EXECUTIVE SUMMARY

Background

This report summarizes the data collection, traffic analyses, and improvement alternatives for the development of a Truck Route Plan for the City of Sharon in Mercer County, Pennsylvania. With convenient access to national markets via nearby rail lines, I-80, I-79, and SR 60, numerous industrial and distribution facilities in and around Sharon generate a significant amount of heavy-truck traffic (tractor-trailers) in addition to the normal truck traffic typical of a downtown area. The result is an increased level of truck traffic congestion that impacts (1) normal automobile traffic, bicyclists and pedestrians; (2) the City's roadway, bridge, and traffic control infrastructure; and (3) the general aesthetics or environment of the surrounding community, including main street businesses, residential areas, and the Penn State Shenango Campus.

The primary goal of this study was to develop an easily understandable truck route plan that can be implemented to safely and efficiently move trucks through the City of Sharon. Truck access to the numerous heavy truck generating facilities should be enhanced while also improving pedestrian and automobile safety and mobility in the area. To that end, data was first collected and analyzed to identify existing truck and automobile traffic conditions, establish which routes are currently used by trucks, and summarize any existing deficiencies. Improvement alternatives were then developed to reduce these deficiencies, and locally-preferred alternatives were selected, prioritized, and advanced to the level of detail necessary to determine the level of funding needed for programming and implementation.

Data Collection and Analysis

Traffic volume and classification data included 9 automatic traffic recorder sites to collect 24-hour data, and 14 intersection turning movement count sites to collect weekday AM, midday, and PM peak hour data. Data verified that there are significant volumes of truck traffic throughout the study area, including 30-190 trucks per hour at the highest volume intersections (with the highest being US 62 @ West Budd Street), 600-1500 trucks per day along the highest volume roadway segments (with the highest being US 62, west of Irvine Avenue), and an estimated 4300 trucks per day in/out of the study area.

Field surveys included a review of existing truck route signing, geometric conditions, traffic signals, traffic operations, and general field observations. Existing truck route signing was typically found to be incomplete, inconsistently designed, or atypically placed in the field, all having the net effect that truck-related sign perception was very difficult, which may degrade the level of compliance with any existing truck prohibitions or the effective guidance provided by any existing truck trailblazing. Geometric analyses identified 15 existing commonly-used truck maneuvers that either could not (9 maneuvers) or could only marginally (6 maneuvers) accommodate trucks without significant vehicular conflicts or curb impacts. Such maneuvers had a negative effect on traffic operations at several locations.

To gain additional insight into the existing truck routes and travel patterns, project-specific Truck Route Surveys were distributed to 13 major truck-generating establishments or transportation providers, and 30 other local businesses throughout Sharon. Survey response rates of 54% and 27%, respectively, exceeded the response rate of 20% that is typically expected for a statistically valid survey and represented a good cross-section of trucking activities throughout the study area. Results identified 4 distinct truck origin & destination zones within the study area, plus 4 external zones outside the study area, and were intuitive in that the largest proportion of trucks (61%) was to/from the south and/or west (toward I-80) along US 62 (35%) or SR 60 (26%). The paths taken through the study area to access businesses within these zones were consistent based on the survey responses.

Based on the data and analyses, three corridors were defined and evaluated for truck route improvements. These areas included (1) a Railroad & Penn Route that currently uses Railroad, Silver, Pitt, and Dock Streets to access businesses in the vicinity of Penn and Shenango Avenues; (2) a Dock & Sharpsville Route that currently uses Dock and Pitt Streets, Connelly Boulevard, and Sharpsville Avenue to access businesses in the vicinity of Winner Steel and as far north as Clark Street; and (3) other high truck-volume areas including Budd Street, which has direct access to/from US 62, and general through-truck traffic that overlaps all areas.

Numerous route-specific improvement options were evaluated to address deficiencies along each corridor. General improvements were also evaluated such as modifications to truck route signing, general signing and pavement markings, and traffic signal operations. Ultimately, improvements were focused on achieving the project goals, as identified through engineering investigations and stakeholder involvement, through seven key objectives as follows:

- Simplify the truck routes and/or consolidate the routes (and related impacts) to fewer streets.
- Implement intersection geometric improvements to address problematic truck turning maneuvers.
- Eliminate crossing of the inbound and outbound truck routes along Railroad Street and Dock Street to reduce truck-related conflicts.
- Reduce or eliminate heavy-truck traffic from the Penn State Shenango campus.
- Reduce truck volumes and address truck-related deficiencies along Sharpsville Avenue, particularly between Connelly Boulevard and Silver Street.
- Reduce truck volumes and address truck-related deficiencies along Connelly Boulevard, particularly for circulation between Dock Street and US 62.
- Address grade-related concerns for heavy-truck traffic, particularly for special permit loads currently utilizing Pitt Street from Dock Street to Sharpsville Avenue.

Locally-Preferred Alternatives

Weighed against these objectives, and specifically based on decisions made during the June 15, 2007, project meeting with MCRPC, the City of Sharon, PENNDOT, and other project stakeholders, the locally-preferred alternatives for the Truck Route Plan were selected by the collective stakeholders as follows:

- General improvements throughout the study area, as applicable, and including modifications to:

  - Truck route signing with improved trailblazing and color-designated routes, specifically designed and implemented subsequent to the locally-preferred short-term alternatives for the Railroad & Penn and Dock & Sharpsville Routes, and including modifications to truck route, prohibition, and wayfinding signs, as required.

  - General signing and pavement markings at the intersection of Connelly Boulevard @ US 62 / Sharpsville Avenue, including the addition of post-mounted lane-use control signs on the US 62 approach and standard pavement marking upgrades on the Sharpsville Avenue approach.

  - Traffic signal timing coordination improvements at the intersection of Connelly Boulevard @ US 62 / Sharpsville Avenue and Connelly Boulevard @ Dock Street. (No equipment additions or modifications were assumed as part of this study; only signal timing or phasing changes, as necessary.)

  - Traffic signal detection for the northbound Budd Street approach at the intersection of US 62 @ Budd Street to eliminate false calls due to vehicles from other approaches actuating the signal. (No equipment additions or modifications were assumed as part of this study; only traffic signal programming modifications, as necessary.)

- Railroad & Penn truck route modifications that include a new Railroad Street Connection between Penn Avenue and Shenango Avenue, and geometric improvements in the vicinity of Pitt Street and Silver Street.

- Dock & Sharpsville truck route modifications that include removal of an existing channelizing island on Wishart Court, signalization or other traffic control improvements at Wishart Court and Sharpsville Avenue, and other geometric improvements in the vicinity of Dock Street and Wishart Court. (No signal warrant or other intersection control investigations were conducted as part of this study.)

- Long-term improvements to improve circulation between US 62 and SR 60 via a permanent Budd Street reconnection.

Conceptual-level cost estimates were developed for each of the locally-preferred alternatives, and alternatives were grouped to allow phased implementation as reflected in the table below. This phasing was not intended as a calendar schedule, but rather to help facilitate efficient planning and implementation of the improvements with regard to the importance or complexity of each alternative, the relationship between alternatives, and the need to program the necessary funding. All improvements will require additional engineering, design, and funding for construction and implementation, and estimated costs of each are incorporated into the estimates below. While this cost information should be sufficient for programming funding, it is conceptual-level only and will need to be updated as any designs are finalized

Summary Table: Cost Estimate and Implementation Schedule for Locally-Preferred Alternatives

Phase	Improvement	Estimated Cost [1]	
1	**General Improvements**	**TOTAL**	**$12,000**
	Temporary Budd Street Reconnection (By Others)		n/a
	Signing and Pavement Marking Modifications		$2,500
	Traffic Signal Modifications		$9,500
2	**Railroad & Penn Truck Route Modifications**	**TOTAL**	**$678,000**
	Silver Street Improvements [2,3]		$252,000
	Pitt Street Improvements [2,3]		$117,500
	Railroad Street Connection [2]		$308,500
3	**Dock & Sharpsville Truck Route Modifications**	**TOTAL**	**$312,500**
	Wishart Court Improvements		$312,500
4	**Truck Route Signing**	**TOTAL**	**$16,500**
	Truck Route, Prohibition, and Trailblazing Sign Improvements		$16,500
5	**Permanent Budd Street Reconnection**	**TOTAL**	**$236,500**
	Railroad Preemption System [3]		$236,500
-	**OVERALL PROJECT TOTAL (PHASES 1-5)**	**TOTAL**	**$1,255,500**

Note 1: All estimates are intended for conceptual use only, are based on year 2007 dollars, and include 15% contingency, 12% engineering, and 8% construction inspection costs in the values shown.

