I-83 Master Plan
S.R. 0083 (Exits 24-28) in York County, Pennsylvania

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Pennsylvania Department of Transportation
District 8-0

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EXECUTIVE SUMMARY

The I-83 Master Plan focuses on the section of I-83 from the Church Road (S.R. 0238) interchange in Manchester Township to the Susquehanna Trail (S.R. 0295) interchange in Conewago Township in York County, a distance of approximately 5.3 miles. The plan also evaluated other network intersections, not located directly along I-83, in Manchester Township, East Manchester Township, Conewago Township, and Manchester Borough. The study provides recommendations to improve safety and mobility throughout the study area, addresses tiered improvements that can be completed within the next ten years, and provides the required background information to develop long term goals for the future. In addition to the existing interchanges, the study addresses the feasibility of an interchange at Exit 26 (Canal Road—S.R. 0921).

Background and Goals

The master plan included a detailed evaluation and analysis of existing and future traffic conditions, including a safety study, and an overview of environmental resources and structural/pavement conditions. This section of the I-83 corridor is located in an area that has experienced significant growth from when it was constructed in the 1950s from mostly rural and residential land uses, to the mixed-use area it is today, that serves many industrial and warehouse facilities. The project area carries high traffic volume that contains high truck percentages, thus creating conflicts between local and commuter traffic due to the large number of motorists that use the interchanges. In addition, many of the local road systems are overburdened by large tractor trailers servicing the industrial uses along Board Road, Willow Springs Road and Espresso Way.

The I-83 Master Plan evaluated various traffic improvement concepts to improve operational safety and traffic concerns along the I-83 corridor and other network intersections.

PennDOT and Stakeholder Involvement

PennDOT has committed to bettering our transportation system and our communities through collaborative planning through the PennDOT Connects Program. An Intermunicipal Coordinating Committee (ICC) was formed at the onset of the project including representatives from each of the study area municipalities, York County Planning Commission, Central Pennsylvania Transportation Authority (CPTA, referred to as rabbittransit), York County Economic Alliance, PA Motor Truck Association, and state legislators that represent the area. Three ICC meetings were held; May 2016, October 2016 and June 2018. The first two meeting were held in advance of studying any alternatives, while the final meeting presented the DRAFT Master Plan findings.

The purpose of the ICC meetings was to report on the project status and gather input on transportation needs. In addition to the ICC, project overview presentations were provided and input was gathered at a York Area Metropolitan Planning Organization (YAMPO) Technical Committee Meeting and a York County Transportation Coalition Meeting. Finally, individual stakeholder interviews were conducted with representatives from rabbittransit (CPTA), York County Economic Alliance, and key warehouse/industrial facilities.

Future Analysis and Conditions Overview

Without reconstructing this section of I-83 and the interchanges, the study area is expected to operate acceptably and under capacity for typical conditions (with no traffic incidents) 10 years from today in 2027. However, 30 years from today, in 2047, the mainline segment will fail system-wide with the existing roadway configuration.

The traffic flow along portions of I-83 are expected to become oversaturated, with minimal usable gaps in the traffic stream. The operations of the on- and off-ramps are controlled by the capacity of the freeway, therefore, given the likelihood of congestion along I-83, the merge and diverge segments will also experience extensive back-up.

Most of the pavement along this section of I-83 is reaching the end it’s service life; furthermore the key geometric design elements and characteristics of the existing roadway configuration do not offer optimum efficiency or maximum safety.

This section of I-83 and the interchanges will require reconstruction and reconfiguration to add capacity, fix deteriorating pavement, and to apply current design standards in order to improve safety and traffic flow.

The study was divided into five project areas. This included 1) the I-83 mainline and ramps, 2) the signalized interchange intersections at Exit 24 (Church Road—S.R. 0238), 3) Exit 28 (Susquehanna Trail—S.R. 0295), 4) the future Exit 26 (Canal Road—S.R. 0921) interchange, and 5) other network intersections not along I-83 in Manchester Township, Easter Manchester Township, Conewago Township, and Manchester Borough.

