

A Pennsylvania Local Development District

TITUSVILLE TRUCK STUDY FINAL REPORT





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TITUSVILLE TRUCK STUDY Final Report

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NOTE: All appendices have been included in electronic PDF-format only, located on an enclosed CD in the "Appendices" section at the back of this report.

- Appendix A: Meeting Summaries
- Appendix B: Traffic Count Data
- Appendix C: Truck Survey Summary
- Appendix D: Truck Forecasting Summary
- Appendix E: Truck Climbing Lane Analysis
- Appendix F: Intersection Geometric Analysis
- Appendix G: Conceptual Quantity and Cost Estimates







LIST OF ABBREVIATIONS

AADT	- Average Annual Daily Traffic
AASHTO	- American Association of Highway and Transportation Officials
ADA	- Americans with Disabilities Act
ADT	- Average Daily Traffic
ATR	- Automatic Traffic Recorder
CBD	- Central Business District
CCIP	- Congested Corridor Improvement Program
COFC	- Container on Flat Car
DCED	- Department of Community and Economic Development
DE	- Downtown East (Titusville CBD, East of Franklin Street)
DW	- Downtown West (Titusville CBD, West of Franklin Street)
EB	- Eastbound
ET	- East Titusville
FHWA	- Federal Highway Administration
FRA	- Federal Railroad Administration
GIS	- Geographic Information Systems
GPS	- Global Positioning System
ITMS	- Internet Traffic Monitoring System
KOZ	- Keystone Opportunity Zone
LOS	- Level of Service
MPH	- Miles per Hour
MPO	- Metropolitan Planning Organization
NB	- Northbound
NCHRP	- National Cooperative Highway Research Program
OCTL	- Oil Creek & Titusville Line (Railroad)
O-D	- Origin Destination
PennDOT	- Pennsylvania Department of Transportation
SB	- Southbound
SIP	- Skyline Industrial Park
SR	- State Route





LIST OF ABBREVIATIONS (Continued)

TCDA	- Titusville Community Development Agencies
TIP	- Titusville Industrial Park
ТМС	- Turning Movement Count
TODS	- Tourist Oriented Directional Sign
TOFC	- Trailer on Flat Car
ТОР	- Titusville Opportunity Park
ТРС	- Titusville Planning Commission
ТРН	- Trucks per Hour
TRA	- Titusville Redevelopment Authority
TRB	- Transportation Research Board
UPT	- University of Pittsburgh at Titusville
VPD	- Vehicles per Day
VPH	- Vehicles per Hour
WB	- Westbound
WBAPS	- FRA's Web Accident Prediction System





EXECUTIVE SUMMARY

The *Titusville Truck Study* summarizes a review of existing truck traffic, future truck projections, and truck-related improvement options for the City of Titusville, Crawford County, Pennsylvania (Exhibit A). Similar to many historic small communities throughout western Pennsylvania, Titusville's mixed development patterns have generated many benefits for the city and its residents, but have also resulted in an increase in truck volumes and more conflicts

between trucks, cars, and pedestrians. Much of the roadway system in Titusville also pre-dates the emergence of modern design standards for today's larger tractor-trailer trucks, so trucks often have difficulties navigating through town due to narrow roads and intersections, on-street parking, or utilities close to the roadway. Rail activities, steep grades approaching Titusville, and pass-through trucks destined to or from neighboring communities compound these types of conflicts.

<u> Primary Study Goal</u>

To develop a set of practical, implementable, and costeffective solutions to better accommodate truck traffic to, from, and through Titusville.

To accomplish the primary study goals, truck-related movements, concerns, constraints, and opportunities were analyzed from a system-wide perspective to include the following:

Background Data and Analysis

Project data collection included field-surveys using hand-held GPS devices and GIS mapping, traffic volume counts, and a telephone/mail-back truck survey involving over 70 local trucking stakeholders. Project analyses focused on historic document reviews, crash histories, truck climbing lanes, and employee-based future truck traffic projections. Combined, these efforts established a general assessment of the base year (2008) truck volumes and travel conditions.

Future Needs and Projections

Future Truck Traffic

Pending future development patterns, total heavy truck trips per day for the study area are projected to increase between 33-80% within the next 10-15 years. The next step in the study was to focus on forecasting future truck volumes based on anticipated development, and on identifying specific areas of concern where potential improvements may be needed. Compared to existing conditions with 750 heavy truck trips per day to, from, or through the study area, moderate development assumptions will amount to 1000 heavy truck trips per day within the next 10 to 15 years, or as much as 1350 heavy truck trips per day under more aggressive or longer-term growth.

With this potential growth in mind, approximately 34 specific concerns or issues related to truck traffic were identified based on direct field observations, discussions and comments from the various coordination meetings held throughout the project, responses from the truck survey, and other data and analyses reviewed as part of this study.







Exhibit A: Study Area Map and Existing Truck Routes

Potential Improvement Options

In response to the truck related issues and concerns that were identified, potential improvement options were developed based on industry-standard guidance from sources such as the Transportation Research Board's *NCHRP Synthesis 314, Strategies for Managing Increasing Truck Traffic,* and then refined based on stakeholder discussions and a review of the specific conditions within Titusville. Improvements were grouped and investigated as follows:

- General Improvement Options
 - Signing
 - Operations
 - Planning
- Area-Specific Improvement Options
 - Skyline Industrial Park
 - Titusville Industrial Park
 - Downtown (West) Titusville
 - Downtown (East) Titusville
 - Titusville Opportunity Park
 - East Titusville

Locally-Preferred Improvement Options

Potential Improvement Options

Approximately 41 potential improvement options were reviewed to address localized issues such as intersection geometry, parking restrictions, or industrial park access and circulation, as well as system-wide issues such as truck wayfinding signage or truck routes.

Locally-Preferred Improvements

Locally-preferred improvements were identified as immediate, short to mid-term, long-term, or "ongoing" priorities with individual project costs ranging from \$5000 or less for minor improvements to as much as \$1.0M to \$4.5M for major system upgrades (Exhibit B). All improvement options were reviewed with the project stakeholders on March 18, 2009, with the goal of compiling a final list of locally-preferred improvements. Based on discussions from that meeting, all but five options were carried forward (Exhibit B). All options that were retained were subjected to conceptual cost estimates and a priority ranking system in order to prepare projects for phased-implementation and to help facilitate efficient planning, programming, and funding inline with Titusville's truck-oriented development goals.

Several of the proposed options may require future re-evaluation of the current or anticipated truck traffic conditions pending future truck-oriented developments in and around the City. Scheduling must also remain flexible based on availability of required funds, right-of-way acquisition, or the findings of future option-specific studies. Ultimately, through implementation of at least some of the proposed improvement options, positive steps should be made toward the goal of better accommodating truck traffic to, from, and through Titusville.





ID	Project or Action	Responsible Party ¹	Conceptual Cost ²	Priority Rating ³
General O	ptions (Signing)			
SIGN (1)	Maintain Existing Signing	PennDOT (Standard) TRA / City / Twp (Custom)	Nominal	Ongoing
SIGN (2)	Enhance Existing Signing	PennDOT (Standard) TRA / City / Twp (Custom)	Nominal to \$25k ⁴	Ongoing
SIGN (3)	Add Industrial Parking Signage	TRA / City / Twp	\$17,000	A / B
General O	ptions (Operations)			
OPS (1)	GPS-Based Driving Directions	TRA or other local lead	Nominal	А
OPS (2)	Traffic Signal Studies / Modifications	City / Twp	\$5k to \$100k ⁴	A / B
OPS (3)	Parking Studies / Modifications	City	\$50k STUDY ⁵	A / B
General O	ptions (Planning)			
PLAN (1)(A)	Truck Climbing Lane (PA 8 SOUTH)	PennDOT, Northwest Commission	\$3.2M	С
PLAN (1)(B)	Truck Climbing Lane (PA 27 EAST)	PennDOT, Northwest Commission	\$4.5M	С
PLAN (2)	Utility Expansion Studies	TRA / City / Twp	\$75k STUDY ⁵	В
PLAN (3)	Rail / Intermodal Expansion Studies	TRA / City	\$100k STUDY ⁵	В
PLAN (4)	PA 8 / Franklin Street Bridge Replacement	PennDOT, Northwest Commission	\$3.2M ⁶	С
Skyline In	dustrial Park			
SIP (1)	Existing	n/a	\$0	А
SIP (2)	Geometric Improvements (PA 8 @ Skyline Drive)	TRA / City / Twp; with property owner / developer assist	\$168k	B/C
SIP (3)	Wal-Mart Shared Access	TRA / City / Twp; with property owner / developer assist	\$25k STUDY ⁵	B/C

Exhibit B: Project Action Plan

Notes 1-6: Refer to detailed notes at the end of this table (page Executive Summary -6).





ID	Project or Action	Responsible Party ¹	Conceptual Cost ²	Priority Rating ³
Titusville	Industrial Park			
TIP (1)	Existing	n/a	\$0	А
TIP (2)	Geometric Improvements (PA 8 @ McKinney Road)	TRA / City / Twp; with property owner / developer assist	\$166k	B / C
TIP (3)	New Dedicated Access	TRA / City / Twp; with property owner / developer assist	\$462k	B/C
Downtow	n West			
DW (1)	Existing	n/a	\$0	А
DW (3)(A)	Geometric Improvements (Spring Street @ Perry Street)	TRA / City (w/ PennDOT Coordination)	\$170k	B/C
DW (3)(B)	Geometric Improvements (St. John Street @ Perry Street)	TRA / City (w/ PennDOT Coordination)	\$64k	A / B
DW (3)(C)	Geometric Improvements (St. John Street @ Franklin Street)	TRA / City (w/ PennDOT Coordination)	\$771k ⁶	С
DW (4)	Extension of Spring Street 2-Way	TRA / City (w/ PennDOT Coordination)	\$50k STUDY ⁵	B/C
Downtow	n East			
DE (1)	Existing	n/a	\$0	А
DE (2)(A)	Water Street / Brown Street Truck Route (Geometric Improvements, Franklin @ Water)	TRA / City (w/ PennDOT Coordination)	\$96k	С
DE (2)(B)	Water Street / Brown Street Truck Route (Water Street Pavement Improvements)	TRA / City (w/ PennDOT Coordination)	\$607k	В
DE (2)(C)	Water Street / Brown Street Truck Route (Geometric Improvements, Water @ Brown)	TRA / City (w/ PennDOT Coordination)	\$79k	С
DE (2)(D)	Water Street / Brown Street Truck Route (Geometric Improvements, Brown @ PA 27)	TRA / City (w/ PennDOT Coordination)	\$80k	С

Exhibit B: Project Action Plan (Continued)

Notes 1-6: Refer to detailed notes at the end of this table (page Executive Summary -6).





ID	Project or Action	Responsible Party ¹	Conceptual Cost ²	Priority Rating ³
Titusville	Opportunity Park			
TOP (1)	Existing	n/a	\$0	А
TOP (2)(A)	Geometric Improvements (PA 27 @ Industrial Boulevard)	TRA / City (w/ PennDOT Coordination)	\$112k	С
TOP (2)(B)	Geometric Improvements (PA 27 @ Caldwell Street)	TRA / City (w/ PennDOT Coordination)	\$173k	B/C
TOP (4)	Modification of Spring Street Gate	TRA / City, with property owner / developer assist	\$25k STUDY ⁵	A / B
TOP (5)	Extension of Water Street to TOP Rear-Access	TRA / City; with property owner / developer assist	\$1.0M	B/C
TOP (6)	Extension of Water Street to Sewer Plant Road	TRA / City; with property owner / developer assist	\$515k	С
East Titus	ville			
ET (1)	Existing	n/a	\$0	А
ET (2)	Access Consolidation at Campbell Road	TRA / City / Twp; with property owner / developer assist	\$250k	B / C
ET (3)	East Titusville TOP Connection	TRA / City / Twp; with property owner / developer assist	\$298k to \$555k ⁴	С

Exhibit B:	Project	Action	Plan	(Continued)
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Note 1: Reference to a responsible party is intended for conceptual planning purposes only and does <u>not</u> imply any existing formal commitments or binding agreements. Responsibilities for individual parties may vary with regard to design, funding, oversight, construction, maintenance etc. "City" refers to City of Titusville; "Twp" refers to Oil Creek Township.

Note 2: Estimates are intended for conceptual use only, are based on year 2009 dollars, and include 15% contingency, 20-35% engineering, 15% temporary traffic control & mobilization, and 8% construction inspection costs. They do <u>not</u> include potentially substantial costs related to right-of-way, utilities, and environmental impacts or related mitigation.

Note 3: Priority ratings are assigned as "A" for immediate, "B" for short to mid-term, "C" for long-term and "Ongoing" for continuous or regular tasks such as maintenance-related activities or monitoring of certain conditions.

Note 4: Where displayed as a range, the conceptual costs will vary depending on the specific type, location, or extent of improvements that are ultimately pursued.

Note 5: Where displayed as a STUDY, the conceptual cost represents an assumed amount for further planning or engineering study of the subject option. No physical construction or other specific efforts are reflected in this cost.

Note 6: PLAN (4) and DW (3)(C) are listed here separately, but would ideally be combined into a single project cost to reconstruct St. John Street @ Franklin Street concurrently with any future replacement of the PA 8 / Franklin Street Bridge.



1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION AND PURPOSE

This report for the *Titusville Truck Study* summarizes a review of existing truck traffic, future truck projections, and truck-related improvement options for the City of Titusville, Crawford County, Pennsylvania. Titusville is in a similar position to many of the historic small towns and communities throughout western Pennsylvania with regard to truck traffic. The City has developed over time to include a variety of land uses in town that benefit local residents by providing education, employment, entertainment, and shopping opportunities within close proximity of each other. These benefits are partly related to the success and expansion of active industrial facilities both within the City and on the outskirts of town. While this mix is beneficial, it also generates an



increased volume of truck traffic and leads to more conflicts between trucks, cars, and pedestrians. Additionally, the roadway system and roadside development in Titusville often pre-date the emergence of modern design standards for today's larger tractor-trailer trucks. This makes it difficult for trucks to navigate through town due to narrow roads and intersections, on-street parking, or utilities close to the roadway. Truck-related conflicts and concerns are further compounded by rail activities in Titusville, steep grades on roadways approaching Titusville, and additional pass-through trucks destined to or from neighboring communities via the state highway system through Titusville.

The primary goal of this study was to develop a set of practical, implementable, and costeffective solutions to better accommodate truck traffic to, from, and through Titusville. Accomplishing this goal required truck-related movements, concerns, constraints, and opportunities to be analyzed from a system-wide perspective. These efforts and pertinent findings are summarized throughout this report as follows:

- Chapter 2: Background Data and Analysis
- Chapter 3: Future Needs and Projections

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- Chapter 4: Potential Improvement Options
- Chapter 5: Locally-Preferred Improvement Options

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1.2 LOCATION AND STUDY AREA

This project is located in the southeast corner of Crawford County, Pennsylvania, and encompasses the City of Titusville and portions of Oil Creek Township (Figure 1). The approximate study area limits are: PA 8 from Segment 730 (Venango County) to Segment 70 (Crawford County); PA 27 from Segment 440 (Crawford County) to Segment 210 (Venango County); and PA 89 within the City of Titusville to Segment 20. The study area includes the primary truck-generating sites in the immediate Titusville area, including businesses and industry located in Skyline Industrial Park, Titusville Industrial Park, Downtown Titusville, Titusville Opportunity Park, and East Titusville.





2.0 BACKGROUND DATA AND ANALYSIS

2.1 FIELD SURVEY

Field surveys were conducted in September through early November 2008 to observe and document truck-traffic conditions throughout the study area. Basic field observations included a review of existing truck routes, truck-related signing, geometric conditions, and general travel conditions. GPS point data was also collected using hand-held equipment to identify the exact location of the following:

- Truck-generating business and industry sites
- Loading docks and loading zones
- Specific truck route signing installations
- Grade begin / end points along PA 8 and PA 27 leaving Titusville.
- Railroad crossings
- Special interest sites (i.e., potential constraints, schools, churches, parks, etc.)

The GPS point data was overlaid onto aerial photographs and ArcGIS shape files. The resulting GIS model allowed the transportation network and potential truck activities to be reviewed from a systems-wide perspective throughout the study area.

Based on the field surveys, descriptions of the study area roadways and truck routes (Figure 2) are summarized below.