Note 2: Where indicated, values include estimated costs for right-of-way acquisition.

Note 3: Where indicated, values include estimated costs to fully upgrade (to current standards) any existing or proposed at-grade railroad crossings being impacted by the improvements.

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Note: All Appendices have been included in electronic PDF format only. The electronic files may be found on the enclosed CD at the end of this report.

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION AND PURPOSE

This report summarizes the data collection, traffic analyses, and improvement alternatives for the development of a Truck Route Plan for the City of Sharon in Mercer County, Pennsylvania (Figure 1). Sharon is located in an enterprise zone with excellent access to national markets via nearby rail lines, I-80, I-79, and SR 60. This convenient location has helped to establish numerous industrial and distribution facilities within and adjacent to the City's downtown area. These facilities are a valuable asset to the community, providing jobs and tax base, but they also generate a significant amount of heavy-truck traffic (tractor-trailers) in addition to the normal truck traffic (smaller distribution or box-type trucks) typical of a downtown area. The result is an increased level of truck traffic congestion that impacts normal automobile traffic, bicyclists and pedestrians. This congestion is compounded by the fact that many of the downtown streets were constructed prior to the advent of tractor trailers and were not designed to accommodate these heavy vehicles. Truck traffic also impacts the City's roadway, bridge, and traffic control infrastructure, as well as the general aesthetics or environment of the surrounding community, including main street businesses, residential areas, and the Penn State Shenango Campus.

The primary goal of this study was to develop an easily understandable truck route plan that can be implemented to safely and efficiently move trucks through the City of Sharon. Truck access to the numerous heavy truck generating facilities should be enhanced while also improving pedestrian and automobile safety and mobility in the area. General steps in the development of this plan were summarized in the following chapters of this report:

- Chapter 2 – Data Collection:
  - Identified existing truck and automobile traffic conditions.
  - Surveyed where trucks go to and come from within the project area.
- Chapter 3 – Analysis of Existing Conditions:
  - Established which routes are currently used by trucks.
  - Summarized any existing deficiencies affecting truck travel.
- Chapter 4 – Analysis of Improvement Alternatives:
  - Developed alternatives to reduce deficiencies and meet the project objectives.
  - Determined the impacts of the proposed alternatives on traffic flow.
- Chapter 5 – Conclusions and Preferred Alternatives:
  - Selected preferred alternatives and defined required / related improvements.
  - Prioritized improvements for cost-effective, multi-year implementation.

1.2 STUDY AREA

The study area boundaries for this project generally run from the Pennsylvania/Ohio border eastward to approximately Oakland Avenue, and from the southern Sharon municipal boundary northward to approximately Clark Street (Figure 1). The primary corridors providing truck access to/from the City of Sharon are:

- **US 62 West / Shenango Valley Expressway** – provides market access to Youngstown and Warren, Ohio and to I-80 West, with links into downtown Sharon via Irvine Avenue, Connelly Boulevard, or Sharpsville Avenue.
- **SR 60 / Martin Luther King, Jr., Boulevard** – provides market access to the Broadway Avenue Industrial Corridor (located to the south) and to I-80 East, with links into downtown Sharon via SR 718 / Dock Street.
- **US 62 East / Connelly Boulevard and SR 518 / State Street** – provide market access to Hermitage and points east, with direct links into downtown Sharon.
- **SR 518 / Sharpsville Avenue** – provides market access to Sharpsville and points north, with direct links into downtown Sharon and to Clark Street.

Thirteen major heavy-truck generating facilities are located in or immediately adjacent to the study area (Figure 1). Most roadways providing access to these facilities are two-way collectors with one-lane in each direction (several have on-street parking), and there are approximately 16 signalized intersections throughout the study area. The primary east-west roads used by trucks include Budd Street, Connelly Boulevard, Pitt Street, Silver Street, and Clark Street. The primary north-south roads used by trucks include Irvine Avenue, Water Street, Penn Avenue, Shenango Avenue, Railroad Street, Dock Street, and Sharpsville Avenue. State Street is the City's main street corridor and has typical main street automobile, pedestrian, and parking activities in addition to six signalized intersections.

There are several bridges and railroad crossings within the study area that also serve as vital parts of the transportation network that were considered in the development of the Truck Route Plan. Partway through this study, the State Street Bridge over the Shenango River was closed for reconstruction. Three additional bridges along US 62 / Shenango Valley Expressway are scheduled for closure and reconstruction subsequent to this study. Active rail lines along the east or west side of the Shenango River and west of SR 60 and Dock Street serve many of the same heavy-truck generating facilities included in this study. These lines include at least 14 at-grade railroad crossings along many of the downtown roadways. One additional at-grade crossing will be introduced along Budd Street as part of a temporary Budd Street reconnection that is currently planned and scheduled (independent of this study) as part of the US 62 / Shenango Valley Expressway bridge reconstruction.

2.0 DATA COLLECTION

2.1 TRAFFIC VOLUMES

Traffic volume data for this project was collected by staff members of the Mercer County Regional Planning Commission (MCRPC) and provided to the consultant team for review and analysis. Traffic counts included a combination of Automatic Traffic Recorder (ATR) counts and intersection Turning Movement Counts (TMC).

2.1.1 ATR

ATR counts recorded hourly traffic volume data in each direction along a given segment of roadway for a minimum of 24 hours. Most counts also included classification data identifying 13 separate classes of vehicles, including bikes, cars, buses, and various types of single-unit trucks and tractor-trailer trucks.

Project-specific ATR counts were collected in October 2006, and historic data for several additional locations were provided for April, May, or October 2005. Raw ATR data for the roadway segments listed below is included in Appendix A; additional compilation details are included in Appendix D:

- SR 60 (south of Budd Street)
- US 62 (between Connelly Boulevard and SR 60 Bridge)
- US 62 (between Connelly Boulevard and Stambaugh Avenue)
- East Connelly Boulevard (west of SR 60)
- US 62 Business / State Street (east of North Sharpsville Avenue)
- West State Street (west of Irvine Avenue)
- Shenango Avenue (north of Silver Street)
- SR 718 (north of Clark Street)
- SR 518 (north of Clark Street)

ATR data was summarized to develop average daily traffic volumes (Figure 2A) and average daily truck volumes (Figure 3A).

2.1.2 TMC

TMC's detailed the total number of vehicles during the count period that turned each direction (left, through, or right) on each approach to a given intersection, as well as manual classification data identifying small trucks and large trucks. For TMC data collection purposes, small trucks included single-unit trucks with up to four-axles; large trucks included buses and all tractor-trailer combinations.

Project-specific TMC's were collected in November 2006 for 2, 4, or 6 hour periods during a typical weekday. Count periods spanned the AM peak period (7:00-9:00 AM), Midday peak period (11:00 AM-1:00 PM), and PM peak period (3:00-5:00 PM). Raw TMC data is included in Appendix B for the following intersections:

- Site 1 – US 62 @ Irvine Avenue
- Site 2 – West State Street @ Irvine Avenue
- Site 3 – West State Street @ SR 718 / Water Street
- Site 4 – East State Street @ Dock Street
- Site 5 – Silver Street @ Railroad Street
- Site 6 – Silver Street @ North Sharpsville Avenue
- Site 7 – East State Street @ Sharpsville Avenue
- Site 8 – Connelly Boulevard @ Irvine Avenue
- Site 9 – Connelly Boulevard @ South Water Street
- Site 10 – Connelly Boulevard @ Dock Street
- Site 11 – Connelly Boulevard @ US 62 / Sharpsville Avenue
- Site 12 – SR 60 @ Wayne Place
- Site 13 – US 62 @ West Budd Street
- Site 14 – South Irvine Avenue @ Budd Street

TMC data was summarized to develop AM, Midday, and PM peak hour volumes for total vehicles and total trucks (Figure 2B-D), and to breakout small trucks and large trucks (Figure 3B-D).