Multiple design concepts were developed for each of the project areas. The concepts involved significant widening along I-83, reconfiguration of interchanges Exit 24 and Exit 28, adding a partial or full interchange at Exit 26 (Canal Road – S.R. 0921), and roadway and signal improvements to the other network intersections not located along the main corridor.
Design Concepts

The I-83 corridor and ramps, as well as the other network intersections were evaluated to address the future needs 10 to 30 years from today for the years 2027 and 2047. Design concepts were developed to address both immediate and long range goals. The improvement plan developed for the year 2027 will help advance the study area towards the larger scale, more long-term goals.

Currently, there is a strong demand for a new interchange at Canal Road (S.R. 0921) and this will continue to increase mostly due to the zoning and planned industrial developments totaling more than 5 million square feet. Although a full interchange at Canal Road (S.R. 0921) is consistent with the long range needs of the study area, it also provides the biggest footprint, and as such, budget and constructability constraints necessitate a more realistic and tiered approach to improvements. As such, the following design concepts were looked at for Canal Road (S.R. 0921):

- Northbound only off-ramp
- Northbound off-ramp and southbound on-ramp
- Full interchange (Northbound on and off-ramp, Southbound on and off-ramp)

Additional concepts such as a partial cloverleaf configuration, a 2-leg diamond interchange and a 3 partial cloverleaf interchange were examined at Exit 26, however were dismissed for either not meeting the project goals, or due to environmental or right-of-way constraints.

Implementation Schedule

This master plan examined both 2027 and 2047 land use and transportation trends. Specific locations were identified and a range of transportation improvement solutions was developed for the I-83 corridor, the interchanges, and other network intersections that can be implemented immediately or advanced incrementally. These improvements were developed in a program for implementation by state and local governments, to address current need, as well as long term goals. In summary, this comprehensive I-83 master plan is a tool to guide the local municipalities, York County, and PennDOT 8-0 in the planning and programming of future transportation improvement projects.

A summary of the recommended improvements per project section is provided.

I-83 Mainline and Interchange Sections

### Description of Improvements

#### I-83 Mainline Section
- Widen and Reconstruct I-83 to 6-lanes

#### Exit 24 Interchange Section
- Church Road and I-83 ramp signalized intersections
  - Updated traffic signal improvements and timing optimization
  - Advanced signal control (adaptive)
  - Realignment of on/off-ramps (update to current standards)
  - Exclusive right-turn lane along SB off-ramp
  - Update exclusive westbound right-turn lane along Church Road at SB off-ramp
  - Update exclusive southbound right-turn lane along Board Road
  - Additional through lane to Board Road along NB off-ramp
  - Replacing the Church Road bridge over I-83 to provide additional travel and turning lanes

#### Exit 26 Interchange Section
- New Canal Road interchange intersections
  - Construction of NB only off-ramp
  - Construction of partial interchange
  - Replacing the I-83 bridge over Canal Road to provide additional travel and turning lanes
  - Construction of a Full Diamond Interchange

