabinet modifications
3. Includes new counts, assume no change out of equipment. If new cabinets/controllers and interconnect, $20,000/intersection
4. Assumes remaining 75% of streetscape cost after initial aesthetic improvements

APPENDIX A

Summary of Public Comments

Public Outreach

The public outreach program for the Hal Greer Boulevard Corridor Study consisted of one public information meeting and three meetings of a stakeholder committee. The primary topics of the stakeholder meetings were as follows:

1. April 15, 2004 – to describe the scope and purpose of the study and to solicit feedback on areas of concern and suggestions for alternative improvements to the corridor. There were 19 people who signed the meeting attendance form.
2. May 25, 2004 – to summarize the first meeting and to present results of traffic analysis including alternative improvements. The meeting was also a dress rehearsal for the public information meeting held later the same day. There were 15 people who signed the meeting attendance form.
3. May 27, 2004 – to describe the consultant's recommended improvements based on public input, KYOVA input, field observations, traffic analysis and engineering judgment. The stakeholder committee was given opportunities to comment on the recommendations.

A synthesis of input received from stakeholders at the May 25, 2004 meeting is listed below:

- add crosswalk between McDonald's and Charleston Avenue
- Doulton intersection is confusing
- Charleston Avenue intersection is confusing
- Left-turn prohibitions would divert traffic to residential streets
- 8th Avenue is an industrial corridor and needs to be upgraded
- Restrict left-turns as needed during peak hours
- Widen wingwall of viaduct to provide left-turn lanes on Hal Greer
- consider reversible lane under viaduct
- include bricks in paved crosswalk or paint crosswalks a different color
- install dynamic message sign in advance of Meadows Elementary School and change message but inform motorists of need to slow down.
- targeted enforcement of vehicular speeds is needed
- purchase a radar speed trailer to optimize police involvement
- include ped countdown signal at Doulton Ave crossing
- include auditory signal at Doulton for blind pedestrians

A synthesis of public input received on May 25, 2004 is listed below:

a. Install a barrier at the east edge of Hal Greer Boulevard in the 1000 and 1100 block adjacent to the Northcott development to preclude vehicles running off the road into the resident's back-yard and to preclude children from Northcott running into the street. The design at the edge of Hal Greer Boulevard adjacent to the Meadows Elementary School was suggested as a workable and acceptable design treatment.

b. Maintain good vehicular access between Hal Greer Boulevard and all side streets and business driveways. There were several similar comments made about Charleston Avenue, Doulton Avenue, 10th Street and various businesss driveways that are attributable to safety-related lane closures installed in the construction zone that are assumed to be relieved once construction is completed. A representative of the West Virginia Division of Highways was present at the meeting and responded to numerous construction-related questions and comments. He responded that the lane closures are temporary and required to ensure safety. They will be removed following construction.
c. Hal Greer Boulevard has many "roles" including accommodating local traffic as well as regional and state traffic to and from Cabell-Huntington Hospital, Marshall University and downtown Huntington. These roles can be conflicting, as the speaker indicated in regards to permitted vehicular speeds whereby local traffic can move slower than through traffic. Concern for safety in sections of Hal Greer Boulevard adjacent to residential areas was the speaker's stated concern.
d. Pedestrians and bicyclists frequently use the Hal Greer Boulevard underpass at the CSX railroad viaduct. The walkway is typically full of litter and the pipe railing separating the walkway from traffic lanes is bent in severely toward the walkway, leaving little or no space for two pedestrians to pass one another. The City of Huntington was identified as the agency responsible for cleaning the underpass. A representative of the City was present at the meeting and said they would see about the clean-up. Note this was accomplished on May 27, 2004.
e. Crosswalks were requested at signalized intersections along the corridor that are similar to those painted at the intersection of Hal Greer Boulevard and 5th Avenue. Several speakers cited the need for crosswalks at different intersections including Charleston Avenue, Doulton Avenue, 9th, 8th, 7th and 6th Avenues.
f. Because of the offset alignment of Charleston Avenue, Doulton Avenue and 10th Avenue there is driver confusion as well as difficulty walking across Hal Greer Boulevard. No one suggested aligning these streets, however, additional traffic signal equipment would be helpful in alerting drivers and pedestrians as to save travel.
g. Several speakers responded to the ideas presented in the consultant's slide presentation including a countdown pedestrian signal that would display the number of seconds remaining until the pedestrian is permitted to cross the street.
h. During storms, the walkway and travel lanes on Hal Greer Boulevard under the CSX viaduct floods. A representative of the City indicated the solution to the drainage problem that has existed for at least 20 years is a very expensive city-wide reconstruction project to increase drainage pipe sizes and plant capacity to handle the additional incoming stormwater runoff.

A public opinion survey was distributed by the consultant (copy attached) with a summary of the results of 14 questionnaires as follows:

- Nearly all respondents live near the study section of Hal Greer Boulevard
- A majority of respondents have lived in the area for more than 10 years. Over two-thirds have lived there more than 5 years.

- A majority rated the overall travel experience on Hal Greer Boulevard before construction began as "fair" with some rating it as "very good" and two respondents rating it as "poor".
- The quality of pedestrian facilities were rated as "poor"
- The quality of bicycle facilities were rated as "poor" by those who chose to respond to that question. Many responded "don't know".
- A wide variety of responses were received on the quality of bus service on Hal Greer Boulevard.
- A majority responded the quality of driving conditions is "fair" with four respondents indicating it is "very good".
- Taxi service was rated as "fair" to "very good" by those who chose to respond.
- A majority of respondents would be "very likely" to support the following changes to Hal Greer Boulevard:
- Widen to add left-turn lanes as needed
- Stripe the road differently so that crosswalks are noticeable to drivers (near universal support for this treatment indicated on the surveys)
- Build concrete islands on the double-yellow stripes to give pedestrians safe places to stand at signalized crosswalks. (near universal support).
- Plant trees between sidewalks and the street (near universal support).

Specific comments indicated on the survey forms are as follows (verbatim):

a. The public and stakeholders should be included in the process during studies, design, engineering and planning. Information should be hashed and rehashed involving public and stakeholders more so.
b. Appreciate the initiative taken to receive ideas from neighborhood people. We know the significance of Hal Greer and what it means to widen and enhance this distinctive corridor. Thanks !
c. Lights for pedestrian crossing at Doulton (two similar comments)
d. Lights for pedestrian crossing at Charleston Avenue
e. Low short walls for residential areas like Northcott Court
f. Trucks have moved from 5th to 16th Street.
g. Speed of traffic (five similar comments) … protect families and kids
h. Entry and exit of traffic into businesses
i. Safety
j. Traffic congestion
k. Left-turn lanes on to Hal Greer Boulevard
l. Appearance of the community after construction
m. Usability by pedestrians
n. Needs marked crosswalks / crossing signals
o. Needs to be completed because traffic is backed up during rush hours. I think it is a hazard
p. Traffic congestion around entrance to McDonald's restaurant, BB&T bank, and Cabell-Huntington Hospital
q. Is it possible to have signals on Hal Greer coordinated?
r. Increase diversity of modes of transportation (i.e. walk, bike, bus, cabs)

A synthesis of input received from stakeholders at the May 27, 2004 meeting is listed below:

In general, the response from stakeholders was supportive. The only stated areas for improvement were directed at WVDOH with requests to accelerate construction, extend the five-lane widening to 9th Avenue, and remove the orange barrels associated with temporary work zones.

Mr. Davis offered use of his property on the north side of 10th Avenue in the first block west of Hal Greer Boulevard for use as a pullout by school buses near the Barnett Child Care Center. The consultant thanked Mr. Davis for his generous offer and promised to incorporate this recommendation into the study report. Representatives of the City of Huntington should also follow-up directly to investigate the stated problem and offered solution.

Consultant recommendation to install safety barrier along east side of Hal Greer Boulevard in front of Northcott Court may disrupt City Solid Waste pick-up service if the alleys are blocked off from Hal Greer. This issue needs further attention.

Traffic signal improvements should include auditory sounds for blind pedestrians and people with low vision.

Traffic signal improvements should include a protected left-turn arrow for vehicles on westbound 8th Avenue at Hal Greer Boulevard.

A majority of stakeholders present voted to lower the posted speed limit on Hal Greer Boulevard to 30 mph (from existing 35 mph) between Meadows Elementary School and 3rd Avenue. There were 10 votes in favor of lowering the speed limit, no one opposed with four abstentions.

The consultant was asked to contact TTA to inquire about improvements at bus stops in the study area, including benches, shelters, signs and posted schedules. Bus pullouts were discussed and the consultant indicated there was insufficient space (in general) in the corridor to add a pull-out lane.

Bicycle improvements were discussed. The consultant indicated insufficient space to widen Hal Greer Boulevard to add bike lanes; however, one stakeholder who indicated he is an avid cyclist mentioned that the bicycling community would appreciate little things like regular street sweeping to clear debris and turning stormwater drain grates to preclude getting a bicycle tire stuck or flattened.

Next Steps – the consultant will prepare a written study report for submittal to KYOVA by June 22, 2004. KYOVA will contact meeting participants to offer electronic copies of the report for review or on-site review at KYOVA's office on Sixth Avenue. Requests for the power point show will be handled by Michele Craig, KYOVA Executive Director.

