Confidential – Congested Corridor Improvement Program Study

Congested Corridor Improvement Program

Philadelphia Street Corridor

Indiana County, PA

prepared for:

PENNDOT

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2006

Congested Corridor
Improvement Program
Philadelphia Street Corridor
Indiana County, PA

1. EXECUTIVE SUMMARY

1.1 Overview

The Pennsylvania Department of Transportation (PennDOT) initiated the Congested Corridor Improvement Program (CCIP) to identify congested corridors in the Commonwealth and, in conjunction with its partners, define and implement the needed improvements. A Standard Study Methodology (SSM) was developed as part of the CCIP to provide a uniform approach to identify improvements and assess their effectiveness in accordance with the goal of the program. The SSM identifies the steps involved in an engineering study of improvement alternatives and focuses on the use of simulation models as analysis tools to evaluate the operational impacts of those alternatives.

It is not the intent of the CCIP to focus on long-range planning but instead to focus on ***immediate*** and ***short-term*** improvements that achieve the goal of a 20 percent reduction in peak hour travel time and/or system delay on the improved transportation corridor. Long-term improvements, where identified, are presented only at the conceptual level. These may require additional traffic data, more thorough traffic analysis, and detailed engineering before implementation is possible.

Based on an evaluation of the suitability for the CCIP, the Philadelphia Street corridor was included in the program. The study corridor is located in PennDOT Engineering District 10-0 within Indiana County, and extends from US 422 Business to South 3rd Street. It is contained within the Borough of Indiana and White Township, is 2.66 miles in length, and includes 10 signalized intersections.

1.2 Study process

1.2.1 Stakeholder Formation and project meetings

The initial stage of the study process involved formation of a stakeholder group. The Standard Study Methodology identifies coordination among stakeholders within congested corridor regions as an essential part of the entire corridor improvement process. Project meetings are the arenas to identify project progress, exchange information, and obtain consensus to move forward in a given direction.

The major stakeholders for this project identified by PennDOT District 10-0 were as follows:

- PennDOT Engineering District 10-0
- PennDOT's Bureau of Highway Safety and Traffic Engineering (BHSTE)
- Indiana Borough
- White Township
- Southwestern Pennsylvania Commission
- Indiana County Planning Commission.

1.2.2 DATA COLLECTION

An inventory of existing roadway features was developed through available as-built plans, traffic signal permit plans, aerial photography, and field observation data. A comprehensive traffic data collection effort was undertaken to establish base operational conditions for the corridor. This effort included mainline traffic volume counts, manual intersection turning movement counts, and a travel time and delay study. The mainline traffic counts were conducted from March 21 to March 22, 2006 using Automatic Traffic Recording (ATR) devices. Vehicle turning movement and pedestrian counts were performed at the study intersections for the AM peak period (6:00 AM to 9:00 AM), Midday peak period (11:00 AM to 1:00 PM), and PM peak period (3:00 PM to 6:00 PM) from March 21 to March 22, 2006. The travel time studies were performed during these same time frames using the procedures described in the Institute of Transportation Engineers (ITE) Manual of Transportation Engineering Studies.

1.2.3 TRAFFIC ANALYSES

The entire corridor was analyzed using the collected peak hour traffic volumes along with the traffic analysis and simulation software packages Synchro and SimTraffic. This software was calibrated to match the field-measured travel time and delay. Analyses were conducted using existing 2006 traffic data and projected 2016 data, both with and without improvements.

1.2.4 ALTERNATIVES ANALYSIS

The alternatives in this study were divided into immediate, short-, and long-term improvements. The assumed time to implement for each category is as follows:

- Immediate – Less than 1 year
- Short – 1 to 3 years
- Long – Greater than 3 years.

The immediate and short-term improvements require a minimum time framework to implement, and therefore can be completed within the schedule of the CCIP. The long-term improvements may require thorough planning and extensive design, which may require special environmental considerations and right-of-way acquisition, and therefore may not be completed within the parameters of the CCIP.

1.3 TABLE OF RECOMMENDATIONS

Cost of Immediate Improvements

LOCATION	IMPROVEMENT	ESTIMATED COST
Corridor-wide	Retime signals	$2,600
	Upgrade pavement markings	$15,000
	Upgrade signing	
	Implement an Access Management Policy	NA
Shelly/Mill Run Drive	Relocate pedestrian push buttons (2 locations)	$500
College Lodge/ Acorn Street	Improve intersection sight distance	Not calculated
13th Street	Repair side street detection	$1,000
9th Street	Improve lane use signing including WB left-turn lane drop	$500
7th Street	Reconfigure NB approach to left only and shared thru/right	$500
	Reconfigure SB approach to left only and shared thru/right	$500
	Improve lane use signing	$500
6th Street	Remove bollard	$500
4th Street	Fix deficient transition traveling eastbound east of intersection	$500
	Reconfigure SB approach to left only and shared thru/right	$500

Cost of Short-term Improvements

LOCATION	IMPROVEMENT	ESTIMATED COST
Corridor-wide	Signal Enhancement Project	$1,000,000
	Convert four lane section to two through lanes with a center turn lane and bicycle lanes	Not calculated
US 422 Business	Add NB left-turn lane	$354,000
	Add WB left-turn lane	
13th Street	Add EB and WB left-turn lanes	$4,000
11th Street	Add EB and WB left-turn lanes	$4,000
	Install RR gate arms as currently planned	Not calculated
	Check to verify signal does not warrant RR preemption	Not calculated
9th Street	Add NB right-turn lane	$2,000
7th Street	Consider installing bulb-outs	$94,000
	Modify pedestrian phasing ▪ Option 1: Reevaluate timing needs for all ped phase ▪ Option 2: Install lead pedestrian intervals	$500
6th Street	Add NB right-turn lane	$2,000
3rd Street	Add EB and WB left-turn lanes	$4,000

Breakdown of Signal Enhancement

Element	Implementation Considerations
Solid state controllers and possible closed loop	▪ Required for updated timing implementation ▪ Approximate cost: $14,000
Wireless interconnect	▪ Required for updated timing implementation ▪ Approximate cost: $1,000
Detection	▪ Detection is necessary to maximize corridor performance ▪ Approximate cost : $24,000
Refine timings	▪ Engineering and implementation only; no construction costs
Recalculate pedestrian and clearance intervals	▪ Engineering and implementation only; no construction costs
Light emitting diode (LED) indications	▪ Approximate cost: $5,600
Countdown pedestrian indications and pushbuttons	▪ Approximate cost: $5,800
Upgrade crosswalks	▪ Approximate cost: $500
Replace outdate structures, as needed	▪ Approximate cost: $25,000
Upgrade street name signs	▪ Approximate cost: $2,000
Additional costs (Mobilization, Conduit/Cabling)	▪ Approximate cost: $15,500

Cost of Long-term Improvements

Location	Improvement	Estimated Cost
Corridor-wide	In current four-lane section, modify the cross section to provide one travel lane in each direction, a two-way left-turn lane, and two five-foot bicycle lanes	$38,000
	In current four-lane section, add a landscaped grass median in areas where center-turn lane would not be needed	$250,000
US 422 Business	Add NB right-turn lane	$380,000
	Add WB right-turn lane	
Shelly/Mill Run Drive	Add second WB left-turn lane	$83,000
9th Street	Realign 9th Street	$272,000
7th Street	Consider pedestrian mall on north leg (see discussion on negative impact to traffic operations) if it benefits community development	NA

Total Estimated Cost

Alternative Category	Estimated Cost
Immediate	$22,600
Short-Term	$$1,464,500
Long-Term	$985,000

These costs are the total of all improvements for the respective term. The costs per improvement typically include the total of materials, labor, and right-of way where required. Cost estimate calculations are contained in the Technical Appendices.

Corridor Benefit/Costs

Alternative Category	Estimated B/C
Immediate	45.87
Short-Term	2.64
Long-Term	12.03

Safety Crash Reductions for Immediate Improvements

Location	Improvement	Estimated Crash Reduction Factor
Corridor-wide	Retime signals	0.10
	Upgrade pavement markings	0.10
	Upgrade signing	
	Implement an Access Management Policy	NA
	Total	0.19
Shelly/Mill Run Drive	Relocate pedestrian push buttons (2 locations)	0.10
College Lodge/ Acorn Street	Improve intersection sight distance	0.30
13th Street	Repair side street detection	0.10
11th Street	None	NA
9th Street	Improve lane use signing including WB left-turn lane drop	0.10
7th Street	Reconfigure NB approach to left only and shared thru/right	0.27
	Reconfigure SB approach to left only and shared thru/right	0.27
	Improve lane use signing	0.10
	Total	0.32
6th Street	Remove bollard	0.20
5th Street	None	NA
4th Street	Fix deficient transition traveling eastbound east of intersection	0.05
	Reconfigure SB approach to left only and shared thru/right	0.27
	Total	0.27
3rd Street	None	NA

Safety Crash Reductions for Short-term Improvements

Location	Improvement	Estimated Crash Reduction Factor
Corridor-wide	Signal Enhancement Project	0.22
US 422 Business	Add NB left-turn lane	0.27
	Add WB left-turn lane	
13th Street	Add EB and WB left-turn lanes	0.47
11th Street	Add EB and WB left-turn lanes	0.47
	Install RR gate arms as currently planned	0.70
	Check to verify signal does not warrant RR preemption	NA
	Total	0.84
9th Street	Add NB right-turn lane	0.10
7th Street	Consider installing bulb-outs	0.30
	Modify pedestrian phasing ▪ Option 1: Reevaluate timing needs for all ped phase ▪ Option 2: Install lead pedestrian intervals	0.25 for lead pedestrian interval
6th Street	Add NB right-turn lane	0.10
3rd Street	Add EB and WB left-turn lanes	0.47

Safety Crash Reductions for Signal Enhancement Project

Element	Estimated Crash Reduction Factor
Solid state controllers and possible closed loop	0.20
Wireless interconnect	0.10
Detection	0.10
Refine timings	0.10
Recalculate pedestrian and clearance intervals	0.10
Light emitting diode (LED) indications	0.30
Countdown pedestrian indications	0.25
Upgrade crosswalks	0.25
Replace outdated structures, as needed	-
Upgrade street name signs	0.20

Safety Crash Reductions for Long-term Improvements

Location	Improvement	Estimated Crash Reduction Factor
US 422 Business	Add NB right-turn lane Add WB right-turn lane	0.10
Shelly/Mill Run Drive	Add second WB left-turn lane	0.27
9th Street	Realign 9th Street	0.50
7th Street	Consider pedestrian mall on north leg (see discussion on negative impact to traffic operations) if it benefits community development	0.30

2. INTRODUCTION

2.1 Background

The Pennsylvania Department of Transportation (PennDOT) initiated a pilot Congested Corridor Improvement Program (CCIP) to identify congested corridors in the Commonwealth and, in conjunction with its partners, define and implement the needed improvements. The goal of the CCIP is a 20 percent reduction in peak hour travel time on the improved transportation corridor. However, due to the uniqueness of the corridor, this study focused on optimizing intersection throughput, reducing overall intersection delay, and improving safety. The proposed improvements are directed at activities such as roadway geometry, signal operations, access management, multimodal initiatives, Intelligent Transportation Systems (ITS), traffic regulation techniques, Transportation Demand Management (TDM) measures, and planning and zoning practices that are appropriate for a particular transportation corridor. Transportation corridors and associated improvements are identified in partnership with Metropolitan Planning Organizations (MPOs) and Rural Planning Organizations (RPOs), including utilization of existing congestion management systems, which some MPOs/RPOs have already developed.

The CCIP initiative resulted from PennDOT's recent strategic planning process, the "Moving Pennsylvania Forward Update." It falls under the Mobility and Access Strategic Focus Area and the High-Level Goal of Efficient Movement of People and Goods. In addition, this congested corridor initiative is consistent with the principles of regional and corridor-based planning advocated by PennPlan (Pennsylvania's Statewide Long-Range Transportation Plan) and Pennsylvania's Highway Congestion Management Strategic Plan, which was developed with input from the planning partners and other stakeholders. Further information on PennPlan can be found on PennDOT's website (www.dot.state.pa.us) under More Links – Programs and Initiatives.

PennDOT requested each planning partner to nominate and submit information for corridors in their region for possible inclusion in this program. PennDOT identified certain criteria to determine which congested corridors should be nominated for a particular region. Using these criteria, the planning partners were asked to provide information about each of the corridors they nominated.

Review meetings were scheduled with the planning partners to discuss the nominations and obtain additional information on the nominated corridors in order to fully evaluate them for inclusion in the program. A 'Nomination Checklist' was distributed to each of the planning partners in advance of the review meetings to identify criteria that may not have been addressed in the original nomination report. In addition to completing each checklist, the meetings provided a forum to discuss the background of each corridor, refine the limits if warranted, identify risk factors that may preclude achievement of program goals, and discuss potential solutions.

The corridors were evaluated and selected based on their suitability for the program and stakeholder commitments. Based on this evaluation, the Philadelphia Street corridor located in Indiana County was included in the program.

2.2 Planning Ties

The CCIP has fundamental links to SPC's congestion management process and the Department's operational initiatives such as the Mobility Plan and Transportation Systems Operation Plan.

Planning Element	Ties to CCIP Study
Mobility Plan	▪ PennDOT and their planning partners have begun the development of the Mobility Plan, which will provide a long-term vision of the transportation system in Pennsylvania ▪ An integral component of the Mobility Plan is the Transportation Systems Operation Plan (TSOP)
Transportation Systems Operational Plan	▪ The TSOP will provide PennDOT with its first Operations Program and will look at major component areas including arterial systems ▪ A priority project included in TSOP was implementation of the Transportation Advisory Committee's Pennsylvania Traffic Signal Systems: A Review of Policies and Practices recommendations ▪ One recommendation in the TAC study was to expand the CCIP initiative ▪ A major theme of the TAC study was to proactively operate and manage signal systems ▪ Presently, the TSOP projects are being reviewed and applied at a regional level (Regional Operations Plan)
SPC's Congestion Management Process	▪ Indiana corresponds to Corridors 107 & 108 in SPC's CMP ▪ The CCIP complements SPC's CMP by focusing on Operational Improvement Strategies ▪ The information provided in the CCIP should be fed back into the CMP in order to adjust strategies and priorities
Indiana Multimodal Mobility Study (2003), which was a PennDOT sponsored Land Use Initiative	▪ http://www.spcregion.org/pdf/indianastudy.pdf Key recommendations include: ▪ *Coordination of traffic signals on Philadelphia Street is recommended if two improvements are made. First, the lane continuity should be improved so a vehicle passing through the commercial district does not have to change lanes. Secondly, the traffic signal equipment will need to be upgraded.* ▪ *Overall corridor pavement markings should be examined with special emphasis on lane continuity (i.e. the ability to travel through a corridor without having to change lanes).* ▪ *Developing a three-lane section (one through lane each direction with the third being a left turn lane, two-way left turn lane, or median) with aligned left turn lanes will provide similar delays with improved traffic flow.* The CCIP refined and further developed some of the recommendations from this study.

2.3 Standard Study Methodology

In addition to identifying congested corridors throughout the Commonwealth, the Department also developed a Standard Study Methodology (SSM) to identify improvements and assess their effectiveness in achieving the program goal of reducing peak hour travel time by 20 percent. This document describes the application of the SSM to the selected corridor and identifies criteria such as improvement alternatives, selection of analytical tools, data collection requirements, and measures of effectiveness.

In the past, these corridors were of local interest and typically studied on an individual basis. However, the increasingly complex problems in transportation are becoming of wide interest and are best studied through a coordinated approach. The SSM identifies the steps involved in an engineering study of improvement alternatives and focuses on the use of simulation models as analysis tools to evaluate the operational impacts of those alternatives.

The engineering study process is typically initiated after operational or safety concerns are identified. In urbanized areas with a population over 200,000, transportation concerns may be identified as part of the Congestion Management System (CMS), but smaller areas may identify concerns in local corridors through experience. The corridors involved in this program were identified through written correspondence from the MPO or RPO to PennDOT upon a request to nominate a limited number of corridors within their boundaries. The written nominations from the MPOs/RPOs contain a description of the corridor and identified potential improvements. The goal of the SSM is to identify the most cost-effective solutions to improve the peak hour travel time on the selected corridor.

The SSM consists of multiple tasks in three specific stages which are shown in **Exhibit 2.1.** The first stage is the identification of viable alternatives. This stage includes coordination with the multiple stakeholders to identify problems and proposed solutions. Because many engineering studies are integral to a larger, more comprehensive process in which all transportation facilities are considered, it is vital that the steps are coordinated with all the stakeholders throughout the process to ensure success of this methodology. With this in mind, discrete steps were identified that call for consensus from the project team before moving further. The second stage consists of the engineering study, which includes selection of analytic tools, data collection, and analysis. Finally, the best alternatives are identified for their effectiveness and documented.

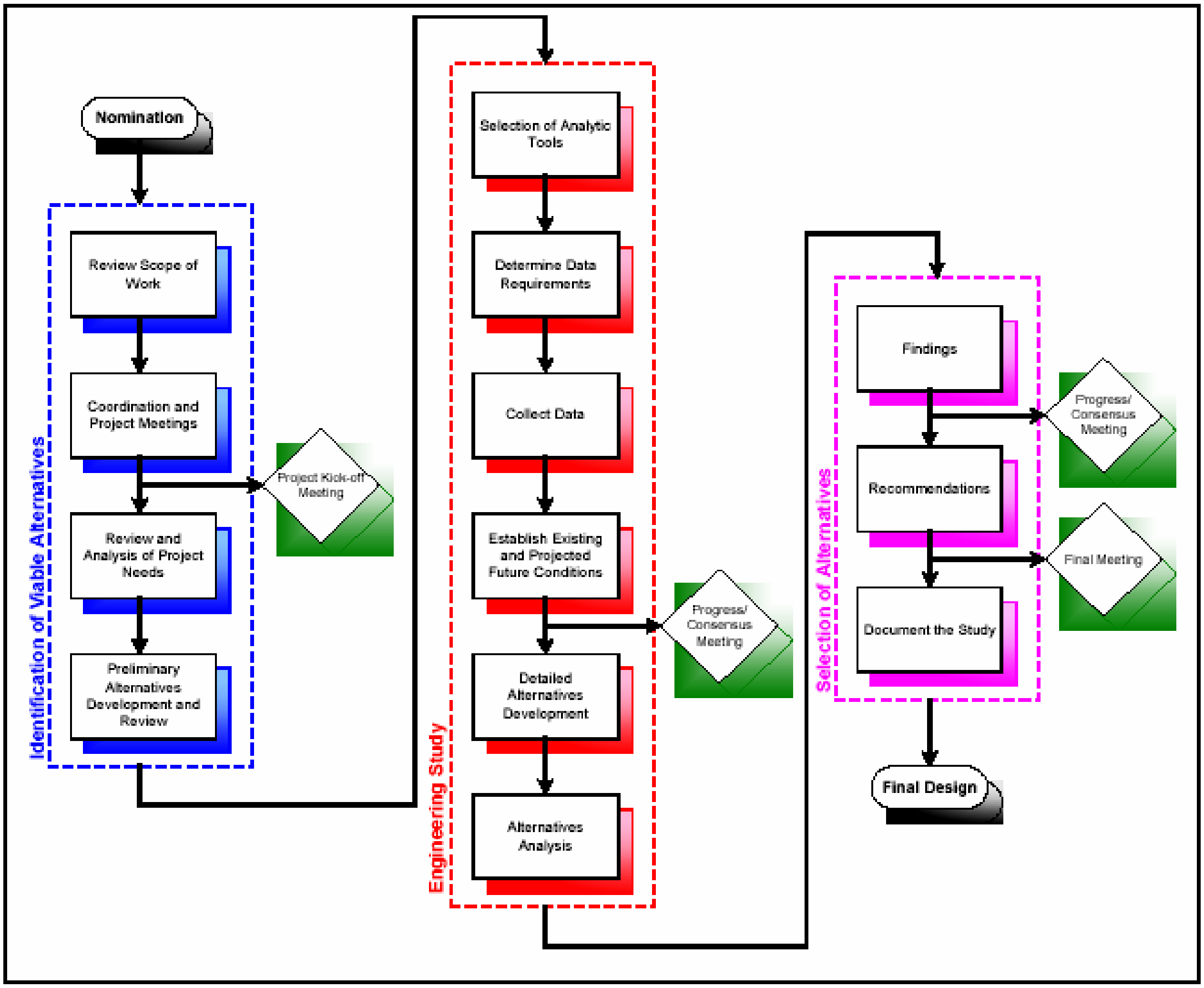


Exhibit 2.1 Standard Study Methodology Flowchart

During the identification of viable alternatives, a preliminary assessment of the bottlenecks and congested areas is made with the stakeholders, and improvement alternatives are identified. Baseline measurements are obtained to establish existing conditions and to determine bottleneck locations. The baseline conditions are critical to measure the effectiveness of alternatives and will be revisited throughout the program. Improvement alternatives consist of geometric, signal operations, access management, multimodal, ITS, traffic regulation, TDM, and planning and zoning practice improvements. Alternatives that could address the concerns are identified, and the list of alternatives is reduced to include the most viable alternatives.