#### Exit 28 Interchange Section
- Susquehanna Trail and I-83 ramp signalized intersections
  - Updated traffic signal improvements and timing optimization
  - Advanced signal control (adaptive)
  - Realignment of on/off-ramps (update to current standards)
  - Exclusive right-turn lane along SB off-ramp
  - Exclusive right-turn lane along EB Susquehanna Trail
  - Road closure of Locust Point Road
  - Replacing the Susquehanna Trail bridge over I-83 to provide additional travel and turning lanes
  - SPUJ Configuration
<table>
<thead>
<tr>
<th>Other Network Intersections</th>
<th>Description of Improvements</th>
<th>Other Network Intersections</th>
<th>Description of Improvements</th>
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<tr>
<td><strong>Church Road area in Manchester Township</strong></td>
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<td><strong>Susquehanna Trail area in Conewago Township</strong></td>
<td>Installation of a traffic signal to be in a coordination system with the signals at the I-83 ramp intersections</td>
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<tr>
<td><strong>Church Road and Susquehanna Trail</strong></td>
<td>Updated traffic signal and optimizing timings</td>
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<td>Exclusive left-turn lanes along EB and WB Susquehanna Trail</td>
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<td>Exclusive right-turn lane along WB Church Road</td>
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<td><strong>Church Road/Starview Road and George Street</strong></td>
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<td>Updated traffic signal and optimized timings</td>
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<td>Widen Emig Road to provide separate left and right-turn lanes</td>
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<td></td>
<td>Widen NB George Street to provide exclusive right-turn lane</td>
<td><strong>Manchester Borough Intersections</strong></td>
<td>Installation of a traffic signal</td>
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<td><strong>Sinking Spring Road</strong></td>
<td>Extend to provide connection between Church Road and Susquehanna Trail</td>
<td><strong>Zions View Road/Musser Street and York Street</strong></td>
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<td><strong>Canal Road area</strong></td>
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<td>Updated traffic signal and optimizing signal timings</td>
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<td><strong>East Manchester Township</strong></td>
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<td>Widen Musser Street to provide an exclusive left-turn lane and exclusive right-turn lane</td>
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<td><strong>Canal Road and Zions View Road</strong></td>
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<td>Realignment of Zions View Road</td>
<td><strong>Main Street and York Street/Maple Street</strong></td>
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<td>Widen all approaches to provide separate turning lanes</td>
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<td>Widen SB Main Street to provide an exclusive left-turn lane</td>
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<td><strong>Canal Road and Espresso Way</strong></td>
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<td>Widen NB Susquehanna Trail to provide a separate left-turn lane</td>
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<td>Closure of Copenhaffer Road between Susquehanna Trail and Canal Road</td>
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The section of I-83 involved with this study is approximately 5.3 miles long and encompasses parts of Manchester Township, East Manchester Township, Manchester Borough, and Conewago Township spanning north-central York County. The study includes the I-83 corridor between Exits 24 and 28, and other network intersections not located directly on the corridor as depicted in Figure 1.

The plan is intended to improve safety and mobility of the area’s transportation system, identify improvements that can be implemented within the next ten years, and to develop long term goals. For the project sections. In addition to the existing interchanges, in order to support the rapid growth, the study addresses the feasibility of an interchange at Exit 26 (Canal Road—S.R. 0921).

In addition, the study considers the construction of an Exit 26 (Canal Road—S.R. 0921) Interchange both as a full or partial interchange and how it would affect future traffic operations throughout the study area. The study was divided into five project areas. This included 1) the I-83 mainline and ramps, 2) the signalized interchange intersections at Exit 24 (Church Road—S.R. 0238), 3) Exit 28 (Susquehanna Trail—S.R. 0295), 4) the future Exit 26 (Canal Road—S.R. 0921) interchange, and 5) other network intersections not along I-83 in Manchester Township, Easter Manchester Township, Conewago Township, and Manchester Borough.

1.1 Study Area Background

I-83 has been under consideration for improvement by PennDOT since 2002 when a feasibility study was completed for I-83 Section 033 which included Exits 21 and 22. An interchange improvement study was completed in 2003 for Exits 16, 18, and 19. These interchanges and corresponding corridors were separated into three projects to further the design efforts between the years of 2003 to 2007. In 2014, Exits 19, 21 and 22 were included in the I-83 North York Widening Study and most recently, Exit 18 was advanced to construction. In 2014, the request for proposal for this project area was solicited by PennDOT for Section 080 of I-83, which includes the existing interchanges of Exit 24 and Exit 28.

Figure 1 depicts the section of I-83 and other network intersections included in this study.
1.2 Purpose of the Master Plan

The purpose of this plan is to analyze existing conditions, assess projected development trends, and develop a corridor-wide plan that provides transportation solutions to improve safety and traffic operations. The study addresses long term improvements (2047) along I-83 and the existing interchanges, a potential new interchange at Canal Road (S.R. 0921), as well as provides a range of improvements that would fit within the footprint of the larger scale projects.

Safety Concerns and Substandard Design Elements

Safety concerns currently exist on Interstate 83 (I-83) between Exit 24 (Church Road—S.R. 0238) and Exit 28 (Susquehanna Trail—S.R. 0295) as well as on the local roadway network. Recent crash data indicate rates twice as high as the statewide average for a similar interstate as I-83. Rear-end and fixed object crashes accounted for 70% of all crashes along the mainline of I-83. Causes include hitting median barrier, embankments, utility poles and other objects in the roadway. Those patterns are indicative of substandard inside and outside shoulder width and lack of recovery areas.

