Through Way Plan

Introduction

While an overall theme of the Plan is to develop a multi-modal system to provide travel options, the automobile will continue to be an important element of the mode mix. For the Plan, Liberty Avenue plays a key role, since it is identified as the Through Way component of the system of complete streets. As the primary arterial in the Strip District, Liberty Avenue carries heavy commuter traffic in the morning and afternoon peak travel periods. Likewise, Liberty Avenue has a history of crashes and fatalities. Finally, it has a number of Port Authority bus routes and stops serving numerous locations within the Strip District. This makes for a complex technical challenge for alternatives development.

Liberty Avenue looking outbound

Identifying Liberty Avenue Alternatives

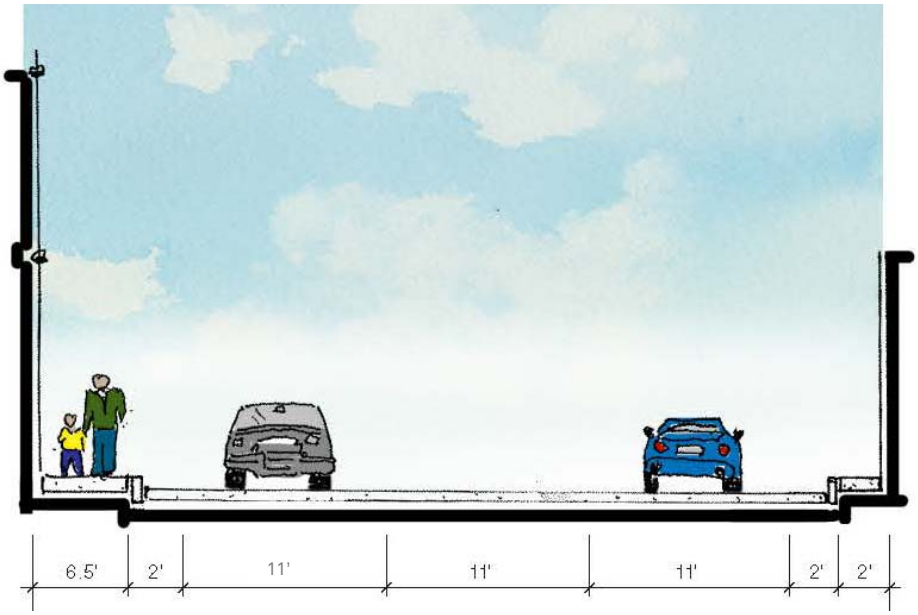
During the charrette, the idea of instituting a “road diet” on Liberty Avenue was tested. A road diet is a reduction in the number of lanes or a reallocation of lanes. Using the Synchro traffic model developed as part of the Southwestern Pennsylvania Commission’s (SPC) Regional Signals in Coordination (SINC) project as a base, AM and PM models for the Strip District were developed. The base model was expanded to include intersections studied as part of the Buncher Development Traffic Impact Study.

The Design Team conducted a walking tour to review the AM and PM operations on Liberty Avenue and other key locations in the study area. The review included an identification of potential deficiencies, obstructions to accessibility, and driver behavior. Several trends were noted:

- During the AM peak hours, key signalized intersections along Liberty Avenue are controlled by police officers.
- Outside of the peak hours, the signals operate on pre-timed, time-of-day patterns, i.e., there is no vehicular detection for side streets. This means that even if there are no vehicles on the side street, this approach still gets green time during the cycle.
- The pedestrian accommodations such as signal heads, push buttons, markings, etc. are not consistent throughout the study area.
- Lanes are approximately 10 ft. wide on Liberty Avenue and drivers tend to shy away from the outbound outside lane due to an adjacent wall.
- Rights-of-way widths are varied along the stretch of Liberty Avenue in the Strip District.
- Drivers tend to avoid being behind a bus due to the numerous stops along Liberty Avenue. In the outbound direction, when a bus is not present, drivers tend to avoid the inside lane due to left-turning vehicles.

Based on these findings and trends, the Design Team developed alternatives aimed at modifying the lane configurations, while providing congestion relief, maintaining capacity and reducing crashes and fatalities. The two alternatives are 1) One-lane each direction with a center turn lane and 2) Two lanes outbound and one lane inbound. The proposed typical section of Liberty Avenue is shown in Figure 1.