2.1.1 <u>PA 8</u>

PA 8 (SR 0008) runs north-south through the study area as a signalized urban minor arterial consisting of one travel lane in each direction with on-street parking on one or both sides of the roadway throughout most of the city. The route splits into a one-way pair via eastbound Spring Street and westbound Central Avenue for the downtown portion overlapping PA 27. PA 8 serves the heart of Titusville's Central Business District (CBD) via Franklin Street and connects traffic to the commercial and industrial areas northwest of town near Wal-Mart, Skyline Industrial Park, and Titusville Industrial Park.









South of Titusville, PA 8 transitions to a mostly two-lane rural arterial with rolling terrain. Regionally, it is an important Crawford County link with Oil City, Venango County, and points south, as well as Union City, Erie County, and points north.

2.1.2 <u>PA 27</u>

PA 27 (SR 0027) runs east-west through the study area and, similar to PA 8, is a signalized urban minor arterial with one travel lane in each direction, on-street parking, and a one-way pair along eastbound Spring Street and westbound Central Avenue. PA 27 serves the Titusville CBD via Spring Street / Central Avenue and connects traffic to the industrial areas east of town near Titusville Opportunity Park and East Titusville.





East and west of Titusville, PA 27 transitions to a mostly two-lane rural arterial with rolling terrain. Regionally, it is an important Crawford County link with Meadville and I-79 to the west, as well as Pleasantville, PA 36, and Forest County to the east.

2.1.3 <u>PA 89</u>

PA 89 (SR 0089) runs north-south off the north edge of the study area as a rural two-lane collector with rolling terrain. It primarily serves the more rural communities north of Titusville and into Erie County. It also carries a portion of the logging truck traffic common to the lumber industries of this area.







2.1.4 Truck Routes

PA 8/27 TRUCK (St. John Street / Perry Street)

In addition to heavy truck travel along PA 8 and PA 27 proper, trucks circulate through the southwest quadrant of the CBD by way of an officially-designated PA 8/27 Truck Route along



St. John Street and Perry Street (SR 2024). PA 8/27 TRUCK bypasses the heart of the CBD and avoids tight intersection geometrics along portions of Franklin Street, Spring Street, and Central Avenue. It also links truck traffic to downtown industry sites along Perry Street, including Charter Plastics, Buffalo Structural Steel, and Titusville Dairy, as well as the Oil Creek & Titusville Line (OCTL) Railroad.

Water Street / Brown Street

An unofficial truck route runs through the southeast quadrant of the downtown area along Water Street and Brown Street. While not designated as an official truck route, field



observations and traffic volume data verified that trucks commonly use this connection between PA 8 to the south and PA 27 just west of the Titusville Opportunity Park area. The route appears to be especially attractive for westbound truck travel from PA 27 to PA 8 south, effectively bypassing a longer loop through downtown if trucks were to follow Central Avenue to Perry Street to access the official PA 8/27 TRUCK.

Water Street is also likely used by trucks to access various downtown businesses east of Franklin Street, including multiple grocery stores, Titusville Beverage, and Interstate Pipe & Supply Company. Potential truck conflicts along this route include residential activities at the Billie Brown Building, school activities at Titusville Middle School, and related pedestrian, bicycle, or school bus traffic.





2.2 POTENTIAL CONSTRAINTS

Beyond a focus on existing truck routes and travel conditions, field surveys also included a cursory review of potential constraints, conflicts, or controlling factors that could affect truck travel or the selection of future improvement alternatives throughout the study area. Potential constraints (Figure 3) were categorized as follows:

2.2.1 <u>Historic District</u>

PennDOT District 1-0 provided information from the *National Register of Historic Places* that detailed the geographic boundaries of the Titusville Historic District. The Historic District contains approximately 170 acres reflecting architectural landscape and streetscape features of the 19th century and the beginning of the oil industry. While much of the Historic District is located in the mostly residential areas north of Central Avenue, it also extends across Central Avenue and Spring Street into the CBD. Any improvement options developed as part of this study will have to consider potential limitations or restrictions that may be related to properties within the Historic District.

2.2.2 Bridges

Access to/from the south of Titusville is funneled across Oil Creek via one of three bridge crossings located at Perry Street, PA 8 / Franklin Street, or Brown Street. The Perry Street Bridge is currently weight-restricted and scheduled for replacement. Even after replacement, however, residential areas along Bloss Street would essentially eliminate the Perry Street Bridge from consideration as a potential candidate for carrying heavy truck traffic. Similarly, residential areas and nearby recreational facilities would eliminate the Brown Street Bridge from consideration with regard to truck access.



Given these limitations and within reasonable expectations for future truck improvement possibilities, any truck route options must connect to the PA 8 / Franklin Street Bridge as the best and only available crossing of Oil Creek.





2.2.3 OCTL Railroad

The OCTL Railroad runs mostly east-west through Titusville on tracks approximately located north of Water Street and between St. John Street and Mechanic Street. OCTL rail services include freight operations throughout the area with connections to the Western New York and Pennsylvania RR and then to Norfolk Southern operations to the south, as well as tourist-oriented scenic railroad activities locallybased at the Perry Street station. Local rail lines include at least 14 at-grade street crossings that occasionally impact existing truck or automobile traffic, as well as other gravel crossings and



overpass locations that may impact truck operations throughout the City.

Previous studies (Chapter 2.3) have been dedicated to improving railroad access and service opportunities in the area, including an improved intermodal transportation facility within Titusville Opportunity Park. Discussions with members of the Titusville Redevelopment Authority (TRA) also indicate that there are potential concerns with track storage limitations and possible street blockages that, as rail traffic increases, could significantly impact north-south emergency services access throughout Titusville. While this report has its focus on truck traffic, improvement options must also acknowledge the relationships that exist between truck volumes, truck operations, and rail activities, as well as the potential impacts of existing or future at-grade railroad crossings or the possibility of future rail traffic increases.

2.2.4 Special Interest Sites

Special interest sites included in the GPS survey for this study were identified solely from field observations of properties that may present notable conflicts or concerns with regard to existing or future truck traffic, truck routes, or improvement options. These sites typically included schools, churches, parks and recreational facilities where property impacts would be highly unfavorable and/or where mixing their associated activities with heavy truck traffic would also be undesirable. The most notable of these sites were as follows:

- Woodlawn Cemetery, St. Titus Church, and residential areas along PA 8 north of Titusville that may limit available right-of-way for future geometric improvements or roadway widening.
- OCTL Scenic Railroad and related tourist / pedestrian activities centered around the Perry Street Railroad Station and along the officially-posted PA 8/27 TRUCK.





- The Billie Brown Building and related residential activities, as well as the Titusville Middle School and related school traffic, located along Water Street and intermixed with existing truck traffic observed along this route.
- Titusville Stadium located on the southeast corner of Brown Street at PA 27 and adjacent to Universal Steel & Alloy and Titusville Opportunity Park.



- Burgess Park and Titusville Community Center located along the north side of PA 27 and across from truck access points to Titusville Opportunity Park.
- University of Pittsburgh at Titusville (UPT), Titusville Early Childhood Learning Center, and Titusville High School, which generate occasional truck traffic within



school and residential areas in the vicinity of East Spruce Street and East Walnut Street.

2.2.5 Other Constraints

Potential truck improvement options must also at least qualitatively consider the following additional possible constraints:

- Right-of-way availability
- Truck conflicts with residential neighborhoods and activities
- Existing topography, particularly with regard to PA 8 South and PA 27
- Environment impacts, including wetlands or noise
- Financial costs and/or limited funding with regard to any of the above





2.3 DOCUMENT REVIEW

Numerous studies of different parts of the overall transportation network have been conducted in the Titusville area. To build upon the findings and conclusions of those previous studies, several documents were reviewed at the outset of this Truck Study as follows:

2.3.1 <u>Meadville-Titusville East-West Corridor Study (1996)</u>

The referenced 1996 study focused on the overall PA 27 corridor between Meadville and Titusville. Recommended improvements in the Titusville area focused primarily on signal upgrades through downtown and intersection improvements for PA 27 at PA 8. Many of the intersection improvements appear to have already been implemented. At the time of this writing, the majority of the referenced signal upgrades were also in the process of being addressed as part of PennDOT's *Titusville Traffic Signal Improvement Project*.

Additional considerations from the Meadville-Titusville study included signal upgrades and left-turn lanes for the intersection of PA 8 at Spruce Street, as well as a truck climbing lane on PA 27 west of Titusville. Those improvements have not been implemented to-date, although at the time of this writing, there were plans for Titusville Public Works to repair / replace certain traffic signal components to improve side-street detection at Spruce Street. There were not any known plans to install left-turn lanes at that location, or to install a truck climbing lane on PA 27 West. No such improvements were explicitly re-analyzed as part of this *Titusville Truck Study* and, based on a cursory review of the latest traffic data, additional analyses would be required to verify the extent of need or impact of those improvements. It can be stated that, in comparison to the PA 8 South and PA 27 East truck climbing lanes analyzed later in this report (Chapter 2.6), truck and traffic volumes along PA 27 West were notably lower than either of those segments (Chapter 2.4).

2.3.2 LDDAP / ARC Intermodal Study (2001)

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The referenced 2001 study focused on the analysis of Titusville Opportunity Park as one of three Northwest Keystone Opportunity Zone (KOZ) sites for improved intermodal facilities. Significant business / industry expansion throughout the park appears to have occurred since completion of that study. Recommendations from the *LDDAP / ARC Intermodal Study* that would be pertinent to the findings of this truck study include the following:

- Develop a circulation plan for the entire Titusville Opportunity Park to improve truck access and support an increase in truck traffic (estimated 2001 cost of \$10,000, not including any design or construction costs resulting from the plan).
- Construct a parallel rail siding at the western end of the Titusville Opportunity Park to improve storage space for rail cars waiting to be loaded (estimated 2001 cost of \$200,000).



- Construct a rail car maintenance facility and additional trackage from the OCTL to improve service and remove trains awaiting repair from the tracks (estimated 2001 cost of \$750,000 to \$1 million).
- Develop Building 65 as a Hardwood Intermodal Transfer Facility (estimated 2001 cost of \$1.75 million to \$2.2 million).
- Extend Water Street ¹/₂-mile from Brown Street to provide an additional site access road to the rear (south) of Titusville Opportunity Park (estimated 2001 cost of \$500,000 to \$600,000).

2.3.3 Intermodal Feasibility Study (2003)

The referenced 2003 study was a follow-up to the 2001 *LDDAP / ARC Intermodal Study* and focused on the feasibility of implementing improved intermodal transportation facilities at the Titusville Opportunity Park to primarily serve the lumber and wood products industries. The results of that study indicated that establishment of a trailer-on-flat-car (TOFC) / container-on-flat-car (COFC) intermodal transfer facility was deemed to be infeasible due to "railroad system institutional and economic factors", despite a strong market demand. However, expansion of boxcar / gondola car intermodal facilities was deemed to be feasible with a recommended development site at Titusville Opportunity Park's Building #65 with approximately \$760,000 of rail siding and building improvements.

For purposes of this truck study, market analyses for the expanded rail scenarios in the *Intermodal Feasibility Study* were interpreted as follows:

- TOFC / COFC demand would equate to 4,200 container loads per year, estimated to generate approximately 34 truck loads per day, or 2-4 trucks per hour.
- Boxcar / gondola car demand would equate to 8.2 railcar loads per week, estimated to generate approximately 5-12 truck loads per day, or 1-2 trucks per hour.

2.3.4 Freight Analysis Data (2004-2006)

Various freight analysis data were provided by the Northwest Commission for review in TRANSEARCH 2004 database format and as a 2006 summary report. It was determined that the level of database detail was of limited value for street-level analyses within Titusville or, lacking future year data, for developing truck projections at the local level. However, the 2006 summary report indicated a projected increase of 65% in overall domestic freight volumes between 1998 and 2020, including a 75% increase in tonnage moved by truck. The summary also noted that regional growth in northwest Pennsylvania would be similar to state and national patterns.







2.3.5 Route 8/27 Corridor CCIP Study (2004)



The referenced 2004 study was conducted as part of PennDOT's Congested Corridor Improvement Program (CCIP) and focused primarily on traffic signal upgrades for the PA 8 / PA 27 corridors from the intersection of West Spring Street and West Central Avenue to an eastern terminus at Main Street and Caldwell Street. While not specifically a truck study, corridor improvements resulting from the CCIP Study would benefit all vehicular traffic flows, including trucks. Specific outcomes of the CCIP Study that were pertinent to this truck study included the following:

- The CCIP Study identified several locations where trucks have difficulties maneuvering due to narrow streets or intersections. It acknowledged the need to improve corner turning radii over time and/or to evaluate alternate truck routes. Applicable analyses have been referenced in this report (Chapter 2.8, Appendix F).
- The CCIP Study reviewed a 2003 PennDOT evaluation of traffic signal warrants at the existing signalized intersection of PA 27 and Caldwell Street. This evaluation determined that the signal was no longer warranted. The study further noted concerns with maintenance and equipment issues given the age (over 40 year-old) of the controller assembly and recommended that the signal be removed and replaced with side-street stop sign control.
- The CCIP Study paved the way for PennDOT's *Titusville Traffic Signal Improvement Project*, which was in final design at the time of this writing.

2.3.6 <u>Titusville Traffic Signal Improvement Project (2008-2009)</u>

The referenced 2008/2009 design project will replace or upgrade traffic signals along Spring Street and Central Avenue between the western PA 8 / PA 27 split and Brown Street. It will also review and possibly implement stop bar placement or on-street parking revisions to improve truck turning at various locations, most notably at the intersection of Franklin Street and Central Avenue. At the time of this writing, this project was in the final design stages with a tentative let date for construction in the fall of 2009.





2.3.7 Long Range Transportation Plan (2007-2032)

A copy of the Northwest Commission's 2007-2032 Long Range Transportation Plan (LRTP) was reviewed to identify any planned projects that may be of interest to this truck study. Candidate projects within Crawford County and the Titusville area were limited to the following listings:



- PA 8 / PA 27 (the aforementioned Titusville Traffic Signal Improvement Project)
- South Perry Street Bridge (the aforementioned bridge replacement project)
- SR 89 S-Curves (recently completed)
- Phase 2 of Transload Facility (currently unfunded)
- Completion of the Titusville Bike Trail (currently un-funded)

In addition to the above, discussions with a member of the Titusville Planning Commission (TPC) also yielded information on a tentative extension of the Titusville Trail in the vicinity of Oil Creek. At the time of this writing, specific trail alignments or trailhead locations had not been finalized, although east-west alignments between approximately Martin Street and the OCTL Railroad Station on Perry Street could consider dedicated rail-trail space and/or portions of St. John Street, Mechanic Street, or Water Street.





2.4 TRUCK / TRAFFIC VOLUMES

Truck and traffic volumes for this project were collected using a combination of Automatic Traffic Recorder (ATR) counts and intersection Turning Movement Counts (TMC). All counts were collected between October 23 and November 13, 2008.

2.4.1 <u>ATR Data</u>

ATR counts recorded hourly traffic volume and vehicle classification data in each direction along a given segment of roadway for a minimum of 24 hours during a typical weekday. The raw data identified 13 separate classes of vehicles that were aggregated into the following groups:

- Passenger Vehicles = Classes 1-3 (bikes, cars & trailers, 2-axle "long" vehicles)
- Small Trucks = Classes 4-7 (buses and 2, 3, or 4-axle single-unit trucks)
- Large Trucks = Classes 8-13 (tractor-trailer combinations)

Eight ATR locations were included in this study to help summarize daily truck and traffic volumes along the local roadway network. Locations included:

- ATR 1 St. John Street (between Perry Street and Franklin Street)
- ATR 2 PA 8 (south of Bloss Street)
- ATR 3 PA 27 (east of East Titusville)
- ATR 4 PA 8 (north of Skyline Industrial Park)
- ATR 5 PA 89 (near Titusville's northern city limits)
- ATR 6 PA 27 (near Titusville's western city limits)
- ATR 7 Water Street (between Drake Street and Kerr Street)
- ATR 8 Caldwell Street (south of PA 27)

2.4.2 <u>TMC Data</u>

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 by movement. For this project, TMC's were collected for 1 or 2 hour intervals during the weekday Midday (11:00 AM to 1:00 PM) and/or PM (3:00 to 5:00 PM) peak. These time periods were selected as they were the most common truck volume peaks based on the ATR data, although truck traffic was generally steady throughout the day between the hours of 8:00 AM to 4:00 PM at all locations.