During the engineering study, the viable alternatives are evaluated in terms of their effect on travel time and other factors. The accurate assessment of these alternatives requires the application of formal analysis procedures such as software applications. This stage will also require a data collection effort to supplement the analysis. The extent of the data collection effort should be identified up front and will depend on the amount of existing information that is recent and available. The traffic volumes are then projected for the future design year.

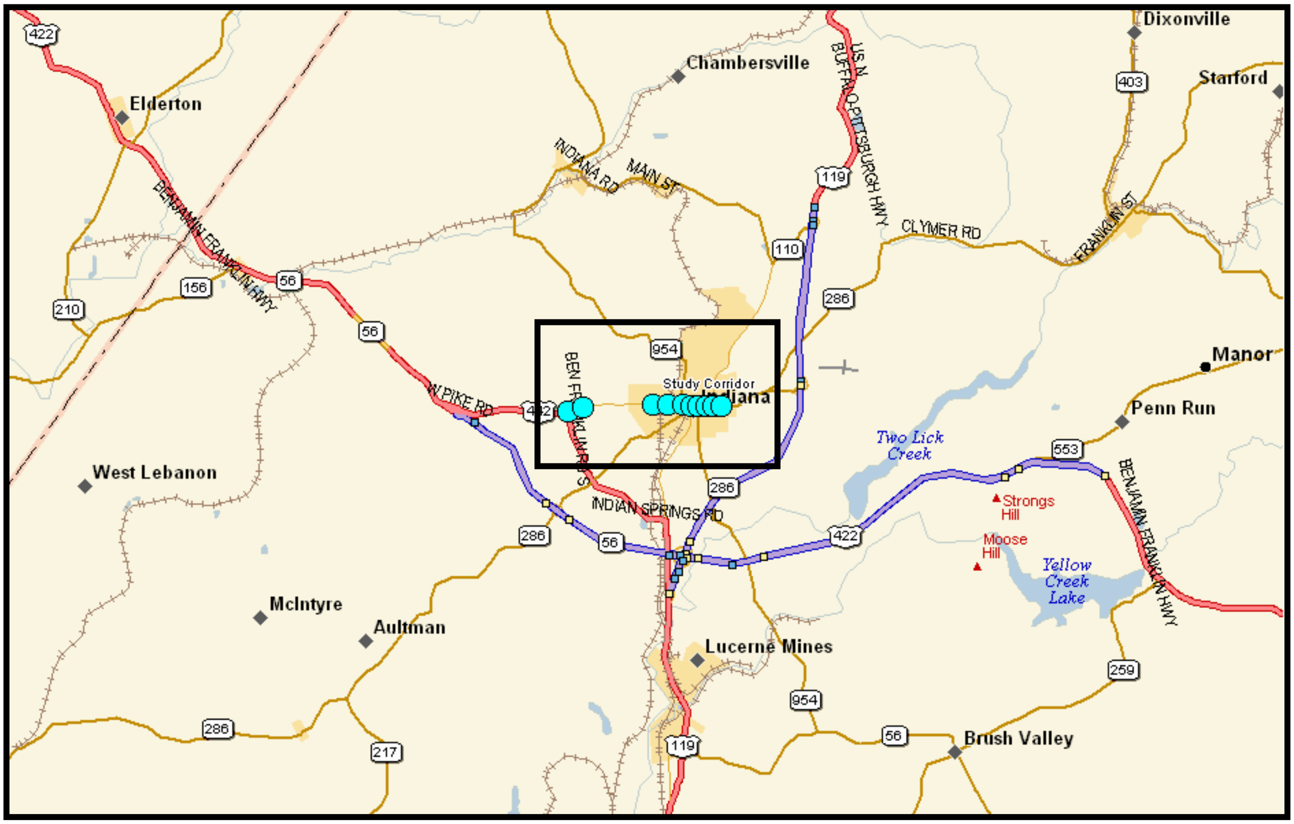
During the alternative selection stage, the alternatives are assessed and selected for implementation. The comparison of alternatives includes existing conditions, future no-build (includes planned projects that will be constructed within 10 years), and future build alternatives (no-build plus the alternatives). It is anticipated that there will be Short-Term and Long-Term improvement alternatives. In some cases, immediate improvements such as traffic signal timing optimization may be identified. The assessment should be focused on travel time, but it may consider other factors such as safety, disruption to the environment and adjacent property, and cost. Safety impacts may be based on informal assessment or formal quantitative evaluation, depending upon the location. Selection of alternatives may reflect construction costs as well. The methods used to determine the preferred alternatives will vary based on location and should be based upon all relevant facts. Finally, the study process is documented in a study report that includes the relevant findings and identified courses of action.

Although the goal of this study is to reduce congestion by 20 percent, all alternatives considered were evaluated to ensure that they are “reasonable and feasible.”

2.4 STUDY AREA

The Philadelphia Street corridor is located in PennDOT Engineering District 10-0 within Indiana County. The corridor extends from US 422 Business at the western end of the study area to South 3rd Street at the eastern end as presented in **Exhibit 2.2**. The study corridor is located in the Borough of Indiana and White Township, is 2.66 miles in length, and includes 10 signalized intersections.

Throughout the corridor, one lane of travel is provided in each direction, with the exception of the portion between 9th Street and 5th Street which has two lanes of travel in each direction. Other than at the signalized locations, left turn maneuvers are executed from the through lanes. The posted speed limit varies between 25 and 40 mph.



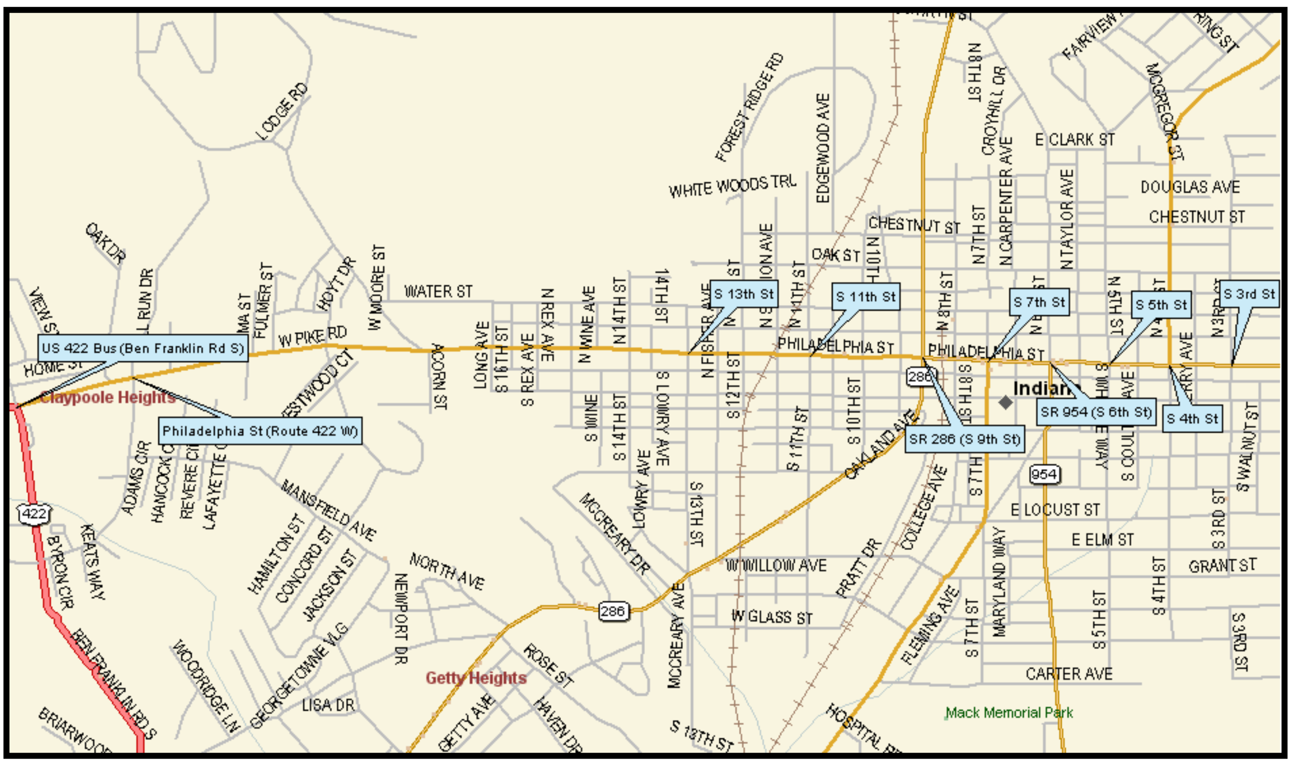


Exhibit 2.2 Location Map

2.5 STAKEHOLDER PROCESS

A stakeholder group was formed to help identify areas of concern, identify planned improvements, brainstorm potential solutions, and provide feedback on the overall project. Study stakeholders included:

- PennDOT Bureau of Highway Safety and Traffic Engineering
- PennDOT Engineering District 10-0
- Indiana Borough
- White Township
- Southwestern Pennsylvania Commission
- Indiana County Planning Commission.

The stakeholder group held two meetings. Meeting 1 focused on the project, areas of concern and planned improvements. Meeting 2 focused on existing conditions of the corridor and potential solutions. **Exhibit 2.3** outlines the material covered at each meeting.

Exhibit 2.3 Stakeholder Meetings

MEETING DATE	MEETING AGENDA
Meeting 1 – March 2, 2006	⅄ Stakeholder introductions ⅄ Project introduction and overview ⅄ Project schedule and milestones ⅄ Planned improvements
Meeting 2 – June 7, 2006	⅄ Summary of study progression ⅄ Existing traffic data ⅄ Crash data analysis ⅄ Identification of evaluation periods ⅄ Identification of possible improvements ⅄ Immediate improvements ⅄ Short-term improvements ⅄ Long-term considerations ⅄ Next steps

3. EXISTING CONDITIONS

3.1 Roadway and Corridor Classifications

3.1.1 Roadway Classification

Roadway classification of Philadelphia Street as well as intersecting roadways was taken from PennDOT's Straight Line Diagrams and is highlighted on **Exhibit 3.1**. Philadelphia Street has a federal functional classification of minor arterial in this area.

3.1.2 Posted Speed Limits

Posted speed limit data was gathered from traffic signal permit sheets and field observations. Posted speed limits are noted in **Exhibit 3.1**. Generally, speed limits varied from 25 to 45 mph.

3.1.3 Roadway Geometry

Intersection lane configurations were inventoried utilizing traffic signal permit plans and field observations. Lane configurations for each study intersection are presented in **Exhibit 3.1**.

3.1.3.1 Roadway Mapping Development

The mapping for this project was developed based on aerial photogrammetry, traffic signal permit plans, and field verification. To provide a composite drawing of the study area that could be utilized, information from the aerials and traffic signal permit plans was combined.

3.1.4 Signalized Intersections

The Philadelphia Street corridor includes 10 signalized intersections that are not currently interconnected. **Exhibit 3.2** summarizes the operational characteristics of each signalized intersection.

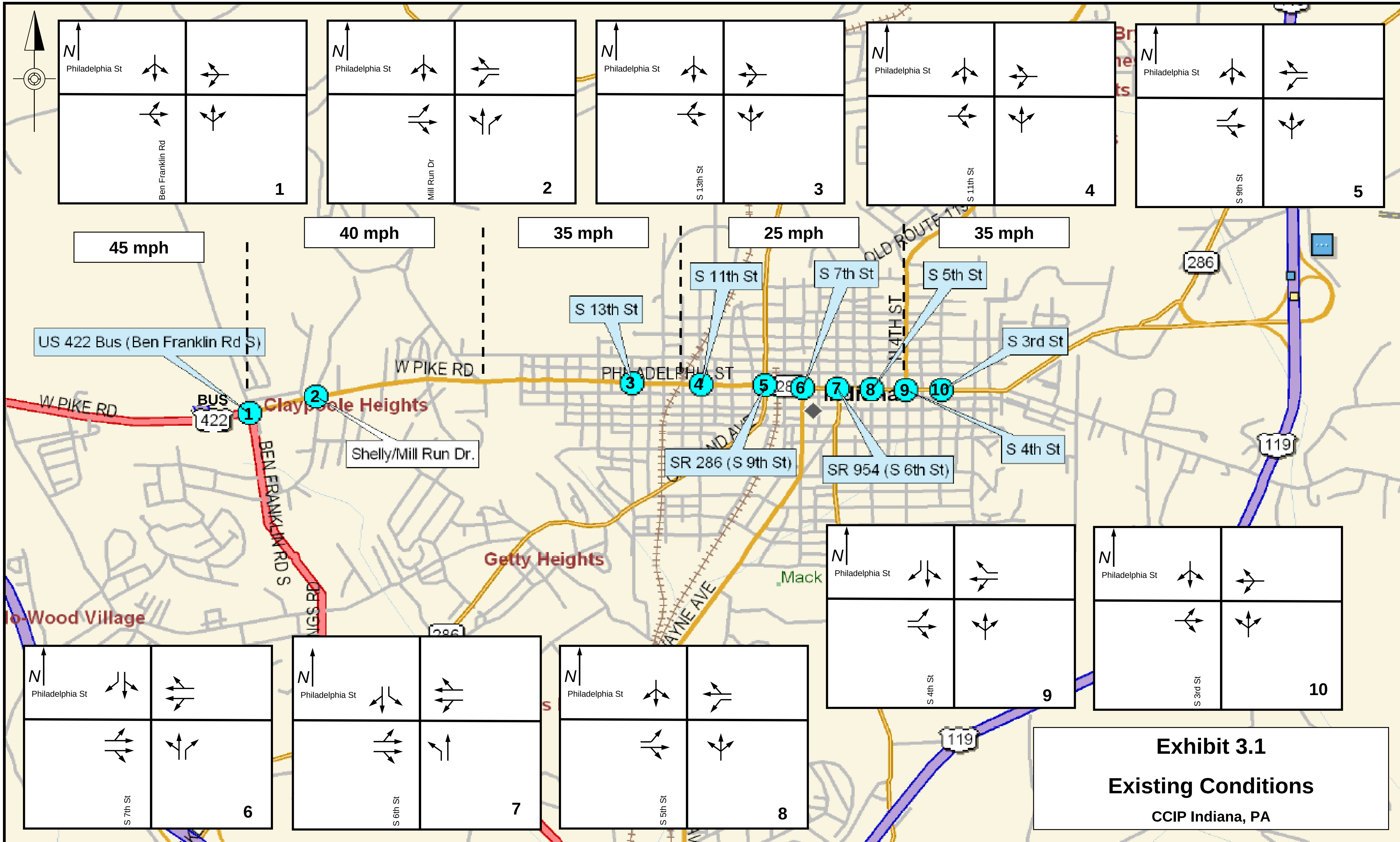


Exhibit 3.1

Existing Conditions

CCIP Indiana, PA

Exhibit 3.2 Intersection Operational Characteristics

Intersection	Photo	Municipality	Existing Systems and Cycle Lengths	Phasing
US 422 Business		White Township	System: None, free operation Cycle: Max cycle 80 sec	Two-phased operation
Shelly/Mill Run Drive		White Township	System: None, free operation Cycle: Max cycle 105 sec	Three-phased operation with: ▪ WB lead protected/ permitted left-turn phase
13th Street		Indiana Borough	System: None, free operation Cycle: Max cycle 70 sec	Two-phased operation

Exhibit 3.2 Intersection Operational Characteristics

Intersection	Photo	Municipality	Existing Systems and Cycle Lengths	Phasing
11th Street		Indiana Borough	System: None, free operation Cycle: Max cycle 59 sec	Two-phased operation
9th Street		Indiana Borough	System 9th to 4th, status unclear Cycle: 70 sec	Three-phased operation with: ▪ WB lead protected/ permitted left-turn phase
7th Street		Indiana Borough	System: System 9th to 4th, status unclear Cycle: 70 sec	Four-phased operation with: ▪ WB lead protected/ permitted left-turn phase ▪ All ped phase

Exhibit 3.2 Intersection Operational Characteristics

Intersection	Photo	Municipality	Existing Systems and Cycle Lengths	Phasing
6th Street		Indiana Borough	System: System 9th to 4th, status unclear Cycle: 70 sec	Two-phased operation
5th Street		Indiana Borough	System: System 9th to 4th, status unclear Cycle: 70 sec	Two-phased operation
4th Street		Indiana Borough	System 9th to 4th, status unclear Cycle: 70 sec	Three-phased operation with: ▪ EB lead protected/ permitted left-turn phase

Exhibit 3.2 Intersection Operational Characteristics

Intersection	Photo	Municipality	Existing Systems and Cycle Lengths	Phasing
3rd Street		Indiana Borough	System: None, free operation Cycle: Max cycle 60 sec	Two-phased operation

3.1.5 Pedestrian and Bicycle Facilities

Both pedestrian and bicycle activity are present throughout the corridor. There is limited pedestrian activity at the western portion of the corridor where there are presently no sidewalks for pedestrian use. Pedestrian push buttons are somewhat inaccessible at these intersections. Demands in the western portion of the corridor may increase as future land development occurs.

Pedestrian volumes increase significantly between 11th Street and 5th Street. These demands may be attributed to commercial district activities as well as the nearby university. Within the Borough, pedestrian accommodations vary. Most intersections have pedestrian indications and the intersection at 7th Street has an exclusive pedestrian phase and audible signal. In general, most crosswalks warranted upgrade (repainting) and indications have faded.

There was a significant amount of pedestrian activity that occurred during the study data collection period. **Exhibit 3.3** summarizes pedestrian volumes during the 3-hour count periods in the morning and evening, and 2-hour count period in the midday.