Figure 1: Proposed Through Way Typical Section



Alternative 1: Liberty Avenue (One-lane each direction with a center turn lane)

A countermeasure to reduce predominant crash types (rear-end and left-turn type) in the Liberty Avenue corridor is to provide storage for left-turn movements. Due to the limited right-of-way and roadway width, a road diet concept with one lane in each direction with a center turn lane was tested. This alternative includes the following elements:

- Maintain four-lane roadway on Liberty Avenue from 11th Street to 16th Street. At 16th Street, drop the outbound thru lane as an exclusive left-turn lane.
- Reduce number of lanes on Liberty Avenue from 16th Street to Herron Avenue to one lane in each direction, plus left-turn lanes at each intersection where left-turns are permitted.
- Increase Liberty Avenue lane widths to 11 ft. while maintaining the existing curb lines.
- Add traffic signal vehicle detection to side roads.
- Add traffic signal vehicle detection to left-turn lanes on Liberty Avenue; modify phasing to have an exclusive left-turn phase.
- Add traffic signal vehicle detection to 16th Street and Penn Avenue.
- Modify the 21st Street approach at Liberty Avenue, to be a left-turn lane plus a through-right lane. This is accomplished by removing parking on one side of 21st Street between Penn Avenue and Liberty Avenue.
- Modify the 28th Street approach at Liberty Avenue, to be a left-turn lane plus a thru-right lane.

Existing 21st Street approach to Liberty Avenue

Alternative 2: Liberty Avenue (Two Lanes Outbound and One Lane Inbound)

Based on the existing traffic volumes, the left-turns from Liberty Avenue to the side roads is typically minor. However, these vehicles have a major impact on the corridor's traffic operations and safety. A second alternative was evaluated to test two lanes outbound and one lane inbound. Coupled with Penn Avenue, AM commuters have two choices for traveling inbound. This is confirmed by the directional distribution during the AM and PM peak hours along Liberty Avenue. This alternative includes the following elements:

- Maintain a four-lane roadway on Liberty Avenue from 11th Street to 16th Street. At 16th Street, drop the outbound through lane as an exclusive left-turn lane.
- Reduce the number of lanes on Liberty Avenue from 16th Street to Herron Avenue to two lanes outbound and one lane inbound.
- Increase Liberty Avenue lane widths to 11 ft. while maintaining the existing curb lines.
- Add detection to side roads.
- Add detection to 16th Street & Penn Avenue.
- Modify the 16th Street approach at Liberty Avenue, to be a left-turn lane plus a shared left-right lane. No right-turns on red will be allowed.
- Modify the 21st Street approach at Liberty Avenue to be a left-turn lane plus a through-right lane. This is accomplished by removing parking on one side of 21st Street between Penn Avenue and Liberty Avenue.
- Modify the 28th Street approach at Liberty Avenue to be a left-turn lane plus a thru-right lane.

Existing 16th Street approach to Liberty Avenue

Results of Liberty Avenue Alternative Analysis

The alternatives were tested and compared to the Optimized Existing conditions reported in the SINC project. As a conservative approach, no vehicular volume offset for changes in mode choice were incorporated. Table 1 summarizes the average travel time, delay, and speed for Liberty Avenue between 16th Street and 31st Street. The results indicate the two alternatives tested may provide operational efficiencies by reducing the time it takes to traverse from 16th to 31st Streets within the Strip District. These efficiencies are a combination of the changes in lane assignments plus the proposed upgrades to the existing signal system. During the analysis, the goal was to progress the thru movement, i.e. Liberty Avenue, which results in increased delay at several side road approaches. Although not reported within this memo, under Alternative 1, the Liberty Avenue outbound thru movement at several intersections operates poorly during the PM peak period. This can be attributed to the reduction in thru lanes. It is recommended to conduct additional evaluations to develop signal timing plans to balance these delays.

Table 1: Measures of Effectiveness Summary

Measure of Effectiveness	Direction	Existing[1 & 2]		Alternative 1		Alternative 2	
		AM	PM	AM	PM	AM	PM
Average Travel Time (min.)	Outbound	4.0[1]	6.1[1]	3.4	5.2	3.2	4.0
	Inbound	3.9[1]	4.9[1]	4.0	4.7	3.5	4.1
Average Delay (min.)	Outbound	1.3[1]	3.3[1]	0.9	2.9	0.7	2.0
	Inbound	1.0[1]	2.0[1]	1.6	2.4	1.0	1.8
Average Travel Speed (mph)	Outbound	25.9[2]	21.2[2]	27	19	28	25
	Inbound	22.0[2]	18.5[2]	21	21	25	22

Notes:
1 – From SINC project (optimized 90-second cycle length)
2 – Average travel speed based on "before" conditions from SINC report. Average travel speeds for recommended (optimized) scenario were not reported.

Previous studies in the corridor identified several safety concerns including the location of fixed objects, narrow lane widths, and rear-end and left-turn type crashes. Both Alternatives take steps to address these issues with the proposed template of three 11 ft. lanes with 1 ft. offsets to the existing curbs. Alternative 1 also provides left-turn storage which would likely reduce the number of rear-end type crashes. While left-turn lanes are not provided with Alternative 2, safety for left-turning vehicles is enhanced since this movement is made against only one opposing thru lane.

The Through Way Plan Features

Providing a progressed movement through the Strip District will enhance vehicular operations, reduce delay, and increase safety. The following general recommendations are listed as follows and shown on Figure 2.