TMC locations and the specific time periods that were counted included:

- TMC 1 Perry Street @ Spring Street (PM)
- TMC 2 Perry Street @ Central Avenue (PM)
- TMC 3 Franklin Street @ St. John Street (Midday)
- TMC 4 Franklin Street @ Water Street (Midday)
- TMC 5 PA 27 @ Brown Street (PM)
- TMC 6 Central Avenue @ Franklin Street (PM)
- TMC 7 Central Avenue @ Perry Street (PM)
- TMC 8 PA 27 @ East Industrial Boulevard (Midday)
- TMC 9 PA 8 @ Spruce Street (Midday)
- TMC 10 PA 8 @ McKinney Street (Midday)
- TMC 11 PA 8 @ Skyline Drive (Midday)

2.4.3 Volume Summary

Based on the full set of ATR and TMC data, truck and traffic volumes were estimated throughout the study area (Table A). Summary volumes include minor data balancing and adjustments where discrepancies were perceived, as well as reference to supplemental data from other traffic studies, most notably including the 2004 *Route 8/27 Corridor CCIP Study* and the 2008/2009 *Titusville Traffic Signal Improvement Project*.

	Location	2-Way	Total	Estimated Tr	actor-Trailers
	Location	ADT	% Trucks	Daily	Peak Hour
1	St. John Street	3,200	11%	230	25
2	PA 8, South of Titusville	6,200	10%	310	35
3	PA 27, East of Titusville	7,900	9%	230	25
4	PA 8, North of Titusville	8,500	7%	280	25
5	PA 89, North of Titusville	1,400	9%	60	5
6	PA 27, West of Titusville	3,900	7%	100	15
7	Water Street	1,300	9%	70	10
8	Caldwell Street	450	9%	30	5

Table A: Base Year (2008) Truck and Traffic Volume Summary





2.5 TRUCK CRASH ANALYSIS

Historical crash data for PA 8, PA 27, and PA 89 within the study area were supplied by PennDOT for the three-year period from 1/1/2005 through 12/31/2007. Crash locations were plotted onto maps of the project area based on roadway segment and offset data included in the crash reports. Data was then reviewed to identify any notable trends, particularly with respect to large truck involvement. Findings may be summarized as follows:

- Common crash types throughout the study area were generally consistent with statewide averages or typical for downtown areas and signalized arterials.
- Of the 94 total crashes reviewed for the 3-year period, only 6 involved large trucks, including 4 along PA 8 (each at a different location), 1 along PA 27, and 1 along PA 89. Of those six occurrences, only two actually resulted from actions of the driver of the large truck.

In addition to reviewing roadway crash records, the Federal Railroad Administration's (FRA) *Web Accident Prediction System* (WBAPS) was used to identify crashes or related concerns at any of Titusville's at-grade railroad crossing locations. Per the WBAPS, no accidents were cited at any of the local crossings within the previous five years. Additionally, none of the Titusville crossings were prioritized within the top 25% of the WBAPS county-wide list of locations. During this study, PennDOT officials verified that a crossing would typically have to fall within the top 25% of that list in order for potential railroad crossing device improvements to qualify for funding eligibility under Section 130 Funds (Rail/Highway Grade Crossing Hazard Elimination & Rail/Highway Grade Crossing Lights/Gates) or Section 148 Funds (Highway Safety Improvement Program).

Based on a review of both the PennDOT and WBAPS crash records, it was determined that there were no significant findings, no exceptional crash clusters, and, most relevant to this study, no notable large truck involvement.





2.6 TRUCK CLIMBING LANE WARRANTS

The average upgrade along PA 8 southbound, south of Titusville, was estimated to be approximately 5.5% for 1.3 miles. The average upgrade along PA 27 eastbound, east of Titusville, was estimated to be approximately 6.0% for 2.0 miles. An assessment of truck climbing lane warrants was conducted for both roadways in accordance with PennDOT and American Association of State Highway and Transportation Officials (AASHTO) guidance (Appendix E). This guidance outlines the following criteria that should be satisfied in order to consider the installation of a truck climbing lane along a section of highway:

- Warrant 1: Upgrade traffic flow rate > 200 vehicles per hour (vph)
- Warrant 2: Upgrade truck flow rate > 20 trucks per hour (tph)
- Warrant 3: Upgrade speed reduction \geq 10 mph for typical heavy trucks

Various scenarios were analyzed versus the above warrants, including the base year conditions with all trucks, with heavy trucks only (i.e., tractor-trailers), and with varying levels of assumed future traffic increases (Chapter 3.1). Both PA 8 and PA 27 satisfied warrants 1 and 3 under all scenarios. Warrant 2, the upgrade truck flow rate, was just marginally satisfied under base year conditions with total trucks of 32-38 tph, but was not satisfied if the analyses considered only the heavy truck volumes (heavy trucks being the more applicable vehicle type to need a climbing lane, as opposed to smaller single-unit trucks). Depending of the level of assumed growth in the future truck traffic, Warrant 2 would be marginally satisfied with just heavy trucks under both the Partial-Build and Max-Build scenarios along PA 8, and under the Max-Build scenario along PA 27.

While it may be stated, based on the above, that both roadways marginally satisfy all warrant criteria for installation of truck climbing lanes, it is important to note that the warrants reflect when climbing lanes should be "considered", not when they are "required". Other factors must be reviewed as part of the decision-making process, including such issues as traffic operations along the roadways, anticipated right-of-way or environmental impacts, construction costs and funding availability, as well as how the climbing lane improvements would fit within the overall transportation system (i.e., are additional climbing lanes required farther south on PA 8 or east on PA 27). A two-lane highway segment analysis was completed for the PA 8 and PA 27 upgrade segments in accordance with typical traffic operations analysis procedures, and it was determined that operations and capacity are, and would remain, within normally "acceptable" ranges for all scenarios mentioned above without climbing lanes. Considering the lengths of grade and the existing topography, potential construction costs and other impacts could be significant, and funding consideration for such improvements would likely need to be incorporated into the overall long-term planning process for the region.





2.7 TRUCK SURVEY AND RESPONSE SUMMARY

2.7.1 <u>Survey Medium and Participants</u>

Project-specific truck surveys were developed and distributed to help identify existing trucking stakeholder information, truck routes, origins and destinations, and related data that would help to assess the existing truck travel patterns and develop and prioritize truck improvements. To gain practical and realistic insight into existing truck operations, these surveys were provided directly to the end-users of the system – the major truck-generating establishments and other local businesses throughout Titusville. The list of survey participants was compiled based on information from the City of Titusville's website, meetings with the Titusville Redevelopment Authority (TRA) and Titusville Community Development Agencies (TCDA), and general field observations of the area. A complete list of participants, as well as compiled survey responses and a sample survey form, are included in Appendix C.

	vey Questions 9-10: Local Truck Routes
9.	Where do your local trucks come from or go to?
	List locations, or show on survey map
	Construction of the state of th
10.	What routes do your local trucks follow?
	Describe routes, or show on survey map:
	(
Su	vey Questions 11-13: Long-Hauf Truck Routes
11,	Where do your long-haul trucks come from or go to outside of Titusville?
	List offes or zip codes
12.	What general routes do your long-haul trucks follow entering/exiting Titusville?
	% at trucks softem NORTH of Taxsville via PA Route 8
	"
	N. or Investo extensis EAST of Texasistic sets PA Route 27
	The second
	We or Itrucka technon WEST of Titusofle via PA Route 27 We or Itrucka technon NORTH of Titusofle via PA Rote 89
	Vor Buckle torhone WEST of Thinsder via PA Robe 27 Vor Buckle torhone WEST of Thinsder via PA Robe 99 Vor Buckle torhone NORTH of Thinsder via PA Robe 99
13.	Wor bucks tofteen WEST of Taxade via PA Rose 27 Wor bucks tofteen NORTH of Taxade via PA Rose 89 What <u>specific</u> rootes do your leng-hauf trucks follow within Taxaville 7 Describe rootes or school or do your room
13.	No or
13.	Wor bucks to throw WEST of Taxonde via PA Roate 27 Wor bucks to/how NORTH of Taxonde via PA Roate 27 Wor bucks to/how NORTH of Taxonde via PA Roate 80 What <u>satesting</u> reactes do your long-haut bucks follow within Taxonde 7 Describe reades, or show on survey map:

Surveys were conducted via telephone, fax, e-mail, and regular mail throughout the months of October, November, and December 2008. A total of 71 survey participants were identified, and 56 (78%) of those participants were successfully contacted. A total of 33 (46%) survey responses were ultimately received, exceeding the target response rate of 20% that would typically be accepted as statistically valid; thus the compiled survey responses were assumed to represent a fair cross-section of trucking activities throughout the study area.

2.7.2 Survey Responses

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Survey responses and pertinent information derived from each block of survey questions are summarized in the sections below:

Questions 1-4: General Truck and Commodity Information

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- Types of freight shipped or received varied widely by participant (Refer to Appendix C).
- Quantities of freight shipped or received were generally not provided in the survey responses.



Questions 5-8: Truck Demand

• Total survey responses directly accounted for 29 local and 109 long-haul trucks per day. Focusing on the long-haul trucks and assuming that each "truck" accounts for two "trips" (i.e. one entering and one leaving the respondent's place of business), the total surveyed truck demand was the equivalent of 218 long-haul one-way truck trips per day (Table B).

Truck Demand Summary	Daily # Trucks		Daily Long-Haul Truck Trips			
	Local	Long-Haul	In	Out	Pass-Thru	Total
Raw Survey	29	109	109	109	n/a	218
Extrapolated Survey	38	206	206	206	n/a	412
Base Forecast w/ Pass-Thru	n/a	250	250	250	250	750

Table B: Surveyed Truck Demand Summary

- The raw survey demand was extrapolated to fill-in the "non-respondent" survey data based on field observations and by matching assumptions for similar business/industry types or sizes. The extrapolated survey effectively accounted for a total of 412 long-haul one-way truck trips per day in/out of Titusville.
- The extrapolated survey demand was ultimately compared to the ATR and TMC volume summaries, project-specific origin-destination data, and historical origin-destination data from the 1996 *Meadville-Titusville East-West Corridor Study* to establish the following:
 - The overall Base Year 2008 truck forecast amounted to 750 long-haul one-way truck trips per day.
 - This total included 500 "Titusville" truck trips in/out of the study area, plus 250 additional truck trips as non-stop "pass-thru" traffic.
 - Considering documented data and engineering judgment, the final ratio of approximately 66% Titusville truck traffic with 33% pass-thru truck traffic met expectations.
- Compared to past trends, 14% of the respondents indicated that their current truck volumes were lower; 36% indicated they were higher and/or expected a future increase; and 50% indicated that operations have been steady.





• All but four of the respondents indicated zero potential for any of their freight volume to be shifted from truck to rail service. Exceptions (and their potential transfer volume) included B&D Italia (10% furniture), International Waxes (35% wax products), Baillie Lumber (50% lumber), and Marsh Planing (5% lumber).

Questions 9-13: Truck Routes

- PA 8 was the most heavily used route, followed by PA 27 east of Titusville, PA 27 west of Titusville, and PA 89.
- Downtown truck route references included Perry Street and St. John Street along PA 8/27 TRUCK, Central Avenue and Spring Street through town, and occasional references to Water Street and Brown Street.
- The overall truck volume and origin-destination data were ultimately used to help complete the truck forecasting network, detailing the specific truck travel pairs and volumes on each major roadway segment throughout the study area (Chapter 3.1.1, Appendix D).

Questions 14-15: Potential Improvements

- Specific areas of concern and potential improvements identified in the survey responses were mixed. Several respondents left this section of the survey blank. Several others, including many of the larger trucking stakeholders, specifically listed "none" or only minor, localized concerns or recommendations, implying that many of the end-users did not perceive larger-scale trucking concerns.
- The most commonly-cited concerns (11 responses) dealt with roadway geometry including narrow streets and tight intersections through which trucks have difficulties maneuvering. While various locations were noted, the Perry Street intersections at Central Avenue and Spring Street (the terminus of PA 8/27 TRUCK) were cited most frequently.
- The second most commonly-cited concerns (7 responses) dealt with general truck routing and industrial park access throughout the study area. Routes were generally referred to as not being "truck-friendly". Improved access for trucks between PA 8 south of Titusville and the Titusville Opportunity Park or PA 27 east of Titusville was also specifically requested.
- Additional concerns, in order of frequency, included issues pertaining to truck route signing, miscellaneous truck/traffic operations (traffic signals, parking, maintenance, etc.), or miscellaneous other issues (correction of GPS-generated directions, enforcement of truck routes and restrictions, etc.).





2.8 INTERSECTION GEOMETRIC ANALYSES

This study investigated several locations where tractor-trailer trucks may have difficulty making turning maneuvers due to existing intersection geometrics such as tight corner radii, narrow lanes, skewed approach angles, etc. To quantify any problematic 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, and truck turning envelopes were simulated for standard WB-50 or WB-67 tractor-trailer trucks with a minimum design turning radius of 45'. 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 survey. In most cases, trucks navigate the subject turns successfully today by swinging wide through the intersection. Such maneuvers, however, often encroach on the adjacent or opposing travel lanes, conflict with other vehicles, or run across (and occasionally damage) nearby curbs, shoulders, or property corners. Specific movements of concern (Table C, Appendix F) are summarized below.

Intersection	Movement(s) of Concern	Figure Reference # (Appendix F)*
PA 8 @ Skyline Dr	SB-R, EB-R	F1-F4
PA 8 @ McKinney Rd	SB-L, NB-R, WB-R	F5-F8
Perry St @ Spring St	EB-R, NB-R	MTA C8-C9
Perry St @ Central Ave	WB-L, NB-L	MTA C5-C6
Franklin St @ Spring St / Diamond St	EB-L, NB-R	MTA C11-C13
Franklin St @ Central Ave	WB-R, SB-R	MTA C1-C2
St John St @ Perry St	SB-L, WB-R	F9-F10
St John St @ Franklin St	EB-R, NB-L	F11-F14
Water St @ Franklin St	NB-R, WB-L	F15-F16
Water St @ Brown St	EB-L, SB-R	F17-F18
PA 27 @ Brown St	NB-R, WB-L	F19-F20
PA 27 @ Caldwell St	All	F21-F24
PA 27 @ Industrial Blvd	EB-R, NB-R	F25-F28

Table C: List of Possible Intersection Geometric Concerns

* All figures based on AutoTURN analyses are located in Appendix F; including reference copies of "MTA" figures by McCormick, Taylor & Associates from the 2004 *PA 8/27 Corridor CCIP Study*.




- *PA 8* @ *Skyline Drive (SB-R, EB-R)* includes the PA 8 southbound right-turn onto Skyline Drive, and the Skyline Drive eastbound right-turn onto PA 8 southbound, both serving heavy truck access to/from Skyline Industrial Park. Due to corner radii and intersection skew, travel to PA 8 south and along the edge of an adjacent depression or culvert appears to be particularly tight.
- *PA 8 @ McKinney Road (SB-L, NB-R, WB-R)* includes the PA 8 southbound leftturn and northbound right-turn onto McKinney Road, and the McKinney Road westbound right-turn onto PA 8 northbound, all serving heavy truck access to/from Titusville Industrial Park. Impacts to property frontage on the northeast corner of PA 8 may be significant with trailers apt to track across the corner lot.
- *Perry Street* @ *Spring Street* (*EB-R*, *NB-R*) includes the Spring Street eastbound right-turn to Perry Street, and the Perry Street northbound right-turn to Spring Street, both serving heavy truck access to the designated PA 8 / PA 27 truck routes. Clearances are marginal for a WB-50 truck if traffic obeys all stop-bar setbacks and signal indications, thus keeping the intersection clear to accommodate wide-swinging maneuvers. Larger trucks may impact curb, sidewalk, or property on the southwest and southeast corners where any possibility of intersection widening would be contingent on property, right-of-way, and/or ADA-accessibility impacts.
- *Perry Street* @ *Central Avenue* (*WB-L, NB-L*) includes the Central Avenue westbound left-turn to Perry Street, and the Perry Street northbound left-turn to Central Avenue, both serving heavy truck access to the designated PA 8 / PA 27 truck routes. Clearances are marginal for a WB-50 truck if traffic obeys all stop-bar setbacks and signal indications, thus keeping the intersection clear to accommodate wide-swing maneuvers. Larger trucks may impact curb, sidewalk, or property on the southwest and southeast corners where the possibility of intersection widening would be severely limited by property, right-of-way, and/or ADA-accessibility impacts that include portions of Scheide Park and Titusville's Historic District.
- *Franklin Street* @ *Spring Street & Diamond Street* (*EB-L*, *NB-R*) includes the Spring Street eastbound left-turn to Franklin Street, and the Franklin Street northbound right-turn to Diamond Street, which serve truck access between PA 8, PA 27, and PA 89. While the northbound right-turn does not appear to be a major concern, the eastbound left-turn is exceptionally tight and encroaches on the southbound travel lanes. Geometric improvement opportunities at that location are essentially non-existent without significant impacts to existing properties and Titusville's Historic District. Pavement marking or on-street parking revisions are also questionable without significant impacts to turn-lanes and storage lengths on Franklin Street in the short block between Central Avenue and Spring Street. Notably, however, the eastbound left serves a comparatively low volume of truck traffic (conservatively forecasted as 10 heavy trucks per day) to PA 89, and so impacts are infrequent.