Exhibit 3.3. Peak Period Pedestrian Activity

Intersection		Peak Period Pedestrian Activity		
		AM	Mid	PM
1	*Ben Franklin Rd*	*0*	*0*	*0*
2	*Shelly/Mill Run*	*0*	*0*	*0*
3	*13th St*	*8*	*1*	*11*
4	*11th St*	*33*	*46*	*61*
5	*9th St*	*71*	*173*	*95*
6	*7th St*	*106*	*329*	*376*
7	*6th St*	*164*	*250*	*302*
8	*5th St*	*71*	*68*	*138*
9	*4th St*	*9*	*16*	*40*
10	*3rd St*	*8*	*13*	*11*

3.1.6 Transit Service

The Indiana Transit Authority has two routes that traverse the study corridor: Express West Route and Express East Route. Existing transit routes and stops are depicted in **Exhibit 3.4**.

Within the study area, the majority of stops associated with routes do not occur on Philadelphia Street with the exception of a stop just east of 4th Street.

3.1.7 Adjacent Land Use

For the most part, the corridor is characterized by dense commercial and residential development, becoming more sporadic as you proceed to the western portion of the study area. The dense land use throughout the majority of the corridor limits the feasibility of major geometric enhancements. In the western portion of the study area, there is greater potential for future development activities.

Exhibit 3.4

Indiana Transit Routes

CCIP Indiana, PA

3.2 Traffic Data Collection

3.2.1 Automated Traffic Recordings

One of the first tasks completed was the placement of Automatic Traffic Recorders (ATRs) at several locations throughout the corridor. ATRs were placed on Philadelphia Street near each end of the corridor, as well as a point between 7th and 9th Street. The ATRs were placed for a two-day period to identify the peak periods of travel and provide a general profile of how traffic moves throughout the corridor. **Exhibit 3.5** illustrates the traffic volume profile for a typical weekday at the mid-corridor location.

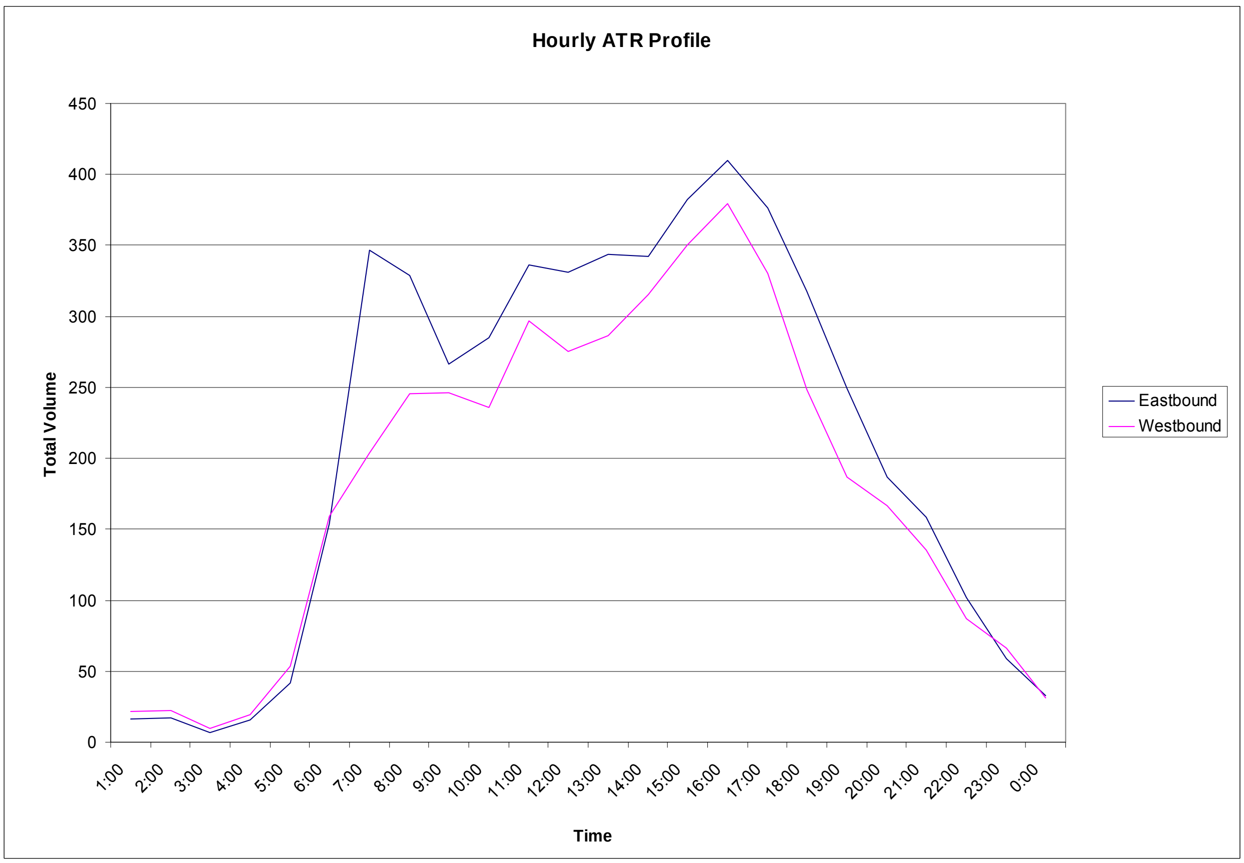


Exhibit 3.5 Typical Weekday Hourly Volume Variation (Philadelphia Street between 7th Street and 9th Street – March 20 to March 22, 2006)

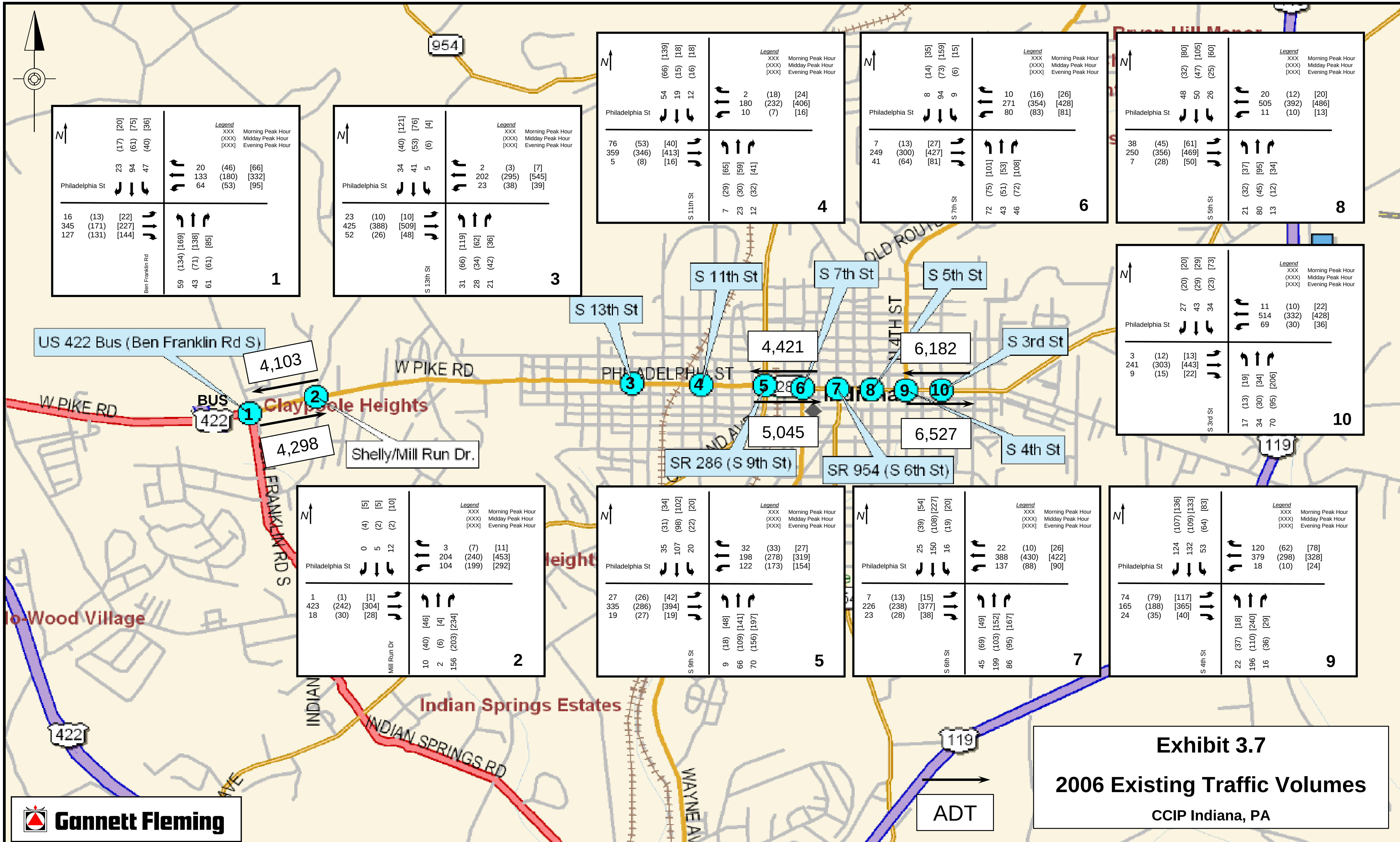
3.2.2 Manual Turning Movement Counts

Manual Turning Movement Counts (TMCs) were conducted at each signalized intersection in the study area. The counts were conducted during three travel periods: 6:00 to 9:00 (AM Peak), 11:00 to 1:00 (Midday Peak), and 3:00 to 6:00 (PM Peak). These counts were summarized and the peak hour during each peak period was identified. **Exhibit 3.6** indicates the total intersection volume by location in the corridor. The volume shown is the total approach volume for all legs approaching the intersection.

Exhibit 3.6 Turning Movement Count Peak Hour Volumes

Crossing Street	AM	Midday	PM
US 422 Business	1032	978	1409
Shelly/Mill Run Drive	938	976	1393
13th Street	887	1001	1576
11th Street	759	852	1255
9th Street	1040	1257	1497
7th Street	930	1121	1541
6th Street	1324	1240	1637
5th Street	1069	1036	1510
4th Street	1323	1135	1591
3rd Street	1072	912	1345

Exhibits 3.7 illustrates the peak hour turning movement volumes of each intersection in addition to average daily traffic recordings. It also shows the 24-hour traffic volumes obtained from the ATRs.


US 422 Bus (Ben Franklin Rd S)
4,103
4,298
Shelly/Mill Run Dr.
W PIKE RD
BUS 422
Claypoole Heights
PHILADELPHIA ST
S 13th St
S 11th St
S 7th St
S 5th St
S 3rd St
S 4th St
SR 286 (S 9th St)
SR 954 (S 6th St)
4,421
6,182
5,045
6,527
954
119
422
Indian Springs Estates
INDIAN SPRINGS RD
WAYNE AVE
ADT
Gannett Fleming
Exhibit 3.7
2006 Existing Traffic Volumes
CCIP Indiana, PA

3.2.3 TRAVEL TIME AND DELAY STUDY

The goal of the Congested Corridor Improvement Program is to reduce travel time through the corridor by 20 percent. To provide a baseline for measuring the effectiveness of the program and to provide data for model validation, a travel time and delay study was conducted for the Philadelphia Street corridor. The 2.66-mile corridor was traversed five times in each direction during each peak period (AM, Midday, PM) to determine the existing travel times. As the corridor was traversed, any time the vehicle speedometer dropped below 10 mph the duration of time below 10 mph was recorded as stopped time. The cumulative delay time recorded between signalized intersections was applied to the approaching signal as delay. From that information, graphs such as **Exhibits 3.8 and 3.9** were developed to identify how the travel speed compared to the posted speed limit for the roadway.

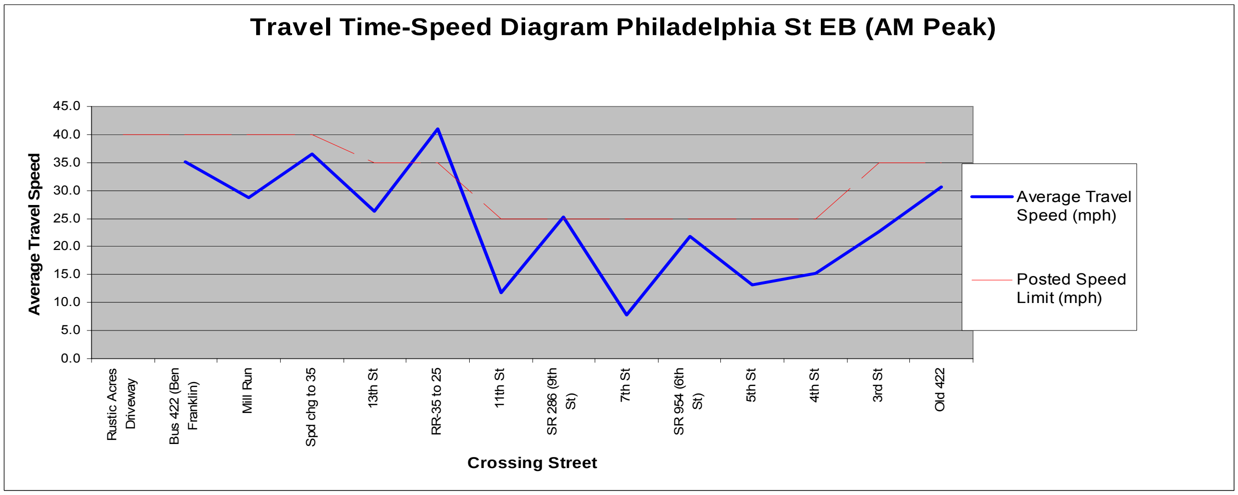


Exhibit 3.8 Travel Time – Speed Diagram Philadelphia St EB (AM Peak)

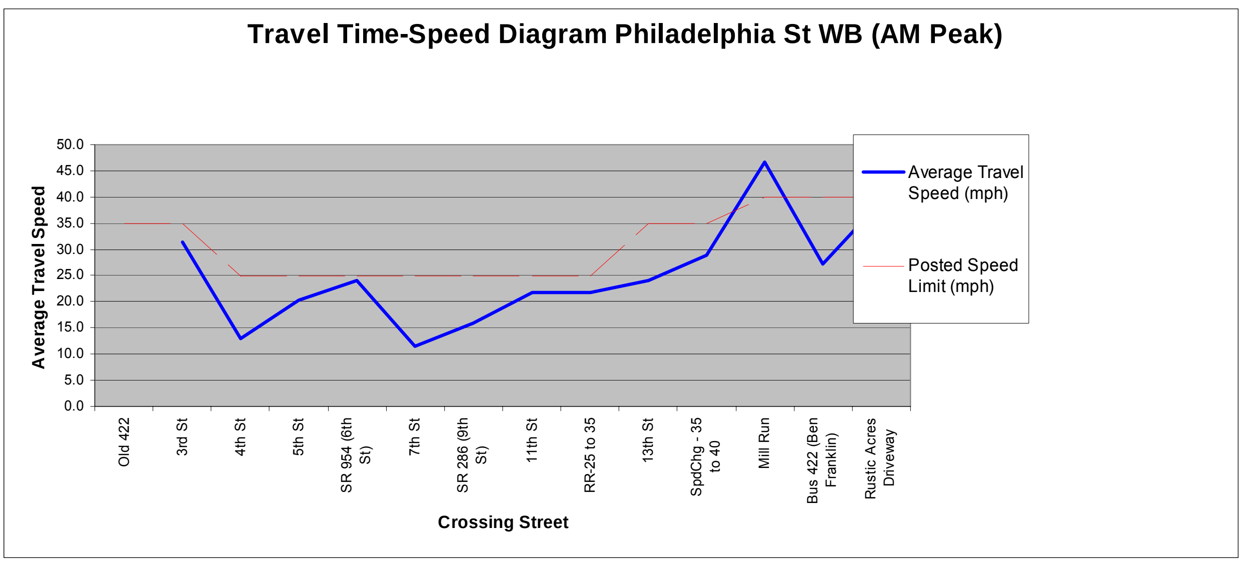


Exhibit 3.9 Travel Time – Speed Diagram Philadelphia St WB (AM Peak)

Complete travel time-speed diagrams for each time period are included in the Technical Appendix to this report. **Exhibit 3.10** lists the average travel times and travel speeds that were recorded in each direction for the Philadelphia Street corridor.

Exhibit 3.10 Average Travel Times and Speeds

Direction	Average Trip Time (min)	Average Travel Speed (mph)
AM Eastbound	7.6	24
Midday Eastbound	9.1	20
PM Eastbound	8.9	21
AM Westbound	7.0	26
Midday Westbound	7.7	24
PM Westbound	7.6	24

Generally, travel times in the eastbound direction exceeded travel times in the westbound direction. The mid-day eastbound trip was the highest travel time.

The delay portion of the results helps to determine what areas in the corridor cause a significant disruption to a driver's trip. Delay diagrams such as **Exhibits 3.11 and 3.12** demonstrate which intersections cause delay.

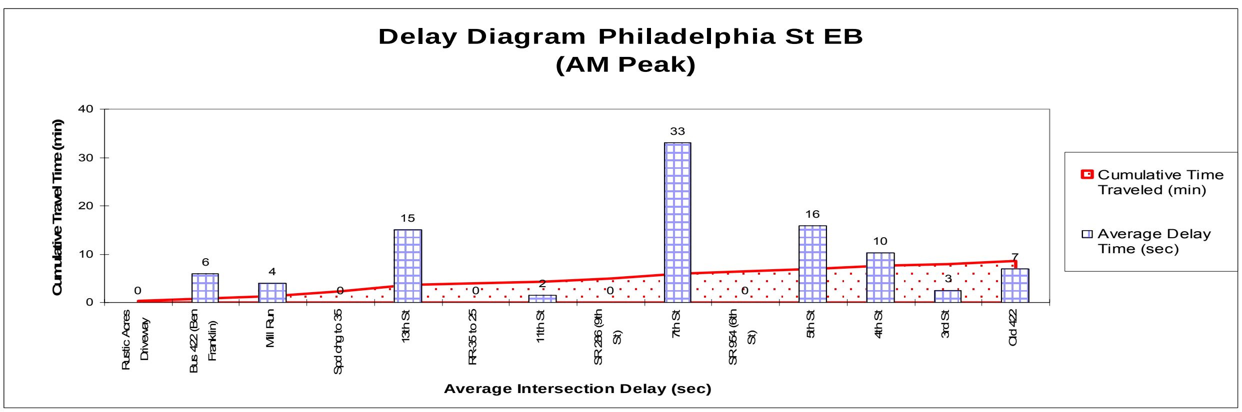


Exhibit 3.11 Delay Diagram Philadelphia Street Eastbound (AM Peak)

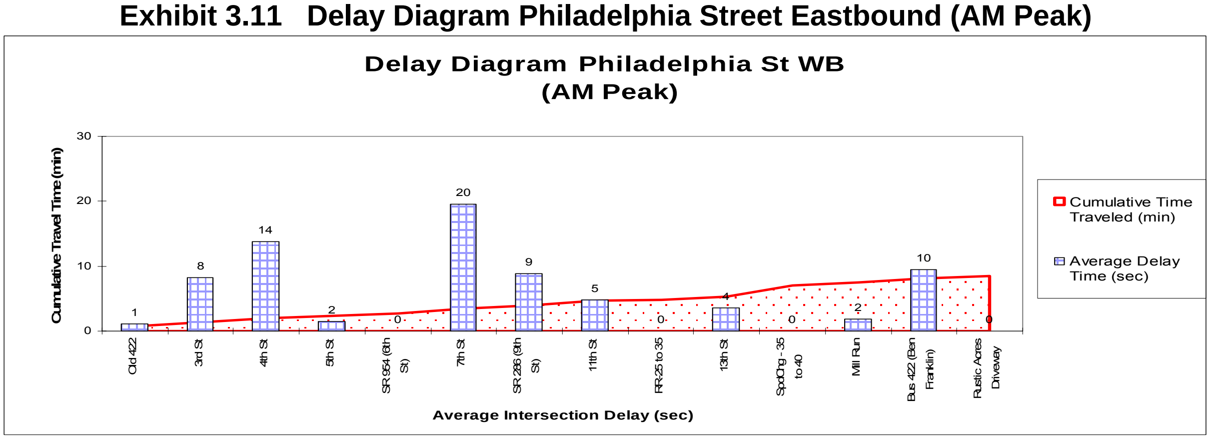


Exhibit 3.12 Delay Diagram Philadelphia Street Westbound (AM Peak)

Graphs for the other time periods are presented in the Technical Appendix.