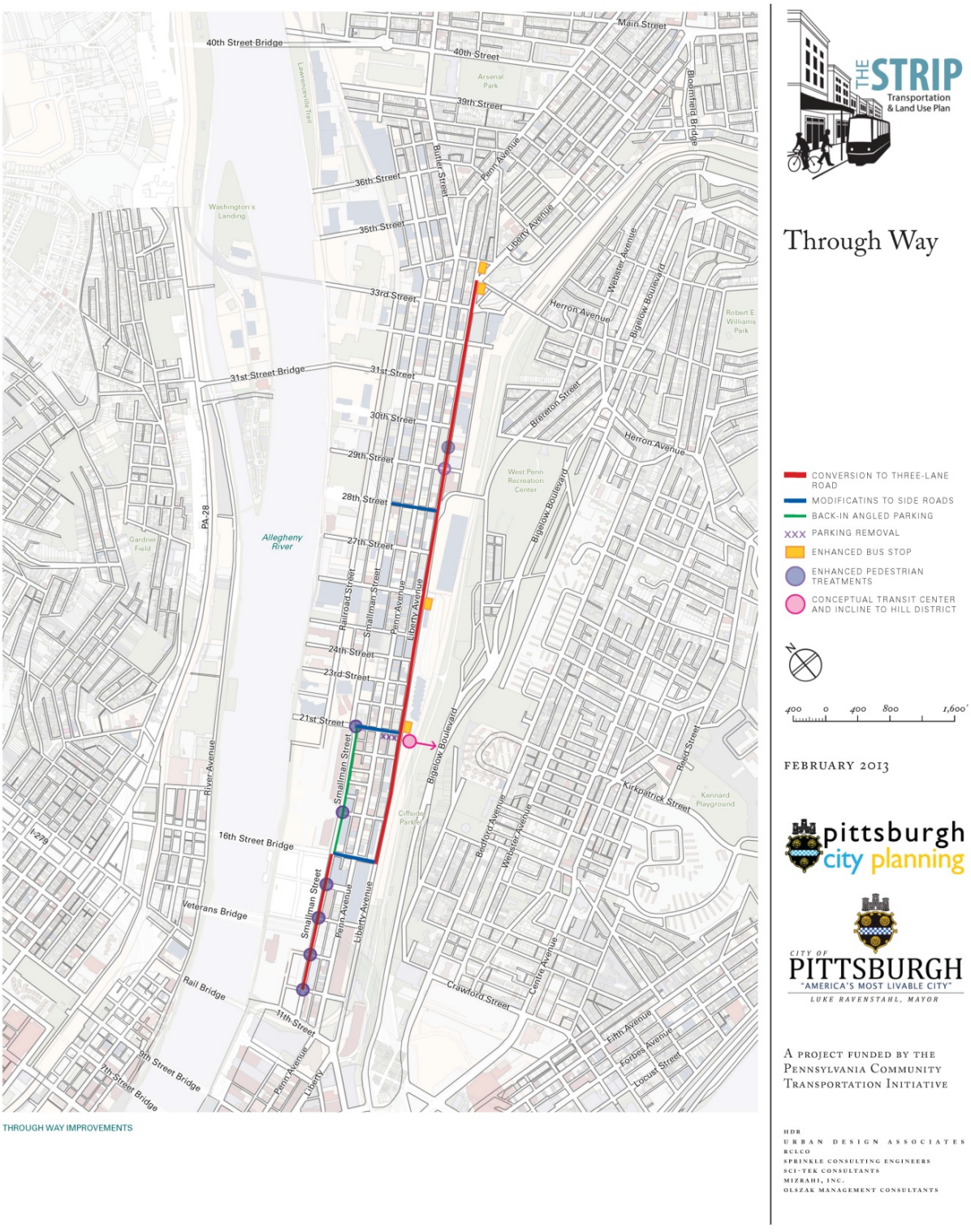
- Reduce Liberty Avenue to three lanes from 16th Street to Herron Avenue.
- Widen Liberty Avenue travel lanes to 11 ft.
- Modify lane configurations at 21st Street and 28th Street approaches to Liberty Avenue.
- Add side road vehicle detection at signalized approaches to Liberty Avenue.
- Provide enhanced bus stops at Liberty Avenue and 21st Street, 25th Street, and Herron Avenue while consolidating adjacent stops. These enhanced stops should include shelters, bus arrival information, bus pull-offs, etc.
- Add high-visibility crosswalk markings, pedestrian push buttons and count-down signal heads.
- Remove fixed objects along Liberty Avenue adjacent to travel lanes including unused poles, posts, and signs.

The Through Way Plan Benefits

Liberty Avenue remains the principal through route, serving AM and PM peak period traffic. The road diet allows for a reduced number of lanes without sacrificing capacity or safety concerns. Benefits that accrue to the Strip District include:

- Provide traffic calming which can reduce the number of crashes.
- Enhance traffic operations for a progressed movement along Liberty Avenue.
- Reduce conflict points.
- Provide positive guidance for pedestrians crossing Liberty Avenue.

Figure 2: Proposed Through Way Plan



THROUGH WAY IMPROVEMENTS