APPENDIX B

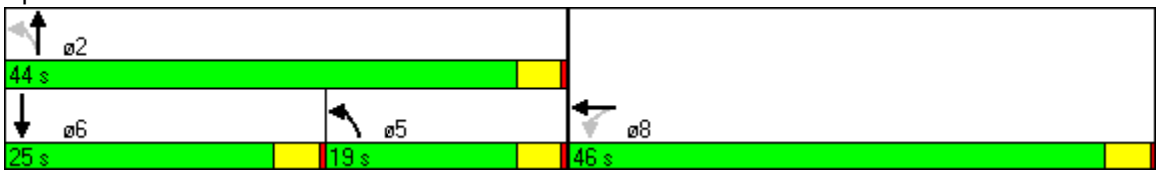
Existing Conditions Traffic Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1009			724			423			434	
Travel Time (s)		19.7			14.1			8.2			8.5	
Volume (vph)	0	0	0	442	1480	28	170	157	0	0	85	22
Lane Group Flow (vph)	0	0	0	0	2119	0	185	171	0	0	116	0
Turn Type				Perm			pm+pt					
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Minimum Split (s)				20.0	20.0		8.0	20.0			20.0	
Total Split (s)	0.0	0.0	0.0	46.0	46.0	0.0	19.0	44.0	0.0	0.0	25.0	0.0
Total Split (%)	0%	0%	0%	51%	51%	0%	21%	49%	0%	0%	28%	0%
Yellow Time (s)				3.5	3.5		3.5	3.5			3.5	
All-Red Time (s)				0.5	0.5		0.5	0.5			0.5	
Lead/Lag							Lag				Lead	
Lead-Lag Optimize?							Yes				Yes	
Queue Length 50th (ft)					269		84	77			47	
Queue Length 95th (ft)					313		141	130			94	
Internal Link Dist (ft)		929			644			343			354	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary

Area Type: Other
Cycle Length: 90
Offset: 34 (38%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 1: 3rd Ave. & Hal Greer Blvd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					0.86		1.00	1.00			1.00	
Frt					1.00		1.00	1.00			0.97	
Flt Protected					0.99		0.95	1.00			1.00	
Satd. Flow (prot)					6323		1770	1863			1811	
Flt Permitted					0.99		0.66	1.00			1.00	
Satd. Flow (perm)					6323		1233	1863			1811	
Volume (vph)	0	0	0	442	1480	28	170	157	0	0	85	22
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	480	1609	30	185	171	0	0	92	24
Lane Group Flow (vph)	0	0	0	0	2119	0	185	171	0	0	116	0
Turn Type				Perm			pm+pt					
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Actuated Green, G (s)					42.0		40.0	40.0			21.0	
Effective Green, g (s)					42.0		40.0	40.0			21.0	
Actuated g/C Ratio					0.47		0.44	0.44			0.23	
Clearance Time (s)					4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)					2951		638	828			423	
v/s Ratio Prot							c0.05	0.09			0.06	
v/s Ratio Perm					c0.34		c0.08					
v/c Ratio					0.72		0.29	0.21			0.27	
Uniform Delay, d1					19.3		16.7	15.3			28.3	
Progression Factor					1.00		0.83	0.77			1.00	
Incremental Delay, d2					1.5		1.1	0.5			1.6	
Delay (s)					20.8		15.0	12.4			29.9	
Level of Service					C		B	B			C	
Approach Delay (s)		0.0			20.8			13.7			29.9	
Approach LOS		A			C			B			C	

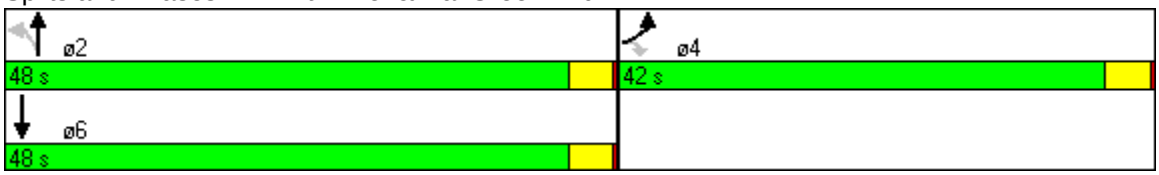
Intersection Summary			
HCM Average Control Delay	20.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.51		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.7%	ICU Level of Service	A

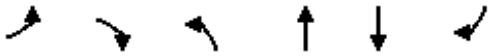
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15	9	15			9
Right Turn on Red		No				No
Link Speed (mph)	35			35	35	
Link Distance (ft)	1019			514	423	
Travel Time (s)	19.9			10.0	8.2	
Volume (vph)	58	181	118	325	505	85
Lane Group Flow (vph)	63	197	0	481	641	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	
Total Split (s)	42.0	42.0	48.0	48.0	48.0	0.0
Total Split (%)	47%	47%	53%	53%	53%	0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	
Lead/Lag						
Lead-Lag Optimize?						
Queue Length 50th (ft)	21	72		98	63	
Queue Length 95th (ft)	45	123		m161	80	
Internal Link Dist (ft)	939			434	343	
50th Up Block Time (%)						
95th Up Block Time (%)						
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)						

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Offset: 6 (7%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 40	
Control Type: Pretimed	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 2: 4th Ave. & Hal Greer Blvd.





Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	0.98	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1770	1583		3493	3463	
Flt Permitted	0.95	1.00		0.65	1.00	
Satd. Flow (perm)	1770	1583		2286	3463	
Volume (vph)	58	181	118	325	505	85
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	63	197	128	353	549	92
Lane Group Flow (vph)	63	197	0	481	641	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	38.0	38.0		44.0	44.0	
Effective Green, g (s)	38.0	38.0		44.0	44.0	
Actuated g/C Ratio	0.42	0.42		0.49	0.49	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	747	668		1118	1693	
v/s Ratio Prot	0.04				0.19	
v/s Ratio Perm		c0.12		c0.21		
v/c Ratio	0.08	0.29		0.43	0.38	
Uniform Delay, d1	15.6	17.2		14.9	14.4	
Progression Factor	1.00	1.00		0.57	0.35	
Incremental Delay, d2	0.2	1.1		0.8	0.5	
Delay (s)	15.8	18.3		9.3	5.6	
Level of Service	B	B		A	A	
Approach Delay (s)	17.7			9.3	5.6	
Approach LOS	B			A	A	

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.1%	ICU Level of Service	A

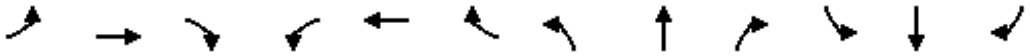
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1008			846			993			514	
Travel Time (s)		19.6			16.5			19.3			10.0	
Volume (vph)	107	1291	171	0	0	0	0	414	237	319	411	0
Lane Group Flow (vph)	0	1705	0	0	0	0	0	708	0	347	447	0
Turn Type	Perm									pm+pt		
Protected Phases		4						2		1	6	
Permitted Phases	4									6		
Minimum Split (s)	20.0	20.0						20.0		8.0	20.0	
Total Split (s)	34.0	34.0	0.0	0.0	0.0	0.0	0.0	29.0	0.0	27.0	56.0	0.0
Total Split (%)	38%	38%	0%	0%	0%	0%	0%	32%	0%	30%	62%	0%
Yellow Time (s)	3.5	3.5						3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5						0.5		0.5	0.5	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes				
Queue Length 50th (ft)		249						107		142	94	
Queue Length 95th (ft)		295						170		219	126	
Internal Link Dist (ft)		928			766			913			434	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary

Area Type: Other
Cycle Length: 90
Offset: 74 (82%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Pretimed

Splits and Phases: 6: 5th Ave. & Hal Greer Blvd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0		4.0	4.0	
Lane Util. Factor		0.86						0.95		1.00	0.95	
Frt		0.98						0.95		1.00	1.00	
Flt Protected		1.00						1.00		0.95	1.00	
Satd. Flow (prot)		6282						3346		1770	3539	
Flt Permitted		1.00						1.00		0.16	1.00	
Satd. Flow (perm)		6282						3346		296	3539	
Volume (vph)	107	1291	171	0	0	0	0	414	237	319	411	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	116	1403	186	0	0	0	0	450	258	347	447	0
Lane Group Flow (vph)	0	1705	0	0	0	0	0	708	0	347	447	0
Turn Type	Perm									pm+pt		
Protected Phases		4						2		1	6	
Permitted Phases	4									6		
Actuated Green, G (s)		30.0						25.0		52.0	52.0	
Effective Green, g (s)		30.0						25.0		52.0	52.0	
Actuated g/C Ratio		0.33						0.28		0.58	0.58	
Clearance Time (s)		4.0						4.0		4.0	4.0	
Lane Grp Cap (vph)		2094						929		548	2045	
v/s Ratio Prot								c0.21		c0.16	0.13	
v/s Ratio Perm		c0.27								0.20		
v/c Ratio		0.81						0.76		0.63	0.22	
Uniform Delay, d1		27.5						29.8		15.3	9.2	
Progression Factor		1.00						0.74		1.24	1.76	
Incremental Delay, d2		3.6						4.6		5.3	0.2	
Delay (s)		31.1						26.5		24.2	16.4	
Level of Service		C						C		C	B	
Approach Delay (s)		31.1			0.0			26.5			19.8	
Approach LOS		C			A			C			B	

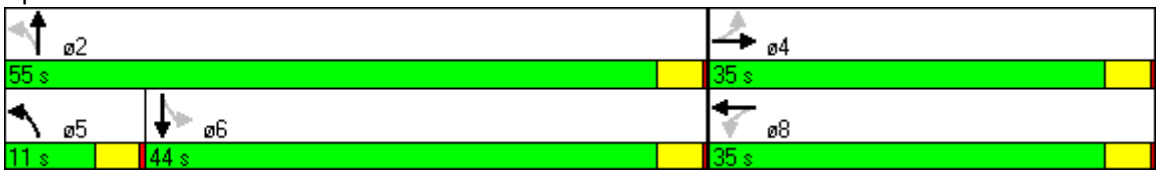
Intersection Summary			
HCM Average Control Delay	27.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.1%	ICU Level of Service	C

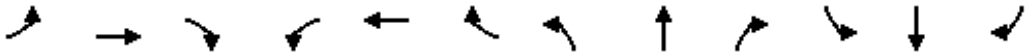
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1015			830			634			993	
Travel Time (s)		19.8			16.2			12.4			19.3	
Volume (vph)	49	107	155	18	88	16	163	574	32	19	617	64
Lane Group Flow (vph)	0	337	0	0	133	0	0	836	0	0	762	0
Turn Type	Perm			Perm			pm+pt			Perm		
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	20.0	20.0		20.0	20.0		8.0	20.0		20.0	20.0	
Total Split (s)	35.0	35.0	0.0	35.0	35.0	0.0	11.0	55.0	0.0	44.0	44.0	0.0
Total Split (%)	39%	39%	0%	39%	39%	0%	12%	61%	0%	49%	49%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?										Yes	Yes	
Queue Length 50th (ft)		125			49			46			86	
Queue Length 95th (ft)		212			93			118			114	
Internal Link Dist (ft)		935			750			554			913	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Offset: 51 (57%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 55	
Control Type: Pretimed	

Splits and Phases: 9: 7th Ave. & Hal Greer Blvd.