- *Franklin Street* @ *Central Avenue* (*WB-R, SB-R*) includes the Central Avenue westbound right-turn to Franklin Street, and the Franklin Street southbound right-turn to Central Avenue, both serving heavy trucks to/from PA 89. Based on the findings and efforts of independent studies, including the ongoing *Titusville Traffic Signal Improvement Project*, it has been previously-determined that minor modifications to on-street parking or stop bar locations would allow this intersection to reasonably accommodate the necessary truck movements.
- *St. John Street* @ *Perry Street* (*SB-L*, *WB-R*) includes the southbound left-turn and westbound right-turn truck movements that constitute travel along St. John Street and Perry Street via the designated PA 8 / PA 27 truck route. Separately, trucks navigate either movement with relative ease. Potential conflicts and turning difficulties occur whenever two trucks arrive at the intersection simultaneously, including tight corner clearance on the northeast quadrant.
- St. John Street @ Franklin Street (EB-R, NB-L) includes the St. John Street eastbound right-turn to Franklin Street, and the Franklin Street northbound left-turn to St. John Street, both serving heavy truck access between the designated PA 8 / PA 27 truck route and PA 8 to/from the south. Notable issues at this intersection include the following:
 - The eastbound right-turn is exceptionally difficult for heavy trucks, requiring trucks to wait for traffic gaps in both directions of PA8 to swing very wide maneuvers that encroach on all lanes and all approaches. These conditions are exacerbated by marginal intersection sight distance limitations caused by a slight upgrade on the eastbound approach and looking right through the Franklin Street bridge structure or left through parked vehicles along Franklin Street.

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- By comparison, the northbound left-turn clears the intersection more easily. However, in that case the tracking path of the trailer encroaches on the St. John Street stop bar, which can lead to conflicts with eastbound vehicles on St. John Street that tend to pull ahead of the stop bar to compensate for the aforementioned sight distance limitations.
- Considering the proximity of the Franklin Street Bridge to this intersection, geometric improvement opportunities would be severely limited without actually replacing the bridge.



- *Water Street* @ *Franklin Street* (*NB-R*, *WB-L*) includes the Franklin Street northbound right-turn to Water Street, and the Water Street westbound left-turn to Franklin Street, both serving truck access to/from PA 8 to the south. Although trucks and buses both successfully navigate this intersection today, radii on the southeast corner may be tight, especially for larger trucks.
- *Water Street* @ *Brown Street* (*EB-L*, *SB-R*) includes the eastbound left-turn and southbound right-turn truck movements that constitute travel along Water Street and Brown Street between PA 8 to the south and PA 27 to the east. Separately, trucks navigate either movement with relative ease. Marginal clearance issues may occur whenever two trucks arrive at the intersection simultaneously, potentially including tight corner clearance on the northwest quadrant.
- *PA* 27 @ *Brown Street* (*NB-R, WB-L*) includes the Brown Street northbound rightturn to PA 27, and the PA 27 westbound left-turn to Brown Street, both serving truck access to/from PA 27 to the east. Separately, trucks navigate either movement with relative ease. Marginal clearance issues may occur whenever two trucks arrive at the intersection simultaneously, potentially including tight corner clearance on the southeast quadrant.
- PA 27 @ Caldwell Street (All) includes all truck turns through the intersection of PA 27 and Caldwell Street serving access to the Universal Stainless & Alloy Products site. Significant clearance issues result from exceptionally tight southwest and southeast corner radii, as well as a generally narrow street width along Caldwell Street. These conditions are likely exacerbated as trucks also contend with an upgrade on the northbound Caldwell Street

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approach, marginal intersection sight distance limitations looking left along PA 27 due to roadway curvature and street trees, and occasional conflicts with on-street parking along Caldwell Street that hamper a truck's ability to maneuver.

• *PA* 27 @ *Industrial Boulevard* (*EB-R*, *NB-R*) – includes the PA 27 eastbound right-turn to Industrial Boulevard, and the Industrial Boulevard northbound right-turn to PA 27, both serving access to/from Titusville Opportunity Park. Most trucks should be able to navigate this intersection with minimal clearance issues, particularly if stop bar placement is setback appropriately. Larger trucks, however, may experience some difficulty, particularly with the northbound right-turn as a result of the corner radii on the southeast quadrant and the existing curvature of PA 27 as it extends east of the intersection.



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3.0 FUTURE NEEDS AND PROJECTIONS

Having established a general assessment of base year (2008) truck volumes and travel conditions, the next step was to establish future needs and projections throughout the study area. These efforts focused on forecasting future truck volumes based on anticipated development, and on identifying specific areas of concern where potential improvements may be needed.

3.1 TRUCK FORECASTING

3.1.1 <u>Truck Network Summary</u>

Based on a compilation of all data in the previous chapters, a simplified picture of the overall truck network was defined on the assumption of six internal and five external truck zones (Figure 4). The internal zones (i.e., those serving only truck trips that start or end within Titusville) were defined to capture and group the majority of the truck-generating establishments as follows:

- Zone 100 (**SIP**) = Skyline Industrial Park and Vicinity
- Zone 200 (**TIP**) = Titusville Industrial Park
- Zone 300 (**DW**) = Downtown West (of Franklin Street) and Vicinity
- Zone 400 (**DE**) = Downtown East (of Franklin Street) and Vicinity
- Zone 500 (**TOP**) = Titusville Opportunity Park and Vicinity
- Zone 600 (ET) = East Titusville

The external zones (i.e., those serving all trips into or out of the study area, whether to/from an internal zone or as pass-thru truck traffic from external to external zone) were defined to include the major roads entering / exiting the study area as follows:

- Zone 901 = PA 8 (North)
- Zone 902 = PA 8 (South)
- Zone 903 = PA 27 (East)
- Zone 904 = PA 27 (West)
- Zone 905 = PA 89

Using these zones and the available truck volume and origin-destination data, the Base Year forecast of 750 heavy truck trips daily was detailed in matrix format and distributed across the roadway segments throughout the study area (Figure 5, Appendix D).





3.1.2 Truck Trip Generation

Methodology

Using the Base Year truck network as a starting point, future truck traffic increases were estimated on the basis of employee projections according to the following generic equation:

Trucks = (# Employees) x (Truck Generation Rate per Employee)

Projected employee estimates were developed at a January 8, 2009, project meeting at which most of the property-specific assumptions were provided by TRA (Appendix A). Truck generation rates per employee were based on project-specific industrial park data where appropriate, or on industry-standard rates per the Federal Highway Administration's (FHWA) *Quick Response Freight Manual II.* As a simplifying assumption, pass-thru truck traffic was grown separately at a rate equal to the resulting employee-based percent increase in trucks to/from Titusville. Truck projections were detailed for two future scenarios – Max-Build and Partial-Build (Table D, Appendix D).

Cotogony	Scenario			
Calegory	2008 Base	Partial-Build	Max-Build	
# Additional Employees	-	436	899	
# Additional Heavy Truck Trips per Day	-	250	600	
Total Heavy Truck Trips per Day	750	1000	1350	
% Increase in Heavy Truck Trips	-	33%	80%	

Table D: Employee-Based Future Heavy Truck Projections

Max-Build Scenario

The future Max-Build scenario assumes that all truck-oriented developable space identified by TRA will be built-out and occupied within a 10-15 year timeframe. This build-out would include all confirmed and tentative development currently on the books; all finished, unfinished, and/or vacant existing space within each of the industrial parks; all vacant lots within each of the industrial parks; and miscellaneous vacant properties throughout the CBD. As such, the Max-Build scenario essentially represents aggressive long-term growth with a potentially conservative increase of 899 new jobs and 80% more heavy truck trips than in the Base Year conditions (Table D, Figure 6).





Partial-Build Scenario

The future Partial-Build scenario assumes that only a portion of the truck-oriented developable space included in the Max-Build scenario will actually be built-out and occupied within a 10-15 year timeframe. This build-out would include all confirmed and tentative development currently on the books, as well as miscellaneous vacant properties throughout the CBD. In contrast to the Max-Build, however, the Partial-Build only adds approximately one-third of all finished, un-finished, and/or vacant existing space within each of the industrial parks; and approximately one-third of all vacant lots within each of the industrial parks. As such, the Partial-Build scenario represents less-aggressive or mid/long-term growth with a more modest increase of 436 new jobs and 33% more heavy truck trips than in the Base Year conditions (Table D, Figure 7).

3.2 SPECIFIC AREAS OF CONCERN

With the base year and future year truck scenarios established, the remaining step prior to developing potential improvement options is to prepare a final compilation of the specific areas of concern throughout the study area. These areas were identified based on direct field observations, discussions and comments from the various coordination meetings held throughout the project, compiled responses from the truck survey, and other data or information summarized in this report thus far.

For ease of reference, specific areas of concern have been assigned a generic index number, tabulated with a brief description (Table E), and located on blow-up maps of the study area (Figure 8 through Figure 11).





Index #	Area / Location	Potential Concern / Issue				
Area-Wide						
7A	PA 8 SB, south of Titusville	Approximately 5.5% upgrade for 1.3 miles; climbing lane warrants marginally satisfied				
7B	PA 27 EB, east of Titusville	Approximately 6.0% upgrade for 2.0 miles; climbing lane warrants marginally satisfied				
Zone 100	(Skyline Industrial Park)					
1A	PA 8 @ Skyline Drive	Tight intersection geometry, especially EB right-turn from Skyline Drive to PA 8				
1B	PA 8 @ Skyline Drive	Missing or inconsistent signage does not clearly identify entrance to Skyline Industrial Park from PA 8				
1C	Skyline Industrial Park	Utility expansion, including water/wastewater capacity, may need to precede future development				
Zone 200) (Titusville Industrial Park)					
2A	PA 8 @ McKinney Road	Tight intersection geometry for several movements, especially to/from PA 8 north of McKinney Road				
2B	PA 8 @ McKinney Road	Missing or inconsistent signage does not clearly identify entrance to Titusville Industrial Park from PA 8				
2C	PA 8 @ Wal-Mart	Unspecified traffic signal delays cited in Truck Survey responses (unconfirmed by this study)				
Zone 300	(Downtown West)					
ЗA	PA 8 @ West Spruce Street	Side-street signal detection issues cited in coordination meetings cause added delay and queuing along PA 8				
3B	PA 8, approximately between W. Main St. and W. Spruce St.	On-street parking along PA 8 NB appears to constrict the road's cross-section and add friction for passing trucks				
3C	PA 8 @ PA 27	Initially listed as having tight intersection geometry, but subsequently dropped as marginal clearance was confirmed				
3D	Perry St. @ PA 8/27 (Spring St.)	Tight intersection geometry, especially both right-turns between PA 8/27 and Perry Street				
3E	Perry St. @ PA 8/27 (Central Ave.)	Tight intersection geometry, especially both left-turns between PA 8/27 and Perry Street				
3F	Perry St. @ St. John St.	Tight intersection geometry, especially for concurrent NB/SB truck movements along PA 8/27 TRUCK				
3G	PA 8/27 TRUCK (Northbound)	Verify adequate trailblazing for PA 8/27 TRUCK, including possible vegetation removal south of Franklin St. Bridge				
ЗH	PA 8/27 TRUCK (Southbound)	Verify adequate trailblazing for PA 8/27 TRUCK, including possible sign additions prior to PA 89 intersection				
31	Downtown Titusville	On-street truck loading along various downtown streets, especially Spring & Central, occasionally blocks travel lane				

Table E: Areas of Concern (Summary Index and Descriptions)





Index #	Area / Location	Potential Concern / Issue		
Zone 400	(Downtown East)			
4A	St. John St. @ PA 8 / Franklin St.	Tight intersection geometry and limited sight-distance, especially for right-turn from St. John St. EB to PA 8 SB		
4B	Franklin St. @ PA 8/27 (Spring St.)	Tight intersection geometry, especially for left-turn from Spring St. to PA 89		
4C	Franklin St. @ PA 8/27 (Central Ave.)	Tight intersection geometry, especially for right-turn from Central Ave. to PA 89		
4D	Water Street / Brown Street	Currently used by trucks as an "unofficial" route; potential conflicts with Billie Brown Bldg. and Titusville Middle School		
Zone 500	(Titusville Opportunity Park)			
5A	PA 27 in vicinity of Titusville Opportunity Park	Missing or inconsistent signage does not clearly identify entrances to TOP, or return to PA 8/27 TRUCK prior to Brown St.		
5B	PA 27 @ Caldwell Street	Tight intersection geometrics for virtually all movements; limited sight-distance; and out-dated signal on "flash"		
5C	Caldwell Street	On-street parking increases difficulties for trucks that must "swing wide" to maneuver through Caldwell St. @ PA 27		
5D	East Spring Street addresses	Map services (Map Quest, Google Earth, Yahoo Maps, etc.) provide incorrect GPS-based directions to some addresses		
5E	Universal Stainless & Alloy Products	Access via Caldwell St. appears to struggle with intersection geometrics, sight distance, and upgrade approach to PA 27		
5F	Titusville Opportunity Park	On-site truck circulation and staging areas may need to be more clearly defined to accommodate future growth		
5G	Titusville Opportunity Park	Tight intersection geometry for right-turns to or from PA 27; no prominent identity as the main entrance to TOP		
5H	Water Street Extension	Potential rear access to TOP cited in 2001 LDDAP / ARC Intermodal Study could help to accommodate future growth		
51	Titusville Opportunity Park	Potential intermodal facility expansion cited in previous studies may emphasize need for improvements in TOP		
5J	Titusville Opportunity Park	Utility expansion may need to precede development of existing vacant lots		
Zone 600	(East Titusville)			
6A	Titusville Opportunity Park (near RTI)	Possible alternate access to PA 27 cited during project coordination meetings		
6B	PA 27 @ Campbell Road	Possible intersection realignment between Campbell Road and Oil Creek Plastics may improve or consolidate access		
6C	East Titusville Industry Sites	Possible on-site circulation road between Baillie Lumber, Oil Creek Plastics, Precision Profiles could consolidate access		

Table E: Areas	of Concern	(Summary	Index and	Descriptions)	(Continued)
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4.0 POTENTIAL IMPROVEMENT OPTIONS

To begin to address the concerns and issues summarized in the previous chapter, groups of potential improvement options were developed for review and discussion with the project stakeholders. As a starting point, standard categories and types of improvements from the Transportation Research Board's *NCHRP Synthesis 314, Strategies for Managing Increasing Truck Traffic*, were reviewed for applicability. Based on stakeholder discussions and a review of the specific areas of concern in Titusville, the basic categories of NCHRP-defined improvements that were considered on this project included, but were not limited to, the following:

- Improved Highway Design
 - Improved highway geometrics
 - New or upgraded structures
 - New or improved pavement
- Roadway Facilities
 - Dedicated roads for trucks or commercial vehicles
 - Truck climbing lanes
- Operational Strategies
 - Parking restrictions or prohibitions
 - Improved intermodal strategies
- Signing
 - Improved directional or informational signing
- Enforcement / Compliance
 - Enhanced enforcement or remove non-compliant trucks
- Alternative Infrastructure
 - Improvements in rail infrastructure

These types of improvements were grouped and investigated in the sections that follow as either general or area-specific solutions. General options included signing, operations, and planning activities; area-specific options were separated by industrial park or truck zone according to the previously-defined truck network (Chapter 3.1).







4.1 GENERAL (SIGNING)

(Figure 12; Also Table E, Concerns 1B, 2B, 3G, 3H, and 5A). Signing options detailed below were aimed at relatively low-cost, short-term and/or ongoing maintenance solutions focused strictly on improving truck-related signing throughout the study area.