The most significant delays occur at 7th Street. This may be due in part to the exclusive pedestrian phase that occurs at this location. **Exhibit 3.13** shows the delay that was recorded for each peak period in each direction through the corridor.

Exhibit 3.13 Average Peak Period Delay

Intersection	AM Delay EB (sec)	AM Delay WB (sec)	Midday Delay EB (sec)	Midday Delay WB (sec)	PM Delay EB (sec)	PM Delay WB (sec)
US 422 Business	6	10	10	10	14	12
Shelly/Mill Run Drive	4	2	9	2	5	3
13th Street	15	4	11	16	22	18
11th Street	2	5	8	3	8	7
9th Street	0	9	16	14	34	22
7th Street	33	20	33	22	45	21
6th Street	0	0	7	8	11	4
5th Street	16	2	11	2	11	4
4th Street	10	14	9	6	9	17
3rd Street	3	8	3	10	16	12

3.3 Operational Conditions

3.3.1 Selection of an Analysis Tool

One of the most critical aspects of the study is the selection of an appropriate software package for analysis and simulation. The two most commonly used traffic simulation packages used are SimTraffic and CORSIM. SimTraffic is the simulation arm of the traffic operations program Synchro developed by Trafficware. CORSIM is a powerful simulation tool, developed by the Federal Highway Administration. CORSIM consists of subprograms including ITraf, NETSIM, FREESIM and TRAFVU.

Most studies comparing the two simulation programs have indicated there are nominal differences in the outputs of the two programs. Vehicular speeds, delay and level of service in corridor assessments have been shown to be comparable.

Some of the primary differences between the two software packages include:

- Data Entry and Software Interaction– SimTraffic data is input through Synchro and is supported by a mapping interface that allows the user to validate inputs as well as to develop the network using CADD files or aerial images. Synchro can optimize traffic operations and can integrate with TRANSYT as an alternate optimization tool. Synchro and SimTraffic permit output to the Highway Capacity Software. The capabilities of Synchro and SimTraffic limit redundant data entry and transfer of operational results resulting in time savings and reducing the possibility of errors in data entry. CORSIM does not readily interact with other software packages and does not have optimization features; therefore this must be accomplished through alternate software packages.

- Freeway Operations – Most independent studies indicate that CORSIM more accurately models freeway operations.
- Unsignalized Intersections – SimTraffic can model various methods of unsignalized traffic control including YIELD conditions and all-way STOP control. CORSIM can only model two-way STOP control intersection.
- Pedestrians – SimTraffic can model individual pedestrians while CORSIM cannot.
- Transit - CORSIM can model transit operation while SimTraffic cannot.
- Queuing – The programs define queuing differently producing slightly different results.
- Graphical Output – SimTraffic allows a network to be displayed over a CADD file or aerial image while CORSIM does not.

Both programs have strengths and weaknesses, but both must be used properly and require network validation. Due to the flexibility of the Synchro/SimTraffic software packages and the arterial makeup of the study corridor it was concluded by the Study Team that Synchro would be used as the base input tool and SimTraffic would be used as the simulation program.

3.3.2 Calibration of Analysis Tool

After creating a Synchro model for each peak period, the travel time and delay times calculated within the model were compared to the results of the travel time and delay study. The following sub-sections describe the calibration techniques that were employed. Key adjustments included saturation flow rate, turning speed, parking maneuvers and link speed.

3.3.2.1 Intersection Delay and Flow

The most significant source of delay along the Philadelphia Street corridor comes from traffic signal delay. The travel time and delay study was compared with the Synchro model delay calculations for existing conditions. It is important to remember that the delays observed in the field are not necessarily indicative of the delays that Synchro calculates. The field observed delay is an average of five runs in each direction, whereas the Percentile Delay Method is utilized to calculate the Synchro delay. The Percentile Delay Method is based on the effective red time of the phase, the arrival rate of vehicles, the saturated flow rate and the maximum queue length. The process uses trigonometric relationships to determine maximum queue lengths, vehicle delay and percentile scenarios to find the standard deviations for those scenarios. Then, based on the operation of the signal, other calculation processes are entered to determine the delay that is given. A delay comparison between the field-observed delay and Synchro calculated delay is available in the Technical Appendix.

3.3.2.2 Corridor Travel Times

In addition to the comparisons of mid-block travel time and intersection delay, field-observed and calculated corridor travel times were compared. **Exhibit 3.14** shows the trip time comparison of the calibrated Synchro model and the observed trip time from the travel time and delay study. As the chart indicates, the modeled trip time is generally within ten percent of the observed trip time. From this comparison it is clear that the model is emulating field conditions fairly well and is therefore considered calibrated. The delay comparison that is provided in the Technical Appendix should be consulted when implementing any proposed changes to the existing traffic signal timing plans in the field.

Exhibit 3.14 Calibrated SYNCHRO Travel Time vs. Field Observed Travel Time

Peak Period and Direction	Field Trip Time (min)	Synchro Trip Time (min)
AM Eastbound	7.6	7.6
Midday Eastbound	9.1	8.5
PM Eastbound	8.9	8.6
AM Westbound	7.0	7.5
Midday Westbound	7.7	7.7
PM Westbound	7.6	8.1

3.3.3 Arterial Level of Service

Level of service is a measure of operational conditions. There are six levels of service, A – F. A represents free flow while F represents congested conditions.

Synchro calculates the arterial level of service based on speed and the arterial class. The arterial class is calculated automatically based on distances between intersections (segments) and link speeds. Synchro calculates Philadelphia Street as a Class III roadway, with speeds of 25 to 40 mph. **Exhibit 3.15** shows the existing arterial level of service that was calculated by Synchro for the Philadelphia Street Corridor.

Exhibit 3.15 Operational Arterial Level of Service

Peak Period	Existing Arterial Operational Level of Service Eastbound	Existing Arterial Operational Level of Service Westbound
AM	C	C
Midday	C	C
PM	C	C

3.3.4 Intersection Level of Service

The level of service for each intersection was calculated using the methodologies set forth in the Highway Capacity Manual and utilizing the Synchro software package. Intersection level of service is a measure of intersection operations. For signalized intersections, a letter grade is based on the delay that is encountered at the intersection. **Exhibit 3.16** shows the parameters for the control delay per vehicle and the corresponding grade based on the Highway Capacity Manual (2000 Edition). In urban settings, level of service D or better is generally deemed acceptable.

Exhibit 3.16 Highway Capacity Manual (2000) Level of Service Grades

Level of Service	Control Delay Per Vehicle (sec)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>50

Exhibit 3.17 shows the existing approach levels of service for all of the signalized intersections in the Philadelphia Street study area. **Exhibit 3.18** illustrates the overall and approach intersection level of service for each time period analyzed under existing conditions.

Exhibit 3.17 Existing Levels of Service

Crossing Road	Direction	Approach LOS AM	Approach LOS Midday	Approach LOS PM
US 422 Business	Eastbound	B	B	B
	Westbound	B	B	B
	Northbound	B	B	E
	Southbound	B	A	B
	Overall	B	B	C
Shelly/Mill Run Drive	Eastbound	A	A	A
	Westbound	A	A	A
	Northbound	A	B	B
	Southbound	C	C	D
	Overall	A	A	A
13th Street	Eastbound	A	A	B
	Westbound	A	B	B
	Northbound	B	C	C
	Southbound	B	B	B
	Overall	A	B	B
11th Street	Eastbound	A	D	A
	Westbound	A	A	B
	Northbound	B	B	C
	Southbound	B	B	A
	Overall	A	C	B
9th Street	Eastbound	A	C	C
	Westbound	A	B	B
	Northbound	E	B	C
	Southbound	E	B	B
	Overall	C	B	C
7th Street	Eastbound	C	C	D
	Westbound	C	C	B
	Northbound	C	C	D
	Southbound	C	B	C
	Overall	C	C	C
6th Street	Eastbound	A	A	A
	Westbound	A	B	A
	Northbound	D	B	C
	Southbound	C	B	C
	Overall	C	B	B
5th Street	Eastbound	B	A	A
	Westbound	B	A	B
	Northbound	B	B	C
	Southbound	B	B	C
	Overall	B	B	B
4th Street	Eastbound	A	A	A
	Westbound	C	B	B
	Northbound	C	C	C
	Southbound	C	B	C
	Overall	B	B	C
3rd Street	Eastbound	A	A	A
	Westbound	A	A	B
	Northbound	A	A	C
	Southbound	B	B	C
	Overall	A	A	C

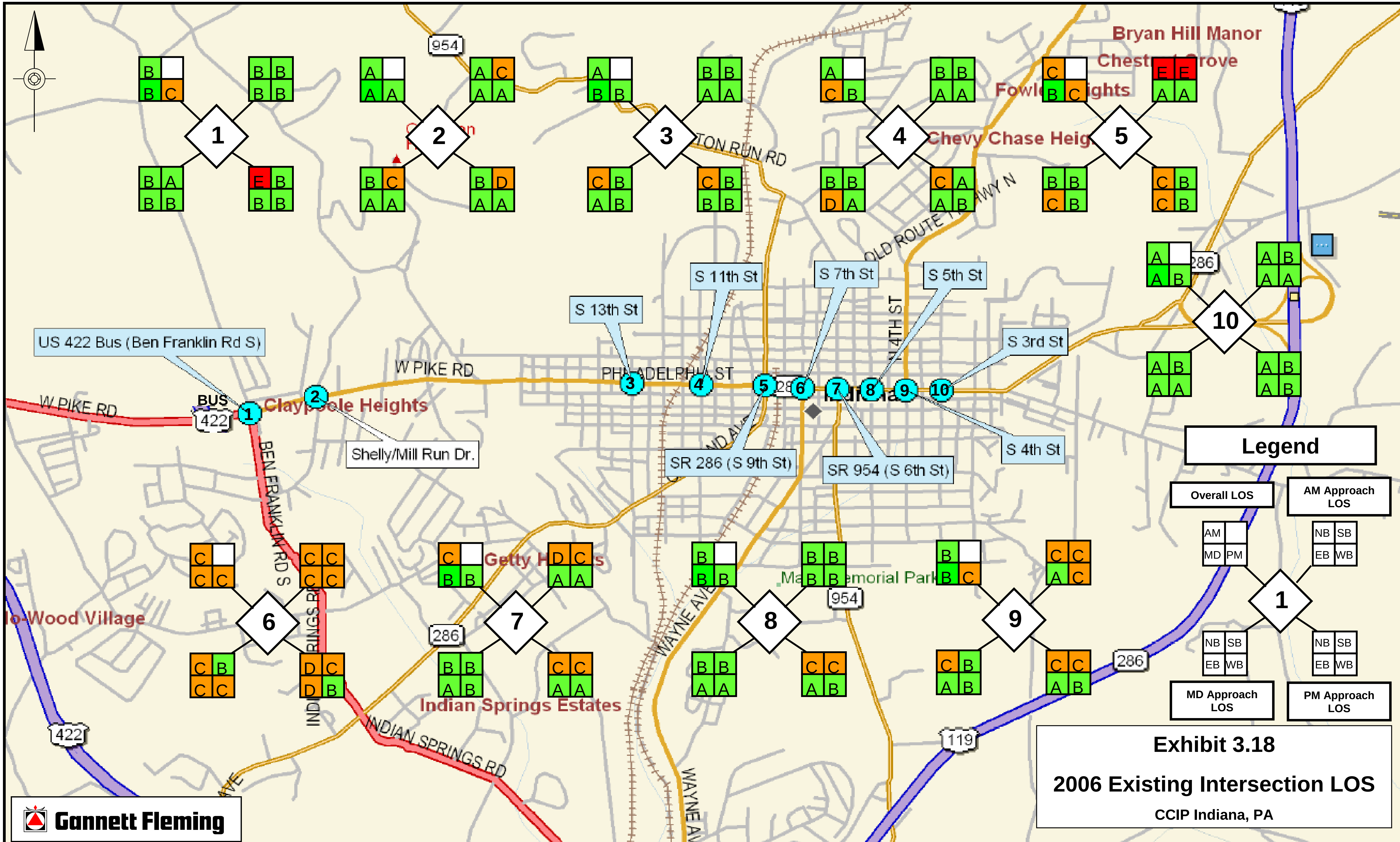


Exhibit 3.18

2006 Existing Intersection LOS

CCIP Indiana, PA

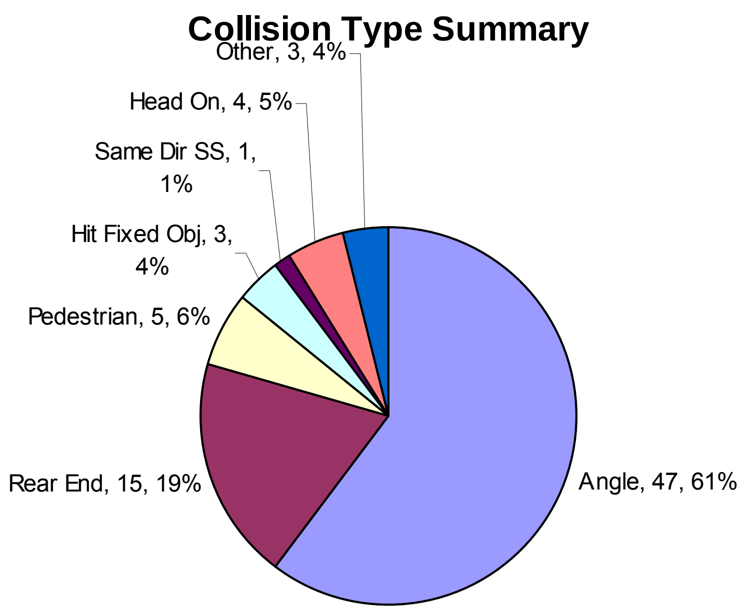
3.3.5 Crash Data

Although this study focused on congestion issues as they relate to traffic volumes, the study team agreed that a review of safety conditions was appropriate since non-recurring congested related to crashes often impacts corridor operations. For this reason, crash data was reviewed for the study area.

The crash analysis consisted of a review of reportable crash data from 1999 through 2004 (not including 2002). Generally, reportable crashes are defined as those requiring a vehicle to be towed or those involving injuries.

Of the 78 crashes that occurred in the corridor nearly 80 percent were angle or rear-end collisions which can be associated with traffic congestion. The types of crashes are presented in **Exhibit 3.19.** **Exhibit 3.20** shows the number of crashes by location.

Exhibit 3.19 Collision Summary



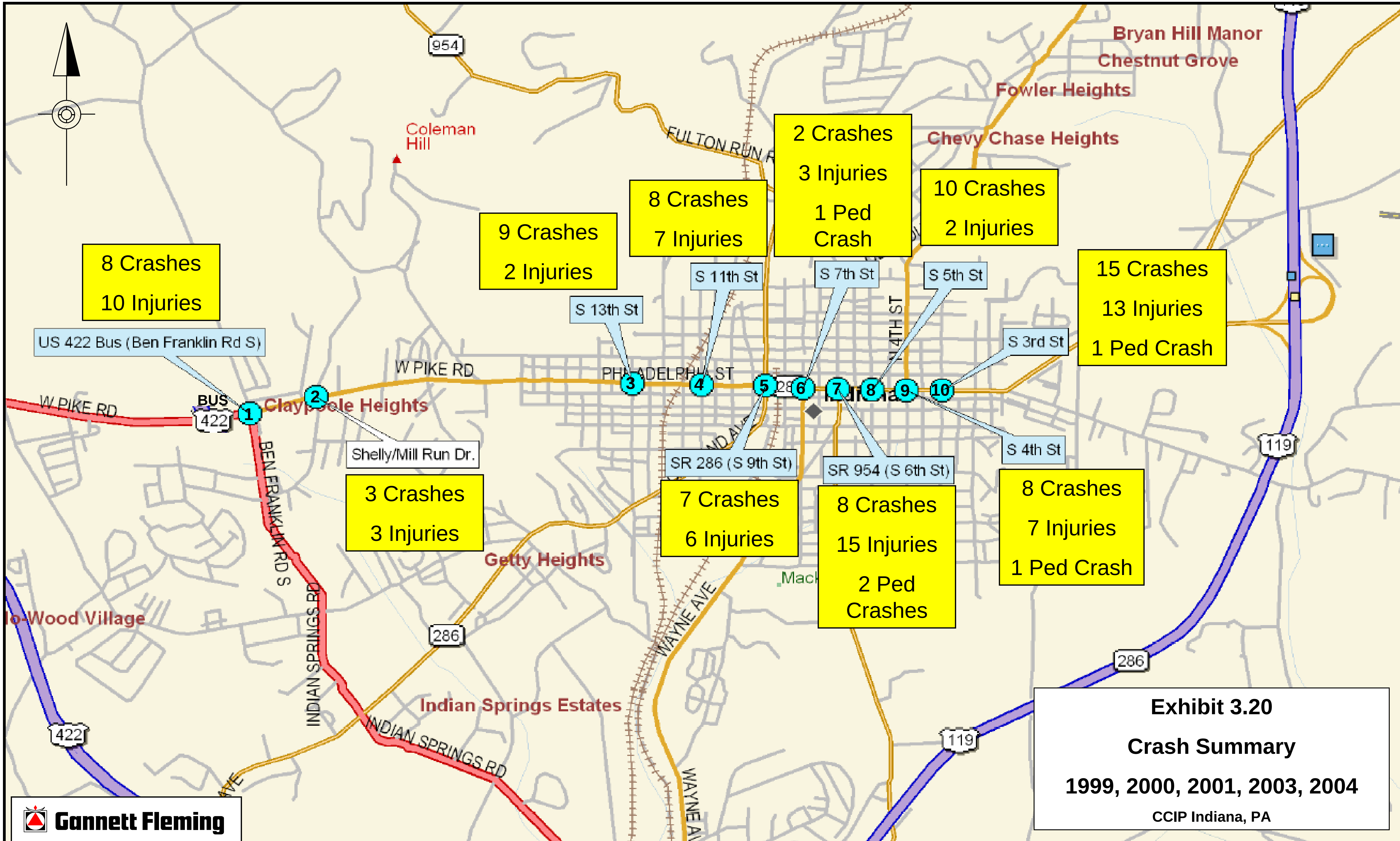


Exhibit 3.20

Crash Summary

1999, 2000, 2001, 2003, 2004

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4. FUTURE NO-BUILD CONDITIONS

4.1 Future Development

The Philadelphia Street corridor is mostly built-out with the exception of the area west of 13th Street which has the potential for additional future development. The future "No-Build" model establishes the operating conditions of the corridor if no improvements were implemented. To accomplish this, traffic is forecasted for a ten-year period and then analyzed using the model developed for the existing conditions analysis.