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		0.93			0.98			0.99			0.99	
Flt Protected		0.99			0.99			0.99			1.00	
Satd. Flow (prot)		1724			1817			3480			3486	
Flt Permitted		0.94			0.93			0.57			0.92	
Satd. Flow (perm)		1625			1703			2017			3213	
Volume (vph)	49	107	155	18	88	16	163	574	32	19	617	64
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	53	116	168	20	96	17	177	624	35	21	671	70
Lane Group Flow (vph)	0	337	0	0	133	0	0	836	0	0	762	0
Turn Type	Perm			Perm			pm+pt			Perm		
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		31.0			31.0			51.0			40.0	
Effective Green, g (s)		31.0			31.0			51.0			40.0	
Actuated g/C Ratio		0.34			0.34			0.57			0.44	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		560			587			1257			1428	
v/s Ratio Prot								c0.05				
v/s Ratio Perm		c0.21			0.08			c0.33			0.24	
v/c Ratio		0.60			0.23			0.67			0.53	
Uniform Delay, d1		24.4			21.0			13.6			18.2	
Progression Factor		1.00			1.00			0.93			0.46	
Incremental Delay, d2		4.7			0.9			2.5			1.4	
Delay (s)		29.1			21.9			15.1			9.7	
Level of Service		C			C			B			A	
Approach Delay (s)		29.1			21.9			15.1			9.7	
Approach LOS		C			C			B			A	

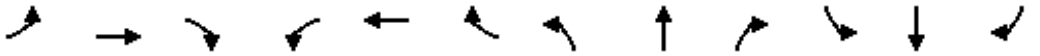
Intersection Summary			
HCM Average Control Delay	15.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	80.9%	ICU Level of Service	D

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		698			829			1749			634	
Travel Time (s)		13.6			16.1			34.1			12.4	
Volume (vph)	53	214	27	50	235	78	2	632	90	117	599	74
Lane Group Flow (vph)	58	262	0	54	255	85	0	787	0	0	858	0
Turn Type	Perm			Perm		Perm	Perm			pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Minimum Split (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		8.0	20.0	
Total Split (s)	31.0	31.0	0.0	31.0	31.0	31.0	45.0	45.0	0.0	14.0	59.0	0.0
Total Split (%)	34%	34%	0%	34%	34%	34%	50%	50%	0%	16%	66%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5	0.5	0.5	0.5		0.5	0.5	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes				
Queue Length 50th (ft)	25	117		23	117	0		152			74	
Queue Length 95th (ft)	57	190		54	188	32		181			105	
Internal Link Dist (ft)		618			749			1669			554	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Offset: 50 (56%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 50	
Control Type: Pretimed	

Splits and Phases: 17: 8th Ave. & Hal Greer Blvd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.95			0.95	
Frt	1.00	0.98		1.00	1.00	0.85		0.98			0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.99	
Satd. Flow (prot)	1770	1832		1770	1863	1583		3473			3464	
Flt Permitted	0.46	1.00		0.45	1.00	1.00		0.95			0.65	
Satd. Flow (perm)	855	1832		835	1863	1583		3313			2260	
Volume (vph)	53	214	27	50	235	78	2	632	90	117	599	74
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	58	233	29	54	255	85	2	687	98	127	651	80
Lane Group Flow (vph)	58	262	0	54	255	85	0	787	0	0	858	0
Turn Type	Perm			Perm		Perm	Perm			pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	27.0	27.0		27.0	27.0	27.0		41.0			55.0	
Effective Green, g (s)	27.0	27.0		27.0	27.0	27.0		41.0			55.0	
Actuated g/C Ratio	0.30	0.30		0.30	0.30	0.30		0.46			0.61	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	257	550		251	559	475		1509			1515	
v/s Ratio Prot		c0.14			0.14						c0.06	
v/s Ratio Perm	0.07			0.06		0.05		0.24			c0.28	
v/c Ratio	0.23	0.48		0.22	0.46	0.18		0.52			0.57	
Uniform Delay, d1	23.7	25.7		23.6	25.5	23.3		17.5			10.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00		0.60			0.79	
Incremental Delay, d2	2.0	2.9		2.0	2.7	0.8		1.2			1.3	
Delay (s)	25.7	28.7		25.5	28.2	24.1		11.7			9.5	
Level of Service	C	C		C	C	C		B			A	
Approach Delay (s)		28.1			27.0			11.7			9.5	
Approach LOS		C			C			B			A	

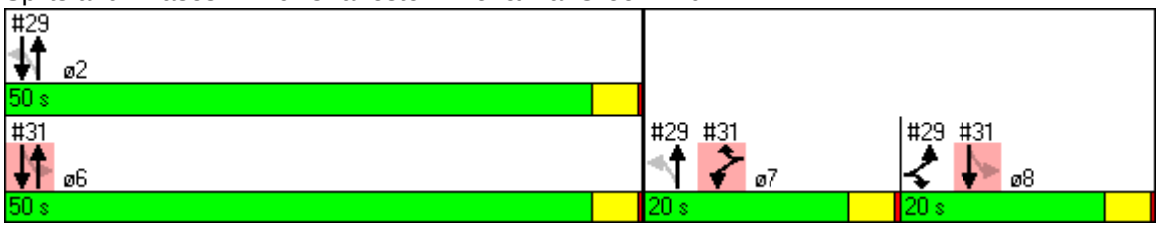
Intersection Summary			
HCM Average Control Delay	15.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C

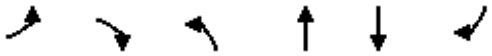
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø6	ø7
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Turning Speed (mph)	15	9	15			9		
Right Turn on Red		No				Yes		
Link Speed (mph)	35			35	35			
Link Distance (ft)	851			113	1749			
Travel Time (s)	16.6			2.2	34.1			
Volume (vph)	53	59	52	618	553	22		
Lane Group Flow (vph)	58	64	57	672	625	0		
Turn Type		Prot	Perm					
Protected Phases	8	8		2 7	2		6	7
Permitted Phases			2 7					
Minimum Split (s)	20.0	20.0			20.0		20.0	20.0
Total Split (s)	20.0	20.0	70.0	70.0	50.0	0.0	50.0	20.0
Total Split (%)	22%	22%	78%	78%	56%	0%	56%	22%
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5
All-Red Time (s)	0.5	0.5			0.5		0.5	0.5
Lead/Lag	Lag	Lag						Lead
Lead-Lag Optimize?	Yes	Yes						Yes
Queue Length 50th (ft)	28	32	0	2	120			
Queue Length 95th (ft)	62	68	m0	2	244			
Internal Link Dist (ft)	771			33	1669			
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (ft)								
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green	
Natural Cycle: 70	
Control Type: Pretimed	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 29: Charleston Ave. & Hal Greer Blvd.





Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.99	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1770	1583	1770	1863	1853	
Flt Permitted	0.95	1.00	0.30	1.00	1.00	
Satd. Flow (perm)	1770	1583	562	1863	1853	
Volume (vph)	53	59	52	618	553	22
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	58	64	57	672	601	24
Lane Group Flow (vph)	58	64	57	672	625	0
Turn Type		Prot	Perm			
Protected Phases	8	8		2 7	2	
Permitted Phases			2 7			
Actuated Green, G (s)	16.0	16.0	66.0	66.0	46.0	
Effective Green, g (s)	16.0	16.0	66.0	66.0	46.0	
Actuated g/C Ratio	0.18	0.18	0.73	0.73	0.51	
Clearance Time (s)	4.0	4.0			4.0	
Lane Grp Cap (vph)	315	281	412	1366	947	
v/s Ratio Prot	0.03	c0.04		c0.36	c0.34	
v/s Ratio Perm			0.10			
v/c Ratio	0.18	0.23	0.14	0.49	0.66	
Uniform Delay, d1	31.5	31.7	3.6	5.0	16.2	
Progression Factor	1.00	1.00	0.02	0.02	0.53	
Incremental Delay, d2	1.3	1.9	0.5	1.0	3.1	
Delay (s)	32.7	33.6	0.6	1.1	11.7	
Level of Service	C	C	A	A	B	
Approach Delay (s)	33.2			1.0	11.7	
Approach LOS	C			A	B	

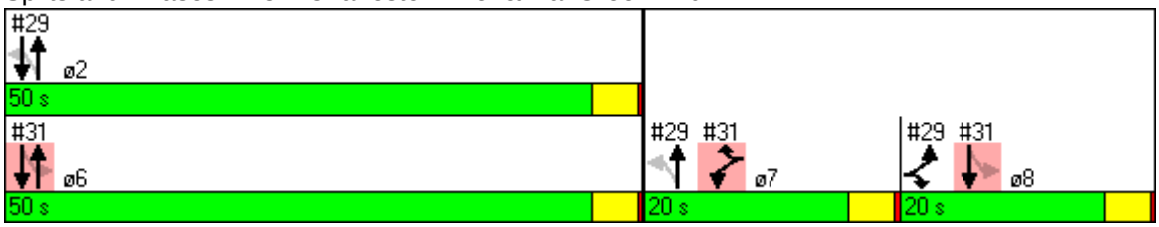
Intersection Summary			
HCM Average Control Delay	8.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.4%	ICU Level of Service	A

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	ø2	ø8
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Turning Speed (mph)	15	9		9	15			
Right Turn on Red		No		Yes				
Link Speed (mph)	35		35			35		
Link Distance (ft)	744		508			113		
Travel Time (s)	14.5		9.9			2.2		
Volume (vph)	52	90	580	27	40	572		
Lane Group Flow (vph)	57	98	659	0	43	622		
Turn Type		Prot			Perm			
Protected Phases	7	7	6			6 8	2	8
Permitted Phases					6 8			
Minimum Split (s)	20.0	20.0	20.0				20.0	20.0
Total Split (s)	20.0	20.0	50.0	0.0	70.0	70.0	50.0	20.0
Total Split (%)	22%	22%	56%	0%	78%	78%	56%	22%
Yellow Time (s)	3.5	3.5	3.5				3.5	3.5
All-Red Time (s)	0.5	0.5	0.5				0.5	0.5
Lead/Lag	Lead	Lead						Lag
Lead-Lag Optimize?	Yes	Yes						Yes
Queue Length 50th (ft)	28	49	268		0	4		
Queue Length 95th (ft)	62	96	397		m1	8		
Internal Link Dist (ft)	664		428			33		
50th Up Block Time (%)								
95th Up Block Time (%)			3%					
Turn Bay Length (ft)								
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green	
Natural Cycle: 70	
Control Type: Pretimed	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 31: Charleston Ave. & Hal Greer Blvd.