4.1.1 Option SIGN (1) – Maintain Existing Signing

Standard Truck Route Signs

One signing option is to simply maintain the existing truckrelated signing already in-place throughout the study area. These signs include PennDOT standard route signs and trailblazers for PA 8, PA 27, and PA 8/27 TRUCK along, and in advance of, the St. John Street / Perry Street posted truck route. While study efforts did not attempt to create a detailed existing signing plan, a cursory review of the existing sign conditions and locations found that the PA 8/27 TRUCK trailblazing appeared to be clear and adequate. Minor vegetation removal around existing signs on PA 8 northbound just south of the Franklin Street Bridge, as well as re-verification that all other required trailblazers are in-place and clearly visible, could be completed as part of regular sign maintenance activities.



Custom Truck Wayfinding Signs

In addition to PennDOT standard signing, custom and/or private truck wayfinding signs were also installed in some locations. These signs focused on local access or guidance, including sitespecific signs for Salvage Direct and Wal-Mart in the vicinity of Skyline Industrial Park, forklift crossing signs for Charter Plastics along Perry Street, a comprehensive sign directory system inside Titusville Opportunity Park, and random others. These signs all appeared to provide



appropriate guidance and did not conflict with any known official route postings or restrictions. Combined, however, they were inconsistent in both their placement and design. As such, truck drivers may not be able to locate, recognize, understand, or act upon the intended messages as quickly or as easily as they could if consistency or standardization were improved.





4.1.2 Option SIGN (2) – Enhance Existing Signing

Standard Truck Route Signs

To improve guidance, existing truck route signing could be enhanced through additional trailblazing. Possible additions, if deemed appropriate based on a thorough review of areawide signing, could include additional guidance for PA 8/27 TRUCK coming from PA 89 or from westbound PA 27 (from east of PA 89). Such trailblazing may emphasize or confirm the potentially unfamiliar "long-loop" that westbound PA 27 trucks are expected to follow as they cross Franklin Street and pass PA 8 on their way to Perry Street and PA 8/27 TRUCK, thus avoiding tight or restricted turns at Franklin Street. Other trailblazing revisions may also need to be reviewed depending on the final selection and implementation of other options to change truck route designations, travel patterns, or preferences.

Custom Truck Wayfinding Signs

Additional enhancements could be pursued at the local level with regard to improving consistency or standardization in the placement or design of any custom truck wayfinding signs throughout the study area. The existing sign directory system within Titusville Opportunity Park is a good example to follow – it incorporates a unique but easily-identifiable set of signs that encompass all businesses in that locale, are placed at appropriate locations for guidance, and are uniform in their design, right



down to the matching building number plaques located throughout the park. Similar directories could be incorporated into Skyline Industrial Park or Titusville Industrial Park to replace non-uniform or non-existent signing where applicable.

The City of Titusville could also review this type of potential enhancement on a broader perspective with Oil Creek Township to explore an area-wide wayfinding sign system that might incorporate all three industrial parks and some of the larger downtown business sites, with the understanding that any such custom or non-standard system would have to be privately-maintained outside of PennDOT right-of-way. Signs within PennDOT right-of-way would be required to conform to PennDOT standards. In either case, any new wayfinding sign additions, if considered, should be considered prudently and conservatively so as to avoid unnecessary sign clutter that might otherwise detract from important regulatory and warning signs along the area roadways. Excessive signage of any kind should be avoided.





4.1.3 Option SIGN (3) – Add Industrial Park Signage

To improve truck wayfinding to the area's industrial parks without creating an extensive business-by-business directory as discussed under the previous option, the major access points for each industrial park could be identified by standard (or custom) directional signs. These types of directional signs were previously-administered under the recently-eliminated Tourist Oriented Directional Sign (TODS) program; it is anticipated that future installations will be administered through a pending Department of Community and Economic Development (DCED) sign program. It was noted during field observations that industrial park entrance points at Skyline Drive, McKinney Road, and Industrial Boulevard were not clearly advertised, potentially leading to missed turns, off-route trucks, added delays, or last-minute maneuvers for any truckers not familiar with the area. To help remedy these types of occurrences, the following may be considered:

- Directional signs with the industrial park name and a simple directional arrow could be installed at the final turn location on each approach to each industrial park.
- Because of the sign's intended audience truckers who are potentially unfamiliar with the area and driving large vehicles with heavy loads supplemental advance turn signs could also be placed ½-mile prior to the final turn locations.
- Placed within highway right-of-way, standard DCED-administered signs must be requested and approved through the PA Tourism Signing Trust (<u>www.palogo.org</u>) and conform to appropriate design standards; PennDOT does not administer this program.
- Alternatively, private-development or custom-designed signs may be installed outside of the right-of-way, provided the appropriate local, City, and/or property permits are obtained.





4.2 GENERAL (OPERATIONS)

(Figure 13; Also Table E, Concerns 2C, 3A, 3B, 3I, 5B, 5C, and 5D). Operations options detailed below were aimed at miscellaneous improvements to GPS-based driving directions, traffic signal operations, or parking restrictions that may affect all vehicular traffic as well as trucks.

4.2.1 Option OPS (1) – GPS-Based Driving Directions

To investigate misguided GPS-based driving directions, various internet mapping sites were reviewed, including those from MapQuest, Google Earth, Yahoo Maps, and Magellan. It was verified that incorrect directions were returned for certain addresses. For example, directions provided by Google Earth to 701 East Spring Street in Titusville Opportunity Park instructed drivers on eastbound PA 27 to turn right onto Brown Street and left onto East Spring Street. Such a route would miss the actual entrances via Caldwell Street or Industrial Boulevard, and erroneously direct traffic through the Titusville Stadium parking area and along a locked/gated section of Spring Street across private property near Universal Stainless & Alloy Products.



A more detailed search of the internet mapping sites revealed that all provided some type of error correction form. To solve the directional problems mentioned above, individual businesses could submit the appropriate correction form whenever a problem is identified with one or more of the mapping sites. If this type of problem is more common-place or systemic for a particular group of addresses, businesses could work through partnerships and/or with existing organizations within the City (planning, redevelopment authority, chamber of commerce, etc.) to take a more organized, proactive approach to verifying or submitting correction forms for any problems that are found. One or more persons or agencies spearheading such an effort could develop, advertise, and/or collect local "address correction" forms, compile the required contact information for any of the mapping providers, and systematically begin submitting the necessary corrections. If done on a broad scale in an "official" manner, as opposed to privately by individuals, chances or opportunities to help the mapping providers actually follow-through with the appropriate updates may increase.

4.2.2 Option OPS (2) – Traffic Signal Studies / Modifications

Over the course of this project, various traffic signal-related concerns were identified in responses to the Truck Survey and at different project meetings. Many of these concerns were general or non-specific in nature, such as simply "improve signals". Others cited general concerns through the CBD that will be addressed separately by PennDOT's ongoing *Titusville Traffic Signal Improvement Project*.





While not explicitly addressed within the scope of this truck study, and also outside the limits of the ongoing *Titusville Traffic Signal Improvement Project*, the following signal concerns may require further investigation by local signal maintenance forces and/or PennDOT, as applicable:

- *PA 8* @ *Wal-Mart Drive* verify that traffic signal operations are fully-functioning as intended, and consider traffic signal timing optimization if needed.
- *PA 8* @ *West Spruce Street* replace side-street detection and consider traffic signal timing optimization to minimize mainline signal delays, stoppages, and queuing.
- *PA 27* @ *Caldwell Street* re-visit and/or follow-through with recommendations of previous studies to remove this signal as an unwarranted installation, or consider re-study for replacement as a flashing beacon with modern equipment.

4.2.3 Option OPS (3) – Parking Studies / Modifications

Over the course of this project, various field observations, meeting discussions, and survey comments involved issues pertaining to on-street parking. While not explicitly addressed within the scope of this study, the following parking-related concerns may require further investigation by Titusville's local planning, maintenance, and/or redevelopment personnel:

• *PA* 8 (approximately between West Main Street and West Spruce Street) – investigate the roadway cross-section and current parking allowances, restrictions, and/or enforcement to address potential lane encroachments caused by vehicles parked along PA 8 that contribute to friction, delay, and real or perceived congestion for passing truck traffic in that area.

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- *CBD On-Street Loading Zones* investigate on-street parking layouts and requirements throughout the CBD, including Spring Street and Central Avenue, to review the possibility of converting parking spaces or regulating hours to allow designated on-street loading zones full-time or for certain hours of the day, thereby reducing potential lane blockages caused by trucks unloading from one of the existing travel lanes.
- *Caldwell Street* re-investigate current parking allowances, restrictions, and/or enforcement to address potential conflicts between parked vehicles and heavy trucks along Caldwell Street, accounting for the wide-swinging maneuvers that trucks are forced to make to navigate the PA 27 / Caldwell Street intersection.



4.3 GENERAL (PLANNING)

(Figure 13; Also Table E, Concerns 1C, 4A, 5I, 5J, 7A and 7B). Planning options detailed below were aimed at longer-term solutions focused on broader aspects of the overall transportation network or future development capacity of the study area, as well as rail-related infrastructure in general.

4.3.1 Option PLAN (1) – Truck Climbing Lanes

Based on truck climbing lane analyses conducted earlier in this report (Chapter 2.6), climbing lanes are at least marginally warranted along PA 8 southbound (south of Titusville) and PA 27 eastbound (east of Titusville). The 1996 *Meadville-Titusville East-West Corridor Study* also previously recommended PA 27 westbound (west of Titusville) for consideration of a climbing lane. This truck study, however, did not re-analyze that recommendation beyond noting that truck volumes along PA 27 to the west were notably lower than along PA 8 or PA 27 to the east.

In all cases, the potential costs and funding requirements for installation of any climbing lane, as well as the potential right-of-way or environmental impacts, require further investigation as part of a more comprehensive, long-term planning process. Such a process may be more conducive to reviewing and/or justifying the need for climbing lanes from a systems or county-wide perspective, or with respect to future increases or decreases in the anticipated amount of truck traffic due to future changes in local or regional development patterns.

4.3.2 Option PLAN (2) – Utility Expansion Studies

In identifying and discussing truck-oriented developable sites over the course of this project, it was determined that several vacant parcels are available in both Skyline Industrial Park and Titusville Opportunity Park. While not explicitly detailed as part of this study, it appeared that some amount of expansion to the overall utility infrastructure, potentially including water or wastewater treatment capacities, may be needed in order for development of these sites to be readily viable. While the need and potential cost-sharing for such expansion would obviously be contingent on securing future tenants for these sites, and assuming no such study has already been completed, it could be beneficial to investigate any utility infrastructure needs or limitations in more detail to help plan for and accommodate future development.

4.3.3 Option PLAN (3) – Rail / Intermodal Expansion Studies

Discussions over the course of this project have highlighted a desire to continue to improve and expand rail service within Titusville. Possible major components to these efforts would include the following:

• Rail infrastructure and intermodal facilities within the Titusville Opportunity Park, in line with those detailed as part of the 2001 *LDDAP / ARC Intermodal Study* or the 2003 *Intermodal Feasibility Study* (Chapter 2.3).





- Expansion of rail lines for storage, loading / unloading, and track-switching operations on the west side of town near Perry Street where any increase in the frequency or overall length of rail traffic could affect vehicular traffic blockages due to a number of at-grade railroad crossings.
- Development of emergency services plans or facilities to accommodate more frequent street blockages as rail traffic increases.



• Continued coordination between local agencies, potential developers, and rail service providers to enhance market opportunities for rail traffic and potentially overcome any obstacles to providing local container service in Titusville.

While these ideas were briefly exchanged during this *Titusville Truck Study*, detailed investigations were deemed beyond its scope. Altogether, these issues may justify a more formal and comprehensive review to update and expand the findings of previous rail-related studies and to re-visit specific rail infrastructure requirements from a systems-wide perspective across the City as a whole.

4.3.4 Option PLAN (4) – PA 8 / Franklin Street Bridge Replacement

This project verified that intersection sight distance and truck turning clearances are deficient at the intersection of St. John Street and PA 8 / Franklin Street. However, it also noted that negligible improvements could be made to remedy these situations without affecting the existing Franklin Street Bridge, as the bridge structure itself is part of the sight-distance obstruction, and the southbound bridge approach begins at the tail-end of the intersection radius from eastbound St. John Street.



The status or condition of the Franklin Street Bridge was not investigated as part of this study, although the bridge is not currently listed on the 2007-2032 Long Range Transportation Plan. While planning and programming for the bridge replacement are likely many years out, consideration should be given to incorporating the St. John Street / Franklin Street intersection into the eventual bridge replacement project. Additionally, those plans may also wish to investigate a three-lane bridge option in order to provide a dedicated left-turn lane for heavy truck access from northbound PA 8 onto St. John Street.





4.4 SKYLINE INDUSTRIAL PARK

(Figure 14; Also Table E, Concern 1A). Area-specific options detailed below were aimed at issues in and around Skyline Industrial Park, as well as general access to the park itself.

4.4.1 Option SIP (1) – Existing

Option SIP (1) maintains truck access to / from PA 8 via Skyline Drive as it exists today.

- *Advantages* The existing conditions are "no-cost" and "zero impact". Trucks manage to navigate the PA 8 / Skyline Drive intersection successfully today with no documented safety concerns based on crash records.
- *Disadvantages* Wide-swinging truck maneuvers through the existing intersection occasionally encroach on adjacent or opposing travel lanes. With future increases in background traffic along PA 8, or in truck traffic to/from the park, it may become more difficult for trucks to maneuver in such a manner. As a result, delays or the potential for truck-to-vehicle conflicts may increase. These access conditions could also be a deterrent to future tenants and/or those requiring larger vehicle types.

4.4.2 Option SIP (2) – Geometric Improvements

Option SIP (2) maintains access to Skyline Industrial Park via the existing entrance, but with the addition of geometric improvements at the PA 8 / Skyline Drive intersection.

Intersection Advantages geometric improvements would eliminate any turn clearance or lane encroachment issues for trucks to/from PA 8, including the related disadvantages of Option SIP (1). Such improvements could be beneficial to attracting future development to the park and, if considered in combination with options such as TIP (3) (Chapter 4.5.3), could present opportunities to simultaneously improve and consolidate access for both Skyline Industrial Park and Titusville Industrial Park.



• *Disadvantages* – In addition to pavement construction costs and minor right-of-way requirements, an existing depression or culvert on the southeast quadrant of the PA 8 / Skyline Drive intersection could inflate costs, extend construction limits across PA 8, and/or affect unknown environmental impacts. Additionally, the availability of state funding resources for an isolated intersection improvement are extremely limited, if any, thereby requiring alternative funding sources and/or local cooperative agreements that may be difficult to secure.

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4.4.3 Option SIP (3) – Wal-Mart Shared Access

Option SIP (3) shifts access for Skyline Industrial Park into shared-status via Wal-Mart's rear access drive and to/from PA 8 via the Wal-Mart traffic signal.

- Advantages Trucks from Skyline Industrial Park would gain signalized access to/from PA 8, as well as a dedicated left-turn lane from PA 8 northbound. Maneuvers through the PA 8 / Wal-Mart intersection would be easier for trucks to make than at the PA 8 / Skyline Drive intersection based on a comparison of the existing intersection geometrics. Additionally, having the improved signalized truck access to PA 8 could help attract future tenants to the industrial park.
- Disadvantages Appropriate easements or related agreements would need to be brokered between Wal-Mart and the tenants of Skyline Industrial Park a potentially sensitive issue as shared-use of the existing Wal-Mart truck access and driveway would increase truck volumes using the Wal-Mart signal. Additionally, the existing Skyline Drive connection behind the Wal-Mart building is currently designed only for one-way entry (from Skyline Drive). Fully accommodating two-way access for heavy trucks would require the designation of specific on-site circulation patterns throughout the industrial park, or geometric improvements at the Skyline Drive / Wal-Mart truck access intersection and/or the Skyline Drive loop intersection located just to the north. While not ideal, such improvements were assumed to be preferable versus extending the Wal-Mart driveway to tap directly into Skyline Drive as a new connection. A direct connection could be problematic or costly to design and construct as it would require modifications to a substantial existing retaining wall structure that supports the southwest corner of the Wal-Mart site.

4.4.4 **Option SIP (4) – New Dedicated Access**

Option SIP (4) constructs a new dedicated access for Skyline Industrial Park south of the Wal-Mart driveway, ties into the east end of Kerr Mill Road, and provides an alternate location to improve access to PA 8 with unrestricted intersection geometrics. While briefly considered as a preliminary option, it was ultimately dropped from further investigation based on stakeholder feedback that excessive wetland impacts would likely result from such an alignment.