4.2 Planned Projects

There are no formal planned activities within the corridor itself. In the western portion of the corridor there are some preliminary discussions about a future commercial development with the following characteristics:

- **Copper Beach Development** – Currently building out between Oakland Ave and Philadelphia St.
- **Rose Street II Project** – Will connect Oakland Ave and Philadelphia St, as well as realign College Lodge Road and Acorn Street. The project will include the realignment and widening of the Philadelphia St/Acorn St and College Lodge Road intersection. The proposed alignment will bring College Lodge Road further west to align with Acorn St. The proposed lane configuration for the intersection will yield the following: Philadelphia St will have three lanes with opposing left turns and a thru/right in each direction, Acorn St will have two lanes (the exact lane utilization is to be determined), and College Lodge Rd will have a one-lane approach. The projected time of completion for the project is the end of the construction season in 2009.

4.3 Traffic Forecasts

As mentioned, the future model projects the conditions of the roadway ten years into the future based on a review of historical growth trends. The study team evaluated foure sources of growth data:

- PennDOT: 2.1 percent/year for Indiana County
- **Indiana Co (based on expected pop data): 1.56 percent/year**
- Indiana Borough (based on expected pop data): 1.08 percent/year
- White Twp (based on expected pop data): 2.0 percent/year

Based on stakeholder input, a growth rate of 1.56 percent per year for the portion of the corridor spanning 3rd Street to 13th Street was utilized. The resulting projected growth factor of 1.17 was applied to the existing traffic volumes from 3rd to 13th Street to achieve the 2016 projected conditions

Due to development activities on the west end of the corridor, the study team used a growth factor of 1.37 to calculate 2016 projected volumes for Shelly/Mill Run Drive and US 422 Business. The growth factor was developed by estimating future potential trips and comparing that value to existing intersection volumes.

Exhibit 4.1 details 2016 project traffic volumes.

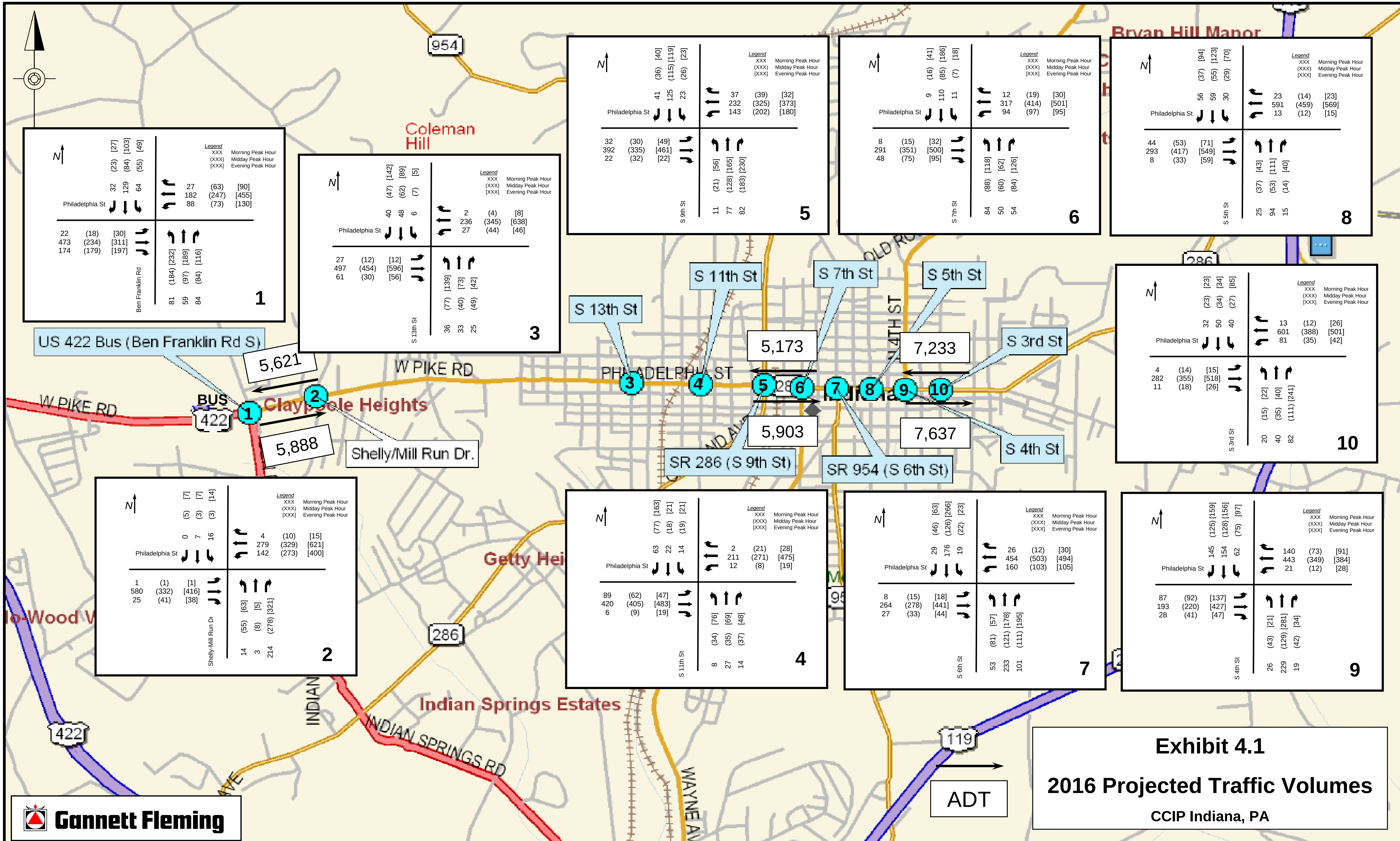


Exhibit 4.1

2016 Projected Traffic Volumes

CCIP Indiana, PA

4.4 Future No-Build Operational Conditions

The operational conditions for the future "No-Build" alternative were quantified in the same manner as the existing conditions described in Section 3. Corridor travel times, arterial level of service, and intersection level of service were calculated and are presented in the following sections.

4.4.1 Corridor Travel Times

Exhibit 4.2 shows a comparison of corridor travel times under existing conditions and under future "no-build" conditions.

Exhibit 4.2 Projected "No-Build" Travel Time vs. Existing Travel Time

Peak Period and Direction	Existing Trip Time (min)	Projected Trip Time (min)
AM Eastbound	7.6	8.0
Midday Eastbound	8.5	9.7
PM Eastbound	8.6	10.1
AM Westbound	7.5	8.1
Midday Westbound	7.7	8.2
PM Westbound	8.1	9.0

Corridor travel times are projected to increase slightly by the 2016 horizon year. This indicates that motorists traveling through the area on Philadelphia Street will experience slightly more delay. The most significant increases in delay will be in the eastbound direction during the midday (1.2 minutes) and PM (1.5 minutes) time periods.

4.4.2 Arterial Level of Service

Exhibit 4.3 shows how Philadelphia Street will operate versus the current conditions on a corridor-wide basis.

Exhibit 4.3 Projected "No-Build" Arterial Level of Service vs. Existing Arterial Level of Service

Peak Period	Existing Arterial Operational Level of Service Eastbound	Projected Arterial Operational Level of Service Eastbound	Existing Arterial Operational Level of Service Westbound	Projected Arterial Operational Level of Service Westbound
AM	C	C	C	C
Midday	C	D	C	C
PM	C	D	C	C

The analysis indicates that arterial levels of service will continue to worsen, especially in the eastbound direction.

4.4.3 Intersection Level of Service

Exhibit 4.4 indicates what the projected level of service for each intersection approach will be in the year 2016. As Exhibit 4.4 indicates, the following intersections will experience overall intersection level of service failures (LOS E or F) during one or more time periods:

- US 422 Business
- 7th Street.

The following intersections have one or more approaches that will experience operational failure during one or more time period:

- US 422 Business
- 11th Street
- 9th Street
- 7th Street
- 6th Street
- 5th Street
- 4th Street.

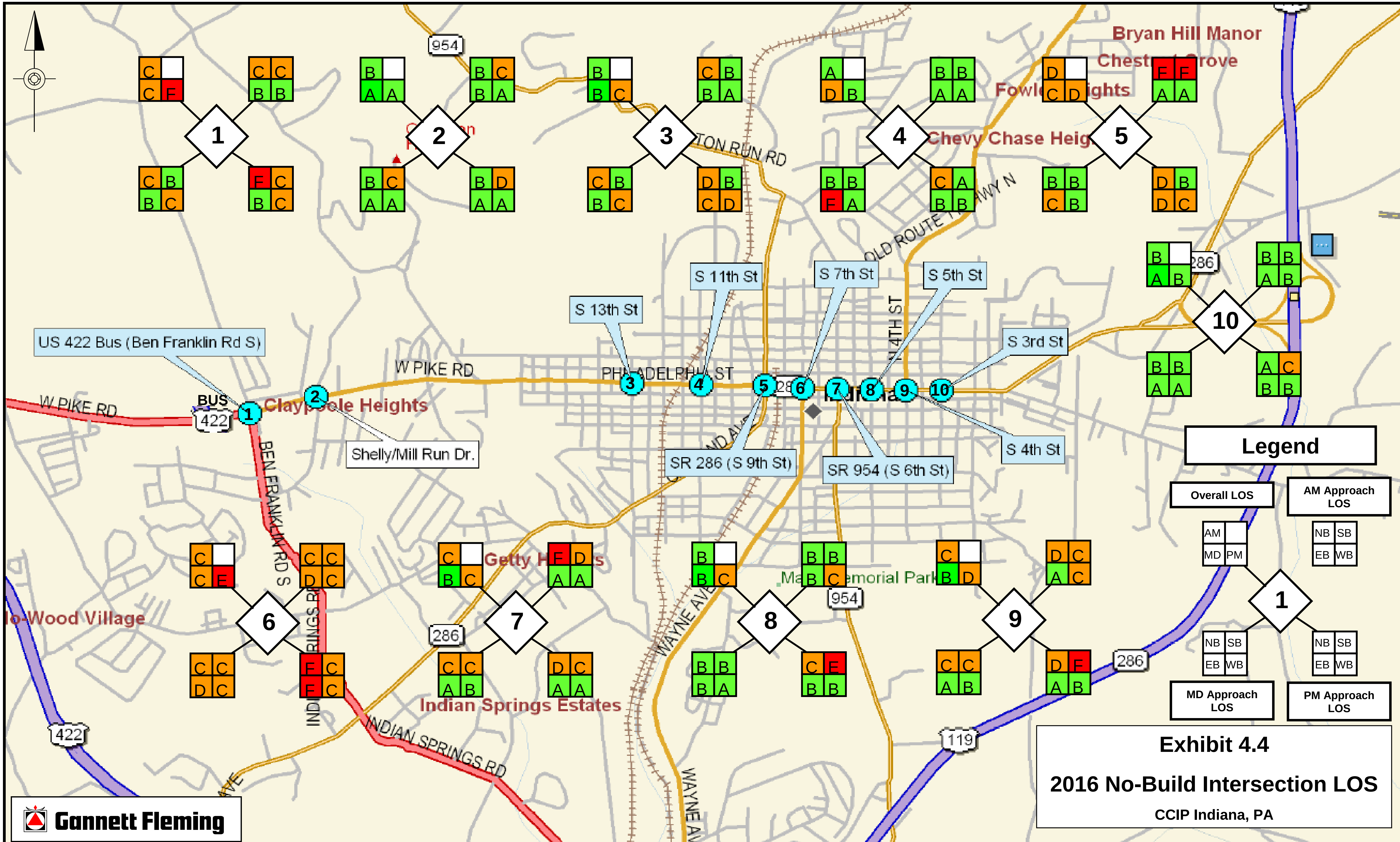


Exhibit 4.4

2016 No-Build Intersection LOS

CCIP Indiana, PA

4.5 Additional Analyses

4.5.1 Signal Warrant Evaluation

As part of the evaluation of existing conditions, signal warrants were evaluated in accordance with PennDOT signal warrant policies as detailed in the Manual on Uniform Traffic Control Devices. **Exhibit 4.5** illustrates the results of the analyses.

Exhibit 4.5 Signal Warrant Evaluation for Existing Conditions

Location	Peak Hour Warrant	Four-hour Warrant	Eight-hour Warrant
US 422 Business	Met	Met	Met
Shelly/Mill Run Drive	Met	Met	Not met
13th Street	Met	Not met	Not met
11th Street	Met	Not met	Not met
9th Street	Met	Met	Not met
7th Street	Met	Not met	Not met
6th Street	Met	Met	Not met
5th Street	Met	Not met	Not met
4th Street	Met	Not met	Not met
3rd Street	Met	Not met	Not met

All intersections continue to warrant signalization.

4.5.2 Left-turn Phasing Evaluation

Left turn phasing was evaluated in accordance with PennDOT practices. In general left-turn phasing can be configured in the following manners:

- Permitted only (no dedicated phase)
- Protected/permitted
- Protected only (no permitted left-turns).

The following movements meet left-turn phasing guidelines, although other factors are often considered:

- Shelly/Mill Run WB-Protected/permitted (Currently used)
- 9th Street WB-Protected/permitted (Currently used).

5. Summary of Adverse Conditions

5.1 Traffic Operations

While overall corridor operations are acceptable from a level of service standpoint, spot deficiencies occur presently and will increase by 2016. Additionally, corridor operations can be enhanced with upgrades to the existing traffic signal system.

5.2 Access Management

For the most part, access within the Borough is controlled and limited between signalized intersections; however, on-street parking can contribute to traffic flow disruptions and can create challenges in developing appropriate traffic signal timings.

In the western portion of the corridor, access management is limited resulting in numerous access points. There is a direct relationship between the number of access points per mile and traffic flow. Additionally, numerous access points can contribute to safety concerns.

5.3 Physical Facility Conditions

Currently, there are many locations within the study area where physical traffic control measures are in poor condition or missing. Features such as pavement markings, crosswalks, lane assignment signs, and traffic control signs cannot be modeled as they affect congestion; however, the absence of such features can cause driver confusion and hesitation as well as undesirable conditions.

5.4 Signal Systems

The traffic signals throughout the corridor are mostly pretimed (no detection) and are not physically interconnected. The use of actuation (or detection) can make signals more responsive to traffic demands and interconnection of signals can promote improved corridor progression.

Physical hardware (signal indications, structures, etc) appear to approaching the end of their life cycle. If significant enhancements are made to signal equipment, hardware needs should be considered.

5.5 Transit and Pedestrian Considerations

The corridor is service by two transit routes and as discussed previously pedestrian activity is significant within the Borough of Indiana. To promote a multi-modal corridor the needs of both should be consider as they relate to the CCIP and congestion.

6. Alternatives Analysis

6.1 Alternative Scenarios

In order to support the planning and programmatic needs of the stakeholder group, three alternative categories were identified as detailed in **Exhibit 6.1**. For each category, an estimated timeframe was assumed based on the anticipated levels of resources needed to implement the improvement.

The Immediate Alternatives are low-cost initiatives that can be carried out in the near future. To that end, detailed guidance on these initiatives is provided in subsequent sections and the Technical Appendix such that minimal engineering is required.

It is assumed that Short-Term Alternatives can be carried out within a three-year period and may include minor geometric improvements.

Long-Term Alternatives are items that require substantially more analysis and documentation than can be provided within the context of this study. These items are expected to have significant costs.

Exhibit 6.1 Alternative Categories

Alternative Categories	Estimated Timeframe	Description
Immediate	Less than 1 year	• Minor signing and pavement marking improvements • Signal timing modifications to existing signal systems and individual intersections • Minor intermodal enhancements
Short-term	1 to 3 years	• Signing and pavement marking improvements • Minor geometric improvements within existing right-of-way or minor right-of-way impacts • Signal timing modifications to existing signal systems and individual intersections
Long-term	Greater than 3 years	• Improvements involving substantial right-of-way acquisition and requiring additional studies, planning and programmatic funding such as major or new roadway construction

6.2 Development of Alternative Ideas

The development of alternative ideas was an iterative process. Areas of concern were identified as a result of stakeholder input, a review of operational deficiencies and causes, and safety concerns. Considering the issues, possible solutions were identified during a brainstorming session and were then field assessed to determine if they were "reasonable and feasible." Brainstormed alternatives were evaluated and validated using Synchro and SimTraffic.

The following paragraphs provide a detailed description of each alternative as well as its impact on intersection operations.

6.2.1 Immediate Improvements

Immediate improvements focus on what can be implemented in one year or less. They are generally low-cost alternatives that are designed to have immediate impacts.

Exhibit 6.2 Summary of Immediate Improvements

Location	Improvement
Corridor-wide	Retime signals
	Upgrade pavement markings
	Upgrade signing
	Implement an Access Management Policy
US 422 Business	None
Shelly/Mill Run Drive	Relocate pedestrian push buttons (2 locations)
College Lodge/ Acorn Street	Improve intersection sight distance (May be part of Rose Avenue Extension)
13th Street	Repair side street detection
11th Street	None
9th Street	Improve lane use signing including WB left-turn lane drop
7th Street	Reconfigure NB approach to left only and shared thru/right
	Reconfigure SB approach to left only and shared thru/right
	Improve lane use signing
6th Street	Remove bollard
5th Street	None
4th Street	Fix deficient transition traveling eastbound east of intersection
	Reconfigure SB approach to left only and shared thru/right
3rd Street	None

6.2.1.1 Corridor-wide Improvements

There are several immediate improvements that can help facilitate safe and efficient traffic flow along the corridor.

- Retime Traffic Signals – The existing signals should be retimed to improve traffic operations in the near future. Ideally, traffic signal timings should be updated every few years to reflect current traffic conditions. While an update to signal timings will improve traffic flow, capabilities are limited due to the lack of actuation and interconnection. The immediate retiming should be implemented as a time-based coordination program in two zones (Borough and western two intersections). The time-based configuration may make maintaining intersection offsets difficult.

- Upgrade Pavement Markings – In general, pavement markings were worn and had limited retroreflectivity. It is suggested that a corridor wide initiative be implemented to upgrade markings to include: centerlines, edgelines, stop bars and crosswalks.

- Upgrade Signing – In general signs are worn and appear to have limited retroreflective properties. It is suggested that a corridor wide initiative be implemented to upgrade signs. Priority should be give to regulatory signs (including NTOR signs) and warning signs.