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	1852		1770	1863
Flt Permitted	0.95	1.00	1.00		0.41	1.00
Satd. Flow (perm)	1770	1583	1852		772	1863
Volume (vph)	52	90	580	27	40	572
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	98	630	29	43	622
Lane Group Flow (vph)	57	98	659	0	43	622
Turn Type		Prot			Perm	
Protected Phases	7	7	6			6 8
Permitted Phases					6 8	
Actuated Green, G (s)	16.0	16.0	46.0		66.0	66.0
Effective Green, g (s)	16.0	16.0	46.0		66.0	66.0
Actuated g/C Ratio	0.18	0.18	0.51		0.73	0.73
Clearance Time (s)	4.0	4.0	4.0			
Lane Grp Cap (vph)	315	281	947		566	1366
v/s Ratio Prot	0.03	c0.06	c0.36			c0.33
v/s Ratio Perm					0.06	
v/c Ratio	0.18	0.35	0.70		0.08	0.46
Uniform Delay, d1	31.4	32.4	16.7		3.4	4.8
Progression Factor	1.00	1.00	1.00		0.10	0.07
Incremental Delay, d2	1.3	3.4	4.2		0.2	0.9
Delay (s)	32.7	35.8	20.9		0.5	1.2
Level of Service	C	D	C		A	A
Approach Delay (s)	34.7		20.9			1.2
Approach LOS	C		C			A

Intersection Summary			
HCM Average Control Delay	13.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	47.7%	ICU Level of Service	A

c Critical Lane Group

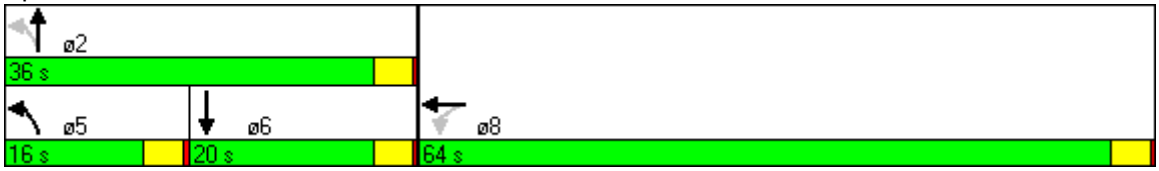
APPENDIX C

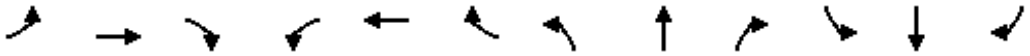
2030 No-Build Traffic Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1009			724			423			434	
Travel Time (s)		19.7			14.1			8.2			8.5	
Volume (vph)	0	0	0	442	1480	28	170	157	0	0	85	22
Lane Group Flow (vph)	0	0	0	0	3540	0	309	285	0	0	194	0
Turn Type				Perm			pm+pt					
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Minimum Split (s)				20.0	20.0		8.0	20.0			20.0	
Total Split (s)	0.0	0.0	0.0	64.0	64.0	0.0	16.0	36.0	0.0	0.0	20.0	0.0
Total Split (%)	0%	0%	0%	64%	64%	0%	16%	36%	0%	0%	20%	0%
Yellow Time (s)				3.5	3.5		3.5	3.5			3.5	
All-Red Time (s)				0.5	0.5		0.5	0.5			0.5	
Lead/Lag							Lead				Lag	
Lead-Lag Optimize?							Yes				Yes	
Queue Length 50th (ft)					565		185	168			111	
Queue Length 95th (ft)					635		m#292	m244			#190	
Internal Link Dist (ft)		929			644			343			354	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Offset: 28 (28%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Pretimed	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 1: 3rd Ave. & Hal Greer Blvd.





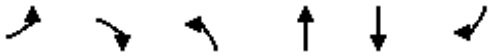
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					0.86		1.00	1.00			1.00	
Frt					1.00		1.00	1.00			0.97	
Flt Protected					0.99		0.95	1.00			1.00	
Satd. Flow (prot)					6201		1736	1827			1776	
Flt Permitted					0.99		0.31	1.00			1.00	
Satd. Flow (perm)					6201		572	1827			1776	
Volume (vph)	0	0	0	442	1480	28	170	157	0	0	85	22
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%
Adj. Flow (vph)	0	0	0	802	2687	51	309	285	0	0	154	40
Lane Group Flow (vph)	0	0	0	0	3540	0	309	285	0	0	194	0
Turn Type				Perm			pm+pt					
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Actuated Green, G (s)					60.0		32.0	32.0			16.0	
Effective Green, g (s)					60.0		32.0	32.0			16.0	
Actuated g/C Ratio					0.60		0.32	0.32			0.16	
Clearance Time (s)					4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)					3721		323	585			284	
v/s Ratio Prot							c0.11	0.16			0.11	
v/s Ratio Perm					c0.57		c0.19					
v/c Ratio					0.95		0.96	0.49			0.68	
Uniform Delay, d1					18.6		30.7	27.4			39.6	
Progression Factor					1.00		0.95	0.92			1.00	
Incremental Delay, d2					7.1		34.4	2.2			12.6	
Delay (s)					25.8		63.6	27.5			52.2	
Level of Service					C		E	C			D	
Approach Delay (s)		0.0			25.8			46.3			52.2	
Approach LOS		A			C			D			D	

Intersection Summary			
HCM Average Control Delay	29.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.6%	ICU Level of Service	D
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15	9	15			9
Right Turn on Red		No				No
Link Speed (mph)	35			35	35	
Link Distance (ft)	1019			514	423	
Travel Time (s)	19.9			10.0	8.2	
Volume (vph)	58	181	118	325	505	85
Lane Group Flow (vph)	99	309	0	756	1007	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	
Total Split (s)	39.0	39.0	61.0	61.0	61.0	0.0
Total Split (%)	39%	39%	61%	61%	61%	0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	
Lead/Lag						
Lead-Lag Optimize?						
Queue Length 50th (ft)	43	158		32	88	
Queue Length 95th (ft)	81	247		m28	m99	
Internal Link Dist (ft)	939			434	343	
50th Up Block Time (%)						
95th Up Block Time (%)						
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)						

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Offset: 60 (60%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 55	
Control Type: Pretimed	
m Volume for 95th percentile queue is metered by upstream signal.	

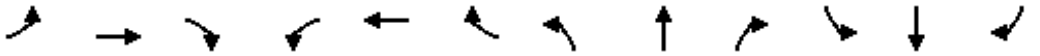
Splits and Phases: 2: 4th Ave. & Hal Greer Blvd.



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	0.98	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1736	1553		3426	3396	
Flt Permitted	0.95	1.00		0.53	1.00	
Satd. Flow (perm)	1736	1553		1856	3396	
Volume (vph)	58	181	118	325	505	85
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	157%	157%	157%	157%	157%	157%
Adj. Flow (vph)	99	309	201	555	862	145
Lane Group Flow (vph)	99	309	0	756	1007	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	35.0	35.0		57.0	57.0	
Effective Green, g (s)	35.0	35.0		57.0	57.0	
Actuated g/C Ratio	0.35	0.35		0.57	0.57	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	608	544		1058	1936	
v/s Ratio Prot	0.06				0.30	
v/s Ratio Perm		c0.20		c0.41		
v/c Ratio	0.16	0.57		0.90dl	0.52	
Uniform Delay, d1	22.4	26.4		15.6	13.1	
Progression Factor	1.00	1.00		0.36	0.35	
Incremental Delay, d2	0.6	4.3		0.4	0.5	
Delay (s)	23.0	30.6		6.0	5.0	
Level of Service	C	C		A	A	
Approach Delay (s)	28.8			6.0	5.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.1%	ICU Level of Service	B

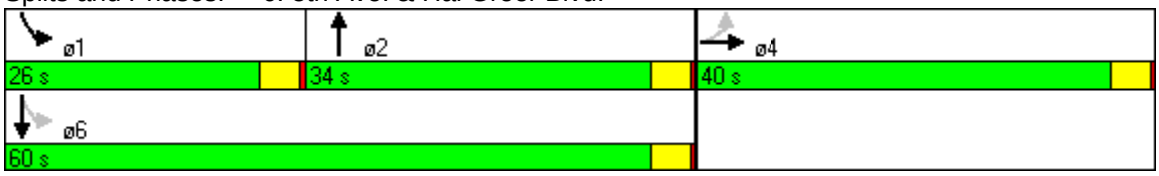
dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	150		0
Storage Lanes	0		0	0		0	0		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1008			846			993			514	
Travel Time (s)		19.6			16.5			19.3			10.0	
Volume (vph)	107	1291	171	0	0	0	0	414	237	319	411	0
Lane Group Flow (vph)	0	2678	0	0	0	0	0	1110	0	544	701	0
Turn Type	Perm									pm+pt		
Protected Phases		4						2		1	6	
Permitted Phases	4									6		
Minimum Split (s)	20.0	20.0						20.0		8.0	20.0	
Total Split (s)	40.0	40.0	0.0	0.0	0.0	0.0	0.0	34.0	0.0	26.0	60.0	0.0
Total Split (%)	40%	40%	0%	0%	0%	0%	0%	34%	0%	26%	60%	0%
Yellow Time (s)	3.5	3.5						3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5						0.5		0.5	0.5	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes				
Queue Length 50th (ft)		~602						~417		~384	108	
Queue Length 95th (ft)		#679						m#397		#582	145	
Internal Link Dist (ft)		928			766			913			434	
50th Up Block Time (%)												
95th Up Block Time (%)										42%		
Turn Bay Length (ft)										150		
50th Bay Block Time %										57%		
95th Bay Block Time %										78%	3%	
Queuing Penalty (veh)										349		

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Offset: 56 (56%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 100	
Control Type: Pretimed	
~	Volume exceeds capacity, queue is theoretically infinite.
	Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer.
	Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: 5th Ave. & Hal Greer Blvd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0						4.0		4.0	4.0	
Lane Util. Factor		0.86						0.95		1.00	0.95	
Frt		0.98						0.95		1.00	1.00	
Flt Protected		1.00						1.00		0.95	1.00	
Satd. Flow (prot)		6161						3282		1736	3471	
Flt Permitted		1.00						1.00		0.12	1.00	
Satd. Flow (perm)		6161						3282		215	3471	
Volume (vph)	107	1291	171	0	0	0	0	414	237	319	411	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%
Adj. Flow (vph)	183	2203	292	0	0	0	0	706	404	544	701	0
Lane Group Flow (vph)	0	2678	0	0	0	0	0	1110	0	544	701	0
Turn Type	Perm									pm+pt		
Protected Phases		4						2		1	6	
Permitted Phases	4									6		
Actuated Green, G (s)		36.0						30.0		56.0	56.0	
Effective Green, g (s)		36.0						30.0		56.0	56.0	
Actuated g/C Ratio		0.36						0.30		0.56	0.56	
Clearance Time (s)		4.0						4.0		4.0	4.0	
Lane Grp Cap (vph)		2218						985		455	1944	
v/s Ratio Prot								0.34		c0.26	0.20	
v/s Ratio Perm		c0.43								c0.41		
v/c Ratio		1.21						1.13		1.20	0.36	
Uniform Delay, d1		32.0						35.0		30.1	12.1	
Progression Factor		1.00						0.73		1.17	1.00	
Incremental Delay, d2		97.8						61.1		105.7	0.5	
Delay (s)		129.8						86.7		140.9	12.5	
Level of Service		F						F		F	B	
Approach Delay (s)		129.8			0.0			86.7			68.6	
Approach LOS		F			A			F			E	