2.2 TRUCK ROUTE SURVEYS

Project-specific truck route surveys were developed and distributed to help identify existing truck routes, truck origins and destinations, and related data that would help assess the existing truck travel patterns and develop and prioritize truck route improvements. To gain practical and realistic insight into the existing truck routes, these surveys were provided directly to the end-users of the system – the major truck-generating establishments, transportation providers, and other local businesses throughout Sharon. A complete list of survey participants, as well as compiled survey responses and sample survey forms, are included in Appendix C.

Two information meetings were held for the major truck-generators and transportation providers on April 12, 2007. At these meetings, the project goals and objectives were presented, and the trucking stakeholders were provided an opportunity to discuss their specific operations and areas of concern. Truck route survey forms were provided to each attendee at the meetings. Additional forms were distributed by mail during the month of April 2007 to all identified stakeholders that did not attend the meetings. Survey responses were received and compiled through the end of May 2007.

A total of 43 surveys were distributed. This total included 13 "Establishment Surveys" or "Transportation Provider Surveys" to businesses with significant trucking operations, and 30 "Business Surveys" to smaller businesses and/or those with minor or minimal trucking operations. Survey response rates of 54% and 27%, respectively, exceeded the target response rate of 20% that is typically accepted as statistically valid. Therefore, the compiled survey responses were assumed to represent a fair cross-section of trucking activities throughout the study area. The survey results were summarized to determine existing truck travel patterns (Figure 5), and all relevant survey data was incorporated and/or considered throughout the completion of this truck route plan.

2.3 FIELD SURVEYS

Field surveys were conducted in April and May 2007. These surveys focused on observing and documenting general traffic and truck traffic conditions throughout the study area, including existing truck route signing, geometric conditions, traffic signal operations, and general field observations.

2.3.1 Truck Route Signing

Existing truck route signing was located, photographed, and/or recorded onto a study area map based on a windshield survey of the existing street network (Figure 4A-B). Existing truck route signing includes two basic groups of signs – truck prohibitions and truck trailblazing. Truck prohibitions include those signs that prohibit or restrict trucks from making certain turns or accessing certain streets or routes. Truck trailblazing includes signs that provide positive guidance allowing trucks to follow designated routes, reach specific destinations, or access certain roadways.

Field-observations pertaining specifically to truck route signing throughout the study area included the following:

- Existing signage was typically incomplete. Several truck trailblazing signs appeared to be missing, and/or critical turns along a given route were not always marked. Positive guidance for outbound trucks or to specific numbered routes was also minimal.

- Existing truck route signs varied widely in design. Sign panel sizes and border, legend, or arrow colors varied from sign to sign. Arrow size, placement, or usage on trailblazers was inconsistent. Standard signs were intermixed with non-standard variations of the same sign.

- Existing truck route signs were not always placed in typical or ideal locations. Some signs were placed on the left side of the road, on the far side of an intersection, or at varying heights. Others were placed beyond a

curve with minimal sight-distance toward the sign for approaching motorists.

- Truck prohibition signage was observed on Pitt Street between Dock Street and Sharpsville Avenue which, according to Winner Steel, is the designated route that special permit trucks to that facility are required to follow.

2.3.2 Geometric Conditions

Tractor-trailer trucks were observed having difficulty making turning maneuvers at several intersections throughout the study area. These trucks blocked adjacent lanes at the beginning of the turn, infringed on opposing lanes at the end of the turn, and/or impacted the adjacent curbs or sidewalks during their turns.

To quantify problematic truck turning maneuvers, AutoTURN software was employed at select locations. AutoTURN is a CAD-based software tool that specifically evaluates vehicle paths and clearances through intersections for various vehicle types. For this project, vehicle centerline paths were drawn to-scale overtop aerial photographs of the study area, and truck turning envelopes were simulated for a standard WB-67 tractor-trailer truck with a minimum turn radius of 41'. The turning envelopes indicated the paths of the front and rear overhangs of the truck being evaluated. Locations were selected for evaluation based on field-observed problems, a review of the existing truck routes, comments from project meetings, and data from the truck route surveys.

Based on the AutoTURN analysis, there were 6 existing truck maneuvers that could only marginally accommodate trucks without vehicular conflicts or curb impacts, including:

- Connelly Boulevard @ US 62 – Eastbound right-turn
- Connelly Boulevard @ Dock Street – Northbound right-turn
- Connelly Boulevard @ Railroad Street – Westbound right-turn
- Connelly Boulevard @ Water Street – Eastbound left-turn
- Pitt Street @ Dock Street – Eastbound right-turn
- Pitt Street @ Penn Avenue – Southbound left-turn

Based on the AutoTURN analysis, there were 9 existing truck maneuvers that could not accommodate trucks without significant vehicular conflicts or curb impacts, including:

- Connelly Boulevard @ Dock Street – Westbound right-turn
- Connelly Boulevard @ Dock Street – Westbound left-turn
- Connelly Boulevard @ Dock Street – Northbound left-turn
- Connelly Boulevard @ Sharpsville Avenue – Southbound right-turn
- Pitt Street @ Dock Street – Northbound right-turn
- Pitt Street @ Sharpsville Avenue – Eastbound left-turn
- Silver Street @ Railroad Street – Northbound left-turn

- Silver Street @ Penn Avenue – Westbound right-turn
- Sharpsville Avenue @ Wishart Court – Eastbound right-turn

Additional geometric-related observations pertained to grades along various roadway segments. Based only on the Truck Route Survey responses and windshield survey, moderate up-grades that may affect trucking operations were noted at:

- Sharpsville Avenue from Connelly Boulevard to State Street
- Pitt Street from Dock Street to Sharpsville Avenue
- Wayne Place from Dock Street to US 62

2.3.3 Traffic Signals and Traffic Operations

Field inventories were collected at 18 intersections throughout the study area. Each inventory detailed the intersection lane arrangements, turn-lane storage lengths, stop sign or traffic signal control, traffic signal timing and phasing, signal detectors, pedestrian facilities, parking, and other relevant operational details.

Field-observations pertaining specifically to traffic signal operations throughout the study area included the following:

- East-west traffic flow along Connelly Boulevard between Dock Street and US 62 / Sharpsville Avenue appeared to be hampered by poor traffic signal progression. For example, westbound traffic that received a green signal at US 62 would have to stop at the Dock Street signal, which created a queue that extended back through the US 62 intersection. This congestion directly affected, or was directly affected by, a significant volume of tractor-trailer trucks circulating between the closely-spaced intersections.

- At the intersection of US 62 and Budd Street, it appeared that westbound left-turning trucks from US 62 occasionally tracked over a portion of the side-street detector for northbound Budd Street. This movement potentially caused false actuations of the Budd Street traffic signal phase and unnecessarily stopped the US 62 mainline.

2.3.4 General Field Observations

Additional general field observations relevant to this study included the following:

- Tractor-trailer trucks were occasionally observed proceeding tentatively along State Street through downtown Sharon, potentially searching for their desired truck route.

- One apparently misguided tractor-trailer truck was observed stopping on State Street just east of the weight-restricted Shenango River Bridge. This vehicle traveled in reverse along State Street before proceeding north onto Shenango Avenue toward the Penn State campus.

- At the intersection of US 62, Connelly Boulevard, and Sharpsville Avenue, centerline pavement markings on the southbound approach appeared to be worn, missing, or non-standard. Intersection geometry also appeared to affect motorists' reactions, potentially due to the skewed north leg that may not be immediately apparent as a receiving lane for the northbound through-movement from US 62.

- At the intersection of Clark Street and Water Street, left-turn sight-distance from westbound Clark Street was limited due to vehicles parked on the right shoulder of Water Street north of the intersection.

3.0 ANALYSIS OF EXISTING CONDITIONS

3.1 TRUCK TRAFFIC SUMMARY

3.1.1 Daily Truck Volumes

Based on a review of daily traffic volume and vehicle classification data (Figure 3A), the following roadway segments carried the highest total truck traffic in the study area:

- US 62, west of Irvine Avenue (1500 trucks per day)
- SR 60, south of Budd Street (1100 trucks per day)
- US 62, east of Sharpsville Avenue (600 trucks per day)

3.1.2 Hourly Truck Volumes

Based on a review of hourly traffic volume and vehicle classification data (Figure 3B-D), the intersections listed below were identified as carrying the highest volumes of total truck traffic. Volumes shown in parentheses are the highest hourly truck volume totals for all applicable intersection approaches.