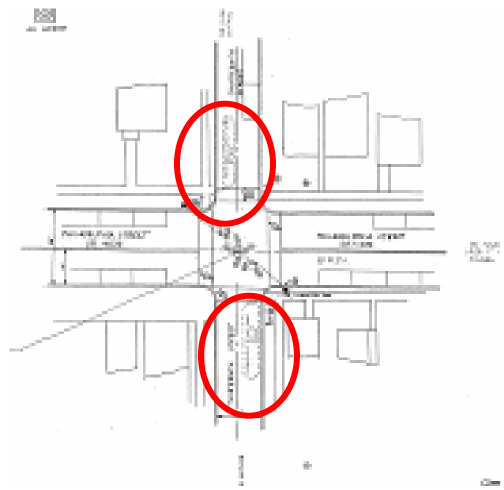
- Access Management Plan - Access management is a broad set of techniques that balance the need to provide efficient, safe, and timely travel with the ability to allow access to individual land parcels. Access management is pursued through the design and control of driveways, curb cuts, turning movements, interior circulation of parking lots, and public street connections and intersections.

  Joint and cross access points are valuable ways to reduce the number of driveways for a given section of roadway. Joint access and cross access points are terminology for legally combining driveways. Joint access is when two adjacent properties share a mutual driveway that parallels the property line between two adjacent parcels. Cross access is when a property has access to a driveway on another property by way of an easement to the parcel's deed. One article published by the Center for Transportation Research and Education says that the rule of thumb for driveway sharing is that if a property has less than 60 feet of frontage on the arterial that it borders, it should not have an individual driveway. Dedicated right-turn lanes, continuous two-way left-turn lanes, driveway consolidation and right-in/right-out driveways are all ways to minimize the effect mid-block access points have on the Philadelphia Street Corridor.

  The greatest opportunity for an access management policy is at the western end of the study corridor in White Township.

6.2.1.2 Intersection Improvements

- Shelly/Mill Run Drive – Although pedestrian activity is limited, pedestrian push buttons are inaccessible due to guiderail placement. Future enhancements should include relocation of pedestrian pushbuttons to better accommodate pedestrians.



- College Lodge/ Acorn Street – This unsignalized intersection was not a study intersection; however, the limited side street sight distance was noted as a concern during the study safety audit. Sight distance enhancements including clearing vegetation and cutting back sideslopes should be considered. This intersection may be upgraded as part of the Rose Avenue Extension which is discussed as a potential long-term project.

- 13th Street – The side street detection at this location is not functional resulting in the side street maxing-out the amount of possible green time. Repairing the detection would reduce delays to mainline traffic.

- 9th Street – Lane use signing, particularly in the westbound direction, should be enhanced. Presently the WB approach is a two-lane section; however, the left-lane becomes a left-turn drop at the intersection. Overhead lane-use signing would clarify the lane requirements to motorists and reduce abrupt lane changing.

- 7th Street – To facilitate traffic flow, reconfigure the NB approach to left only and shared thru/right and reconfigure the SB approach to left only and shared thru/right. Associated with these improvements, upgrade all lane use signing. See **Exhibit 6.3.**

EXHIBIT 6.3

7TH ST IMMEDIATE
CONCEPTUAL IMPROVEMENTS
CCIP INDIANA, PA

PENNDOT

Gannett Fleming

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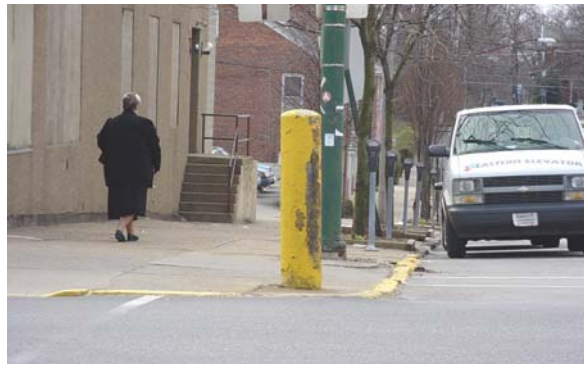
- 6th Street – Remove the bollard on the southeast corner of the intersection. Although this device may be intended to protect the signal pole from being stuck, it is also a fixed object which is located within the lateral offset requirements (2 feet) for the area.



- 4th Street - Upgrade the deficient transition on the eastbound approach that conflicts with on-street parking. This transition does not satisfy PennDOT traffic control requirements.

  Additionally, reconfigure the SB approach to a left only and shared thru/right to better facilitate traffic flow. See **Exhibit 6.4.**

EXHIBIT 6.4

4TH ST IMMEDIATE
CONCEPTUAL IMPROVEMENTS
CCIP INDIANA, PA

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6.2.2 Short-Term Improvements

Short-term alternatives are developed to further reduce the congestion within the study area by providing geometric improvements that involve additional signing and pavement marking upgrades and traffic signal modifications with minimal impact to right-of-way.

Exhibit 6.5 Summary of Short-term Improvements

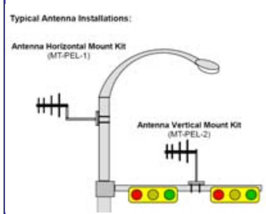
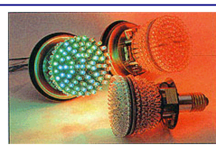
Location	Improvement
Corridor-wide	Signal Enhancement Project ▪ Solid state controllers and possible closed loop ▪ Wireless interconnect ▪ Detection ▪ Refine timings ▪ Light emitting diode (LED) indications ▪ Countdown pedestrian indications ▪ Pedestrian pushbuttons ▪ Recalculate pedestrian and clearance intervals ▪ Upgrade crosswalks ▪ Replace outdated structures, as needed ▪ Upgrade street name signs
US 422 Business	Add NB left-turn lane
	Add WB left-turn lane
13th Street	Add EB and WB left-turn lanes
11th Street	Add EB and WB left-turn lanes
	Install RR gate arms as currently planned
	Check to verify signal does not warrant RR preemption
9th Street	Add NB right-turn lane
7th Street	Consider installing bulb-outs
	Modify pedestrian phasing ▪ Option 1: Reevaluate timing needs for all ped phase ▪ Option 2: Install lead pedestrian intervals
6th Street	Add NB right-turn lane
3rd Street	Add EB and WB left-turn lanes

6.2.2.1 Corridor-wide Improvements

A major signal enhancement project would be the backbone of short-term improvements. Without an upgrade to the entire signal system, minimal improvements can be achieved since the existing signal system is not interconnected and does not have actuation (detection) of side street phases.

Signal enhancement elements are detailed in **Exhibit 6.6**. This is consistent with the recommendations of the *Indiana Multimodal Mobility Study* completed in 2003.

Exhibit 6.6 Signal Enhancement Elements

Element		
Solid state controllers and possible closed loop		Solid state controllers and a closed-loop system will give municipalities the capabilities to program various timings plans (including special event plans), easily manage those plans, oversee signal operations and upgrade timing plans efficiently.
Wireless interconnect		Wireless interconnect options such as spread spectrum radio are a non-intrusive method to connect signals without major infrastructure impacts. By physically interconnecting signals, timing plans and progressional offsets can be maintained.
Detection		Detection of side street traffic allows the signal system to respond and provide appropriate time to side street demands. Presently, most signals operate pretimed, which means a certain amount of time is allotted to the side street regardless of demand. Video detection may be a desirable solution versus traditional loops since there are less maintenance issues and it is less invasive.
Refine timings	Timings should be revised to complement enhanced controller capabilities and geometric enhancements at intersections.	
Recalculate pedestrian and clearance intervals	Associated with any enhancement activities and geometric upgrades, pedestrian clearance times and change and clearance intervals should be validated.	
Light emitting diode (LED) indications		The installation of LED signal indications has proven to lower energy and maintenance costs resulting in lower life-cycle costs. LEDs improve visibility and burn-out gradually. Energy savings is estimated at approximately 40 percent.
Countdown pedestrian indications		Improves both pedestrian and in some cases motorist's awareness of pedestrian crossings since the sign is more active.
Upgrade crosswalks	To promote additional awareness of pedestrian crossings, crosswalks should be upgraded. At a minimum, the crosswalks should adhere to PennDOT marking standards. To provide additional visibility, block style, experimental (yellow-green) or textured pavement styles should be considered.	
Replace outdate structures, as needed		Several mast arms appear to be at the tail end of their effective lives. A signal enhancement project should include an inventory and upgrade of signal structures as needed with special focus on structures that may be supporting upgraded controllers.
Upgrade street name signs		As part of structure and signal enhancements, street name signs should be upgraded to promote better motorists awareness, ultimately reducing abrupt movements.

6.2.2.2 Intersection Improvements

- US 422 Business – To facilitate traffic flow and enhance operations, install a northbound left-turn lane and westbound left-turn lane. Some right-of-way would be required. **See Exhibit 6.7**.

- 13th Street – Add an eastbound and a westbound left-turn lane to facilitate traffic flow. Although left-turn volumes are moderate to low, delayed left turns (due to limited gaps in the opposite direction) also delay through traffic in the same direction. **See Exhibit 6.8.**

- 11th Street – Add an eastbound and a westbound left-turn lane to facilitate traffic flow. Although left-turn volumes are moderate to low, delayed left turns (due to limited gaps in the opposite direction) also delay through traffic in the same direction. **See Exhibit 6.9.** As part of enhancements activities, railroad preemption policies should be reviewed to determine if preemption is required at this intersection. A project is currently planned to install automated railroad gate arms.

- 9th Street – Add a northbound right-turn lane to facilitate traffic flow. Although this improvement will have a minor impact to parking, it will improve the overall efficiency of the intersection. To facilitate turn movements, the curb radii may need to be increased, westbound stop bars may need to be moved eastward, and/or truck movements may need to be restricted. **See Exhibit 6.10.**

EXHIBIT 6.7

BUSINESS 422 SHORT TERM
CONCEPTUAL IMPROVEMENTS
CCIP INDIANA, PA

PENNDOT
Gannett Fleming

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EXHIBIT 6.8

13TH ST SHORT TERM
CONCEPTUAL IMPROVEMENTS
CCIP INDIANA, PA

PENNDOT

Gannett Fleming

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EXHIBIT 6.9

11TH ST SHORT TERM
CONCEPTUAL IMPROVEMENTS
CCIP INDIANA, PA

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EXHIBIT 6.10

9TH ST SHORT TERM
CONCEPTUAL IMPROVEMENTS
CCIP INDIANA, PA

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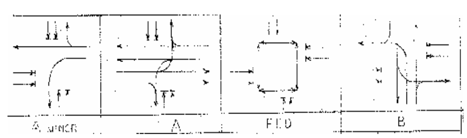
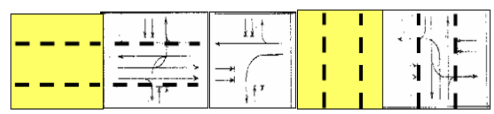
- 7th Street – Travel time and delay runs illustrate that 7th Street has the highest signal delays of any of the intersections studied. This may be due in part to the exclusive pedestrian phase that utilizes 20 seconds of the overall cycle. Special pedestrian accommodations are desired at this location due the high pedestrian demands. Congestion improvements need to facilitate vehicular traffic, but also safe pedestrian movements.

Concept	All Pedestrian Phase	Lead Pedestrian Interval (LPI)
Description	Pedestrians received a dedicated phase which is typically timed to allow them to cross at least one leg and in some cases diagonally.	One practical solution to this problem is to program the traffic signals to allow the pedestrian to begin crossing before the vehicle traffic on the parallel street is given the green light. This is commonly referred to as a leading pedestrian interval (LPI) which lasts for 3-4 seconds. Pedestrians and motor vehicles are separated in time by providing a leading pedestrian interval, which permits pedestrians to gain a head start before turning vehicles are released.
Phasing Configuration		
Pedestrian Impacts	▪ Pedestrian movements occur when vehicular traffic is halted. ▪ Pedestrian delays can actually increase vs LPIs if the pedestrian arrives just after the all ped phase.	▪ Pedestrians enter traffic early before vehicular traffic to promote visibility; however, they move concurrently after the lead pedestrian interval expires.
Traffic Impacts	▪ Traffic is delayed while pedestrian movements take place. At 7th Street this is approximately 20 seconds.	▪ Traffic is delayed for 3-4 seconds per direction (E/W and N/S) for lead pedestrian intervals.
Other Considerations	Community is comfortable with the current arrangement from a pedestrian safety standpoint. By field observation, pedestrians typically did not cross diagonally. This may in part be due to the absence of diagonal pedestrian signal heads.	Research has shown that this treatment is associated with a decrease in pedestrian/motor vehicle conflicts and an increase in the percentage of motorists that yield right of way to pedestrians. This study examined the influence of a three-second LPI on pedestrian behavior and conflicts with turning vehicles (Van Houten, Retting, Farmer, Van Houten, & Malenfant, 2000).

Both solutions are viable. While the lead pedestrian interval can reduce vehicular delay versus an all pedestrian phase, the community has a certain level of comfort with the current configuration.

With either option, pedestrian bulbouts (**Exhibit 6.11**) could be considered that would promote greater visibility and reduce crossing times; however, the impacts to turning movements must be fully considered. Particularly, bulbouts as shown in **Exhibit 6.11** do not allow trucks to make right-turns efficiently.

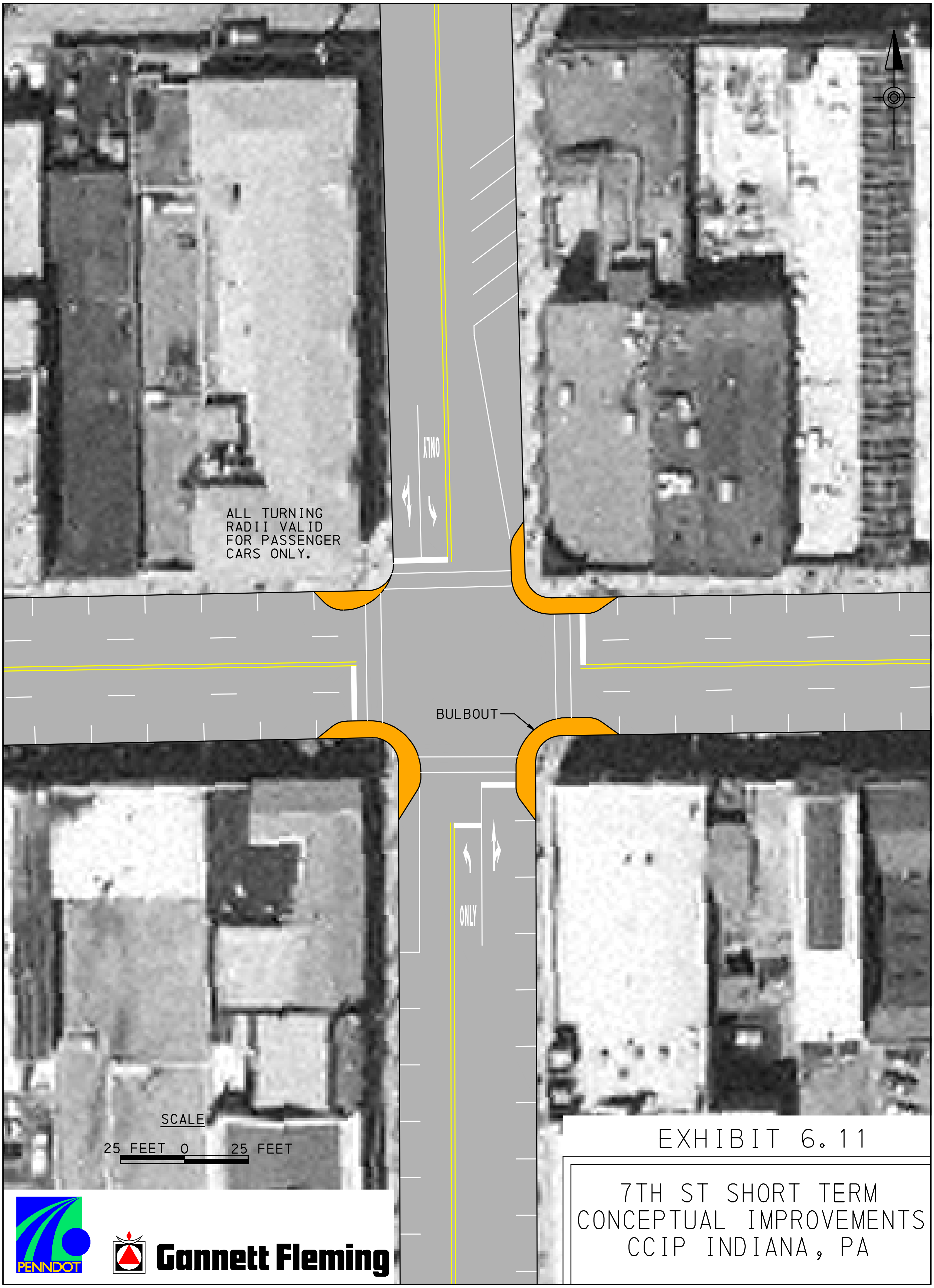


EXHIBIT 6.11

7TH ST SHORT TERM CONCEPTUAL IMPROVEMENTS
CCIP INDIANA, PA

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- 6th Street – Add a northbound right-turn lane to facilitate traffic flow. Although this improvement will have a minor impact to parking, it will improve the overall efficiency of the intersection. To facilitate turn movements, the curb radii may need to be increased, westbound stop bars may need to be moved eastward, and/or truck movements may need to be restricted. **See Exhibit 6.12.**

- 3rd Street – Add an eastbound and a westbound left-turn lane to facilitate traffic flow. Although left-turn volumes are moderate to low, delayed left turns (due to limited gaps in the opposite direction) also delay through traffic in the same direction. **See Exhibit 6.13.**

EXHIBIT 6.12

6TH ST SHORT TERM
CONCEPTUAL IMPROVEMENTS
CCIP INDIANA, PA

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EXHIBIT 6.13

3RD ST SHORT TERM
CONCEPTUAL IMPROVEMENTS
CCIP INDIANA, PA

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6.2.3 Long-Term Improvements

As was stated previously, long-term improvements include items that require more detailed analyses and documentation to demonstrate their true benefit. These items have significant cost associated with implementation. While each improvement is listed independently, a combination of alternatives is possible.

Exhibit 6.14 Summary of Long-term Improvements

Location	Improvement
Corridor-wide	Convert to a three-lane cross section
US 422 Business	Add NB right-turn lane
	Add WB right-turn lane
Shelly/Mill Run Drive	Add second WB left-turn lane
9th Street	Realign 9th Street
7th Street	Consider pedestrian mall on north leg (see discussion on negative impact to traffic operations) if it benefits community development
3rd Street	None

Corridor-wide and general improvements considered include the following:

- Convert to a three-lane cross-section – The *Indiana Multimodal Mobility Study* discussed the benefits of lane continuity through the study corridor. The study proposed a three-lane cross-section (thru lane in each direction with a center left-turn lane) as well as a possible bicycle lane.

  While lane continuity is an issue throughout the corridor (abrupt lane drops were noted previously), lane use modifications must be evaluated from an operation standpoint. The study team evaluated the proposed three-lane section versus the existing configuration with geometric enhancements noted in previous sections.

  Exhibit 6.15 shows a version of this improvement which could be implemented in the short-term due to its limited disturbance. Signing, pavement markings and signal upgrades would be the only required improvements. The improvement concept also provides a bike lane adjacent to the on-street parking lane. "Share The Road" signing may be desirable to improve awareness of bicycle traffic.

  Exhibit 6.16 shows a version of this improvement which could be implemented in the long-term. It assumes the same lane use as **Exhibit 6.15**; however it adds a landscaped median which could be used for improved downtown aesthetics.

  The analysis results comparing corridor and intersection delay for each of the different scenarios are detailed in **Exhibit 6.17**.