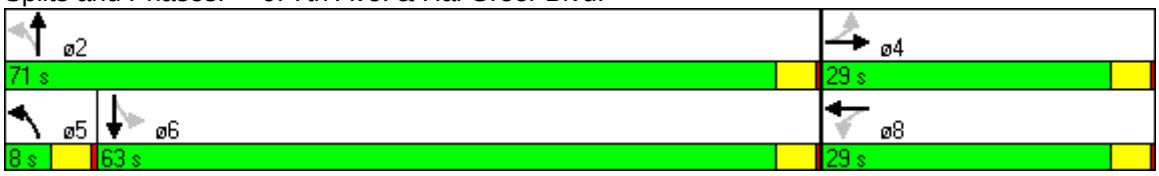
Intersection Summary			
HCM Average Control Delay	105.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.18		
Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	112.2%	ICU Level of Service	G
c Critical Lane Group			

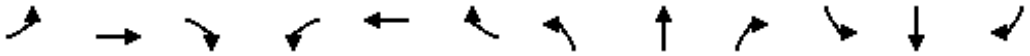
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1015			830			634			993	
Travel Time (s)		19.8			16.2			12.4			19.3	
Volume (vph)	49	107	155	18	88	16	163	574	32	19	617	64
Lane Group Flow (vph)	84	448	0	0	208	0	0	1313	0	0	1194	0
Turn Type	Perm			Perm			pm+pt			Perm		
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	20.0	20.0		20.0	20.0		8.0	20.0		20.0	20.0	
Total Split (s)	29.0	29.0	0.0	29.0	29.0	0.0	8.0	71.0	0.0	63.0	63.0	0.0
Total Split (%)	29%	29%	0%	29%	29%	0%	8%	71%	0%	63%	63%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?										Yes	Yes	
Queue Length 50th (ft)	44	244			~139			~144			151	
Queue Length 95th (ft)	91	#443			#285			m#277			m189	
Internal Link Dist (ft)		935			750			554			913	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)	50											
50th Bay Block Time %		60%										
95th Bay Block Time %	37%	69%										
Queuing Penalty (veh)	83	54										

Intersection Summary

Area Type: Other
Cycle Length: 100
Offset: 8 (8%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Pretimed
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: 7th Ave. & Hal Greer Blvd.





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00			1.00			0.95			0.95	
Frt	1.00	0.91			0.98			0.99			0.99	
Flt Protected	0.95	1.00			0.99			0.99			1.00	
Satd. Flow (prot)	1736	1665			1782			3413			3419	
Flt Permitted	0.49	1.00			0.44			0.51			0.88	
Satd. Flow (perm)	890	1665			786			1766			3009	
Volume (vph)	49	107	155	18	88	16	163	574	32	19	617	64
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%
Adj. Flow (vph)	84	183	265	31	150	27	278	980	55	32	1053	109
Lane Group Flow (vph)	84	448	0	0	208	0	0	1313	0	0	1194	0
Turn Type	Perm			Perm			pm+pt			Perm		
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	25.0	25.0			25.0			67.0			59.0	
Effective Green, g (s)	25.0	25.0			25.0			67.0			59.0	
Actuated g/C Ratio	0.25	0.25			0.25			0.67			0.59	
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)	223	416			197			1249			1775	
v/s Ratio Prot		c0.27						c0.04				
v/s Ratio Perm	0.09				0.26			c0.66			0.40	
v/c Ratio	0.38	1.08			1.06			1.12dl			0.67	
Uniform Delay, d1	31.0	37.5			37.5			16.5			13.9	
Progression Factor	1.00	1.00			1.00			0.63			0.59	
Incremental Delay, d2	4.8	66.3			79.6			37.3			1.8	
Delay (s)	35.8	103.8			117.1			47.7			10.0	
Level of Service	D	F			F			D			B	
Approach Delay (s)		93.0			117.1			47.7			10.0	
Approach LOS		F			F			D			B	

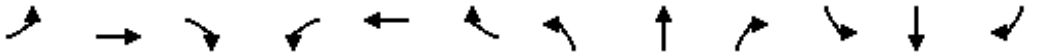
Intersection Summary			
HCM Average Control Delay	45.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.05		
Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	120.8%	ICU Level of Service	H

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		698			829			1749			634	
Travel Time (s)		13.6			16.1			34.1			12.4	
Volume (vph)	53	214	27	50	235	78	2	632	90	117	599	74
Lane Group Flow (vph)	90	411	0	85	401	133	0	1236	0	0	1348	0
Turn Type	Perm			Perm		Perm	Perm			pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Minimum Split (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		8.0	20.0	
Total Split (s)	27.0	27.0	0.0	27.0	27.0	27.0	65.0	65.0	0.0	8.0	73.0	0.0
Total Split (%)	27%	27%	0%	27%	27%	27%	65%	65%	0%	8%	73%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5	0.5	0.5	0.5		0.5	0.5	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes				
Queue Length 50th (ft)	~71	259		~65	253	0		47			~242	
Queue Length 95th (ft)	#173	#456		#162	#439	47		73			m#347	
Internal Link Dist (ft)		618			749			1669			554	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Offset: 95 (95%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 70	
Control Type: Pretimed	
~	Volume exceeds capacity, queue is theoretically infinite.
	Queue shown is maximum after two cycles.
#	95th percentile volume exceeds capacity, queue may be longer.
	Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 17: 8th Ave. & Hal Greer Blvd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.95			0.95	
Frt	1.00	0.98		1.00	1.00	0.85		0.98			0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.99	
Satd. Flow (prot)	1736	1796		1736	1827	1553		3406			3397	
Flt Permitted	0.17	1.00		0.17	1.00	1.00		0.95			0.53	
Satd. Flow (perm)	318	1796		318	1827	1553		3245			1805	
Volume (vph)	53	214	27	50	235	78	2	632	90	117	599	74
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%
Adj. Flow (vph)	90	365	46	85	401	133	3	1079	154	200	1022	126
Lane Group Flow (vph)	90	411	0	85	401	133	0	1236	0	0	1348	0
Turn Type	Perm			Perm		Perm	Perm			pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	23.0	23.0		23.0	23.0	23.0		61.0			69.0	
Effective Green, g (s)	23.0	23.0		23.0	23.0	23.0		61.0			69.0	
Actuated g/C Ratio	0.23	0.23		0.23	0.23	0.23		0.61			0.69	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0			4.0	
Lane Grp Cap (vph)	73	413		73	420	357		1979			1309	
v/s Ratio Prot		0.23			0.22						c0.04	
v/s Ratio Perm	c0.28			0.27		0.09		0.38			c0.67	
v/c Ratio	1.23	1.00		1.16	0.95	0.37		0.62			1.03	
Uniform Delay, d1	38.5	38.4		38.5	38.0	32.4		12.3			15.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00		0.25			1.10	
Incremental Delay, d2	180.6	43.1		156.5	33.9	3.0		1.4			28.3	
Delay (s)	219.1	81.5		195.0	71.9	35.4		4.5			45.3	
Level of Service	F	F		F	E	D		A			D	
Approach Delay (s)		106.2			81.0			4.5			45.3	
Approach LOS		F			F			A			D	

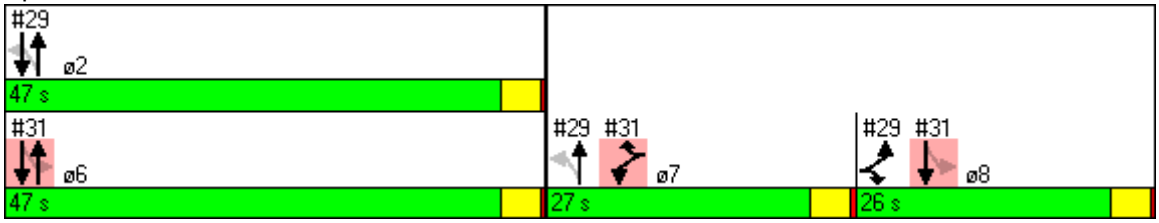
Intersection Summary			
HCM Average Control Delay	45.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.07		
Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	113.0%	ICU Level of Service	G
c Critical Lane Group			

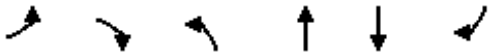
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø6	ø7
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0	0	40			0		
Storage Lanes	1	1	1			0		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Turning Speed (mph)	15	9	15			9		
Right Turn on Red		No				Yes		
Link Speed (mph)	35			35	35			
Link Distance (ft)	851			113	1749			
Travel Time (s)	16.6			2.2	34.1			
Volume (vph)	53	59	52	618	553	22		
Lane Group Flow (vph)	90	101	89	1055	982	0		
Turn Type		Prot	Perm					
Protected Phases	8	8		2 7	2		6	7
Permitted Phases			2 7					
Minimum Split (s)	20.0	20.0			20.0		20.0	20.0
Total Split (s)	26.0	26.0	74.0	74.0	47.0	0.0	47.0	27.0
Total Split (%)	26%	26%	74%	74%	47%	0%	47%	27%
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5
All-Red Time (s)	0.5	0.5			0.5		0.5	0.5
Lead/Lag	Lag	Lag						Lead
Lead-Lag Optimize?	Yes	Yes						Yes
Queue Length 50th (ft)	47	54	0	1	296			
Queue Length 95th (ft)	91	101	m0	1	m283			
Internal Link Dist (ft)	771			33	1669			
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (ft)			40					
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary

Area Type: Other
Cycle Length: 100
Offset: 64 (64%), Referenced to phase 2:NBSB and 6:, Start of Green
Natural Cycle: 65
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 29: Charleston Ave. & Hal Greer Blvd.





Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	
Frt	1.00	0.85	1.00	1.00	0.99	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1805	1615	1805	3471	3456	
Flt Permitted	0.95	1.00	0.21	1.00	1.00	
Satd. Flow (perm)	1805	1615	404	3471	3456	
Volume (vph)	53	59	52	618	553	22
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	157%	157%	157%	157%	157%	157%
Adj. Flow (vph)	90	101	89	1055	944	38
Lane Group Flow (vph)	90	101	89	1055	982	0
Heavy Vehicles (%)	0%	0%	0%	4%	4%	0%
Turn Type		Prot	Perm			
Protected Phases	8	8		2 7	2	
Permitted Phases			2 7			
Actuated Green, G (s)	22.0	22.0	70.0	70.0	43.0	
Effective Green, g (s)	22.0	22.0	70.0	70.0	43.0	
Actuated g/C Ratio	0.22	0.22	0.70	0.70	0.43	
Clearance Time (s)	4.0	4.0			4.0	
Lane Grp Cap (vph)	397	355	283	2430	1486	
v/s Ratio Prot	0.05	c0.06		c0.30	c0.28	
v/s Ratio Perm			0.22			
v/c Ratio	0.23	0.28	0.31	0.43	0.66	
Uniform Delay, d1	32.0	32.5	5.8	6.5	22.7	
Progression Factor	1.00	1.00	0.02	0.02	1.04	
Incremental Delay, d2	1.3	2.0	2.2	0.4	0.2	
Delay (s)	33.3	34.5	2.3	0.5	23.8	
Level of Service	C	C	A	A	C	
Approach Delay (s)	33.9			0.7	23.8	
Approach LOS	C			A	C	

Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.2%	ICU Level of Service	A

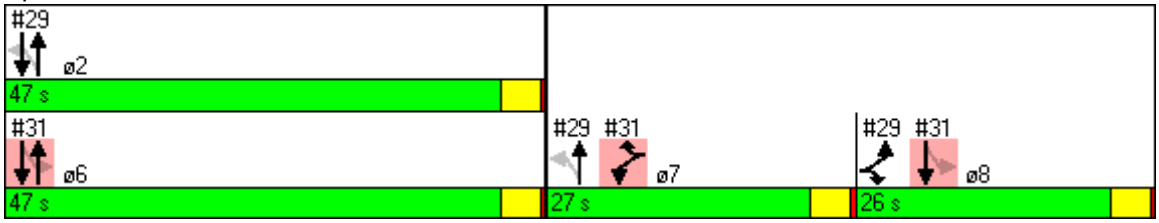
c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	ø2	ø8
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0	0		0	40			
Storage Lanes	1	1		0	1			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Turning Speed (mph)	15	9		9	15			
Right Turn on Red		No		Yes				
Link Speed (mph)	35		35			35		
Link Distance (ft)	744		508			113		
Travel Time (s)	14.5		9.9			2.2		
Volume (vph)	52	90	580	27	40	572		
Lane Group Flow (vph)	89	154	1036	0	68	976		
Turn Type		Prot			Perm			
Protected Phases	7	7	6			6 8	2	8
Permitted Phases					6 8			
Minimum Split (s)	20.0	20.0	20.0				20.0	20.0
Total Split (s)	27.0	27.0	47.0	0.0	73.0	73.0	47.0	26.0
Total Split (%)	27%	27%	47%	0%	73%	73%	47%	26%
Yellow Time (s)	3.5	3.5	3.5				3.5	3.5
All-Red Time (s)	0.5	0.5	0.5				0.5	0.5
Lead/Lag	Lead	Lead						Lag
Lead-Lag Optimize?	Yes	Yes						Yes
Queue Length 50th (ft)	46	84	274		0	4		
Queue Length 95th (ft)	89	144	349		m1	4		
Internal Link Dist (ft)	664		428			33		
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (ft)					40			
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary

Area Type: Other
Cycle Length: 100
Offset: 64 (64%), Referenced to phase 2:NBSB and 6:, Start of Green
Natural Cycle: 65
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 31: Charleston Ave. & Hal Greer Blvd.



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1805	1615	3454		1805	3471
Flt Permitted	0.95	1.00	1.00		0.28	1.00
Satd. Flow (perm)	1805	1615	3454		525	3471
Volume (vph)	52	90	580	27	40	572
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	157%	157%	157%	157%	157%	157%
Adj. Flow (vph)	89	154	990	46	68	976
Lane Group Flow (vph)	89	154	1036	0	68	976
Heavy Vehicles (%)	0%	0%	4%	0%	0%	4%
Turn Type		Prot			Perm	
Protected Phases	7	7	6			6 8
Permitted Phases					6 8	
Actuated Green, G (s)	23.0	23.0	43.0		69.0	69.0
Effective Green, g (s)	23.0	23.0	43.0		69.0	69.0
Actuated g/C Ratio	0.23	0.23	0.43		0.69	0.69
Clearance Time (s)	4.0	4.0	4.0			
Lane Grp Cap (vph)	415	371	1485		362	2395
v/s Ratio Prot	0.05	c0.10	c0.30			c0.28
v/s Ratio Perm					0.13	
v/c Ratio	0.21	0.42	0.70		0.19	0.41
Uniform Delay, d1	31.2	32.8	23.2		5.5	6.7
Progression Factor	1.00	1.00	1.00		0.05	0.05
Incremental Delay, d2	1.2	3.4	2.7		0.9	0.4
Delay (s)	32.4	36.2	25.9		1.2	0.7
Level of Service	C	D	C		A	A
Approach Delay (s)	34.8		25.9			0.8
Approach LOS	C		C			A

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	47.5%	ICU Level of Service	A

c Critical Lane Group

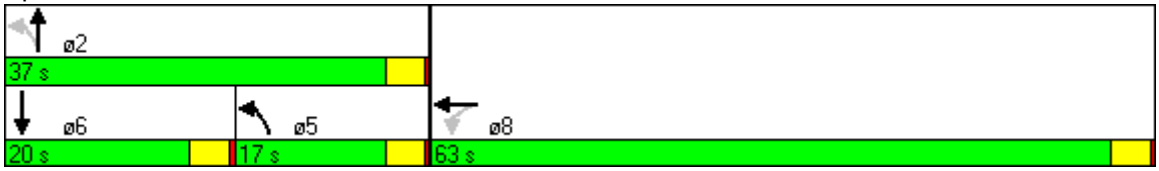
APPENDIX D

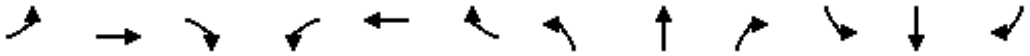
2030 Improvements Traffic Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1009			724			423			434	
Travel Time (s)		19.7			14.1			8.2			8.5	
Volume (vph)	0	0	0	442	1480	28	170	157	0	0	85	22
Lane Group Flow (vph)	0	0	0	0	3540	0	309	285	0	0	194	0
Turn Type				Perm			pm+pt					
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Minimum Split (s)				20.0	20.0		8.0	20.0			20.0	
Total Split (s)	0.0	0.0	0.0	63.0	63.0	0.0	17.0	37.0	0.0	0.0	20.0	0.0
Total Split (%)	0%	0%	0%	63%	63%	0%	17%	37%	0%	0%	20%	0%
Yellow Time (s)				3.5	3.5		3.5	3.5			3.5	
All-Red Time (s)				0.5	0.5		0.5	0.5			0.5	
Lead/Lag							Lag				Lead	
Lead-Lag Optimize?							Yes				Yes	
Queue Length 50th (ft)					582		176	161			111	
Queue Length 95th (ft)					#680		m#308	m223			#190	
Internal Link Dist (ft)		929			644			343			354	
50th Up Block Time (%)												
95th Up Block Time (%)					4%							
Turn Bay Length (ft)												
50th Bay Block Time %												
95th Bay Block Time %												
Queuing Penalty (veh)												

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Offset: 72 (72%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 90	
Control Type: Pretimed	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 1: 3rd Ave. & Hal Greer Blvd.





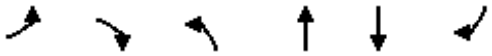
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0		4.0	4.0			4.0	
Lane Util. Factor					0.86		1.00	1.00			1.00	
Frt					1.00		1.00	1.00			0.97	
Flt Protected					0.99		0.95	1.00			1.00	
Satd. Flow (prot)					6201		1736	1827			1776	
Flt Permitted					0.99		0.44	1.00			1.00	
Satd. Flow (perm)					6201		804	1827			1776	
Volume (vph)	0	0	0	442	1480	28	170	157	0	0	85	22
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%	167%
Adj. Flow (vph)	0	0	0	802	2687	51	309	285	0	0	154	40
Lane Group Flow (vph)	0	0	0	0	3540	0	309	285	0	0	194	0
Turn Type				Perm			pm+pt					
Protected Phases					8		5	2			6	
Permitted Phases				8			2					
Actuated Green, G (s)					59.0		33.0	33.0			16.0	
Effective Green, g (s)					59.0		33.0	33.0			16.0	
Actuated g/C Ratio					0.59		0.33	0.33			0.16	
Clearance Time (s)					4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)					3659		386	603			284	
v/s Ratio Prot							c0.10	0.16			0.11	
v/s Ratio Perm					c0.57		c0.16					
v/c Ratio					0.97		0.80	0.47			0.68	
Uniform Delay, d1					19.6		33.2	26.6			39.6	
Progression Factor					1.00		0.78	0.71			1.00	
Incremental Delay, d2					9.0		12.7	2.1			12.6	
Delay (s)					28.6		38.5	21.0			52.2	
Level of Service					C		D	C			D	
Approach Delay (s)		0.0			28.6			30.1			52.2	
Approach LOS		A			C			C			D	

Intersection Summary			
HCM Average Control Delay	29.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.6%	ICU Level of Service	D
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15	9	15			9
Right Turn on Red		No				No
Link Speed (mph)	35			35	35	
Link Distance (ft)	1019			514	423	
Travel Time (s)	19.9			10.0	8.2	
Volume (vph)	58	181	118	325	505	85
Lane Group Flow (vph)	99	309	0	756	1007	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	
Total Split (s)	39.0	39.0	61.0	61.0	61.0	0.0
Total Split (%)	39%	39%	61%	61%	61%	0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	
Lead/Lag						
Lead-Lag Optimize?						
Queue Length 50th (ft)	43	158		232	108	
Queue Length 95th (ft)	81	247		m285	m145	
Internal Link Dist (ft)	939			434	343	
50th Up Block Time (%)						
95th Up Block Time (%)						
Turn Bay Length (ft)						
50th Bay Block Time %						
95th Bay Block Time %						
Queuing Penalty (veh)						

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Offset: 32 (32%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 55	
Control Type: Pretimed	
m Volume for 95th percentile queue is metered by upstream signal.	

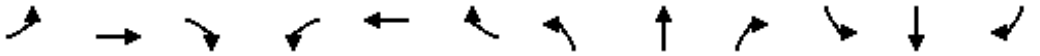
Splits and Phases: 2: 4th Ave. & Hal Greer Blvd.