- US 62 @ West Budd Street (190 trucks per hour)
- US 62 @ Irvine Avenue (150 trucks per hour)
- Connelly Boulevard @ US 62 / Sharpsville Avenue (150 trucks per hour)
- Connelly Boulevard @ Dock Street (110 trucks per hour)
- Sharpsville Avenue @ East State Street (70 trucks per hour)
- Dock Street @ East State Street (50 trucks per hour)
- Silver Street @ Sharpsville Avenue (50 trucks per hour)
- Silver Street @ Railroad Street (30 trucks per hour)

3.1.3 Truck Origins-Destinations

A basic summary of the total daily truck traffic entering and exiting the study area, referred to as the study area's cordon truck flow, is shown on Figure 3A, Inset "A". The percentages were derived by comparing the total daily truck volume for each road listed by an estimated 4300 trucks per day in/out of the study area. Results are intuitive in that the largest proportion (61%) is to/from the south and/or west (toward I-80) along US 62 (35%) or SR 60 (26%).

The Truck Route Survey results (Appendix C) were used to expand the cordon truck flow information to establish where trucks go to or come from within the City itself (Figure 5 and Appendix D). Once this information was evaluated, four distinct zones ("A" through "D") within the study area and four primary external zones ("E" through "H") were identified as follows:

- **Zone "A"** – This zone includes Sharon Tube, Jolley Industries, Sharon Commercial Printing, and Winner International. Trucks typically access each site from Penn or Shenango Avenues and other local streets. Inbound/outbound access is primarily via Railroad Street (70%).

- **Zone "B"** – This zone includes Carine and Company and Goldstein's. Trucks access each site from Shenango Avenue or Railroad Street and other local streets. Inbound/outbound access is almost exclusively via Railroad Street (95%).

- **Zone "C"** – This zone includes American Industries and Winner Steel, with Winner Steel being the second highest volume truck generator in the study area. Site access to Winner Steel Gates "C" and "D" (35%) is from Sharpsville Avenue to Clark Street. Site access to Winner Steel Gates "A" and "B" (55%) is directly from Sharpsville Avenue. Site egress from Winner Steel is split to Wishart Court and Dock Street due to a channelizing island that interferes with truck access from Gate "A" to Dock Street. Inbound/outbound access is split between Dock Street and Sharpsville Avenue, with specific requirements for special permit loads using Pitt Street.

- **Zone "D"** – This zone includes operations for Chadderton Trucking, PI&I and others. Truck access is direct to/from US 62 via Budd Street.

- **External Zones "E" through "H"** – In addition to traffic to/from the internal zones described above, truck traffic also passes through Sharon from external zone to external zone. While these pairs were not explicitly quantified, they would generally overlap, or add to, heavy-truck routes along US 62 (East), US 62 (West), SR 60, and SR 518.

3.2 TRUCK ROUTE SIGNING

Field observations and a review of the existing truck route signing (Figure 4A-B) reveal several deficiencies with the current system of truck prohibitions and truck trailblazing.

- **Incomplete Signage** – Missing or overlooked signs can result in misguided trucks ending up on streets where they should not be.

- **Inconsistent Design** – Inconsistently designed signs are difficult to recognize or lead to confusion with similar-looking unrelated signs. For example, red-on-white parking signs look similar to red-on-white truck route signs, and truck route guidance messages look similar to truck prohibitions, particularly from a distance.

- **Atypical Sign Placement** – Atypical sign placement can contribute to last-minute lane changes, direction changes, or other erratic driving behaviors that may decrease the level of safety for nearby motorists, pedestrians, and bicycles. For example, signs placed on the far side or left side of an intersection may be difficult to recognize or read prior to entering the intersection.

The net effect of the above concerns is that truck-related sign perception in the study area is very difficult, which may degrade the level of compliance with the existing truck prohibitions or the effective guidance provided by the existing truck trailblazing. These factors are especially problematic for heavy-truck drivers whose primary focus should be on safely navigating their vehicles through an unfamiliar downtown area without undue issues related to interpreting or following signs.

3.3 TRUCK ROUTES

Based on the truck origin-destination analysis and related field surveys, existing truck routes through downtown Sharon can be consolidated into three groups: (1) Railroad Street and Penn Avenue (2) Dock Street and Sharpsville Avenue, and (3) other routes such as Budd Street.

3.3.1 Railroad & Penn Route

The Railroad & Penn Route is a combination of Zones "A" and "B" from the origin-destination analysis. Approximately 90-95% of the heavy-trucks for those zones enter/exit Sharon from the south via US 62 or SR 60. The majority of that traffic uses Connelly Boulevard to access Railroad Street (inbound), or Pitt Street to access Dock Street (outbound). Trucks to Zone "A" follow the Pitt/Silver one-way couplet to access Penn Avenue locations. Trucks to Zone "B" continue north on Railroad Street to access Franklin Street, Shenango Avenue, and vicinity (note that Franklin Street is the east-west cross-street at the north end of Railroad Street). There are a number of geometric, signage, and other miscellaneous deficiencies along this route.

Geometric Deficiencies

At least three intersections along these routes have geometric constraints that do not accommodate adequate turn radii for heavy trucks. Locations include:

- Connelly Boulevard @ Dock Street – northbound left-turn
- Silver Street @ Railroad Street – northbound left-turn
- Silver Street @ Penn Avenue – westbound right-turn

Signing Deficiencies

Localized truck trailblazing specifically for these routes is incomplete. Following the inbound signage shown on Figure 4A-B, several signs appear to be missing, particularly

where truck traffic splits northbound or westbound (depending on their destination) at the intersection of Railroad Street and Silver Street. Following the outbound signage, signs are missing, inconsistent, and not ideally located.

Miscellaneous Deficiencies

Given the orientation of this route, which follows Railroad Street inbound and Dock Street outbound, the inbound/outbound truck traffic crosses paths at two locations. At the intersection of Railroad Street and Pitt Street, northbound (inbound) trucks conflict with eastbound (outbound) trucks. At the intersection of Dock Street and Connelly Boulevard, northbound and westbound (inbound) trucks conflict with southbound (outbound) trucks. The crossed paths compound any truck-related deficiencies along this route.

One additional concern along the existing Railroad & Penn Route is that truck traffic to/from the Penn Avenue locations via Silver Street and Pitt Street travel through or very near the Penn State Shenango Campus. The presence of heavy-truck traffic in this area is not desirable for the campus atmosphere and directly conflicts with recent streetscape improvements that are meant to encourage pedestrian and bicycle traffic between the campus and downtown Sharon. As pedestrian, bicycle, and on-street parking activities increase through the campus and surrounding areas, the potential for conflicts with heavy-truck traffic presents a higher level of safety concerns.

3.3.2 Dock & Sharpsville Route

The Dock & Sharpsville Route is Zone "C" from the origin-destination analysis, plus that portion of Zone "A" utilizing Sharpsville Avenue to Clark Street. Approximately 90% of the heavy-trucks for this route enter/exit Sharon from the south via US 62 or SR 60. The majority of the inbound traffic accesses Sharpsville Avenue either directly, if coming from US 62, or via Connelly Boulevard, if coming from SR 60. From Sharpsville Avenue, traffic splits to any one of the four Winner Steel Gates and/or to Clark Street and the north end of Shenango Avenue. Most outbound traffic follows Dock Street to Connelly Boulevard, but traffic from Winner Steel Gate "A" uses Sharpsville Avenue via Wishart Court due to a channelizing island that blocks direct truck access to Dock Street. This island affects approximately 25% of Winner Steel's exiting truck traffic.

Geometric Deficiencies

In addition to the Wishart Court channelizing island and the Pitt Street upgrade, at least four intersections along this route have other geometric constraints that do not accommodate adequate turn radii for heavy-trucks. Locations include the following:

- Connelly Boulevard @ Dock Street – westbound right-turn
- Pitt Street @ Dock Street – northbound right-turn

- Pitt Street @ Sharpsville Avenue – eastbound left-turn
- Sharpsville Avenue @ Wishart Court – eastbound right-turn

Signing Deficiencies

Localized truck trailblazing specifically for this route is essentially non-existent. While there are several truck prohibition signs, there are no standard truck route signs or other trailblazing to provide positive guidance inbound, and only minimal signage outbound.