Traffic Congestion

Traffic congestion along this section of I-83 and the surrounding roadway network has been increasing in recent years, particularly during the peak commuter periods, resulting in poor levels of service and excessive queuing. Vehicle back-up occurs at the I-83 interchanges due to the heavy volumes, traffic incidents, inadequate ramp storage, lane configuration across the bridges, outdated traffic signals and/or turning radii and/or geometrics at interchanges that does not meet current design standards. Figure 2 depicts the future traffic conditions, 30 years from today, if no improvements or new interchanges are built. As shown, the existing roadway configurations can not accommodate future traffic demand.

Highway design elements do not meet today’s interstate standards

- Originally built in the 1950’s and 1960’s
- Substandard I-83 cross-section
- Substandard ramp designs
- Crash rates twice as high as the statewide average
- Five fatalities in the study area
- Other network intersections showing crash patterns

Inadequate ramp design conditions are present at Exit 24 (Church Road—S.R. 0238) and Exit 28 (Susquehanna Trail—S.R. 0295) and contribute to safety issues. The existing ramp radii do not meet the horizontal curve design criteria. In addition, ramp tapers do not meet the design criteria for 35 mph, and do not meet the angle of intersection design criteria.

Traffic congestion along the Board Road approach to Church Road/I-83 NB Ramps

- Excessive queuing at interchanges
- Any incident along I-83 can cause long-lasting gridlock given the high volume of

1.0 INTRODUCTION
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Figure 2 – 2047 Future No-Build Traffic Conditions (No Intersection Improvements or Canal Road Interchange)

**Truck and local traffic conflicts**

High traffic volumes combined with heavy truck traffic on local roads leads to a decrease in access and mobility for local and regional through traffic. According to the origin-destination study conducted during the peak commuter periods the majority of the traffic utilizing Exit 24 (Church Road—S.R. 0238) and Exit 28 (Susquehanna Trail—S.R. 295) had origins or destinations within a mile of the interchange. This is indicative of the localized nature of much of the traffic within the study area and further reinforces the existing conflicts between the types of traffic that exists along the corridor.

Municipalities report poor access to industries for freight haulers and oversized vehicles that travel along Board Road (S.R. 1031), Willow Springs Road (T941), and Espresso Road (T838) to access the warehouse facilities. These roads are generally inadequate to accommodate large vehicles.

- Local road system is overburdened by truck traffic servicing the warehouse uses along Board Road, Willow Springs Lane and Espresso Road
- Large trucks have difficulty navigating some local area roads due to geometric deficiencies

Tractor Trailers at I-83 SB off ramp at Church Rd
2.0 EXISTING CONDITIONS

2.1 Existing Land Use and Planning
Significant traffic volumes, including a high percentage of trucks, utilize Exit 24 or Exit 28 to access the industrial developments. This burdens the interchanges and the local road network including roads within Manchester Township, East Manchester Township and Conewago Township. These municipalities’ planning documents note similar transportation concerns. Due to the close proximity to the I-83 corridor, this area is identified as a targeted economic development zone with local planning documents that support a new interchange at Canal Road (S.R. 0921). Figure 3 illustrates the existing land uses within the project area.

2.2 Existing Roadway Characteristics
Figure 4 depicts the functional classification of the study area roadway network, while Table 1 provides supporting roadway information including traffic volumes, heavy vehicles and percentages, and prevailing speed. Appendix C: Infrastructure Conditions Report further details the existing conditions of the project study area/limits.

Interstate 83 (I-83)
I-83 is a major, limited-access north/south divided highway that crosses into Maryland twenty-four (24) miles south of the Exit 24 (Church Road–S.R. 0238) Interchange and terminates in the City of Baltimore, which is fifty-eight (58) miles south of Exit 24. The interstate extends twenty-two (22) miles to the north of Exit 28, ending at a merge point with Interstate 81 northeast of Harrisburg. The total length of the interstate is 87 miles. Throughout the study area, the roadway generally consists of two 12-foot wide lanes in each direction with a 10-foot shoulder and is divided by a concrete barrier. The posted speed limit of the roadway is 65 mph.