EXHIBIT 6.15

TWO-WAY LEFT TURN LANE
MARKING CONCEPT W/O MEDIAN
CCIP INDIANA, PA

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EXHIBIT 6.16

TWO-WAY LEFT TURN LANE MARKING CONCEPT W/MEDIAN
CCIP INDIANA, PA

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Exhibit 6.17 Cross-section Analysis and Resulting Corridor and Intersection Delay Comparason

		2016 No-Build		2016 Build, Existing Lane Use			2016 Build, Three Lane Cross Section		
		Delay	Travel Time	Delay	Travel Time	% Diff. Travel Time	Delay	Travel Time	% Diff. Travel Time
AM	EB	16	58	11	53	-9%	11	53	-9%
	WB	20	55	15	51	-7%	15	51	-7%
	Total	36	113	26	104	-8%	26	104	-8%
Mid	EB	28	67	9	47	-30%	10	48	-28%
	WB	19	63	13	56	-11%	13	56	-11%
	Total	47	130	22	103	-21%	23	104	-20%
PM	EB	39	92	18	70	-24%	19	71	-23%
	WB	33	100	25	91	-9%	26	91	-9%
	Total	72	192	43	161	-16%	45	162	-16%
Average Total		52	145	30	123	-15%	31	123	-15%

			2016 Build, Existing Lane Use	2016 Build, Three Lane Cross Section
AM	Eastbound	9th St	■	
		7th St		■
		6th St		■
		5th St		■
	Westbound	5th St	■	
		6th St	■	
		7th St	■	
		9th St		■
Midday	Eastbound	9th St	■	
		7th St		■
		6th St	■	
		5th St	■	
	Westbound	5th St		
		6th St		■
		7th St		■
		9th St	■	
PM	Eastbound	9th St	■	
		7th St		■
		6th St	■	
		5th St		■
	Westbound	5th St		
		6th St	■	
		7th St		■
		9th St		■

■ Scenario has greater delay at intersection for respective time period over compared scenario

As can be seen, delays are similar considering the existing cross section with four lanes and the cross section modified to provide three lanes. The average percentage difference in travel times over the No-Build condition for either option with signal equipment upgrades is similar.

- Assess the Rose Street Extension - The study team was asked to assess the need for the proposed Rose Street Extension. While the Rose Street Extension is not warranted to provide adequate operations in the western end of the corridor (with short-term improvements identified in this report) in the short-term, the project may warrant consideration in the long-term. In the long-term, land use development may increase traffic demands. Current long-term improvements at the US 422 Business intersection would have right-of-way impacts (including to the school on the southeast quadrant). The Rose Street Extension may mitigate the need for long-term improvements at the western end of the corridor. Additionally, this study did not evaluate the potential safety benefits of the project such as the possible realignment of the College Lodge Road/ Acorn Street intersection discussed in previous sections.

- Prohibit left-turns at select intersections NOT RECOMMENDED - Prohibiting left-turns at intersections w/o exclusive left turn lanes would decrease delay. This alternative would have access impacts and was not carried forward in detail.

- E-W one-way pair NOT RECOMMENDED - A one-way pair with Water Street in the east-west direction would help facilitate traffic flow; however, access issues as well as tie-ins at the end of the corridor resulted in this alternative not being carried forward in detail.
- N-S one-way pairs - Select one-way pairs in the north-south directions would improve traffic flow and help address the lack of available right of way for side street turning lanes. This alternative was not studied in detail.

6.2.3.1 Intersection Improvements

- US 422 Business – Add northbound and westbound right-turn lanes to facilitate traffic flow. This improvement is depicted in **Exhibit 6.16**. The right-of-way impacts for this improvement may outweigh the potential benefits. Additionally, these improvements may not be warranted if the Rose Avenue Extension project is carried forward.

- Shelly/Mill Run Drive - Add second WB left-turn lane to facilitate traffic flow. As previously discussed in the long-term traffic volume derivation, this improvement is necessary to meet acceptable levels of service for existing traffic volumes expanded by a growth factor. The actual need for this improvement will be dependent on future area traffic growth as well as usage of the commercial development it accesses. If the Rose Street Extension project is carried forward, this improvement may not be necessary because it would reduce traffic on Shelly Drive.

- 9th Street – The intersection at 9th Street is an offset intersection that results in operational and safety concerns. Ideally this intersection should be realigned such that the geometry is a conventional 4-leg configuration; however, right-of-way requirements may impact the Jimmy Stewart Museum (on the northeast leg) and the church (on the southwest leg). **Exhibit 6.17** depicts a realignment alternative at a conceptual level.

EXHIBIT 6.18

BUSINESS 422 LONG TERM CONCEPTUAL IMPROVEMENTS
CCIP INDIANA, PA

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EXHIBIT 6.19

9TH ST LONG TERM
CONCEPTUAL IMPROVEMENTS
CCIP INDIANA, PA

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- 7th Street - Consider a pedestrian mall on north leg **if it benefits community development**.

The concept of a pedestrian mall has been explored on the north leg of the 7th Street intersection. While the concept may have benefits to the community and promote economic development, the impacts to pedestrian and vehicular travel should also be considered.

From a pedestrian standpoint, the project would enhance pedestrian activity in the Borough. At the intersection, pedestrian access could be controlled using the options previously discussed; however, the north leg would be free to pedestrian movement without delay and vehicular conflict.

From a vehicular standpoint, demands would be relocated to neighboring intersections, including 6th and 9th Streets. Unfortunately, there is limited right-of-way at these intersections (on the side street) to widen to accommodate additional demands. The relocated demands would increase side street delays at 6th and 9th street from 1 to 4 seconds without impact to operational level of service.

Ultimately, community stakeholders should weigh the pros and cons and make an informed decision as to what is best for the community; however, it appears that the proposed concept could enhance community quality of life with limited impact to access and operational performance.

7. ALTERNATIVES MEASURES OF EFFECTIVENESS

The following sections provide a comparison of certain measures of effectiveness for the immediate and short-term improvement alternatives. A comparison is not provided for the long-term improvement alternatives due to the need for more detailed analysis than is provided in this report.

7.1 Immediate Improvement Comparison

7.1.1 Corridor Travel Times

As discussed in previous sections, the corridor travel time and system delay are the primary measures of effectiveness used in determining the success of the program. The Immediate improvement corridor travel times are depicted in **Exhibit 7.1**.

Exhibit 7.1 Immediate Alternative Travel Times

Peak Period and Direction	Existing Trip Time (min)	Immediate Alternative Travel Time (min)
AM Eastbound	7.6	7.1
Midday Eastbound	8.5	7.3
PM Eastbound	8.6	7.8
AM Westbound	7.5	7.3
Midday Westbound	7.7	7.3
PM Westbound	8.1	7.7

The Immediate alternative models were developed using existing volumes that were recorded in March 2006. As **Exhibit 7.1** indicates, a reduction in travel times is experienced by re-timing the existing traffic signals. While the change is moderate (6.5 to 14 percent) in the eastbound direction, the reductions also range from 2.5 to 5 percent in the westbound direction.

7.1.2 Arterial Level of Service

As Section 3.3.3 discussed, the arterial level of service is calculated using Synchro by comparing link speed, intersection separation, and travel times to determine a letter grade similar to the intersection level of service grade. **Exhibit 7.2** shows a comparison of the existing arterial levels of service versus those with the immediate improvements in place.

Exhibit 7.2 Immediate Alternative Levels of Service

Time Period	Existing Arterial LOS	Immediate Alternative LOS
AM Eastbound	C	C
Midday Eastbound	C	C
PM Eastbound	C	C
AM Westbound	C	C
Midday Westbound	C	C
PM Westbound	C	C

While delay is decreased, overall LOS for each direction remains the same.

7.1.3 Intersection Level of Service

Exhibit 7.3 shows what the levels of service will be once the Immediate alternative is implemented. With the improvements, all approaches will operate acceptably at LOS D or better unlike the no-build conditions described in Section 3.

Exhibit 7.3 Immediate Improvement Levels of Service

Crossing Street	Direction	Approach LOS		
		AM	Midday	PM
US 422 Business	Eastbound	B	B	B
	Westbound	B	B	C
	Northbound	B	B	D
	Southbound	B	B	B
	Overall	B	B	C
Shelly/Mill Run Drive	Eastbound	A	B	B
	Westbound	A	A	A
	Northbound	A	A	A
	Southbound	C	B	C
	Overall	A	A	B
13th Street	Eastbound	A	A	A
	Westbound	A	A	B
	Northbound	C	C	D
	Southbound	C	B	B
	Overall	A	B	B
11th Street	Eastbound	A	A	A
	Westbound	A	A	A
	Northbound	C	C	C
	Southbound	C	B	B
	Overall	A	A	A
9th Street	Eastbound	B	B	C
	Westbound	A	A	A
	Northbound	B	B	C
	Southbound	B	B	B
	Overall	B	B	B
7th Street	Eastbound	C	C	D
	Westbound	B	B	C
	Northbound	C	C	D
	Southbound	C	B	C
	Overall	B	C	C
6th Street	Eastbound	A	A	A
	Westbound	A	A	A
	Northbound	B	B	B
	Southbound	B	B	B
	Overall	B	A	B
5th Street	Eastbound	A	A	B
	Westbound	B	A	B
	Northbound	B	B	B
	Southbound	B	B	C
	Overall	B	A	B
4th Street	Eastbound	A	A	A
	Westbound	B	B	B
	Northbound	D	C	C
	Southbound	C	B	C
	Overall	B	B	B
3rd Street	Eastbound	A	A	A
	Westbound	A	A	A
	Northbound	B	B	B
	Southbound	C	C	C
	Overall	B	A	A

Compared to the existing levels of service, the immediate improvements will result in an improvement to many approach and overall LOS, with all movements operating at acceptable levels.

7.1.4 Immediate Alternatives Conclusion

While the most important operational modification contained in the Immediate alternative involves traffic signal timing adjustments, the other identified improvements will also contribute to reducing the congestion experienced in the corridor. Items such as improved signing and pavement markings can reduce congestion by limiting driver confusion and indecision while also improving safety.

7.2 Short-Term Improvement Comparison

7.2.1 Corridor Travel Times

The corridor travel times for the proposed Short-Term improvements are shown in **Exhibit 7.5.**

Exhibit 7.5 Short-Term Alternative Travel Times

Peak Period and Direction	Existing Trip Time (min)	Short-Term Alternative Travel Time (min)
AM Eastbound	7.6	6.9
Midday Eastbound	8.5	7.1
PM Eastbound	8.6	7.2
AM Westbound	7.5	6.8
Midday Westbound	7.7	7.0
PM Westbound	8.1	7.4

With short term improvements, eastbound travel times will improve by 9 percent in the AM peak hour and by 16 percent in both the midday and PM peak hour. Westbound travel times will improve by 9 percent for all time periods.

7.2.2 Arterial Level of Service

Exhibit 7.5 illustrates the arterial level of service as a result of the Short-Term alternative.

Exhibit 7.5 Short-Term Alternative Levels of Service

Time Period	Existing Arterial LOS	Short-Term Alternative LOS
AM Eastbound	C	B
Midday Eastbound	C	C
PM Eastbound	C	C
AM Westbound	C	C
Midday Westbound	C	C
PM Westbound	C	C

Arterial level of service remains unchanged except the eastbound direction in the AM peak hour which improves from LOS C to LOS B.

7.2.3 Intersection Level of Service

Exhibit 7.6 shows what the levels of service will be once the Short-Term alternative is implemented. With the improvements, all approaches will operate acceptably at LOS D or better unlike no-build conditions described in Section 3.

Exhibit 7.6 Short-Term Alternative Levels of Service

Crossing Street	Direction	Approach LOS		
		AM	Midday	PM
US 422 Business	Eastbound	A	A	A
	Westbound	A	B	B
	Northbound	B	B	B
	Southbound	C	B	B
	Overall	B	B	B
Shelly/Mill Run Drive	Eastbound	B	B	A
	Westbound	A	A	A
	Northbound	A	A	B
	Southbound	B	B	C
	Overall	B	A	A
13th Street	Eastbound	A	A	A
	Westbound	A	A	B
	Northbound	C	C	D
	Southbound	C	B	B
	Overall	A	A	B
11th Street	Eastbound	A	A	A
	Westbound	A	A	A
	Northbound	C	C	C
	Southbound	C	B	B
	Overall	A	A	B
9th Street	Eastbound	A	B	B
	Westbound	A	A	A
	Northbound	B	B	B
	Southbound	C	B	B
	Overall	B	B	B
7th Street	Eastbound	A	A	A
	Westbound	A	A	A
	Northbound	B	B	B
	Southbound	B	B	B
	Overall	A	A	A
6th Street	Eastbound	A	A	A
	Westbound	B	B	C
	Northbound	B	A	A
	Southbound	B	B	B
	Overall	B	B	B
5th Street	Eastbound	A	B	A
	Westbound	A	A	A
	Northbound	B	B	B
	Southbound	B	B	C
	Overall	B	B	B
4th Street	Eastbound	A	A	A
	Westbound	B	B	B
	Northbound	D	B	C
	Southbound	C	B	C
	Overall	B	B	B
3rd Street	Eastbound	A	A	A
	Westbound	A	A	A
	Northbound	B	B	B
	Southbound	C	C	C
	Overall	A	A	A

7.2.4 SHORT-TERM ALTERNATIVES CONCLUSION

An enhanced signal system along with minor geometric enhancements/modifications can reduce delay by 9-16 percent. Additionally, these improvements will result in all approaches operating at acceptable levels of service.

7.3 COMPARISON OF IMPROVEMENT ALTERNATIVES WITH EXISTING CONDITIONS

7.3.1 MEASURES OF EFFECTIVENESS DEFINITIONS

- **Alternative Category** – Identification of the model, peak period and direction for the measures of effectiveness to be reported.
- **Arterial Level of Service** – Based on speed and arterial class. Arterial class is based on the distances between intersections and the speed between intersections. Speed is the total distance divided by the total travel time.
- **Average Speed** – The distance between intersections divided by the travel time including delays.
- **Emissions**:
  - CO – Carbon Monoxide Emissions (Fuel Consumption x 69.9 g/gal)
  - NOx – Nitrogen Oxides Emissions (Fuel Consumption x 13.6 g/gal)
  - VOC – Volatile Oxygen Compounds Emissions (Fuel Consumption x 16.2 g/gal)
- **Fuel Consumption** – Total Travel x Speed + Total Delay + Stops
  - Each of the items for fuel consumption have additional factors applied.
- **Fuel Economy** – the average distance a vehicle can travel on 1 gallon of gas.
- **Number of Stops** – Calculated by the number of vehicles being delayed for more than 10 seconds. The number of stopped vehicles is calculated by counting the number of delayed vehicles for each delay time and adjusting the vehicles that stop less than 10 seconds.
- **Signal Delay** – The percentile delay for a lane group. Signal Delay is equal to 1.3 times the stopped delay.
- **Travel Time** – Equal to running speed plus signal delay

Exhibits 7.7 through **7.18** summarize measures of effectiveness by direction and time period.

Exhibit 7.7 Immediate Alternative AM Eastbound Measures of Effectiveness

Alternative Category	Signal Delay (hr)	Number of Stops	Arterial Level of Service	Average Speed (mph)	Fuel Consumption (gal)	Fuel Economy (mpg)	Emissions (kg)			Travel Time (hr)
							CO	NO_x	VOC	
Existing	10	1806	C	26	66	18.0	4.63	0.90	1.07	46
Immediate	8	1356	C	27	61	19.4	4.29	0.84	1.00	43

Exhibit 7.8 Immediate Alternative AM Westbound Measures of Effectiveness

Alternative Category	Signal Delay (hr)	Number of Stops	Arterial Level of Service	Average Speed (mph)	Fuel Consumption (gal)	Fuel Economy (mpg)	Emissions (kg)			Travel Time (hr)
							CO	NO_x	VOC	
Existing	12	1976	C	22	56	15.9	3.88	0.75	0.90	41
Immediate	11	1941	C	23	54	16.5	3.76	0.73	0.87	39

Exhibit 7.9 Immediate Alternative Midday Eastbound Measures of Effectiveness

Alternative Category	Signal Delay (hr)	Number of Stops	Arterial Level of Service	Average Speed (mph)	Fuel Consumption (gal)	Fuel Economy (mpg)	Emissions (kg)			Travel Time (hr)
							CO	NO_x	VOC	
Existing	15	1948	C	22	65	16.4	4.52	0.88	1.05	48
Immediate	8	1371	C	26	56	18.9	3.91	0.76	0.91	41

Exhibit 7.10 Immediate Alternative Midday Westbound Measures of Effectiveness

Alternative Category	Signal Delay (hr)	Number of Stops	Arterial Level of Service	Average Speed (mph)	Fuel Consumption (gal)	Fuel Economy (mpg)	Emissions (kg)			Travel Time (hr)
							CO	NO_x	VOC	
Existing	13	2053	C	23	64	17.0	4.48	0.87	1.04	47
Immediate	9	1686	C	25	59	18.5	4.12	0.80	0.96	43

Exhibit 7.11 Immediate Alternative PM Eastbound Measures of Effectiveness

Alternative Category	Signal Delay (hr)	Number of Stops	Arterial Level of Service	Average Speed (mph)	Fuel Consumption (gal)	Fuel Economy (mpg)	Emissions (kg)			Travel Time (hr)
							CO	NO_x	VOC	
Existing	21	2752	C	22	87	16.2	6.10	1.19	1.41	65
Immediate	15	2267	C	24	81	17.6	5.63	1.10	1.31	59

Exhibit 7.12 Immediate Alternative PM Westbound Measures of Effectiveness

Alternative Category	Signal Delay (hr)	Number of Stops	Arterial Level of Service	Average Speed (mph)	Fuel Consumption (gal)	Fuel Economy (mpg)	Emissions (kg)			Travel Time (hr)
							CO	NO_x	VOC	
Existing	19	2950	C	24	97	17.4	6.75	1.31	1.56	71
Immediate	18	2729	C	24	95	17.6	6.64	1.29	1.54	69

Exhibit 7.13 Short-Term Alternative AM Eastbound Measures of Effectiveness

Alternative Category	Signal Delay (hr)	Number of Stops	Arterial Level of Service	Average Speed (mph)	Fuel Consumption (gal)	Fuel Economy (mpg)	Emissions (kg)			Travel Time (hr)
							CO	NO_x	VOC	
Existing	10	1806	C	26	66	18.0	4.63	0.90	1.07	46
Short-Term	6	1312	B	29	59	20.1	4.15	0.81	0.96	42

Exhibit 7.14 Short-Term Alternative AM Westbound Measures of Effectiveness

Alternative Category	Signal Delay (hr)	Number of Stops	Arterial Level of Service	Average Speed (mph)	Fuel Consumption (gal)	Fuel Economy (mpg)	Emissions (kg)			Travel Time (hr)
							CO	NO_x	VOC	
Existing	12	1976	C	22	56	15.9	3.88	0.75	0.90	41
Short-Term	9	1796	C	24	51	17.3	3.58	0.70	0.83	37

Exhibit 7.15 Short-Term Alternative Midday Eastbound Measures of Effectiveness

Alternative Category	Signal Delay (hr)	Number of Stops	Arterial Level of Service	Average Speed (mph)	Fuel Consumption (gal)	Fuel Economy (mpg)	Emissions (kg)			Travel Time (hr)
							CO	NO_x	VOC	
Existing	15	1948	C	22	65	16.4	4.52	0.88	1.05	48
Short-Term	7	1446	C	27	55	19.3	3.83	0.75	0.89	39

Exhibit 7.16 Short-Term Alternative Midday Westbound Measures of Effectiveness

Alternative Category	Signal Delay (hr)	Number of Stops	Arterial Level of Service	Average Speed (mph)	Fuel Consumption (gal)	Fuel Economy (mpg)	Emissions (kg)			Travel Time (hr)
							CO	NO_x	VOC	
Existing	13	2053	C	23	64	17.0	4.48	0.87	1.04	47
Short-Term	9	1874	C	25	60	18.1	4.20	0.82	0.97	43

Exhibit 7.17 Short-Term Alternative PM Eastbound Measures of Effectiveness

Alternative Category	Signal Delay (hr)	Number of Stops	Arterial Level of Service	Average Speed (mph)	Fuel Consumption (gal)	Fuel Economy (mpg)	Emissions (kg)			Travel Time (hr)
							CO	NO_x	VOC	
Existing	21	2752	C	22	87	16.2	6.10	1.19	1.41	65
Short-Term	10	2130	C	26	76	18.7	5.28	1.03	1.22	54

Exhibit 7.18 Short-Term Alternative PM Westbound Measures of Effectiveness

Alternative Category	Signal Delay (hr)	Number of Stops	Arterial Level of Service	Average Speed (mph)	Fuel Consumption (gal)	Fuel Economy (mpg)	Emissions (kg)			Travel Time (hr)
							CO	NO_x	VOC	
Existing	19	2950	C	24	97	17.4	6.75	1.31	1.56	71
Short-Term	15	2644	C	25	92	18.2	6.44	1.25	1.49	66

8. Implementation Plan

In order to prioritize the proposed improvement alternatives that the congested corridor program has identified, a programming cost estimate as well as a benefit/cost analysis must be completed for each proposed improvement.