A lack of positive guidance appears to be especially problematic at the intersection of US 62 / Connelly Boulevard / Sharpsville Avenue. Due to the skewed north leg of the intersection, the approach from the south along US 62 may appear to trucks as if they were approaching only a T-intersection, which may contribute to confusion or misdirection for trucks planning to continue north to Sharpsville Avenue. Worn, missing, or non-standard pavement markings were also observed on the southbound Sharpsville Avenue approach, potentially making it less clear if the skewed north leg is, in fact, an allowable through-movement from the south.

Miscellaneous Deficiencies

Unique to this route are special permit double-coil steel loads traveling between Winner Steel and points south on SR 60. By legislation and due to the weight of these vehicles, the special permit loads are routed north on Dock Street, east on Pitt Street, and north on Sharpsville Avenue to Winner Steel Gate "A", with return trips directly south on Dock Street. Meetings with Winner Steel and MCRPC staff have indicated that the special permit loads used to be routed from Dock Street to Sharpsville Avenue via Connelly Boulevard, but these trucks were re-routed due to the physical damage being caused along Connelly Boulevard by the heavy loads. The new route on Pitt Street is also problematic due to an eastbound upgrade approaching Sharpsville Avenue. Considering the weight of these vehicles, accelerating along that upgrade from a stop can introduce significant delays to any trailing traffic and places a tremendous strain on the power and drive trains of the truck itself.

3.3.3 Other Routes

Trucks to/from Budd Street (Zone "D" in Figure 5) have direct access to US 62 and essentially operate independently of other traffic patterns through downtown. However, many trucks from this zone serve as the transportation providers for other truck-generating facilities in the area, including those that use the Railroad & Penn and Dock & Sharpsville Routes.

Peak hour volumes indicate that a significant heavy-truck movement also occurs between US 62 and SR 60, which would include Budd Street trucks as well as through-trucks between external Zones "E" and "F". The connection is made along Connelly

Boulevard via traffic signals at Dock Street and at US 62 / Sharpsville Avenue. Both intersections have geometric constraints that do not accommodate adequate turn radii for heavy trucks. Field observations verify that these constraints, combined with significant truck volumes and inefficient signal coordination, contribute to a notable increase in delays, queuing, and related congestion for truck and automobile traffic in the vicinity.

3.4 TRAFFIC SIGNAL OPERATIONS

A capacity and level of service (LOS) analysis was conducted for 11 signalized intersections within the study area to assess the existing traffic operations. This analysis was completed using Synchro software, which follows the procedures outlined in the Transportation Research Board's "Highway Capacity Manual". LOS is a letter-grade based on the average delay per vehicle due to the traffic control in place at an intersection. LOS ranges from A through F, with LOS A representing the best operating conditions and LOS F representing the worst. Detailed Synchro reports are included in Appendix E, and summary LOS results are shown in Table 1.

Table 1: Signalized Intersection LOS Summary

Signalized Intersection	LOS AM Peak	LOS Midday Peak	LOS PM Peak
U.S. 62 @ Irvine Ave	A	B	B
State St @ Irvine Ave	B	B	B
State St @ Water St	B	No Data	B
State St @ Dock St	B	B	B
Silver St @ Sharpsville Ave	B	B	B
State St @ Sharpsville Ave	B	B	B
Connelly Blvd @ Irvine Ave	B	B	B
Connelly Blvd @ Dock St	B	B	C
Connelly Blvd @ Sharpsville Ave	C	C	C
Budd St @ U.S. 62	A	A	A
Budd St @ Irvine Ave	A	A	A

All intersections were identified as operating at an acceptable LOS C or better, which is generally considered an acceptable range of operations, for all three peak periods. No capacity or LOS-related concerns were identified that would have a significant impact on the assessment of existing truck routes or the development of truck route improvement alternatives.

4.0 ANALYSIS OF IMPROVEMENT ALTERNATIVES

Several improvement alternatives were developed to address deficiencies and concerns detailed throughout Section 3.0. Many of the alternatives and options were derived from comments and feedback gathered from the Truck Route Surveys and related meetings held on April 12, 2007. An initial package of alternatives was then presented to and discussed with a Public Advisory Committee (PAC) during a meeting held on June 15, 2007. Applicable meeting minutes are documented in Appendix F. The resulting improvement alternatives – categorized as general improvements, short-term route improvements, or long-term route improvements – are detailed below.

4.1 GENERAL IMPROVEMENTS

General improvements include alternatives that would impact overall truck traffic and/or auto traffic in the area, may not be related to a single truck route, and/or could be developed and implemented immediately (or within a very short timeframe) independent of other alternatives. These improvements address truck route signing, general signing and pavement markings, and traffic signal operations.

4.1.1 Truck Route Signing

Truck route signing alternatives focused on improving the level of effectiveness of the overall sign system by introducing a higher level of standardization, consistency, and completeness into the existing truck prohibitions and trailblazing. The goal of these alternatives is to allow truck drivers to quickly and easily locate, recognize, understand, and act upon any desired sign message. Improvement options are described below and on Figure 6.

Truck Prohibitions

To improve recognition and compliance of all truck prohibitions, signs could be upgraded to standardize sign style, design, and placement. Two examples are shown in Figure 6. In each example, all the different types of existing signs shown could be replaced at each location using the same standard sign. Exact locations of the replacement signs should also consider visibility requirements for approaching drivers.

Trailblazing Option 1 – Basic Standardization

Option 1 to enhance truck trailblazing includes a basic standardization of all signs, locations, and route or destination postings. Modifications are described below and on Figure 6 for inbound signage along the primary roads entering downtown Sharon, wayfinding signage to specific business/industry locations within downtown Sharon, and outbound signage for trucks leaving the immediate downtown area.

- **Inbound Signage** – Replace, add, or upgrade inbound signs with typical "Truck Route" signs (PENNDOT R14-1) and appropriate turn markers (PENNDOT M5 or M6-series). All critical turns or junctions along any designated truck route should be signed accordingly to ensure a continuous, un-broken path that truck drivers can easily identify and follow point-to-point.

- **Wayfinding Signage** – Upgrade all wayfinding signs to specific business/industry locations using a single, consistent design style. Use individual sign panels for each location, all having the same size, color, font, border, etc., coupled with appropriate turn markers (PENNDOT M5 or M6-series). The business/industry sign panels could be similar in design to the R14-1 "Truck Route" signs used for the inbound portions of each route, or they could be customized using a distinct font, color, etc., provided that all panels are identical to form a cohesive and easily recognizable wayfinding system.

- **Outbound Signage** – Replace, add, or upgrade outbound signs with typical route markers (PENNDOT M1-series), "TO" markers (PENNDOT M4-5), and appropriate turn markers (PENNDOT M5 or M6-series) to assist trucks in returning to US 62 or SR 60. Outbound signage could also utilize typical "Truck Route" signs (PENNDOT R14-1) with customized information panels (i.e., "To US 62" or "To PA 60") that are of the same design as the business/industry sign panels.

Trailblazing Option 2 – Color-Designated

Option 2 to enhance truck trailblazing builds upon Option 1 by designating different truck routes based on color as per the examples in Figure 6. The color-designation would help to distinguish the trailblazers from any surrounding signage and create a more unique and recognizable wayfinding system. It would also allow multiple routes to be signed accordingly, making it easier for drivers to follow a specific route based on their destination, and allowing local businesses or industries to reference driving directions to a specific route. For example, business directions could state "once you arrive in Sharon, follow the Blue Route to Goldstein's".

Sign modifications for Option 2 would be identical to Option 1, but with the addition of color-designation panels above the inbound and wayfinding sign assemblies. Other options for the color-designation panels could include colored text and/or graphics placed on sign blanks that otherwise match the standard "Truck Route" signs and/or business/industry sign panels. Options for outbound signage would be identical to Option 1.

Trailblazing Option 3 – Custom Wayfinding

Option 3 to enhance truck trailblazing carries the color-designation concepts of Option 2 to a higher level of customization as per the examples in Figure 6. In lieu of using separate sign blanks and standard M5 or M6-series turn markers per Options 1 and 2, Option 3 combines the arrows, business/industry names, and color-designations onto a single customized panel or series of panels. This level of customization could provide a very distinct wayfinding system that enhances overall driver perception and compliance while fitting into a community-appropriate streetscape. However, such a system also potentially increases sign sizes, sign fabrication requirements, and costs, as well as maintenance requirements related to keeping any business/industry legends current.