Church Road (S.R. 0238)
Church Road is a two-lane minor arterial roadway that runs east-west within the project area. The posted speed limit along Church Road is 40 MPH. The Average Annual Daily Traffic (AADT) along Church Road is 13,397 vehicles with truck traffic comprising 14% of the total vehicles (1,876 trucks). Traveling along Church Road from Interchange Place to North George Street is along a downhill grade ranging from -3.0% to -4.7% with total roadway widths ranging from 33 feet to 36 feet. Two horizontal curves are present along Church Road north (35 MPH advisory speed) and south (25 MPH advisory speed) of Sandhurst Road along with appropriate curve ahead warning signs. Church Road approaches the signalized intersection with North George Street/Starview Road along a horizontal curve. Due to a high amount of truck traffic, pavement cracking and rutting was present. Land use along Church Road is industrial and residential.
**Board Road (S.R. 1031)**

Board Road (S.R. 1031) is a two-way local-access minor arterial roadway that runs north/south from Church Road (S.R. 0238) at I-83 Exit 24 (Church Road—S.R. 0238) Interchange north to its terminus at Zion’s View Road in Manchester Borough. This study focuses on the portion of Board Road (S.R. 1031) between Church Road (S.R. 0238) in the south and Crone Road (T941) in the north. The speed limit of the road is 40 mph in both directions throughout the project area.

**North George Street (S.R. 0181)**

North George Street is a two-lane minor arterial roadway that runs north-south within the project area, which includes Emig Road to the south and Church Road/Starview Road to the north. The posted speed limit along North George Street is 35 MPH. The Average Annual Daily Traffic (AADT) along North George Street is 14,665 vehicles with truck traffic comprising 9% of the total vehicles (1,320 trucks). North George Street has variable elevation changes within the study area as a vertical curve crests along a horizontal curve just north of High Street. This horizontal curve has varying curve ahead warning signs and advisory speed limits (30 MPH for northbound and 25 MPH for southbound). The grades south of High Street is -3.4% towards Emig Road and north of High Street -5.7% towards Church Road/Starview Road. North George Street is signed as South Bicycle PA Route J with no bicycle lanes provided and on-street parking prohibited. Sidewalks are provided on the west side of North George Street only; four-feet wide from Emig Road to High Street and three-feet wide north of High Street. Due to sidewalk width and closeness to roadway it seemed uncomfortable for pedestrians to walk. Pavement along North George Street south of Emig to Church Road/Starview Road seems to be in good shape while pavement north of Church Road/Starview Road is in poor shape with numerous potholes, cracking, and rutting. Land use along North George Street varies including residential, commercial, and industrial.

**Starview Road (S.R. 1010)**

Starview Road is a two-lane urban collector roadway that runs north-south within the project area. Geographically overall, Starview Road is an east-west roadway. However, for the purposes of this report, this section of Starview Road runs north-south. The posted speed limit along Starview Road is 25 MPH. The Average Annual Daily Traffic (AADT) along Starview Road is 2,757 vehicles with truck traffic comprising 1% of the total vehicles (27 trucks). Starview Road is unique as this roadway connects parallel with North Church Road. East of North George Street this windy roadway is elevated over the Norfolk Southern Railroad. Two horizontal curves are present along Starview Road; one along the overpass of the Norfolk Southern Railroad and one at the Liverpool Turnpike unsignalized intersection, with both having 20 MPH advisory speed limits posted. Pavement along Starview Road seems to be in adequate condition with noticeable pavement cracking. Rutting, specifically near the stop bar as vehicles approach the Church Road/North George Street signalized intersection, is present. Land use along Starview Road is residential.
Emig Road (S.R. 1012)

Emig Road is a two-lane urban collector roadway that runs east-west within the project area, except below the Norfolk Southern Railroad Overpass, where only one lane is provided with a 13-feet, 10-inch vertical clearance and 16-foot-wide yield controlled single lane. The posted speed limit along Emig Road is 25 MPH. The Average Annual Daily Traffic (AADT) along Emig Road is 10,227 vehicles with truck traffic comprising 8.5% of the total vehicles (870 trucks). Pavement along Emig Road within the project limits seems to be in adequate condition. Land use along Emig Road is industrial and recreational as Emigsville Recreational Area (park) is located south of Emig Road and just west of the Norfolk Southern Railroad.