4.5 TITUSVILLE INDUSTRIAL PARK

(Figure 15; Also Table E, Concern 2A). Area-specific options detailed below would be aimed at issues in and around Titusville Industrial Park, as well as general access to the park itself.

4.5.1 Option TIP (1) – Existing

Option TIP (1) maintains truck access to / from PA 8 via McKinney Road as it exists today.

- *Advantages* The existing conditions are "no-cost" and "zero impact". Trucks manage to navigate the PA 8 / McKinney Road intersection successfully today with no documented safety concerns based on crash records.
- *Disadvantages* Wide-swinging truck maneuvers through the existing intersection occasionally encroach on adjacent or opposing travel lanes and nearby property frontage. With future increases in background traffic along PA 8 or truck traffic to/from the park, or with redevelopment of the corner property, it may become more difficult for trucks to maneuver in such a manner. As a result, delays or the potential for truck-to-vehicle conflicts may increase. These access conditions could also be a deterrent to future tenants and/or those requiring larger vehicle types.

4.5.2 Option TIP (2) – Geometric Improvements

Option TIP (2) maintains access to Titusville Industrial Park via the existing entrance, but with the addition of geometric improvements at the PA 8 / McKinney Road intersection.

• *Advantages* – Intersection geometric improvements would eliminate any turn clearance or lane / property encroachment issues for trucks to/from PA 8, including the related disadvantages of Option TIP (1). Such improvements could be beneficial to attracting future development to the park. Additionally, at the time of this writing, several existing properties were for sale along the north side of PA 8,



just west of the McKinney Road intersection. Depending on the type, timing extent, and of any redevelopment in that area, opportunities could be explored to incorporate **McKinney** Road intersection improvements, future rearfrontage roads, other access or modifications that would be of mutual benefit to both the existing industrial park and the future development tenants.





• *Disadvantages* – Pavement conditions at this location appeared to be in disrepair, and geometric improvements may require reconstruction beyond simple widening of the intersection radii. Right-of-way impacts, particularly as they affect the property on the northwest corner of the intersection, must also be accounted for; and procuring the required funding for an isolated intersection improvement, as with Option SIP (2), could be difficult. Although not explicitly measured at this location, some stakeholders also reflected concerns with reduced sight-distance due to the existing horizontal curve on PA 8 just north of McKinney Road, as well as potential conflicts between truck access and upstream traffic speeds or congestion from the Wal-Mart traffic signal.

4.5.3 Option TIP (3) – New Dedicated Access

Option TIP (3) constructs a new dedicated access for Titusville Industrial Park that leads out of the western edge of the park, west of the HomerWood buildings, and ties into PA 8 opposite Skyline Drive.

- *Advantages* The new connection to PA 8 could be designed to eliminate any truck turn clearance or lane / property encroachment issues. Such improvements could be beneficial to attracting future development to the park and, if considered in combination with options such as SIP (2) (Chapter 4.4.2), could present opportunities to simultaneously improve and consolidate access for both Titusville Industrial Park and Skyline Industrial Park. Moving the truck access to this location would also separate trucks from potentially undesirable interactions with the redevelopment area along PA 8 west of McKinney Road. Additionally, the new location would improve sight-distance and reduce truck conflicts with traffic from the adjacent signal, as the subject horizontal curve and Wal-Mart signal would be located farther downstream.
- Disadvantages Construction costs for the new alignment would be higher than for an isolated intersection improvement, while identifying and procuring the required funding sources would be similarly difficult. Property and/or environmental impacts along the new alignment would also require detailed investigation, particularly with regard to threading the alignment between buildings along PA 8. Additionally, local improvements to streets or circulation patterns inside Titusville Industrial Park, or additional changes to the existing McKinney Road access, may be needed to accommodate or encourage efficient use of the new access road.





4.6 DOWNTOWN (WEST) TITUSVILLE

(Figure 16; Also Table E, Concerns 3C, 3D, 3E, and 3F). Area-specific options detailed below were aimed at issues in the vicinity of downtown Titusville, west of Franklin Street, as well as general truck access throughout the downtown area.

4.6.1 Option DW (1) – Existing

Option DW (1) maintains truck circulation and access throughout the downtown area as it exists today.

- *Advantages* The existing conditions are "no-cost" and "zero impact"; and familiar circulation patterns along the existing PA 8/27 TRUCK via St. John Street and Perry Street are retained. Trucks manage to navigate these downtown streets successfully today with no documented safety concerns based on crash records.
- Disadvantages Based on geometric analyses (Chapter 2.8), trucks experience varying degrees of difficulty while navigating several downtown intersections. Without improvements, those maneuvers will continue to encroach on adjacent or opposing travel lanes and on-street parking, conflict with typical downtown automobile and pedestrian traffic, and occasionally damage nearby curbs, signs, or similar roadside infrastructure. As both automobile and truck traffic volumes increase, the frequency and severity of these types of conflicts may also increase, as will the perceived negative effects of truck traffic on the overall atmosphere of Titusville's downtown community.

4.6.2 Option DW (2) – Re-Routing of PA 89 Truck Traffic

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Option DW (2) re-routes PA 89 truck traffic to avoid difficult turning maneuvers across Franklin Street at Spring Street (EB-L) and Central Avenue (SB-L, WB-R). If implemented, however, the re-routed PA 89 trucks would be forced to follow an unintuitive "long-loop" through town via the PA 8/27 TRUCK on St. John Street and Perry Street, thereby navigating a larger number of difficult intersection maneuvers than the two or three they were trying to avoid. Additionally, geometric analyses indicated that the subject maneuvers across Franklin Street were only of marginal concern and/or related to a comparatively low truck volume. While briefly considered as a preliminary option, Option DW (2) was ultimately dropped from further investigation based on stakeholder feedback and related discussions.





4.6.3 Option DW (3) – Geometric Improvements

Option DW (3) maintains truck circulation and access throughout the downtown area as it exists today, but with the consideration of four tiers of truck accommodations as follows:

- 1st *Tier Maintain existing conditions*: This approach applies to the intersection of Franklin Street @ Spring Street / Diamond Street. Based on geometric analyses at that location, improvement opportunities are severely limited, while the affected truck volumes are also comparatively low. Thus, no modifications are proposed.
- 2nd Tier Verify and enforce existing conditions: This approach applies to the intersections of Franklin Street @ Central Avenue, and Perry Street @ Central Avenue, although it could be similarly-applied to all downtown locations until other future improvements can be made. Based on geometric analyses at the two locations listed, truck clearance issues are marginal, while geometric improvement opportunities are severely limited. Truck accommodations, therefore, must rely on keeping the intersections clear to allow for wide-swinging maneuvers. Those efforts may include verifying stop-bar setbacks, installing fresh stop-bar paint and "Stop Here on Red" signage, reviewing on-street parking restrictions, and/or actively enforcing any of these conditions through police patrols or citations, as needed. As a side note, these types of improvements are being considered independently as part of the ongoing *Titusville Traffic Signal Improvement Project*.
- 3rd Tier Plan and implement short-term geometric improvements: This approach applies to the intersection of St. John Street and Perry Street. At the time of this writing, the Perry Street Bridge was scheduled for replacement. Concurrent with that project, it may be possible to reconfigure the subject intersection such that the north and east legs function as a continuous through-movement, while the south



leg from the Perry Street Bridge tees-in as a sidestreet. Reconstruction in this manner could incorporate minor intersection widening into the northeast quadrant to better accommodate concurrent truck movements along the designated PA 8/27 TRUCK, while also serving as a deterrent to north-south cut-through traffic or speeding across the Perry Street Bridge.





- 4th Tier Plan and implement long-term geometric improvements: This approach applies to the intersections of Perry Street @ Spring Street, and St. John Street @ Franklin Street. In the shorter-term, both locations may be treated as 2nd Tier to verify and enforce stop bar setbacks, parking restrictions, etc. However, long-term plans should consider the following:
 - *Perry Street @ Spring Street:* pursue any opportunities to acquire additional property or right-of-way on the southwest and southeast quadrants of the intersection in order to eventually construct larger curb radii for heavy truck movements.
 - *St. John Street* @ *Franklin Street:* plan to incorporate reconstruction of this intersection into any eventual long-term replacement of the Franklin Street Bridge (Option PLAN (4), Chapter 4.3.4).
- *Advantages* The tiered accommodations listed above, including eventual geometric improvements at the most critical locations, will help to ease truck maneuvering throughout the downtown area. This option also maintains truck traffic along familiar existing routes which, in large part, are appropriate for carrying truck traffic. Right-of-way and property impacts are isolated to spot-improvement locations, and the option generally makes efficient use of the existing roadway infrastructure.
- *Disadvantages* As a result of the many constraints that limit improvement opportunities to varying degrees throughout the study area, the 1st and 2nd tiers listed above essentially offer little more than existing conditions. The 3rd tier improvement must be verified as to whether it meshes appropriately with the Perry Street Bridge replacement. And the 4th tier improvements are likely very long-term solutions that must be accompanied by uncertain right-of-way acquisition and potentially substantial costs.

4.6.4 **Option DW (4) – Extension of Spring Street 2-Way**

Option DW (4) converts Spring Street from one-way to two-way traffic flow between the PA 8 / PA 27 western split and the Perry Street / PA 8/27 TRUCK intersection.

• *Advantages* – The new two-way segment would relocate northbound left-turn truck movements from their existing left-turn at Central Avenue to an improved left-turn at Spring Street, while also improving the Perry Street / Spring Street intersection to better accommodate the eastbound right-turn truck movement. In this manner, truck flows would be consolidated to a single location in hopes of applying limited construction or maintenance resources more efficiently.





 Disadvantages – Substantial further study would be required to fully assess the potential traffic operations impact of the two-way conversion and whether or not it is a beneficial, or even feasible, concept.
Depending on the outcome of such a study and basic assumptions as to the required number of travel lanes, the potential impacts could be considerable.
Substantial factors may include right-ofway, parking losses, or construction costs, as well as a review of how this concept meshes with the bigger-picture one-way traffic patterns throughout Titusville.



4.6.5 Option DW (5) – Direct Connection of Water Street to Perry Street

Option DW (5) constructs a new roadway connection that extends Water Street from Franklin Street to Perry Street, threading between existing buildings at Titusville Dairy and Charter Plastics. The intention was to provide an alternate east-west connection to replace St. John Street, thus avoiding the previously-identified geometric concerns along that route. While briefly considered as a preliminary option, it was ultimately dropped from further investigation based on stakeholder feedback that impacts to private property, truck loading operations, railroad right-of-way, and/or railroad clearance issues would be substantial.

4.6.6 Option DW (6) – Direct Connection of St. John Street to Monroe Street

Option DW (6) constructs a new roadway connection between the west end of St. John Street and the south end of Monroe Street, threading behind existing buildings at the OCTL Railroad Station, Charter Plastics, and others. The intention was to provide an alternate north-south connection to replace Perry Street, including improved truck accommodations at the Spring Street and Central Avenue junctions. While briefly considered as a preliminary option, it was ultimately dropped from further investigation based on stakeholder feedback that impacts to existing buildings, private property, railroad operations, and numerous rail crossings would be substantial.





4.7 DOWNTOWN (EAST) TITUSVILLE

(Figure 16; Also Table E, Concern 4A, 4B, 4C, and 4D). Area-specific options detailed below were aimed at issues in the vicinity of downtown Titusville, east of Franklin Street, as well as general truck access through the downtown area.

4.7.1 Option DE (1) – Existing

Option DE (1) maintains truck circulation and access throughout the downtown area as it exists today.

- *Advantages* The existing conditions are "no-cost" and "zero impact"; and familiar circulation patterns along PA 27, Water Street, or Brown Street are retained. Trucks manage to navigate these downtown streets successfully today with no documented safety concerns based on crash records.
- *Disadvantages* For truck travel from the south to the east, disadvantages are minimal; trucks appear to navigate the intersection of Franklin Street @ Spring Street / Diamond Street with few concerns. For travel in the opposite direction, turn clearance directly from westbound PA 27 to southbound Franklin Street is severely limited, and so trucks are directed to follow an unintuitive "long-loop" west on Central Avenue, south on Perry Street, and then east onto St. John Street before they are able to return to PA 8 south. This loop sends a significant volume of truck traffic along an indirect route through the heart of the CBD, which also adds to the potential for conflicts and truck-related wear and tear through town.

4.7.2 Option DE (2) – Truck Route along Water Street and Brown Street

Option DE (2) modifies truck circulation to/from the east side of town by designating Water Street and Brown Street as an official PA 27 Truck Route.

• *Advantages* – The proposed truck route would short-turn trucks off of Spring Street and Central Avenue, eliminate the long-loop described under the existing conditions, and decrease the overall amount of truck traffic in the heart of downtown Titusville. It would consolidate truck travel to fewer roads, which would also consolidate truck impacts, maintenance and improvement costs to fewer locations. This option would mesh with the way in which trucks are naturally using Water Street and Brown Street as a preferred route today. Designating Water Street as an official route would help to allow the appropriate roadway improvements to be implemented to ensure it is used safely and efficiently.





 Disadvantages – This option would likely require minor roadway widening / resurfacing along Water Street between approximately South Drake Street and Brown Street, essentially as needed to bring that segment of Water Street up to par with the existing curb & gutter segments located on its western half nearer Franklin Street. Minor intersection geometric improvements may also be desirable to better accommodate movements between Franklin Street and Water Street, and between Brown Street and PA 27 (Table C). Additionally, city officials will have to weigh possible conflicts along Water Street between truck traffic and any existing pedestrian, bicycle, or community-oriented activities associated with Titusville Middle School, the Billie Brown Building, or similar existing land uses.









4.8 **TITUSVILLE OPPORTUNITY PARK**

(Figure 17; Also Table E, Concerns 5B, 5C, and 5E through 5H). Area-specific options detailed below were aimed at issues in and around Titusville Opportunity Park, including general access to the park itself and to the adjacent Universal Stainless & Alloy Products site.

4.8.1 Option TOP (1) – Existing

Option TOP (1) maintains truck access to / from the industrial park and adjacent sites as it exists today.

- *Advantages* The existing conditions are "no-cost" and "zero impact". Trucks manage to navigate the PA 27 / Caldwell Street and PA 27 / Industrial Boulevard intersections successfully today with no documented safety concerns based on crash records.
- *Disadvantages* Based on geometric analyses, truck access and clearance issues at the Caldwell Street intersection appear to be substantial and will continue as-is without improvements. Additionally, based on truck forecasting efforts, future growth potential at Titusville Opportunity Park is significant. That potential may warrant improved overall access and circulation to help support and encourage the desired growth, while also planning for its potential truck or traffic volume impacts.

4.8.2 **Option TOP (2) – Geometric Improvements**

Option TOP (2) maintains truck access to / from the industrial park and adjacent sites as it exists today, but with the addition of intersection geometric improvements at the PA 27 / Caldwell Street intersection and the PA 27 / Industrial Boulevard intersection, as needed.

Advantages _ Intersection geometric improvements would enhance existing access on/off of PA 27 by lowering delays and/or improving safety for trucks as well as passenger vehicles. Appropriate turn clearances would be exceptionally beneficial at the Caldwell Street intersection given the severity of the existing turn deficiencies at that location.







 Disadvantages – Right-of-way acquisition needed to improve the Caldwell Street intersection could be substantial and expensive. Additionally, geometric improvements would not eliminate the existing upgrade delays or sight distance limitations at that intersection. Additionally, the isolated intersection improvements by themselves would have little impact on improving overall circulation or managing future truck growth in this area.

4.8.3 Option TOP (3) – Modification of Caldwell Street Gate

Option TOP (3) modifies Universal's existing Caldwell Street truck gate in order to provide truck access to/from the south. In this manner, Universal's truck traffic could be re-routed through the industrial park to share access to PA 27 via Industrial Boulevard, thereby avoiding any issues at PA 27 and Caldwell Street. While briefly considered as a preliminary option, it was ultimately dropped from further investigation based on stakeholder feedback indicating that natural gas heads in a storage building on the southwest corner of that gate would render its reconfiguration difficult, if not infeasible.

4.8.4 Option TOP (4) – Modification of Spring Street Gate

Option TOP (4) relocates Universal's truck access from their existing Caldwell Street gate to a new Spring Street gate connection.