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	0.98	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	1736	1553		3426	3396	
Flt Permitted	0.95	1.00		0.53	1.00	
Satd. Flow (perm)	1736	1553		1856	3396	
Volume (vph)	58	181	118	325	505	85
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	157%	157%	157%	157%	157%	157%
Adj. Flow (vph)	99	309	201	555	862	145
Lane Group Flow (vph)	99	309	0	756	1007	0
Turn Type		Perm	Perm			
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	35.0	35.0		57.0	57.0	
Effective Green, g (s)	35.0	35.0		57.0	57.0	
Actuated g/C Ratio	0.35	0.35		0.57	0.57	
Clearance Time (s)	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	608	544		1058	1936	
v/s Ratio Prot	0.06				0.30	
v/s Ratio Perm		c0.20		c0.41		
v/c Ratio	0.16	0.57		0.90dl	0.52	
Uniform Delay, d1	22.4	26.4		15.6	13.1	
Progression Factor	1.00	1.00		0.68	0.42	
Incremental Delay, d2	0.6	4.3		2.0	0.5	
Delay (s)	23.0	30.6		12.6	5.9	
Level of Service	C	C		B	A	
Approach Delay (s)	28.8			12.6	5.9	
Approach LOS	C			B	A	

Intersection Summary			
HCM Average Control Delay	12.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.1%	ICU Level of Service	B

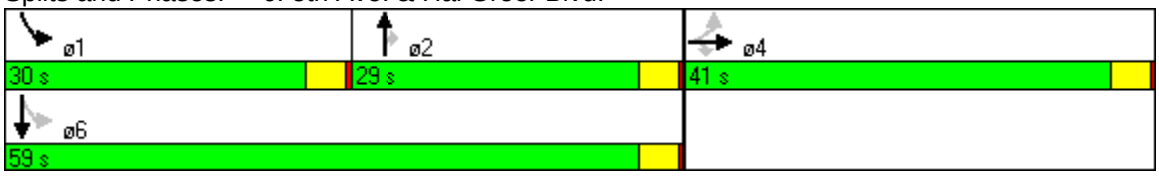
dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

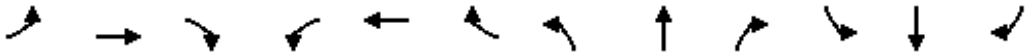


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		100	0		0	0		100	150		0
Storage Lanes	0		1	0		0	0		1	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1008			846			993			514	
Travel Time (s)		19.6			16.5			19.3			10.0	
Volume (vph)	107	1291	171	0	0	0	0	414	237	319	411	0
Lane Group Flow (vph)	0	2386	292	0	0	0	0	706	404	544	701	0
Turn Type	Perm		Perm						Perm	pm+pt		
Protected Phases		4						2		1	6	
Permitted Phases	4		4						2	6		
Minimum Split (s)	20.0	20.0	20.0					20.0	20.0	8.0	20.0	
Total Split (s)	41.0	41.0	41.0	0.0	0.0	0.0	0.0	29.0	29.0	30.0	59.0	0.0
Total Split (%)	41%	41%	41%	0%	0%	0%	0%	29%	29%	30%	59%	0%
Yellow Time (s)	3.5	3.5	3.5					3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5					0.5	0.5	0.5	0.5	
Lead/Lag								Lag	Lag	Lead		
Lead-Lag Optimize?								Yes	Yes			
Queue Length 50th (ft)		~476	78					182	249	~321	174	
Queue Length 95th (ft)		#551	153					#221	#285	#535	230	
Internal Link Dist (ft)		928			766			913			434	
50th Up Block Time (%)												
95th Up Block Time (%)										37%		
Turn Bay Length (ft)			100						100	150		
50th Bay Block Time %		49%						10%	10%	41%	15%	
95th Bay Block Time %		52%	24%					12%	45%	62%	29%	
Queuing Penalty (veh)		147	70					44	96	279	118	

Intersection Summary
Area Type: Other
Cycle Length: 100
Offset: 17 (17%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Pretimed
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: 5th Ave. & Hal Greer Blvd.





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lane Util. Factor		0.86	1.00					0.95	1.00	1.00	0.95	
Frt		1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected		1.00	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)		6261	1553					3471	1553	1736	3471	
Flt Permitted		1.00	1.00					1.00	1.00	0.14	1.00	
Satd. Flow (perm)		6261	1553					3471	1553	252	3471	
Volume (vph)	107	1291	171	0	0	0	0	414	237	319	411	0
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%
Adj. Flow (vph)	183	2203	292	0	0	0	0	706	404	544	701	0
Lane Group Flow (vph)	0	2386	292	0	0	0	0	706	404	544	701	0
Turn Type	Perm		Perm						Perm	pm+pt		
Protected Phases		4						2		1	6	
Permitted Phases	4		4						2	6		
Actuated Green, G (s)		37.0	37.0					25.0	25.0	55.0	55.0	
Effective Green, g (s)		37.0	37.0					25.0	25.0	55.0	55.0	
Actuated g/C Ratio		0.37	0.37					0.25	0.25	0.55	0.55	
Clearance Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lane Grp Cap (vph)		2317	575					868	388	524	1909	
v/s Ratio Prot								0.20		c0.27	0.20	
v/s Ratio Perm		c0.38	0.19						0.26	c0.30		
v/c Ratio		1.03	0.51					0.81	1.04	1.04	0.37	
Uniform Delay, d1		31.5	24.4					35.3	37.5	28.2	12.7	
Progression Factor		1.00	1.00					0.40	0.34	1.05	1.76	
Incremental Delay, d2		26.8	3.2					7.5	54.6	47.1	0.5	
Delay (s)		58.3	27.6					21.6	67.2	76.7	22.9	
Level of Service		E	C					C	E	E	C	
Approach Delay (s)		55.0			0.0			38.2			46.4	
Approach LOS		D			A			D			D	

Intersection Summary			
HCM Average Control Delay	49.2	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	99.9%	ICU Level of Service	E
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	50		0	0		0
Storage Lanes	1		0	0		0	1		0	0		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1015			830			634			993	
Travel Time (s)		19.8			16.2			12.4			19.3	
Volume (vph)	49	107	155	18	88	16	163	574	32	19	617	64
Lane Group Flow (vph)	84	448	0	0	208	0	278	1035	0	0	1194	0
Turn Type	Perm			Perm			pm+pt			Perm		
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	20.0	20.0		20.0	20.0		8.0	20.0		20.0	20.0	
Total Split (s)	33.0	33.0	0.0	33.0	33.0	0.0	20.0	67.0	0.0	47.0	47.0	0.0
Total Split (%)	33%	33%	0%	33%	33%	0%	20%	67%	0%	47%	47%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?										Yes	Yes	
Queue Length 50th (ft)	42	227			112		133	331			408	
Queue Length 95th (ft)	85	#398			196		m141	381			#511	
Internal Link Dist (ft)		935			750			554			913	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)	50						50					
50th Bay Block Time %		56%					18%	23%				
95th Bay Block Time %	33%	63%					19%	23%				
Queuing Penalty (veh)	73	50					95	64				

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Offset: 8 (8%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Pretimed	
#	95th percentile volume exceeds capacity, queue may be longer.
	Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: 7th Ave. & Hal Greer Blvd.

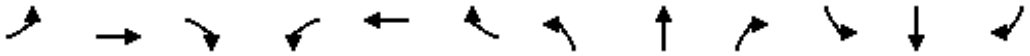
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95			0.95	
Frt	1.00	0.91			0.98		1.00	0.99			0.99	
Flt Protected	0.95	1.00			0.99		0.95	1.00			1.00	
Satd. Flow (prot)	1736	1665			1782		1736	3443			3419	
Flt Permitted	0.52	1.00			0.60		0.09	1.00			0.90	
Satd. Flow (perm)	952	1665			1071		155	3443			3072	
Volume (vph)	49	107	155	18	88	16	163	574	32	19	617	64
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%
Adj. Flow (vph)	84	183	265	31	150	27	278	980	55	32	1053	109
Lane Group Flow (vph)	84	448	0	0	208	0	278	1035	0	0	1194	0
Turn Type	Perm			Perm			pm+pt			Perm		
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	29.0	29.0			29.0		63.0	63.0			43.0	
Effective Green, g (s)	29.0	29.0			29.0		63.0	63.0			43.0	
Actuated g/C Ratio	0.29	0.29			0.29		0.63	0.63			0.43	
Clearance Time (s)	4.0	4.0			4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)	276	483			311		351	2169			1321	
v/s Ratio Prot		c0.27					c0.13	0.30				
v/s Ratio Perm	0.09				0.19		0.37				c0.39	
v/c Ratio	0.30	0.93			0.67		0.79	0.48			0.90	
Uniform Delay, d1	27.6	34.5			31.3		26.6	9.8			26.6	
Progression Factor	1.00	1.00			1.00		0.53	1.65			0.76	
Incremental Delay, d2	2.8	26.4			10.9		11.1	0.5			10.0	
Delay (s)	30.5	60.9			42.2		25.2	16.6			30.2	
Level of Service	C	E			D		C	B			C	
Approach Delay (s)		56.1			42.2			18.4			30.2	
Approach LOS		E			D			B			C	

Intersection Summary			
HCM Average Control Delay	30.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	112.8%	ICU Level of Service	G
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	50		0
Storage Lanes	1		0	1		1	0		0	1		0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		698			829			1749			634	
Travel Time (s)		13.6			16.1			34.1			12.4	
Volume (vph)	53	214	27	50	235	78	2	632	90	117	599	74
Lane Group Flow (vph)	90	411	0	85	401	133	0	1236	0	200	1148	0
Turn Type	Perm			Perm		Perm	Perm			pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Minimum Split (s)	20.0	20.0		20.0	20.0	20.0	20.0	20.0		8.0	20.0	
Total Split (s)	36.0	36.0	0.0	36.0	36.0	36.0	49.0	49.0	0.0	15.0	64.0	0.0
Total Split (%)	36%	36%	0%	36%	36%	36%	49%	49%	0%	15%	64%	0%
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5	0.5	0.5	0.5		0.5	0.5	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes				
Queue Length 50th (ft)	47	225		45	221	0		373		51	266	
Queue Length 95th (ft)	#116	337		#110	329	41		478		m75	m277	
Internal Link Dist (ft)		618			749			1669			554	
50th Up Block Time (%)												
95th Up Block Time (%)												
Turn Bay Length (ft)										50		
50th Bay Block Time %										6%	14%	
95th Bay Block Time %										13%	14%	
Queuing Penalty (veh)										54	28	