Susquehanna Trail (S.R. 0295)

Susquehanna Trail (S.R. 0295) is a local-access two-way roadway that runs north/south and crosses I-83 in an east/west direction as an overpass at Exit 28. The focus of this study is the portion of Susquehanna Trail (S.R. 0295) between Cloverleaf Road in the west and Locust Point Road (S.R. 1021) in the east. Locust Point Road (S.R. 1021) intersects the south side of Susquehanna Trail approximately 370' east of the centerline of I-83. The westbound speed limit is 40 mph throughout the project area. The eastbound speed limit is 40 mph west of I-83 and through the interchange area before it changes to 35 mph east of Locust Point Road (S.R. 1021).

Canal Road (S.R. 0921)

Canal Road (S.R. 0921) is a two-way local-access major community arterial roadway that runs east/west and crosses under I-83 between Exits 24 and 28. The focus of this study includes the portion of Canal Road (S.R. 0921) between Susquehanna Trail (S.R. 0295) to the west and Willow Springs Lane (T941) to the east. The speed limit of the road is 40 mph in both directions throughout the project area.

<table>
<thead>
<tr>
<th>Roadway</th>
<th>Count Location</th>
<th>Average Weekday Traffic Volume</th>
<th>Heavy Vehicles</th>
<th>85th Percentile Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susquehanna Trail (S.R. 4005)</td>
<td>North of Church Road (S.R. 0238)</td>
<td>9,907</td>
<td>14%</td>
<td>44</td>
</tr>
<tr>
<td>Susquehanna Trail (S.R. 0295)</td>
<td>North of Canal Road</td>
<td>4,914</td>
<td>5%</td>
<td>42</td>
</tr>
<tr>
<td>Interstate 83 (S.R. 0083)</td>
<td>Mile 26</td>
<td>48,150</td>
<td>18%</td>
<td>67</td>
</tr>
<tr>
<td>Church Road (S.R. 0238)</td>
<td>East of Susquehanna Trail (S.R. 4005)</td>
<td>16,846</td>
<td>7%</td>
<td>36</td>
</tr>
<tr>
<td>Church Road (S.R. 0238)</td>
<td>East of Board Road (S.R. 1031)</td>
<td>14,023</td>
<td>25%</td>
<td>46</td>
</tr>
<tr>
<td>Board Road (S.R. 1031)</td>
<td>Between Church Road and Willow Springs Lane</td>
<td>4,406</td>
<td>6%</td>
<td>42</td>
</tr>
<tr>
<td>Canal Road (S.R. 0921)</td>
<td>Between Willow Springs Lane and Musser Street</td>
<td>2,305</td>
<td>10%</td>
<td>43</td>
</tr>
<tr>
<td>Canal Road (S.R. 0921)</td>
<td>East of Susquehanna Trail (S.R. 0295)</td>
<td>2,626</td>
<td>9%</td>
<td>43</td>
</tr>
</tbody>
</table>
### Table 2 - Bridge Conditions