4.1.2 General Signing and Pavement Markings

Based on field observations, general signing and pavement markings could be improved for the following approaches to the intersection of US 62 / Connelly Boulevard / Sharpsville Avenue:

- **Southbound Sharpsville Avenue** - upgrade pavement markings on the southbound approach, including installation of standard double-yellow centerline markings where applicable per PENNDOT Publication 111M.

- **Northbound US 62** – install lane-use control signs designating one shared through/left-turn lane and one exclusive right-turn lane. Signs could be side-mounted using standard sign R3-8A, or they could be mast-arm mounted using standard signs R3-5R and R3-6LS (standard sign numbers per PENNDOT Publication 236M).

Improving the intersection lane-use control with these options could provide additional positive guidance for trucks and autos to help alleviate any confusion or misdirection attributable to driver misperception of the skewed north leg of the intersection.

4.1.3 Traffic Signal Operations

Based on field observations, traffic signal operations could be improved for the following intersections:

- Connelly Boulevard @ US 62 / Sharpsville Avenue
- Connelly Boulevard @ Dock Street
- US 62 @ Budd Street

Traffic signal re-timing along Connelly Boulevard could improve coordination to help reduce queuing and delays between the closely-spaced intersections, thereby improving general traffic flow for trucks and autos. Traffic signal detection modifications on Budd

Street could help to reduce or eliminate false side-street actuations, thereby reducing unnecessary stops or delays along the US 62 mainline.

Re-timing efforts could be as simple as verifying that the clocks in the controllers are set to a consistent and correct time to ensure that the programmed signal offsets are working correctly. If necessary, signal communication upgrades could be implemented, and/or the signal timings could be updated. Any signal timing study may also need to be expanded to include at least the nearest upstream signal in any direction, or any signals that currently operate as part of a coordinated system, to ensure appropriate operations of the signal system as a whole, including cross-coordination (i.e., north-south flow versus east-west flow) where applicable.

4.2 SHORT-TERM ROUTE IMPROVEMENTS

Short-term improvements were developed as a package of route-specific options for the Railroad & Penn Route, Dock & Sharpsville Route, an Irvine Avenue option, and a temporary Budd Street reconnection. All short-term improvements would require additional engineering, design, and funding for construction and implementation since the alternatives presented here are at the conceptual level only.

4.2.1 Railroad & Penn Route

Figure 7 illustrates three progressively more extensive options to address concerns and deficiencies along the Railroad & Penn Route, with each option described as follows:

Option 1 – Upgrade Existing Route

Option 1 maintains the existing truck route with location-specific upgrades where necessary. From US 62 or SR 60, the inbound route follows Connelly Boulevard to Railroad Street, and then splits to Penn Avenue via Silver Street, or to Shenango Avenue via Railroad and Franklin Streets. The outbound route utilizes Pitt Street to access Dock Street to Connelly Boulevard.

Option 1 route upgrades would include the following:

- Traffic signal improvements along Connelly Boulevard
- Truck route signing improvements throughout the study area
- Intersection geometric improvements at three locations:
  - Connelly Boulevard @ Dock Street – northbound left-turn
  - Silver Street @ Railroad Street – northbound left-turn
  - Silver Street @ Penn Avenue – westbound right-turn

With these upgrades, Option 1 would (1) improve signing along the existing route, (2) improve traffic flow through the Connelly Boulevard traffic signals, and (3) ease truck-turning through the intersections listed above. This option would not eliminate truck conflicts where the inbound / outbound routes cross, nor would it remove truck traffic from the Penn State Shenango campus.

Option 2 – Minor Route Shift

Option 2 shifts the inbound truck route from Railroad Street to Dock Street. It otherwise maintains the existing inbound route split to Penn Avenue via Silver Street, or to Shenango Avenue via Railroad and Franklin Streets. It also maintains the outbound route via Pitt Street to Dock Street and Connelly Boulevard.

Option 2 route upgrades would include the following:

- Traffic signal improvements along Connelly Boulevard
- Truck route signing improvements throughout the study area
- Intersection geometric improvements at four locations:
  - Connelly Boulevard @ Dock Street – westbound right-turn
  - Silver Street @ Dock Street – northbound left-turn
  - Silver Street @ Railroad Street – westbound right-turn
  - Silver Street @ Penn Avenue – westbound right-turn

With these upgrades, Option 2 would provide the same benefits as Option 1, plus it would shift a portion of the route to a single corridor along Dock Street in lieu of an inbound Railroad Street / outbound Dock Street couplet. This minor route shift would (1) simplify the route in general and (2) eliminate conflicts where the inbound / outbound routes previously crossed. This option would not remove truck traffic from the Penn State Shenango campus.

Option 3 – Railroad Street Connection

Option 3 constructs a new Railroad Street Connection that extends Franklin Street from Shenango Avenue to Penn Avenue, thereby providing an alternate east-west link between Railroad Street and Penn Avenue that avoids Silver Street or Pitt Street through the Penn State Shenango campus. The Railroad Street Connection would cross between buildings on property currently owned by Carine Industries. Both the inbound and outbound truck route would be shifted to utilize Railroad Street, Franklin Street, and the new connection, with access to/from Dock Street via Silver Street and Pitt Street.

Option 3 route upgrades would include the following:

- Traffic signal improvements along Connelly Boulevard
- Truck route signing improvements throughout the study area
- Intersection geometric improvements at four locations:
  - Connelly Boulevard @ Dock Street – westbound right-turn
  - Silver Street @ Dock Street – northbound left-turn
  - Silver Street @ Railroad Street – westbound right-turn
  - Pitt Street @ Railroad Street – southbound left-turn
- Construction of the new Railroad Street Connection as needed to extend Franklin Street from Shenango Avenue to Penn Avenue

With these upgrades, Option 3 would provide the benefits of Options 1 and 2, plus consolidate the route primarily to just the Railroad and Dock Street corridors and remove heavy trucks from most segments of Silver Street, Pitt Street, and Penn Avenue. These changes would (1) simplify the route and related signing, (2) eliminate conflicts where the inbound / outbound routes previously crossed, and (3) eliminate the need for heavy trucks to travel through the Penn State Shenango campus.

4.2.2 Dock & Sharpsville Route

Figure 8 illustrates three progressively more extensive options to address concerns and deficiencies along the Dock & Sharpsville Route, with each option described as follows:

Option 1 – Upgrade Existing Route

Option 1 maintains the existing truck route with location-specific upgrades where necessary. From US 62 or PA 60, the inbound route crosses Connelly Boulevard to proceed north onto Sharpsville Avenue, with the exception of special permit loads that continue to follow Dock Street to Pitt Street. The outbound route generally follows Dock Street, with the exception of trucks from Winner Steel Gate "A" that follow Wishart Court onto southbound Sharpsville Avenue.

Option 1 route upgrades would include the following:

- Traffic signal improvements along Connelly Boulevard
- Truck route signing improvements throughout the study area
- Intersection geometric improvements at four locations:
  - Connelly Boulevard @ Dock Street – northbound right-turn
  - Pitt Street @ Dock Street – northbound right-turn

- Pitt Street @ Sharpsville Avenue – eastbound left-turn
- Wishart Court @ Sharpsville Avenue – eastbound right-turn

With these upgrades, Option 1 would (1) improve signing along the existing route, (2) improve traffic flow through the Connelly Boulevard traffic signals, and (3) ease truck-turning through the intersections listed above. This option would not reduce truck volumes on Sharpsville Avenue, reduce truck movements circulating along Connelly Boulevard between Dock Street and Sharpsville Avenue, or address concerns related to the moderate up-grades on Pitt Street.

Option 2 – Wishart Court Island

Option 2 provides location-specific upgrades similar to Option 1 and removes an existing channelizing island on Wishart Court. Removal of the island allows trucks from Winner Steel Door "A" to access Dock Street directly, eliminating the need to turn from Wishart Court onto Sharpsville Avenue. With this change, the outbound route is shifted entirely from Sharpsville Avenue to Dock Street. The inbound route continues to follow Sharpsville Avenue or, for special permit loads, Dock Street to Pitt Street.