8.1 Costs

For the benefit/cost analysis to be completed, a construction cost must be estimated. This cost estimate is not intended to be used to outline all of the work that will take place if the proposed improvement is implemented but rather to provide a basis of magnitude for the benefit/cost analysis. For the costs that were developed, the "big ticket" items were estimated and a contingency was then applied to each subtotal to determine the construction cost that would be used for the benefit/cost analysis.

The costs shown are the total calculated for the improvements shown. The costs per improvement typically include the total of materials, labor, and right-of way where required. Cost estimate calculations are contained in the appendix.

Cost breakdowns are provided by individual improvement and timeframe for planning and programming purposes. Many of the immediate improvements detailed in **Exhibit 8.1** may be implemented under current maintenance programs.

Exhibit 8.1 Cost of Immediate Improvements

Location	Improvement	Estimated Cost
Corridor-wide	Retime signals	$2,600
	Upgrade pavement markings	$15,000
	Upgrade signing	
	Implement an Access Management Policy	NA
Shelly/Mill Run Drive	Relocate pedestrian push buttons (2 locations)	$500
College Lodge/ Acorn Street	Improve intersection sight distance	Not calculated
13th Street	Repair side street detection	$1,000
9th Street	Improve lane use signing including WB left-turn lane drop	$500
7th Street	Reconfigure NB approach to left only and shared thru/right	$500
	Reconfigure SB approach to left only and shared thru/right	$500
	Improve lane use signing	$500
6th Street	Remove bollard	$500
4th Street	Fix deficient transition traveling eastbound east of intersection	$500
	Reconfigure SB approach to left only and shared thru/right	$500

Short-term programs may require dedicated programming or may potentially utilize funds set aside for implementation of CCIP improvements. Short-term costs are presented in **Exhibit 8.2**.

Exhibit 8.2 Cost of Short-term Improvements

LOCATION	IMPROVEMENT	ESTIMATED COST
Corridor-wide	Signal Enhancement Project	$1,000,000
	Convert four lane section to two through lanes with a center turn lane and bicycle lanes	Not calculated
US 422 Business	Add NB left-turn lane	$354,000
	Add WB left-turn lane	
13th Street	Add EB and WB left-turn lanes	$4,000
11th Street	Add EB and WB left-turn lanes	$4,000
	Install RR gate arms as currently planned	Not calculated
	Check to verify signal does not warrant RR preemption	Not calculated
9th Street	Add NB right-turn lane	$2,000
7th Street	Consider installing bulb-outs	$94,000
	Modify pedestrian phasing ▪ Option 1: Reevaluate timing needs for all ped phase ▪ Option 2: Install lead pedestrian intervals	$500
6th Street	Add NB right-turn lane	$2,000
3rd Street	Add EB and WB left-turn lanes	$4,000

In the short-term a signal enhancement project would provide the infrastructure needed to support timing updates and system operational oversight. The elements to be considered were identified in previous sections. Ideally, all elements would be implemented as part of one project; however, a breakdown of elements could be used in case multiple projects are required for full implementation.

Exhibit 8.3 Breakdown of Signal Enhancement

ELEMENT	IMPLEMENTATION CONSIDERATIONS
Solid state controllers and possible closed loop	▪ Required for updated timing implementation ▪ Approximate cost: $14,000
Wireless interconnect	▪ Required for updated timing implementation ▪ Approximate cost: $1,000
Detection	▪ Detection is necessary to maximize corridor performance ▪ Approximate cost : $24,000
Refine timings	▪ Engineering and implementation only; no construction costs
Recalculate pedestrian and clearance intervals	▪ Engineering and implementation only; no construction costs
Light emitting diode (LED) indications	▪ Approximate cost: $5,600
Countdown pedestrian indications and pushbuttons	▪ Approximate cost: $5,800
Upgrade crosswalks	▪ Approximate cost: $500
Replace outdate structures, as needed	▪ Approximate cost: $25,000
Upgrade street name signs	▪ Approximate cost: $2,000
Additional costs (Mobilization, Conduit/Cabling)	▪ Approximate cost: $15,500

Long-term improvements may require more substantial right-of-way and therefore would require a phased-in approach to implementation.

Exhibit 8.4 Cost of Long-term Improvements

LOCATION	IMPROVEMENT	ESTIMATED COST
Corridor-wide	In current four-lane section, modify the cross section to provide one travel lane in each direction, a two-way left-turn lane, and two five-foot bicycle lanes	$38,000
	In current four-lane section, add a landscaped grass median in areas where center-turn lane would not be needed	$250,000
US 422 Business	Add NB right-turn lane	$380,000
	Add WB right-turn lane	
Shelly/Mill Run Drive	Add second WB left-turn lane	$83,000
9th Street	Realign 9th Street	$272,000
7th Street	Consider pedestrian mall on north leg (see discussion on negative impact to traffic operations) if it benefits community development	NA

Total program cost is $2,114,700 for all improvements including final design and operation and maintenance costs. Total cost by time frame is depicted in **Exhibit 8.5.**

Exhibit 8.5 Total Estimated Cost

ALTERNATIVE CATEGORY	ESTIMATED COST
Immediate	$22,600
Short-Term	$1,464,500
Long-Term	$985,000

Detailed cost estimates are included in the Technical Appendices.

8.2 BENEFIT-COST

8.2.1 FUEL AND DELAY SAVINGS BENEFIT-COST

After the construction costs for the proposed alternatives were developed, a benefit/cost analysis was completed. The congested corridor improvement program's standard study methodology identifies how the benefit should be calculated. That methodology was utilized for this study.

Using the methodology, the benefit/cost ratios in **Exhibit 8.6** were calculated for the improvement alternatives that were included in the model.

Exhibit 8.6 Corridor Benefit/Costs

Alternative Category	Estimated B/C
Immediate	45.87
Short-Term	2.64
Long-Term	12.03

The detailed Benefit-Cost analysis can be found in the Appendix.

8.2.2 Crash Reduction Impacts

In addition to delay benefits, many of the improvements may yield a reduction in crashes.

Exhibits 8.7, 8.8, 8.9 and 8.10 indicate the maximum crash reduction factor for each improvement per FHWA and Kentucky Transportation Center's "Development of Accident Reduction Factors." In practice, the maximum crash reduction would be weighted if multiple improvements are applied at a location. Also used were crash reduction factors provided by Caltrans which they use in B/C calculations for their Highway Safety Improvement Program.

These reduction factors could be applied to total crashes and monetary values to quantify safety benefits.

"Value of Life" from U.S. DOT, Office of the Assistant Secretary for Transportation Policy (http://ostpxweb.dot.gov). Current values are:

$3,000,000 per fatality

$63,000 per person injured

$2,300 per property damage only (PDO)

This effort is not part of the Standard Study Methodology.

Exhibit 8.7 Safety Crash Reductions for Immediate Improvements

Location	Improvement	Estimated Crash Reduction Factor
Corridor-wide	Retime signals	0.10
	Upgrade pavement markings	0.10
	Upgrade signing	
	Implement an Access Management Policy	NA
	Total	0.19
US 422 Business	None	NA
Shelly/Mill Run Drive	Relocate pedestrian push buttons (2 locations)	0.10
College Lodge/ Acorn Street	Improve intersection sight distance	0.30
13th Street	Repair side street detection	0.10
11th Street	None	NA
9th Street	Improve lane use signing including AB left-turn lane drop	0.10
7th Street	Reconfigure NB approach to left only and shared thru/right	0.27
	Reconfigure SB approach to left only and shared thru/right	0.27
	Improve lane use signing	0.10
	Total	0.32
6th Street	Remove bollard	0.20
5th Street	None	NA
4th Street	Fix deficient transition traveling eastbound east of intersection	0.05
	Reconfigure SB approach to left only and shared thru/right	0.27
	Total	0.27
3rd Street	None	NA

Exhibit 8.8 Safety Crash Reductions for Short-term Improvements

Location	Improvement	Estimated Crash Reduction Factor
Corridor-wide	Signal Enhancement Project **(see Exhibit 8.9)**	0.22
US 422 Business	Add NB left-turn lane	0.27
	Add WB left-turn lane	0.27
	Total	0.47
Shelly/Mill Run Drive	None	
13th Street	Add EB and WB left-turn lanes	0.47
11th Street	Add EB and WB left-turn lanes	0.47
	Install RR gate arms as currently planned	0.70
	Check to verify signal does not warrant RR preemption	NA
	Total	0.84
9th Street	Add NB right-turn lane	0.10
7th Street	Consider installing bulb-outs	0.30
	Modify pedestrian phasing ▪ Option 1: Reevaluate timing needs for all ped phase ▪ Option 2: Install lead pedestrian intervals	0.25 for lead pedestrian interval
	Total	0.48
6th Street	Add NB right-turn lane	0.10
5th Street	None	NA
4th Street	None	NA
3rd Street	Add EB and WB left-turn lanes	0.47

Exhibit 8.9 Safety Crash Reductions for Signal Enhancement Project

Element	Estimated Crash Reduction Factor
Solid state controllers and possible closed loop	0.20
Wireless interconnect	0.10
Detection	0.10
Refine timings	0.10
Recalculate pedestrian and clearance intervals	0.10
Light emitting diode (LED) indications	0.30
Countdown pedestrian indications	0.25
Upgrade crosswalks	0.25
Replace outdated structures, as needed	-
Upgrade street name signs	0.20

Exhibit 8.10 Safety Crash Reductions for Long-term Improvements

Location	Improvement	Estimated Crash Reduction Factor
US 422 Business	Add NB right-turn lane	0.10
	Add WB right-turn lane	0.10
	Total	0.19
Shelly/Mill Run Drive	Add second WB left-turn lane	0.27
13th Street	None	NA
11th Street	None	NA
9th Street	Realign 9th Street	0.50
7th Street	Consider pedestrian mall on north leg (see discussion on negative impact to traffic operations) if it benefits community development	0.30
6th Street	None	NA
5th Street	None	NA
4th Street	None	NA
3rd Street	None	NA

8.3 Funding Considerations

CCIP improvement alternatives are broken into three categories. Funding considerations are detailed in **Exhibit 8.11**. Funding priorities should be consistent with timeframes and benefit/cost ratios.

As part of the CCIP program, $250,000 has been set aside on the TIP for immediate and short-term implementations. The best use of these resources is to address immediate improvements and leverage the remaining resources in signal enhancements while requesting/ acquiring additional resources.

Exhibit 8.11 Funding Considerations

Alternative Categories	Estimated Timeframe	Description	Funding Considerations
Immediate	Less than 1 year	▪ Minor signing and pavement marking improvements ▪ Signal timing modifications to existing signal systems and individual intersections ▪ Minor inter-modal enhancements	▪ Utilize maintenance programs (liquid fuels)
Short-term	1 to 3 years	▪ Signing and pavement marking improvements ▪ Minor geometric improvements within existing right-of-way or minor right-of-way impacts ▪ Signal timing modifications to existing signal systems and individual intersections	▪ Utilize CCIP money set aside in TIP ▪ Pursue Transportation Enhancements and Hometown Streets / Safe Routes to School programs for applicable enhancements such as mast arms, crosswalks, pedestrian countdown indications and other pedestrian enhancements
Long-term	Greater than 3 years	▪ Improvements involving substantial right-of-way acquisition and requiring additional studies, planning and programmatic funding such as major or new roadway construction	▪ Acquire additional funding in future TIP updates

Funding programs and financing options are described in more detail on subsequent pages.

8.3.1 Funding Programs

Liquid Fuels Program
PENNSYLVANIA TITLE 75 CHAPTER 90 Section §9010 provides counties with an annual separate fund from which payments may be made for construction, maintenance, and repair of local roads and bridges. The title also provides that counties may allocate monies from this fund to their political subdivisions for these same purposes. ACT 655 DATED 1956 AND AMENDMENTS provides municipalities other than counties with an annual allocation of Liquid Fuels Taxes from the State's Motor License Fund. This allocation is based on the mileage and population of the municipality and the revenues must be used on the roads and streets for which the municipalities are responsible. Allocations are made on the basis of 50 percent mileage and 50 percent population. Mileage is determined by the Department of Transportation. Population is based on official United States Census Reports. These funds can be used for minor maintenance related improvements identified as part of this study.

Transportation Enhancements and Hometown Streets/Safe Routes to School Programs
The Transportation Enhancements (TE) and Hometown Streets/Safe Routes to School (HS/SRTS) Programs provide funding for projects that are often outside the realm of standard highway or transit improvements and help focus attention on better integrating the transportation with the communities it serves. Improvements related to the CCIP that can be funded through these programs include street lighting, bike lanes or paths, sidewalks, crosswalks, and other pedestrian facilities. Enhancements applications are typically accepted every two years (in odd years) through a process administered by PENNDOT and SPC. The next round of Enhancements is anticipated to be in Fall 2007. The next round of HS/SRTS applications is also anticipated to be in Fall 2007.

Twelve Year Program/Transportation Improvement Program
Probably the most well known funding mechanism for transportation projects is PennDOT's Twelve Year Program. The 12 Year Program is not a funding source per se, but a programmed listing of projects that is reviewed and updated every two years.
A subset of the 12 Year Program, the Transportation Improvement Program (TIP) encompasses the first four year period of the 12 Year Program and generally constitutes the highest priority projects. For transportation projects, getting onto the TIP represents an important first step towards receiving federal and state funding and commitment. Municipal officials can and must work directly with their representatives at SPC in advocating the municipality's transportation project needs as projects face regional competition for a limited amount of MPO funds.

Agility Program
As part of PennDOT's Agility Program, Pennsylvania's new "Agile Maintenance Enterprises" (AMEs) operate under Agility principles to provide better maintenance services, faster, and at less expense to their customers. These AMEs consist of PennDOT field organizations, county and local government partners, and customers who identify operational needs and the organizational core competencies to fill those needs. This results in a unique sharing of resources, typically unheard of in government,

and a unified vision for an improved transportation system regardless of how ownership is divided. When governmental jurisdictions cooperate in "virtual" or temporary relationships, individual sovereignty is not challenged but the benefits of consolidation are realized. As a result, transportation customers are enriched through improved transportation services. Delivering improved transportation products and services is accomplished through the formation of these AMEs between PennDOT and other government or not-for-profit partners. These agile partners share resources and work toward a unified work plan for improving the overall transportation system. AMEs are developed to address highly localized and customer impact projects.

8.3.2 FINANCING OPTIONS

If funding cannot be acquired through existing programs, local financing may be an option for carrying projects forward. Some of these options include some form of development generated revenues. Due to the limited opportunity for future development along the Philadelphia Street corridor, these options may not be viable alternatives.

State Infrastructure Bank

Created by legislation signed by then-Governor Ridge in 1997, the Pennsylvania Infrastructure Bank provides loan and credit opportunities to transportation project sponsors for financing projects. The bank affords transportation project sponsors with several benefits that include:

- Accelerated implementation schedules.
- Ability to leverage other state and federal funding sources.
- Construction of non-traditional projects that otherwise would not be funded through the TIP process.
- Attract and involve local financial support in economic development opportunities.

The Pennsylvania State Infrastructure Bank can be a powerful tool for municipalities to use to finance transportation projects that help to ensure the adequacy of their transportation system. Low interest loans are issued at ½ the current prime-lending rate as determined by the Federal Reserve. A complete financing plan must be presented when applying for funds.

Tax Increment Financing

The concept of tax increment financing is to use the difference in taxes generated from a property as vacant land to the taxes generated from that same property once developed to pay for improvements made in that region. Tax increment financing requires that all of the taxing agencies or authorities commit to earmarking the additional tax revenue for a set period of time to pay for agreed upon improvements.

Transportation Partnership District

A transportation partnership provides for a special assessment on land and development to pay for off-site transportation improvements. The special assessment must be approved by those who own at least 50 percent of the assessed land value in order to approve the formation of the district. A district can be used to pay for part or all of the costs associated with a project. To make a district successful, the majority of the landowners in a proposed district need to see direct transportation benefits.

Developer Funded Improvements

New developments will impose traffic impacts on the roadway network. As part of PennDOT's Highway occupancy permit process, developers must meet the Department's requirements for improvements in order to maintain roadway levels of service and safety. Some of the improvements in the study area may fall under the HOP permit process. In addition, the municipalities in the study area have the ability to negotiate with developers for on site improvements related to their development. It is not unusual to exact these improvements from the developer through negotiations.

Traffic Impact Fees

Impact fees can be used to capture the costs that development can levy on the transportation system and the surrounding community. To implement an impact fee ordinance in Pennsylvania, municipalities must conduct a detailed existing traffic conditions study to form a basis for assessing new impacts to development. Much of this information is contained within this study.

9. NEXT STEPS

This document is intended to provide alternatives that will move directly into final design for the Immediate and Short-Term scenarios. The final design and construction of these items could be funded through SPC's 12-Year Program or alternative sources.

The final designs of the Long-Term improvement recommendations are outside the scope of this program. The Long-Term improvements would need to be added to the region's Long-range Transportation Plan (LRTP) which is a prerequisite for the TIP/12-Year Program. The SPC develops and periodically updates the LRTP in cooperation and coordination with its planning partners and with public outreach through its Public Participation Panels.

The Long-Term improvement recommendations that are associated with major roadway construction will be subject to PennDOT's five-phase Transportation Project Development Process. The five-phases of this process include Planning, Prioritization & Programming, Design, Construction, and Maintenance & Operations. Major roadway construction projects will require Preliminary Engineering, which is a subset of the Design Phase, for preliminary engineering studies, environmental studies and public involvement.