<table>
<thead>
<tr>
<th>Feature Carried</th>
<th>Feature Intersection</th>
<th>Bridge Width</th>
<th>Vertical Clearance over/ under I-83</th>
<th>Length</th>
<th>ƒ Spans</th>
<th>Structure Type</th>
<th>Year Built</th>
<th>Deck Conditions</th>
<th>Superstructure Conditions</th>
<th>Substructure Conditions</th>
<th>Culvert Conditions</th>
<th>Structurally Deficient</th>
<th>Functionally Obsolete</th>
<th>Sufficiency Rating</th>
<th>Service Life Estimate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinking Spring Lane</td>
<td>S.R. 0083</td>
<td>32'-4&quot;</td>
<td>16'-6&quot;</td>
<td>201</td>
<td>6492</td>
<td>Steel, I beams</td>
<td>1957</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>NA</td>
<td>--</td>
<td>Y</td>
<td>86</td>
<td>&gt;25</td>
</tr>
<tr>
<td>S.R. 0238; Church Road</td>
<td>S.R. 0083</td>
<td>33'-3&quot;</td>
<td>16'-6&quot;</td>
<td>183</td>
<td>6094</td>
<td>Steel, I beams</td>
<td>1957</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>NA</td>
<td>--</td>
<td>Y</td>
<td>62</td>
<td>10-25</td>
</tr>
<tr>
<td>S.R. 0083</td>
<td>S.R. 0921; Canal Road</td>
<td>90'-4 3/4&quot;</td>
<td>14'-10&quot; to 18'-8&quot;</td>
<td>118</td>
<td>10667</td>
<td>Steel, I beams</td>
<td>1957</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>NA</td>
<td>--</td>
<td>--</td>
<td>59</td>
<td>10-25</td>
</tr>
<tr>
<td>Little Conewago Creek</td>
<td>S.R. 0083</td>
<td>109'-0&quot;</td>
<td>varies</td>
<td>120</td>
<td>10200</td>
<td>Concrete Arch culvert</td>
<td>1957</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>6</td>
<td>--</td>
<td>--</td>
<td>70</td>
<td>10-25</td>
</tr>
<tr>
<td>Tributary to Little Conewago Creek</td>
<td>S.R. 0083</td>
<td>125'</td>
<td>varies</td>
<td>23</td>
<td>1955</td>
<td>Concrete Arch culvert</td>
<td>1954</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>6</td>
<td>--</td>
<td>--</td>
<td>70</td>
<td>10-25</td>
</tr>
<tr>
<td>S.R. 0295; Susquehanna Trail</td>
<td>S.R. 0083</td>
<td>42'-10 1/2&quot;</td>
<td>16'-6&quot;</td>
<td>95</td>
<td>8405</td>
<td>Steel, I beams</td>
<td>1959</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>NA</td>
<td>--</td>
<td>--</td>
<td>98</td>
<td>&gt;25</td>
</tr>
<tr>
<td>Little Conewago Creek</td>
<td>S.R. 0295; Susquehanna Trail</td>
<td>183; S.R. 0083</td>
<td>42'-10 1/2&quot;</td>
<td>16'-6&quot;</td>
<td>95</td>
<td>8405</td>
<td>Steel, I beams</td>
<td>1959</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>NA</td>
<td>--</td>
<td>--</td>
<td>98</td>
</tr>
<tr>
<td>S.R. 0295; Susquehanna Trail</td>
<td>S.R. 0295; Susquehanna Trail</td>
<td>183; S.R. 0083</td>
<td>42'-10 1/2&quot;</td>
<td>16'-6&quot;</td>
<td>95</td>
<td>8405</td>
<td>Steel, I beams</td>
<td>1959</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>NA</td>
<td>--</td>
<td>--</td>
<td>98</td>
</tr>
<tr>
<td>S.R. 0921; Canal Road</td>
<td>S.R. 0083</td>
<td>147'</td>
<td>varies</td>
<td>147</td>
<td>3822</td>
<td>Steel, I beams</td>
<td>1948</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>NA</td>
<td>Y</td>
<td>--</td>
<td>36</td>
<td>&lt;10</td>
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<tr>
<td>S.R. 0921; Canal Road</td>
<td>S.R. 0083</td>
<td>147'</td>
<td>varies</td>
<td>147</td>
<td>3822</td>
<td>Steel, I beams</td>
<td>1948</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>NA</td>
<td>Y</td>
<td>--</td>
<td>36</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Tributary to Little Conewago Creek</td>
<td>S.R. 0083</td>
<td>108'</td>
<td>340</td>
<td>10</td>
<td>340</td>
<td>Concrete, Box culvert</td>
<td>1956</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>6</td>
<td>--</td>
<td>Y</td>
<td>96</td>
<td>&gt;25</td>
</tr>
<tr>
<td>Tributary to Codorus Creek</td>
<td>S.R. 0083</td>
<td>38'</td>
<td>1423</td>
<td>38</td>
<td>1423</td>
<td>P/S, Box beam (spread)</td>
<td>1994</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>N</td>
<td>--</td>
<td>--</td>
<td>86</td>
<td>&gt;25</td>
</tr>
<tr>
<td>Tributary to Starview Road</td>
<td>Norfolk Southern RR</td>
<td>--</td>
<td>1982.5</td>
<td>61</td>
<td>1982.5</td>
<td>P/S, Box beam –adj</td>
<td>1987</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>N</td>
<td>--</td>
<td>Y</td>
<td>76</td>
<td>10-25</td>
</tr>
<tr>
<td>Tributary to Codorus Creek</td>
<td>Norfolk Southern RR</td>
<td>--</td>
<td>26</td>
<td>26</td>
<td>754</td>
<td>Concrete (precast), Box culvert</td>
<td>2012</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>--</td>
<td>Y</td>
<td>19</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Tributary to Codorus Creek</td>
<td>Norfolk Southern RR</td>
<td>--</td>
<td>23</td>
<td>23</td>
<td>0</td>
<td>ST Girder/FB, RV</td>
<td>1896</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>--</td>
<td>--</td>
<td>0</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Tributary to Codorus Creek</td>
<td>Norfolk Southern RR</td>
<td>--</td>
<td>27</td>
<td>27</td>
<td>1135.6</td>
<td>P/S, Box beam –adj</td>
<td>1956</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>N</td>
<td>--</td>
<td>--</td>
<td>71</td>
<td>10-25</td>
</tr>
</tbody>
</table>