Intersection Summary
Area Type: Other
Cycle Length: 100
Offset: 51 (51%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 17: 8th Ave. & Hal Greer Blvd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00		0.95		1.00	0.95	
Frt	1.00	0.98		1.00	1.00	0.85		0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1736	1796		1736	1827	1553		3406		1736	3414	
Flt Permitted	0.27	1.00		0.26	1.00	1.00		0.95		0.08	1.00	
Satd. Flow (perm)	496	1796		472	1827	1553		3246		151	3414	
Volume (vph)	53	214	27	50	235	78	2	632	90	117	599	74
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%	157%
Adj. Flow (vph)	90	365	46	85	401	133	3	1079	154	200	1022	126
Lane Group Flow (vph)	90	411	0	85	401	133	0	1236	0	200	1148	0
Turn Type	Perm			Perm		Perm	Perm			pm+pt		
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	32.0	32.0		32.0	32.0	32.0		45.0		60.0	60.0	
Effective Green, g (s)	32.0	32.0		32.0	32.0	32.0		45.0		60.0	60.0	
Actuated g/C Ratio	0.32	0.32		0.32	0.32	0.32		0.45		0.60	0.60	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0		4.0		4.0	4.0	
Lane Grp Cap (vph)	159	575		151	585	497		1461		265	2048	
v/s Ratio Prot		c0.23			0.22					c0.08	0.34	
v/s Ratio Perm	0.18			0.18		0.09		c0.38		0.37		
v/c Ratio	0.57	0.71		0.56	0.69	0.27		0.85		0.75	0.56	
Uniform Delay, d1	28.2	30.0		28.2	29.6	25.3		24.4		23.3	12.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00		0.65		0.80	0.67	
Incremental Delay, d2	13.8	7.4		14.3	6.4	1.3		5.9		8.6	0.5	
Delay (s)	42.0	37.4		42.5	36.0	26.6		21.6		27.3	8.6	
Level of Service	D	D		D	D	C		C		C	A	
Approach Delay (s)		38.2			34.9			21.6			11.4	
Approach LOS		D			C			C			B	

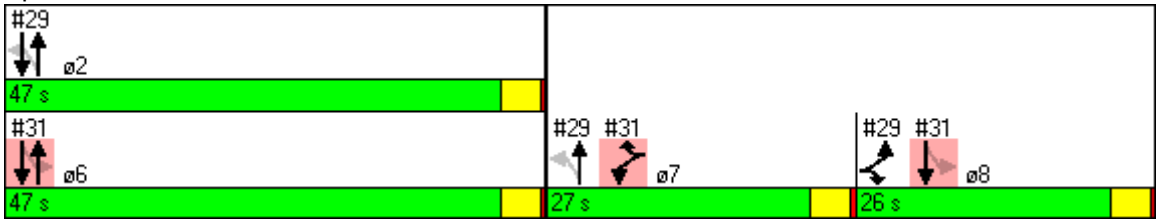
Intersection Summary			
HCM Average Control Delay	22.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	107.2%	ICU Level of Service	F
c Critical Lane Group			

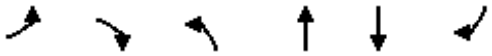
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø6	ø7
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0	0	40			0		
Storage Lanes	1	1	1			0		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Turning Speed (mph)	15	9	15			9		
Right Turn on Red		No				Yes		
Link Speed (mph)	35			35	35			
Link Distance (ft)	851			113	1749			
Travel Time (s)	16.6			2.2	34.1			
Volume (vph)	53	59	52	618	553	22		
Lane Group Flow (vph)	90	101	89	1055	982	0		
Turn Type		Prot	Perm					
Protected Phases	8	8		2 7	2		6	7
Permitted Phases			2 7					
Minimum Split (s)	20.0	20.0			20.0		20.0	20.0
Total Split (s)	26.0	26.0	74.0	74.0	47.0	0.0	47.0	27.0
Total Split (%)	26%	26%	74%	74%	47%	0%	47%	27%
Yellow Time (s)	3.5	3.5			3.5		3.5	3.5
All-Red Time (s)	0.5	0.5			0.5		0.5	0.5
Lead/Lag	Lag	Lag						Lead
Lead-Lag Optimize?	Yes	Yes						Yes
Queue Length 50th (ft)	47	54	0	1	325			
Queue Length 95th (ft)	91	101	m0	1	402			
Internal Link Dist (ft)	771			33	1669			
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (ft)			40					
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary

Area Type: Other
Cycle Length: 100
Offset: 4 (4%), Referenced to phase 2:NBSB and 6:, Start of Green
Natural Cycle: 65
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 29: Charleston Ave. & Hal Greer Blvd.





Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	
Frt	1.00	0.85	1.00	1.00	0.99	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1805	1615	1805	3471	3456	
Flt Permitted	0.95	1.00	0.21	1.00	1.00	
Satd. Flow (perm)	1805	1615	404	3471	3456	
Volume (vph)	53	59	52	618	553	22
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	157%	157%	157%	157%	157%	157%
Adj. Flow (vph)	90	101	89	1055	944	38
Lane Group Flow (vph)	90	101	89	1055	982	0
Heavy Vehicles (%)	0%	0%	0%	4%	4%	0%
Turn Type		Prot	Perm			
Protected Phases	8	8		2 7	2	
Permitted Phases			2 7			
Actuated Green, G (s)	22.0	22.0	70.0	70.0	43.0	
Effective Green, g (s)	22.0	22.0	70.0	70.0	43.0	
Actuated g/C Ratio	0.22	0.22	0.70	0.70	0.43	
Clearance Time (s)	4.0	4.0			4.0	
Lane Grp Cap (vph)	397	355	283	2430	1486	
v/s Ratio Prot	0.05	c0.06		c0.30	c0.28	
v/s Ratio Perm			0.22			
v/c Ratio	0.23	0.28	0.31	0.43	0.66	
Uniform Delay, d1	32.0	32.5	5.8	6.5	22.7	
Progression Factor	1.00	1.00	0.02	0.02	1.20	
Incremental Delay, d2	1.3	2.0	2.2	0.4	1.9	
Delay (s)	33.3	34.5	2.3	0.5	29.1	
Level of Service	C	C	A	A	C	
Approach Delay (s)	33.9			0.7	29.1	
Approach LOS	C			A	C	

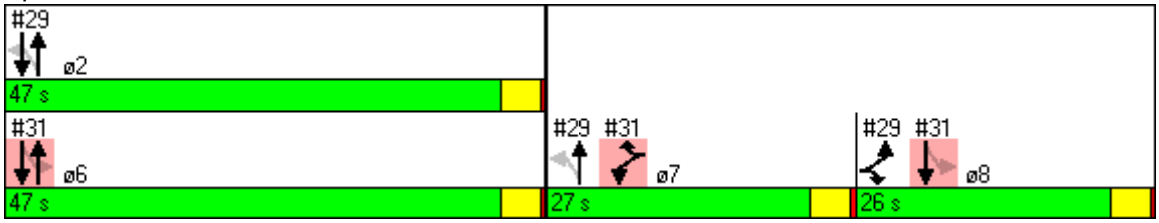
Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.2%	ICU Level of Service	A

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	ø2	ø8
Lane Configurations								
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0	0		0	40			
Storage Lanes	1	1		0	1			
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		
Turning Speed (mph)	15	9		9	15			
Right Turn on Red		No		Yes				
Link Speed (mph)	35		35			35		
Link Distance (ft)	744		508			113		
Travel Time (s)	14.5		9.9			2.2		
Volume (vph)	52	90	580	27	40	572		
Lane Group Flow (vph)	89	154	1036	0	68	976		
Turn Type		Prot			Perm			
Protected Phases	7	7	6			6 8	2	8
Permitted Phases					6 8			
Minimum Split (s)	20.0	20.0	20.0				20.0	20.0
Total Split (s)	27.0	27.0	47.0	0.0	73.0	73.0	47.0	26.0
Total Split (%)	27%	27%	47%	0%	73%	73%	47%	26%
Yellow Time (s)	3.5	3.5	3.5				3.5	3.5
All-Red Time (s)	0.5	0.5	0.5				0.5	0.5
Lead/Lag	Lead	Lead						Lag
Lead-Lag Optimize?	Yes	Yes						Yes
Queue Length 50th (ft)	46	84	274		1	4		
Queue Length 95th (ft)	89	144	349		m1	3		
Internal Link Dist (ft)	664		428			33		
50th Up Block Time (%)								
95th Up Block Time (%)								
Turn Bay Length (ft)					40			
50th Bay Block Time %								
95th Bay Block Time %								
Queuing Penalty (veh)								

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Offset: 4 (4%), Referenced to phase 2:NBSB and 6:, Start of Green	
Natural Cycle: 65	
Control Type: Pretimed	
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 31: Charleston Ave. & Hal Greer Blvd.



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1805	1615	3454		1805	3471
Flt Permitted	0.95	1.00	1.00		0.28	1.00
Satd. Flow (perm)	1805	1615	3454		525	3471
Volume (vph)	52	90	580	27	40	572
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	157%	157%	157%	157%	157%	157%
Adj. Flow (vph)	89	154	990	46	68	976
Lane Group Flow (vph)	89	154	1036	0	68	976
Heavy Vehicles (%)	0%	0%	4%	0%	0%	4%
Turn Type		Prot			Perm	
Protected Phases	7	7	6			6 8
Permitted Phases					6 8	
Actuated Green, G (s)	23.0	23.0	43.0		69.0	69.0
Effective Green, g (s)	23.0	23.0	43.0		69.0	69.0
Actuated g/C Ratio	0.23	0.23	0.43		0.69	0.69
Clearance Time (s)	4.0	4.0	4.0			
Lane Grp Cap (vph)	415	371	1485		362	2395
v/s Ratio Prot	0.05	c0.10	c0.30			c0.28
v/s Ratio Perm					0.13	
v/c Ratio	0.21	0.42	0.70		0.19	0.41
Uniform Delay, d1	31.2	32.8	23.2		5.5	6.7
Progression Factor	1.00	1.00	1.00		0.04	0.04
Incremental Delay, d2	1.2	3.4	2.7		0.9	0.4
Delay (s)	32.4	36.2	25.9		1.1	0.7
Level of Service	C	D	C		A	A
Approach Delay (s)	34.8		25.9			0.7
Approach LOS	C		C			A

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	47.5%	ICU Level of Service	A

c Critical Lane Group