 Advantages – With a new connection to Spring Street, Universal's truck traffic could be re-routed through the industrial park to share access to PA 27 via Industrial Boulevard, thereby avoiding any issues at PA 27 and Caldwell Street. This change

also consolidates access to make more efficient use of the existing infrastructure and any future maintenance dollars, while also consolidating truck volumes to increase the possibility of justifying future improvements such as turn lanes or traffic signalization on PA 27.



• *Disadvantages* – Internal modifications may be needed in order for Universal's onsite truck flows to be able to link to a Spring Street gate; the existence or extent of any such issues are unknown. Additionally, appropriate easements and all required legal, maintenance, or other agreements between the owners/operators of the Universal site and of Titusville Opportunity Park would be required in order to share access as described under this option.





4.8.5 Option TOP (5) – Extension of Water Street to TOP Rear-Access

Option TOP (5) constructs a new dedicated access to the rear (south of) Titusville Opportunity Park as an extension of Water Street and including a connection with Brown Street. This option essentially reiterates a previous recommendation made as part 2001 *LDDAP/ARC Intermodal Study*. Locations for tapping the new access into the industrial park could vary, including possibilities in the vicinity of the Universal site or near TOP Building 65.

• *Advantages* – The proposed connection would enhance overall access and circulation for the industrial park and adjacent properties, both as an improvement for existing conditions and as an amenity for future development. System-wide, and especially if coordinated with an official Water Street truck route per Option DE (2) (Chapter 4.7.2), it could pull a significant volume of heavy trucks off of the PA 27, Spring Street, and Central Avenue routes currently used by trucks heading to/from the downtown area. Locally, if connected to the Universal site, concerns with Universal's existing access via Caldwell Street could be eliminated, and potential issues with shared-access easements or agreements through the industrial park would, at a minimum, be simpler. Optionally (or additionally), if connected in the vicinity of Building 65, opportunities may also exist to further enhance any future intermodal facility expansion at that location.



Disadvantages – As a completely new roadway of approximately ¼ to ½ mile in length, design and construction costs will be significant. Considering the location adjacent to Oil Creek, potential environmental impacts will require detailed investigation, as will any concerns or possible conflicts with an existing sewer mainline that runs through that area. System-wide, the new connection would likely increase truck volumes along Water Street regardless of whether or not it is a designated truck route. This increase may or may not be of concern, depending on final preferences for or against Option DE (2) and with regard to possible conflicts with Titusville Middle School, the Billie Brown Building, etc.





4.8.6 Option TOP (6) – Extension of Water Street to Sewer Plant Road

Option TOP (6) extends Option TOP (5) to connect Water Street via new roadway as far as Sewer Plant Road within Titusville Opportunity Park.

- *Advantages* The proposed connection would expand upon the benefits previouslydetailed under Option TOP (5) and provide additional options to enhance circulation throughout Titusville Opportunity Park. The connection to Sewer Plant Road could be especially beneficial for accommodating future truck access as the industrial park grows and/or as a means to manage any internal truck congestion that might otherwise occur if the Water Street Extension is stopped short under the previous Option TOP (5).
- *Disadvantages* Similar to Option TOP (5), design and construction costs for the approximately ¹/₄ mile roadway extension will be significant; possible environmental or sewer impacts will require investigation; and truck impacts to Water Street may or may not be acceptable.





4.9 EAST TITUSVILLE

(Figure 18; Also Table E, Concerns 6A, 6B, and 6C). Area-specific options detailed below were aimed at issues in and around East Titusville, including general access to the RTI, Baillie Lumber, Oil Creek Plastics, and Precision Profiles sites.

4.9.1 Option ET (1) – Existing

Option ET (1) maintains truck access to / from the East Titusville business and industry sites as it exists today.

- *Advantages* The existing conditions are "no-cost" and "zero impact". Trucks manage to access each of the East Titusville sites today, with traffic to/from each site being served by a separate dedicated driveway.
- *Disadvantages* Existing conditions include 7 driveway connections (at least 4 with occasional heavy truck traffic) and 1 railroad crossing along a ¹/₄-mile curved segment of PA 27 that may also be prone to higher travel speeds. As such, there is an increased potential for vehicle-vehicle and truck-vehicle conflicts or delays. As separate driveways, it could also be difficult to justify or coordinate any future improvements (turn lanes, intersection radii, etc.) should the need for such improvements ever arise.

4.9.2 Option ET (2) – Access Consolidation at Campbell Road

Option ET (2) links traffic between the Baillie Lumber, Oil Creek Plastics, and Precision Profiles sites on the south side of PA 27 via an internal circulation or frontage road, and consolidates access to/from PA 27 at a single four-way intersection opposite Campbell Road.

• *Advantages* – Consolidating access to the subject sites would eliminate several of the existing driveways along PA 27, thus reducing potential conflicts points. The new connection opposite Campbell Road could be designed to fully accommodate all required truck movements efficiently and safely, and the combined truck volumes and impacts may help to justify future improvements such as dedicated turn-lanes, should they ever be needed. The combined access would also reduce the number of potential conflicts and on-site crossings associated with the east-west rail line located between PA 27 and the buildings to the south. Long-term, this configuration may also be more conducive to providing an alternate eastern connection to the Titusville Opportunity Park as detailed in Option ET (3).







• *Disadvantages* – Aside from construction costs and right-of-way for the new connection to PA 27, other pavement or roadway-type improvements may be needed to ensure an adequate internal circulation or frontage road is provided. Appropriate legal and shared-use easements or agreements would be required between the affected property owners. Detailed reviews of the existing on-site operations for each property must also verify whether or not the frontage road concept is compatible or requires additional construction.

4.9.3 Option ET (3) – East Titusville TOP Connection

Option ET (3) links traffic to/from Titusville Opportunity Park with the Campbell Road consolidated connection described under Option ET (2).

- *Advantages* The new eastern connection to Titusville Opportunity Park would enhance truck access and circulation as the industrial park develops, while also linking the East Titusville sites to other truck route improvements such as the Water Street extension discussed in Options TOP (6).
- Disadvantages Aside from construction costs and right-of-way for the new connections, potential wetland or other environmental impacts in the areas north of RTI will require detailed investigation, as will any potential impacts to the RTI site itself. Appropriate legal and shared-use easements or agreements would be required between all affected property owners.





5.0 LOCALLY-PREFERRED IMPROVEMENT OPTIONS

5.1 **OPTIONS ELIMINATED**

The complete list of improvement options from the previous chapter was reviewed with project stakeholders on March 18, 2009, with the goal of compiling a final list of locally-preferred improvements to carry forward to the completion of this truck study. Based on discussions from that meeting (Appendix A), only five options were <u>not</u> carried forward. Those five were dropped from further consideration based on the following:



- *SIP* (4) *New Dedicated Access*: The proposed new connection to Skyline Industrial Park to the south of the existing Wal-Mart site was dropped due to significant anticipated wetland impacts.
- *DW*(2) *Re-Routing of PA 89 Truck Traffic*: The proposed re-routing of PA 89 trucks in the vicinity of Franklin Street was dropped to avoid more substantial impacts along the proposed route than what already occur on the existing route, particularly for a comparatively low truck volume for the affected movement.
- *DW* (5) *Direct Connection of Water Street to Perry Street*: The proposed connection was dropped due to anticipated property, right-of-way, and railroad issues between Charter Plastics and Titusville Dairy.
- *DW* (6) *Direct Connection of St. John Street to Monroe Street*: The proposed connection was dropped due to anticipated property, right-of-way, and railroad issues behind Charter Plastics and the OCTL Railroad Station on Perry Street.
- *TOP* (3) *Modification of Caldwell Street Gate*: The proposed reconfiguration of Universal's existing truck gate was dropped due to conflicts with existing natural gas heads located at the southwest corner of that gate.





5.2 **OPTIONS RETAINED**

Based on the data, analyses, and findings in this report, as well as guidance from the project stakeholders, the complete set of locally-preferred improvement options retained for future consideration are summarized below (based on details in Chapter 4.0):

5.2.1 General (Signing)

- *SIGN* (1) *Maintain Existing Signing*: As part of ongoing maintenance activities, maintain the existing PennDOT standard truck route signs and trailblazers for PA 8/27 TRUCK. Also verify that any custom wayfinding signs specific to individual industrial parks or businesses are up-to-date and appropriately located.
- SIGN (2) Enhance Existing Signing: As part of ongoing maintenance activities, consider installing additional trailblazers as needed on PA 89 or east of Franklin Street to enhance guidance to PA 8/27 TRUCK. Also consider expansion of a custom wayfinding sign system within each industrial park similar to the existing wayfinding system in Titusville Opportunity Park.
- *SIGN* (3) *Add Industrial Parking Signage*: Install directional signs and supplemental advance turn signs at the access points for Skyline Industrial Park, Titusville Industrial Park, and Titusville Opportunity Park. Pursue one of two options:
 - Utilize pending DCED sign program standards in coordination with the PA Tourism Signing Trust, or
 - Develop custom directional signs to be located outside of the highway right-of-way with the appropriate City or other local agreements.

5.2.2 <u>General (Operations)</u>

- *OPS* (1) *GPS-Based Driving Directions*: Develop and implement a local procedure to systematically identify and submit error correction forms for internet-based driving direction or address location problems
- *OPS* (2) *Traffic Signal Studies / Modifications*: Conduct ongoing or special signal maintenance to investigate and potentially modify the following:
 - Appropriate signal operations and timing for PA 8 @ Wal-Mart Drive.
 - Side-street detection and timing revisions for PA8 @ West Spruce Street.
 - Signal removal or equipment upgrades for PA 27 @ Caldwell Street




- *OPS* (3) *Parking Studies / Modifications*: Conduct a comprehensive parking study of the area to further investigate the following:
 - Additional parking restrictions along PA 8 between West Main Street and West Spruce Street to reduce friction for the mainline travel lanes.
 - Designated on-street loading zones for the CBD to reduce travel lane blockages during truck loading / un-loading activities.
 - Appropriate parking restrictions on Caldwell Street to accommodate wide-swinging truck movements to/from the Universal site.

5.2.3 <u>General (Planning)</u>

- *PLAN (1) Truck Climbing Lanes*: Incorporate the re-evaluation and possible future implementation of truck climbing lanes on PA 8 (south of Titusville) and PA 27 (east and west of Titusville) into the comprehensive long-term planning process.
- *PLAN (2) Utility Expansion Studies*: Consider a detailed investigation of utility infrastructure needs or limitations as they pertain to future development requirements within Skyline Industrial Park and Titusville Opportunity Park.
- *PLAN* (3) *Rail / Intermodal Expansion Studies*: Consider a comprehensive study of rail infrastructure and intermodal facility expansion requirements, impacts, and opportunities on a system-wide basis throughout Titusville.
- *PLAN* (4) *PA 8 / Franklin Street Bridge Replacement*: Plan to incorporate reconstruction of the St. John Street / Franklin Street intersection into an eventual Franklin Street Bridge Replacement project. Consider analysis of a future three-lane bridge to accommodate turn lanes along PA 8.

5.2.4 Skyline Industrial Park

- *SIP* (1) *Existing*: For short-term conditions, maintain access to/from Skyline Industrial Park via Skyline Drive as it exists today.
- *SIP* (2) *Geometric Improvements*: For short to mid-term conditions, consider geometric improvements at the intersection of PA 8 and Skyline Drive. Coordinate build opportunities with TIP (3).
- *SIP* (3) *Wal-Mart Shared Access*: For mid to long-term conditions, or in place of SIP (1) or SIP (2), consider shared-access accommodations with Wal-Mart to allow signalized truck access to/from PA 8 via the existing Wal-Mart traffic signal.





5.2.5 <u>Titusville Industrial Park</u>

- *TIP* (1) *Existing*: For short-term conditions, maintain access to/from Titusville Industrial Park via McKinney Road as it exists today.
- *TIP* (2) *Geometric Improvements*: For short to mid-term conditions, consider geometric improvements at the intersection of PA 8 and McKinney Road; coordinate build opportunities with possible re-development nearby on PA 8.
- *TIP* (3) *New Dedicated Access*: For mid to long-term conditions, consider a new dedicated access to PA 8 opposite Skyline Drive; coordinate build opportunities with SIP (2) and/or possible re-development nearby on PA 8.

5.2.6 <u>Downtown (West) Titusville</u>

- *DW* (1) *Existing*: For short-term conditions, maintain truck circulation through Titusville's CBD, west of Franklin Street, as it exists today.
- *DW* (3) *Geometric Improvements*: Consider tiers of short, mid, and long-term improvements to ease truck maneuvers throughout the CBD as follows:
 - 1st Tier Maintain existing operations for minor volume movements and/or where improvement opportunities are severely limited, including Franklin Street @ Spring Street / Diamond Street.
 - 2nd Tier Verify, enforce, and update, as needed, all stop bar setbacks, painted lines, and posted "Stop Here Red" signage to keep intersections clear where wide-swinging maneuvers must occur, including Franklin Street @ Central Avenue, and Perry Street @ Central Avenue.
 - 3rd Tier Incorporate short-term geometric improvements for St. John Street @ Perry Street into the upcoming Perry Street Bridge Replacement Project, including modification of the intersection to allow the north and east legs to function as a continuous through-movement.
 - 4th Tier Plan for long-term geometric improvements for the southwest and southeast corners of Perry Street @ Spring Street based on future right-of-way availability, and for St. John Street @ Franklin Street based on future replacement of the Franklin Street Bridge (Option PLAN (4)).
- *DW* (4) *Extension of Spring Street 2-Way*: Consider future studies to fully assess the potential feasibility, impacts, and implementation requirements for converting Spring Street between PA 8/27 and Perry Street from 1-way to 2-way travel.





5.2.7 <u>Downtown (East) Titusville</u>

- *DE* (1) *Existing*: For short-term conditions, maintain truck circulation through Titusville's CBD, east of Franklin Street, as it exists today.
- *DE* (2) *Truck Route along Water Street and Brown Street*: For short to mid-term conditions, consider designating Water Street and Brown Street as an official PA 27 Truck Route, including minor roadway widening / re-surfacing and geometric improvements as needed.

5.2.8 <u>Titusville Opportunity Park</u>

- *TOP* (1) *Existing*: For short-term conditions, maintain access to/from Titusville Opportunity Park via Industrial Boulevard or Caldwell Street as it exists today.
- *TOP* (2) *Geometric Improvements*: Acquire right-of-way and consider geometric improvements to east truck movements at the intersections of PA 27 @ Caldwell Street and PA 27 @ Industrial Boulevard
- *TOP* (4) *Modification of Spring Street Gate*: In lieu of geometric improvements for PA 27 @ Caldwell Street, pursue the appropriate easements and all required legal agreements to relocate Universal's truck access to the Spring Street gate with shared-access to/from PA 27 through Titusville Opportunity Park.
- *TOP* (5) *Extension of Water Street to TOP Rear-Access*: For mid to long-term improvements, construct a new dedicated access to the rear (south of) Titusville Opportunity Park as an extension of Water Street.
- *TOP* (6) *Extension of Water Street to Sewer Plant Road*: Consider extension of Option TOP (5) such that the new Water Street connection within Titusville Opportunity Park links as far as Sewer Plant Road.

5.2.9 <u>East Titusville</u>

- *ET* (1) *Existing*: For short-term conditions, maintain access to/from the East Titusville business / industry sites as it exists today.
- *ET* (2) *Access Consolidation at Campbell Road*: For mid to long-term improvements, consider installation of an internal frontage road for sites south of PA 27 and consolidation of PA 27 access at a four-way intersection opposite Campbell Road.
- *ET* (3) *East Titusville TOP Connection*: For long-term improvements, create a new eastern connection to Titusville Opportunity Park by linking site traffic to the consolidated Campbell Road connection (Option ET (2)).





5.3 **PROJECT ACTION PLAN**

A final "Project Action Plan" was developed as a complete set of locally-preferred improvement options for this *Titusville Truck Study* with references to specific projects or actions, responsible parties, cost estimates, and assumed priorities (Table F).

Conceptual cost estimates (Table F and Appendix G) were developed based on reasonable quantity, unit-price, and related assumptions for the anticipated option. It should be noted that the estimates prepared for this study do <u>not</u> account for three potentially significant categories of items – right-of-way, utilities, and environmental impacts or related mitigation requirements. It is anticipated that costs associated with any one of those categories will need to be addressed during subsequent conceptual or preliminary design stages for any given option.

The assignment of a "Responsible Party" and "Priority Rating" (Table F) was based on input from the project stakeholders and engineering judgment considering the anticipated location, scope, type, and cost associated with any option. The "Priority Rating" was not intended to represent a specific calendar schedule; rather it balances the relative level of need for a specific option with the anticipated timeframe within which that option can be reasonably implemented. Ratings were assigned as "A" for immediate, "B" for short to mid-term, "C" for long-term, and "Ongoing" for continuous or regular tasks such as maintenance activities or monitoring of certain conditions.