Option 2 route upgrades would include the following:

- Traffic signal improvements along Connelly Boulevard
- Truck route signing improvements throughout the study area
- Intersection geometric improvements at three locations:
  - Connelly Boulevard @ Dock Street – northbound right-turn
  - Pitt Street @ Dock Street – northbound right-turn
  - Pitt Street @ Sharpsville Avenue – eastbound left-turn
- Removal of the existing channelizing island on Wishart Court.

With these upgrades, Option 2 would provide the same benefits as Option 1, plus it would remove approximately 40 outbound trucks per day from Sharpsville Avenue by allowing direct access from Winner Steel Door "A" to Dock Street. This shift would also simplify the truck route. It would only minimally reduce truck movements circulating along Connelly Boulevard between Dock Street and Sharpsville Avenue. This option would not address concerns related to the moderate up-grades on Pitt Street.

Option 3 – Wishart Court Signal

Option 3 expands upon removal of the channelizing island in Option 2 and improves Wishart Court for use as a designated truck route connection to Sharpsville Avenue.

Improvements potentially include signalization of the Wishart Court / Sharpsville Avenue intersection to safely and efficiently accommodate truck access at that location. From SR 60, inbound trucks and special permit loads would utilize Dock Street to Wishart Court to Sharpsville Avenue. From US 62, it was assumed that trucks would simply continue northbound onto Sharpsville Avenue. The outbound truck route would follow Dock Street identically to Option 2.

Option 3 route upgrades would include the following:

- Traffic signal improvements along Connelly Boulevard
- Truck route signing improvements throughout the study area
- Intersection geometric improvements at one location – Wishart Court @ Sharpsville Avenue for the eastbound left / southbound right-turns
- Removal of the existing channelizing island on Wishart Court
- Traffic control improvements at the intersection of Wishart Court and Sharpsville Avenue, potentially including traffic signalization, all-way stop-control, or other appropriate measures pending a traffic signal warrant study

With these upgrades, Option 3 would provide the benefits of Options 1 and 2, plus consolidate the route primarily to the Dock Street corridor, with the exception of inbound traffic from US 62 that would continue to have direct northbound access onto Sharpsville Avenue. These changes would (1) simplify the route and related signing, (2) significantly reduce truck volumes along Sharpsville Avenue between Connelly Boulevard and Wishart Court, (3) reduce truck movements circulating along Connelly Boulevard between Dock Street and Sharpsville Avenue, and (4) relocate special permit loads from Pitt Street to Wishart Court, thus mitigating grade-related concerns along Pitt Street. Additional engineering investigation and design would be required to completely assess traffic signal warrants and/or specific traffic control requirements for the intersection of Wishart Court and Sharpsville Avenue.

4.2.3 Irvine Option

Figure 9 illustrates a truck route option along the Irvine Avenue corridor that could serve as an alternate, or supplement, to previously discussed options for the Railroad & Penn Route and/or Dock & Sharpsville Route. The Irvine Option would capture truck traffic to/from US 62 in Ohio and route trucks along Irvine Avenue to Connelly Boulevard to Water Street. Access from Water Street to Silver Street could serve trucking facilities in the vicinity of Penn Avenue and Shenango Avenue. Access from

Water Street to Clark Street could serve trucking facilities in the vicinity of Clark Street and Sharpsville Avenue.

The primary advantage of the Irvine Option is that it would divert a significant volume of heavy trucks to/from US 62 away from the heart of downtown Sharon. This diversion would essentially segregate US 62 truck traffic from SR 60 truck traffic. Truck-related conflicts or impacts along the busiest portions of Connelly Boulevard and Sharpsville Avenue would decrease accordingly.

Disadvantages associated with the Irvine Option are numerous. Between US 62 and Connelly Boulevard, the route would pass through part of a residential area. Portions of the route along Water Street would infringe on compact business and shopping areas near State Street; portions along Silver Street or Penn Avenue would infringe on the Penn State Shenango campus. The route would increase truck demands along two additional bridges, including one on Silver Street and one on Clark Street. Intersection improvements would be required at four intersections, including Water Street at Connelly Boulevard, Silver Street, and Clark Street, plus Silver Street at Penn Avenue.

4.2.4 Temporary Budd Street Reconnection

While no project-specific short-term improvements were analyzed or proposed for the Budd Street Route, other ongoing or pending construction projects will modify its configuration. As part of the temporary traffic control for reconstruction of several bridge structures along US 62 (by others), a previously-closed segment of Budd Street will be re-opened across the existing railroad tracks between US 62 and SR 60. Discussions with MCRPC indicate that the City of Sharon and other interested stakeholders are pursuing means to maintain this temporary reconnection in-place as a long-term solution even after the US 62 bridge reconstruction projects are complete.

Disregarding specific impacts due to construction by others, re-opening this segment of Budd Street would otherwise provide a new location for trucks to circulate between US 62 and SR 60. If used to re-route trucks in conjunction with other general or route-specific options, this new connection could provide benefits that are similar or identical to those detailed under Section 4.3 for a permanent Budd Street Reconnection.

4.3 LONG-TERM ROUTE IMPROVEMENTS

Long-term improvement options were developed to improve truck access and circulation between US 62 and SR 60 and were intended to complement the short-term improvement options. As with the short-term options, the long-term options will require additional engineering, design, and funding for construction and implementation since the alternatives presented here are at the conceptual level.

Two long-term options to enhance truck access between US 62 and SR 60 were considered – US 62 / SR 60 ramp upgrades via Wayne Place and Orchard Street (Figure 10) or a permanent Budd Street reconnection west of SR 60 (Figure 11). Either option could provide the following notable benefits:

- Simplify the route and related signing, as well as consolidate truck-related infrastructure impacts, requirements, and/or costs to fewer streets.
- Significantly reduce truck volumes circulating along Connelly Boulevard between US 62 and Dock Street, thereby reducing truck-related congestion.
- Eliminate certain short-term geometric improvements that may otherwise be required along Connelly Boulevard by replacing truck turning-movements with through-movements.

4.3.1 US 62 / SR 60 Ramp Upgrades

Full access between US 62 and SR 60 currently exists by way of Wayne Place and Orchard Street via a combination of four at-grade stop or yield-controlled intersections (Figure 10). However, Wayne Place and Orchard Street both currently operate as local street connections and not as true arterial or ramp junctions. Both streets slope uphill from SR 60 toward US 62, passing through a residential area, and intersection geometry may not fully accommodate tractor-trailer traffic without modifications. Therefore, truck traffic is currently prohibited on both streets.

To enhance truck access, the Wayne Street and Orchard Street segments on Figure 10 could be upgraded to function primarily as ramps for a US 62 / SR 60 connection. Upgrades may include intersection geometric modifications, intersection traffic control modifications, and on-street parking restrictions or prohibitions. Additional engineering and design would be required to determine the full extent of the required modifications and any related impacts.

4.3.2 Permanent Budd Street Reconnection

Full access between US 62 and SR 60 can also be achieved by way of a permanent Budd Street reconnection across the existing railroad tracks located west of SR 60 (Figure 11). This reconnection would essentially follow the same concept as the temporary reconnection (by others) discussed in Section 4.2.4. The difference between the temporary and permanent reconnections would relate primarily to the treatment of the new at-grade railroad crossing and the adjacent signalized intersections of Budd Street at US 62 and SR 60.

Discussions with MCRPC and other project stakeholders indicate that trains along the active railroad tracks will occasionally stop and block the segment of Budd Street in

question. Additionally, only approximately 400' of truck storage length exists along Budd Street between US 62 and the railroad crossing; only 300' between the railroad crossing and SR 60. This limited amount of storage can and will quickly be filled by tractor-trailer trucks during any stoppage at the railroad crossing or by excessive queues approaching a red signal at either of the adjacent signalized intersections. These conditions create the potential for trucks to spillback onto US 62 or SR 60, as well as the potential for trucks to queue across the at-grade railroad crossing. Therefore, any permanent Budd Street Reconnection should be designed with appropriate consideration to railroad crossing devices, railroad preemption, adjacent signal clearance phases, fiber-optic blank-out signs for temporary turn restrictions, and/or other design elements as necessary to provide a safe operating environment for both train, truck, and vehicular traffic.