It should be emphasized that most PennDOT-funded transportation projects must be reviewed and approved through the Northwest Commission / PennDOT process before being placed on the Transportation Improvements Program (TIP) list. Realistically, this process could take five to seven years from proposal to project initiation. During the interim, the TRA and the City of Titusville should take action on options that do not require extensive funds or formal processing through the TIP / Long Range Plan. Discussions should also be opened with Oil Creek Township to coordinate possible improvements. Both the City and the Township should explore the potential of promoting certain projects as "3R" maintenance activities, identify opportunities for developer-funded improvements, or consider alternate sources of funding such as grants, transportation enhancements funds, or a specific program such as the Highway Safety Improvement Program.

Several of the proposed options may require future re-evaluation of the current or anticipated truck traffic conditions pending future truck-oriented developments in and around the City. Scheduling must also remain flexible based on availability of required funds, right-of-way acquisition, or the findings of future option-specific studies. Ultimately, through implementation of at least some of the proposed improvement options, positive steps should be made toward the goal of better accommodating truck traffic to, from, and through Titusville.





ID	Project or Action	Responsible Party ¹	Conceptual Cost ²	Priority Rating ³	
General O	ptions (Signing)				
SIGN (1)	Maintain Existing Signing	PennDOT (Standard) TRA / City / Twp (Custom)	Nominal	Ongoing	
SIGN (2)	Enhance Existing Signing	PennDOT (Standard) TRA / City / Twp (Custom)	Nominal to \$25k ⁴	Ongoing	
SIGN (3)	Add Industrial Parking Signage	TRA / City / Twp	\$17,000	A/B	
General O	ptions (Operations)				
OPS (1)	GPS-Based Driving Directions	TRA or other local lead	Nominal	А	
OPS (2)	Traffic Signal Studies / Modifications	City / Twp	\$5k to \$100k ⁴	A/B	
OPS (3)	Parking Studies / Modifications	City	\$50k STUDY ⁵	A/B	
General O	ptions (Planning)				
PLAN (1)(A)	Truck Climbing Lane (PA 8 SOUTH)	PennDOT, Northwest Commission	\$3.2M	С	
PLAN (1)(B)	Truck Climbing Lane (PA 27 EAST)	PennDOT, Northwest Commission	\$4.5M	С	
PLAN (2)	Utility Expansion Studies	TRA / City / Twp	\$75k STUDY ⁵	В	
PLAN (3)	Rail / Intermodal Expansion Studies	TRA / City	\$100k STUDY ⁵	В	
PLAN (4)	PA 8 / Franklin Street Bridge Replacement	PennDOT, Northwest Commission	\$3.2M ⁶	С	
Skyline Industrial Park					
SIP (1)	Existing	n/a	\$0	А	
SIP (2)	Geometric Improvements (PA 8 @ Skyline Drive)	TRA / City / Twp; with property owner / developer assist	\$168k	B/C	
SIP (3)	Wal-Mart Shared Access	TRA / City / Twp; with property owner / developer assist	\$25k STUDY ⁵	B/C	

Table F: Project Action Plan

Notes **1-6***: Refer to detailed notes at the end of this table, Page* 61*.*





ID	Project or Action	Responsible Party ¹	Conceptual Cost ²	Priority Rating ³
Titusville	Industrial Park			
TIP (1)	Existing	n/a	\$0	А
TIP (2)	Geometric Improvements (PA 8 @ McKinney Road)	TRA / City / Twp; with property owner / developer assist	\$166k	B / C
TIP (3)	New Dedicated Access	TRA / City / Twp; with property owner / developer assist	\$462k	B / C
Downtow	n West			
DW (1)	Existing	n/a	\$0	А
DW (3)(A)	Geometric Improvements (Spring Street @ Perry Street)	TRA / City (w/ PennDOT Coordination)	\$170k	B/C
DW (3)(B)	Geometric Improvements (St. John Street @ Perry Street)	TRA / City (w/ PennDOT Coordination)	\$64k	A / B
DW (3)(C)	Geometric Improvements (St. John Street @ Franklin Street)	TRA / City (w/ PennDOT Coordination)	\$771k ⁶	С
DW (4)	Extension of Spring Street 2-Way	TRA / City (w/ PennDOT Coordination)	\$50k STUDY ⁵	B/C
Downtow	n East			
DE (1)	Existing	n/a	\$0	А
DE (2)(A)	Water Street / Brown Street Truck Route (Geometric Improvements, Franklin @ Water)	TRA / City (w/ PennDOT Coordination)	\$96k	С
DE (2)(B)	Water Street / Brown Street Truck Route (Water Street Pavement Improvements)	TRA / City (w/ PennDOT Coordination)	\$607k	В
DE (2)(C)	Water Street / Brown Street Truck Route (Geometric Improvements, Water @ Brown)	TRA / City (w/ PennDOT Coordination)	\$79k	С
DE (2)(D)	Water Street / Brown Street Truck Route (Geometric Improvements, Brown @ PA 27)	TRA / City (w/ PennDOT Coordination)	\$80k	С

Table F:	Project	Action	Plan	(Continued)
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Notes 1-6: Refer to detailed notes at the end of this table, Page 61.





ID	Project or Action	Responsible Party ¹	Conceptual Cost ²	Priority Rating ³
Titusville	Opportunity Park			
TOP (1)	Existing	n/a	\$0	А
TOP (2)(A)	Geometric Improvements (PA 27 @ Industrial Boulevard)	TRA / City (w/ PennDOT Coordination)	\$112k	С
TOP (2)(B)	Geometric Improvements (PA 27 @ Caldwell Street)	TRA / City (w/ PennDOT Coordination)	\$173k	B/C
TOP (4)	Modification of Spring Street Gate	TRA / City, with property owner / developer assist	\$25k STUDY ⁵	A/B
TOP (5)	Extension of Water Street to TOP Rear-Access	TRA / City; with property owner / developer assist	\$1.0M	B/C
TOP (6)	Extension of Water Street to Sewer Plant Road	TRA / City; with property owner / developer assist	\$515k	С
East Titus	ville			
ET (1)	Existing	n/a	\$0	А
ET (2)	Access Consolidation at Campbell Road	TRA / City / Twp; with property owner / developer assist \$250k		B/C
ET (3)	East Titusville TOP Connection	TRA / City / Twp; with property owner / developer assist	\$298k to \$555k ⁴	С

Note 1: Reference to a responsible party is intended for conceptual planning purposes only and does not imply any existing formal commitments or binding agreements. Responsibilities for individual parties may vary with regard to design, funding, oversight, construction, maintenance etc. "City" refers to City of Titusville; "Twp" refers to Oil Creek Township.

Note 2: Estimates are intended for conceptual use only, are based on year 2009 dollars, and include 15% contingency, 20-35% engineering, 15% temporary traffic control & mobilization, and 8% construction inspection costs. They do not include potentially substantial costs related to right-of-way, utilities, and environmental impacts or related mitigation.

Note 3: Priority ratings are assigned as "A" for immediate, "B" for short to mid-term, "C" for long-term and "Ongoing" for continuous or regular tasks such as maintenance-related activities or monitoring of certain conditions.

Note 4: Where displayed as a range, the conceptual costs will vary depending on the specific type, location, or extent of improvements that are ultimately pursued.

Note 5: Where displayed as a STUDY, the conceptual cost represents an assumed amount for further planning or engineering study of the subject option. No physical construction or other specific efforts are reflected in this cost.

Note 6: PLAN (4) and DW (3)(C) are listed here separately, but would ideally be combined into a single project cost to reconstruct St. John Street @ Franklin Street concurrently with any future replacement of the PA 8 / Franklin Street Bridge.



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6.0 **REFERENCES**

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Figure 1: Project Location Map



Figure 2: Study Area Map (Truck Routes)



Figure 3: Study Area Map (Truck Constraints)



Figure 4: Truck Projections (Heavy Truck Zones)



Figure 5: Truck Projections (Base Year Scenario)



Figure 6: Truck Projections (Future Max-Build Scenario)



Figure 7: Truck Projections (Future Partial-Build Scenario)



* Refer to Chapter 3.2, Table E, for summary descriptions by index #

Figure 8: Areas of Concern (Skyline & Titusville Industrial Parks)



* Refer to Chapter 3.2, Table E, for summary descriptions by index #



* Refer to Chapter 3.2, Table E, for summary descriptions by index #

Figure 10: Areas of Concern (Titusville Opportunity Park)



* Refer to Chapter 3.2, Table E, for summary descriptions by index #

Figure 11: Areas of Concern (East Titusville)



RIGHT 1/2 MILE

Skyline Industrial Park



DCED-Administered Directional Signs (Standard Design Option within Highway Right-of-Way)



Custom Directional Signs (Custom Design Option outside Highway Right-of-Way)

Figure 12: Improvement Options Map (Signing)



Figure 13: Improvement Options Map (Operations & Planning)



Figure 14: Improvement Options Map (Skyline Industrial Park)



Figure 15: Improvement Options Map (Titusville Industrial Park)



Figure 16: Improvement Options Map (Downtown Titusville)



Figure 17: Improvement Options Map (Titusville Opportunity Park)



Figure 18: Improvement Options Map (East Titusville)

APPENDICES





APPENDIX A: MEETING SUMMARIES

The detailed contents of Appendix A are listed below. All materials are included in electronic PDF-format only, located on an enclosed CD at the end of this report.

Meeting 1 – Project Kick-Off Meeting (July 7, 2008)

- Meeting Minutes

Meeting 2 – Municipal Officials Meeting (October 29, 2008)

- Meeting Minutes
- Presentation Slides
- Meeting 3 Transportation Committee Meeting (November 13, 2008)
 - Meeting Minutes
 - Presentation Slides
- Meeting 4 Truck Traffic Forecasting Meeting (January 8, 2009)
 - Meeting Minutes

Meeting 5 – Improvement Options Meeting (March 18, 2009)

- Meeting Minutes
- Presentation Slides





APPENDIX B: TRAFFIC COUNT DATA

The detailed contents of Appendix B are listed below. All materials are included in electronic PDF-format only, located on an enclosed CD at the end of this report.

Automatic Traffic Recorder (ATR) Data

- ATR 1 St. John Street (between Perry Street and Franklin Street)
- ATR 2 PA 8 (south of Bloss Street)
- ATR 3 PA 27 (east of East Titusville)
- ATR 4 PA 8 (north of Skyline Industrial Park)
- ATR 5 PA 89 (near Titusville's northern city limits)
- ATR 6 PA 27 (near Titusville's western city limits)
- ATR 7 Water Street (between Drake Street and Kerr Street)
- ATR 8 Caldwell Street (south of PA 27)

Turning Movement County (TMC) Data

- TMC 1 Perry Street @ Spring Street (PM)
- TMC 2 Perry Street @ Central Avenue (PM)
- TMC 3 Franklin Street @ St. John Street (Midday)
- TMC 4 Franklin Street @ Water Street (Midday)
- TMC 5 PA 27 @ Brown Street (PM)
- TMC 6 Central Avenue @ Franklin Street (PM)
- TMC 7 Central Avenue @ Perry Street (PM)
- TMC 8 PA 27 @ East Industrial Boulevard (Midday)
- TMC 9 PA 8 @ Spruce Street (Midday)
- TMC 10 PA 8 @ McKinney Street (Midday)
- TMC 11 PA 8 @ Skyline Drive (Midday)





APPENDIX C: TRUCK SURVEY SUMMARY

The detailed contents of Appendix C are listed below. All materials are included in electronic PDF-format only, located on an enclosed CD at the end of this report.

Sample Truck Survey Form

Truck Survey Summary and Volume Breakdown

- Survey Response Data (Raw Data)
- Survey Response Data (Refined Data)
- Refined Volume Summary by Zone
- Origin-Destination Matrix





APPENDIX D: TRUCK FORECASTING SUMMARY

The detailed contents of Appendix D are listed below. All materials are included in electronic PDF-format only, located on an enclosed CD at the end of this report.

Truck Trip Generation Summary

- Truck Trip Subtotals for Origins-Destinations within Titusville
- Truck Trip Subtotals for Pass-Thru traffic and Overall Study Area
- Origin-Destination Matrix (Base)
- Origin-Destination Matrix (Max-Build)
- Origin-Destination Matrix (Partial Build)

Truck Trip Distribution Summary

- Network Map
- Existing Routes and Base Volumes
- Existing Routes and Partial Build Volumes
- Existing Routes and Max Build Volumes
- Existing "Western" Routes (Zones 100-200) and Partial Build Volumes
- Existing "Central" Routes (Zones 300-400) and Partial Build Volumes
- Existing "Eastern" Routes (Zones 500-600) and Partial Build Volumes
- Existing "Pass-Thru" Routes (Zones 901-905) and Partial Build Volumes




APPENDIX E: TRUCK CLIMBING LANE ANALYSIS

The detailed contents of Appendix E are listed below. All materials are included in electronic PDF-format only, located on an enclosed CD at the end of this report.

Evaluation of Truck Climbing Lane Warrants

- PA 8 (South of Titusville)
- PA 27 (East of Titusville

HCS Two-Lane Highway Segment Analysis

- PA 8 (2008 Base Year)
- PA 8 (2030 Future Assumption w/ 50% Traffic and 2% Truck Increases)
- PA 27 (2008 Base Year)
- PA 27 (2030 Future Assumption w/ 50% Traffic and 2% Truck Increases)





APPENDIX F: INTERSECTION GEOMETRIC ANALYSIS

The detailed contents of Appendix F are listed below. All materials are included in electronic PDF-format only, located on an enclosed CD at the end of this report.

Titusville Truck Study AutoTURN Summary Graphics

- Figure F1-F4: PA 8 @ Skyline Dr
- Figure F5-F8: PA 8 @ McKinney Rd
- Figure F9-F10: St John St @ Perry St
- Figure F11-F14: St John St @ Franklin St
- Figure F15-F16: Water St @ PA 8 / Franklin St
- Figure F17-F18: Water St @ Brown St
- Figure F19-F20: PA 27 @ Brown St
- Figure F21-F24: PA 27 @ Caldwell St
- Figure F25-F28: PA 27 @ Industrial Blvd

PA 8/27 Corridor CCIP Study AutoTURN Reference Graphics

- Figure C1-C4: Franklin St @ Central Ave
- Figure C5-C7: Perry St @ Central Ave
- Figure C8-C10: Perry St @ Spring St
- Figure C11-C13: Franklin St @ Spring St / Diamond St





APPENDIX G: CONCEPTUAL QUANTITY AND COST ESTIMATES

The detailed contents of Appendix G are listed below. All materials are included in electronic PDF-format only, located on an enclosed CD at the end of this report.

SIGN (3) – Add Industrial Park Signage

PLAN (1)(A) – Truck Climbing Lane (PA 8 SOUTH) PLAN (1)(B) – Truck Climbing Lane (PA 27 EAST) PLAN (4) – PA 8 / Franklin Street Bridge Replacement

SIP (2) – Geometric Improvements (PA 8 @ Skyline Drive)

TIP (2) – Geometric Improvements (PA 8 @ McKinney Road)

TIP (3) – New Dedicated Access

DW (3)(A) – Geometric Improvements (Spring Street @ Perry Street) DW (3)(B) – Geometric Improvements (St. John Street @ Perry Street) DW (3)(C) – Geometric Improvements (St. John Street @ Franklin Street)

DE (2)(A) – Water Street / Brown Street Truck Route
(Geometric Improvements, Franklin Street @ Water Street)
DE (2)(B) – Water Street / Brown Street Truck Route
(Water Street Pavement Improvements)
DE (2)(C) – Water Street / Brown Street Truck Route
(Geometric Improvements, Water Street @ Brown Street)
DE (2)(D) – Water Street / Brown Street Truck Route
(Geometric Improvements, Brown Street @ PA 27)

TOP (2)(A) – Geometric Improvements (PA 27 @ Industrial Boulevard)

TOP (2)(B) – Geometric Improvements (PA 27 @ Caldwell Street)

TOP (5) – Extension of Water Street to TOP Rear-Access TOP (6) – Extension of Water Street to Sewer Plant Road

ET (2) – Access Consolidation at Campbell Road

ET (3) – East Titusville TOP Connection (Short Option)

ET (3) – East Titusville TOP Connection (Long Option)





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