5.0 LOCALLY-PREFERRED ALTERNATIVES

Based on the data and analysis presented in this report, as well as discussions from the various project coordination meetings (Appendix F), a set of locally-preferred alternatives for the Truck Route Plan were developed to the level of detail necessary to determine the level of funding needed for programming and implementation.

5.1 SUMMARY OF IMPROVEMENT ALTERNATIVES AND BENEFITS

Truck route improvement alternatives were qualitatively evaluated with respect to seven key objectives that would address the most notable project deficiencies (Table 2). The project objectives include:

- Simplify the truck routes and/or consolidate the routes (and related impacts) to fewer streets.
- Implement intersection geometric improvements to address problematic truck turning maneuvers.
- Eliminate crossing of the inbound and outbound truck routes along Railroad Street and Dock Street to reduce the impacts of truck-related conflicts.
- Reduce or eliminate heavy-truck traffic from the Penn State Shenango campus.
- Reduce truck volumes and address truck-related deficiencies along Sharpsville Avenue, particularly between Connelly Boulevard and Silver Street.
- Reduce truck volumes and address truck-related deficiencies along Connelly Boulevard, particularly for circulation between Dock Street and US 62.
- Address grade-related concerns for heavy-truck traffic, particularly for special permit loads currently utilizing Pitt Street from Dock Street to Sharpsville Avenue.

In addition to the route-specific alternatives summarized in Table 2, each set of alternatives would be preceded and/or accompanied by general improvements according to Section 4.1 of this report. General improvements would include modifications to truck route signing, general signing and pavement markings, and/or traffic signal operations, as applicable and at various locations throughout the study area.

Table 2: Matrix of Improvement Alternatives versus Key Objectives

Improvement Alternative	Simplify / Consolidate Truck Routes	Ease Truck Maneuvers (# of Int. Improvements)	Eliminate Crossing of Truck Routes	Reduce Truck Impacts to Penn State Campus	Reduce Truck Impacts to Sharpsville Ave.	Reduce Truck Impacts to Connelly Blvd.	Reduce Grade-Related Route Concerns
SHORT-TERM OPTIONS (Railroad & Penn Route)							
Option 1 (Upgrade Existing Route)	No	Yes (3)	No	No	n/a	Minimal	n/a
Option 2 (Minor Route Shift)	Moderate	Yes (4)	Yes	No	n/a	Minimal	n/a
Option 3 (Railroad St. Connection)	Yes	Yes (4)	Yes	Yes	n/a	Minimal	n/a
SHORT-TERMS OPTIONS (Dock & Sharpsville Route)							
Option 1 (Upgrade Existing Route)	No	Yes (4)	n/a	n/a	No	Minimal	No
Option 2 (Wishart Court Island)	Moderate	Yes (3)	n/a	n/a	Moderate	Minimal	No
Option 3 (Wishart Court Signal)	Yes	Yes (1)	n/a	n/a	Yes	Yes	Yes
SHORT-TERM OPTIONS (Other)							
Irvine Option	No	Yes (4)	No	Moderate	Moderate	Moderate	Moderate
Temporary Budd St. Reconnection	Yes	Yes (0)	No	No	No	Moderate	No
LONG-TERM OPTIONS							
US 62 / SR 60 Ramp Upgrades	Yes	Yes (4)	No	No	No	Yes	No
Permanent Budd St. Reconnection	Yes	Yes (2)	No	No	No	Yes	No

Note 1: "Minimal" implies a minimal effect in comparison to other alternatives with "Yes" or "No" impacts.

Note 2: "Moderate" implies a moderate effect in comparison to other alternatives with "Yes" or "No" impacts.

5.2 SELECTION OF LOCALLY-PREFERRED ALTERNATIVES

Considering the information in Table 2, and specifically including decisions made during the June 15, 2007, project meeting with MCRPC, the City of Sharon, PENNDOT, and other project stakeholders (Appendix F), the locally-preferred alternatives for the Truck Route Plan were selected by the collective stakeholders as follows:

- General improvements throughout the study area, as applicable (Section 4.1), and including modifications to:

  - Truck route signing per Trailblazing Option 2, Color-Designated Routes (Figure 12A-D), specifically designed and implemented subsequent to the locally-preferred short-term alternatives for the Railroad & Penn and Dock & Sharpsville Routes, and including modifications to truck route, prohibition, and wayfinding signs, as required.

  - General signing and pavement markings at the intersection of Connelly Boulevard @ US 62 / Sharpsville Avenue, including the addition of post-mounted lane-use control signs on the US 62 approach and standard pavement marking upgrades on the Sharpsville Avenue approach.

  - Traffic signal timing coordination improvements at the intersection of Connelly Boulevard @ US 62 / Sharpsville Avenue and Connelly Boulevard @ Dock Street. (No equipment additions or modifications were assumed as part of this study; only signal timing or phasing changes, as necessary.)

  - Traffic signal detection for the northbound Budd Street approach at the intersection of US 62 @ Budd Street. (No equipment additions or modifications were assumed as part of this study; only traffic signal programming modifications, as necessary.)

- Railroad & Penn truck route modifications per Option 3, Railroad Street Connection (Section 4.2.1 and Figure 7), and including a new connection between Penn Avenue and Shenango Avenue (Figure 13A), and geometric improvements in the vicinity of Pitt Street and Silver Street (Figure 13B).

- Dock & Sharpsville truck route modifications per Options 2 and 3, Wishart Court Island Removal and Signal (Section 4.2.2 and Figure 8), and including geometric improvements in the vicinity of Dock Street and Wishart Court (Figure 13C). (No signal warrant or other intersection control investigations were conducted as part of this study.)

- Long-term improvements to improve circulation between US 62 and SR 60 via a permanent Budd Street reconnection (Section 4.3.2 and Figure 11).

5.3 COST ESTIMATES AND IMPLEMENTATION SCHEDULE

Conceptual cost estimates were developed for each of the locally-preferred alternatives (Appendix G and Table 3). Considering the costs, the importance or complexity of each alternative, and the relationship between alternatives, the improvements were grouped to allow phased implementation as reflected in Table 3. This phasing was not intended as a calendar schedule, but rather to help facilitate efficient planning and implementation of the improvements, particularly with regard to obtaining and programming the necessary funding.

Table 3: Cost Estimate and Implementation Schedule for Locally-Preferred Alternatives

Phase	Improvement	Estimated Cost [1]	
1	**General Improvements**	**TOTAL**	**$12,000**
	Temporary Budd Street Reconnection (By Others)		n/a
	Signing and Pavement Marking Modifications		$2,500
	Traffic Signal Modifications		$9,500
2	**Railroad & Penn Truck Route Modifications**	**TOTAL**	**$678,000**
	Silver Street Improvements [2,3]		$252,000
	Pitt Street Improvements [2,3]		$117,500
	Railroad Street Connection [2]		$308,500
3	**Dock & Sharpsville Truck Route Modifications**	**TOTAL**	**$312,500**
	Wishart Court Improvements		$312,500
4	**Truck Route Signing**	**TOTAL**	**$16,500**
	Truck Route, Prohibition, and Trailblazing Sign Improvements		$16,500
5	**Permanent Budd Street Reconnection**	**TOTAL**	**$236,500**
	Railroad Preemption System [3]		$236,500
-	**OVERALL PROJECT TOTAL (PHASES 1-5)**	**TOTAL**	**$1,255,500**

Note 1: All estimates are intended for conceptual use only, are based on year 2007 dollars, and include 15% contingency, 12% engineering, and 8% construction inspection costs in the values shown.

Note 2: Where indicated, values include estimated costs for right-of-way acquisition.

Note 3: Where indicated, values include estimated costs to fully upgrade (to current standards) any existing or proposed at-grade railroad crossing being impacted by the improvements.

All locally-preferred alternatives or related improvements will require additional engineering, design, and funding for construction and implementation. As indicated in the table notes, all values in Table 3 include estimated percentages for contingencies, engineering, and construction inspection, as well as estimated values for any anticipated right-of-way acquisition or railroad crossing modifications, where applicable. Cost information presented in Table 3 or Appendix G should be sufficient for programming funding but is conceptual-level only and will need to be updated as any designs are finalized.

6.0 REFERENCES

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