*Service Life Estimate

- >25 years: sufficiency rating > 80% and/or overall condition rating of 7 or more
- 10-25 years: sufficiency rating 50-80% and/or overall condition rating 5 or 6
- <10 years: sufficiency rating <50% and/or overall condition rating of 4 or less
**Sinking Springs Lane (T839) over I-83 (BMS# 66-4052-0010-0000)**

The structure carries Sinking Springs Lane (T839) over I-83 (SR 0083), and it is located 0.2 miles south of Exit 24 on I-83 in Manchester Township. The structure is in good overall condition and is not posted for load (weight restriction). The three-span structure has a total length of 196 feet, and it has a curb-to-curb width and out-to-out width of 28.5 and 32 feet, respectively. The structure consists of six (6) continuous composite rolled steel I-beams, which are supported by two (2) reinforced concrete abutments on steel H-piles and two (2) reinforced concrete piers on spread footings. The original structure was constructed in 1957 and rehabilitated in 1994. The rehabilitation included the following: column retrofit to the piers, deck replacement, jacking of the superstructure, repair to the damaged stringer, repair of miscellaneous concrete, and replacement of the neoprene strip seal at the near abutment.

The structure is currently functional and not listed as structurally deficient. The most notable deficiency on the structure exists at the bearings. The masonry plates are not properly aligned with the sole plates on each abutment stem. The masonry plates have begun to develop heavy rust. Another notable deficiency is the minor section loss that the fascia beams have experienced near the bearing areas. The last inspection performed was an NBI Element Level completed in November 2017, and the current/existing inspection cycle is 24 months.

**Church Road over I-83 (BMS# 66-0238-0140-1337)**

The structure carries Church Road (S.R. 0238) over I-83 (S.R. 0083), and it is located at Exit 24 on I-83 in East Manchester Township. The structure is in fair overall condition and is not posted for load (weight restriction). The three-span structure has a total length of 183 feet, and it has an out-to-out width of 33.3 feet. The structure consists of six (6) continuous non-composite rolled steel I-beams, which are supported by two (2) reinforced concrete abutments on piles and two (2) reinforced concrete piers on spread footings. The original structure was constructed in 1957 and rehabilitated in 2016. The rehabilitation work included the following: installation of an overhang shield on South overhang, remove and adjust/replace existing scuppers, repair and waterproof the deck, repairs to the substructure units, replacement of the missing anchor studs and retrofitting of the right parapet with a concrete jacket.

The structure is currently functional and not listed as structurally deficient. There are no critical deficiencies worth noting at this time. The last recorded inspection performed was an NBI Element Level completed May 2016, and the current/existing inspection cycle is 24 months.

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**Sinking Springs Lane over I-83: Bridge spanning I-83 consisting of four 12’ travel lanes, 12’ deceleration lane, and substandard shoulder and median width**

**Church Road (S.R 0238) over I-83: Bridge Deck consists of two 11’ lanes and two 4’ shoulders**
Church Road (S.R. 0238) over Tributary to Codorus Creek (BMS# 66-0238-0150-2136)
The structure carries Church Road over a Tributary to Codorus Creek and is located approximately 220 feet west of the signalized intersection of North George Street & Church Road/Starview Road. The single-span structure is not posted for load, has a total length of 38 feet with a curb-to-curb and out-to-out width of 34 feet and 37.5 feet, respectively. The ADT for the structure is 13,397 vehicles and the ADTT is 1,876 trucks. The structure consists of a single prestressed concrete spread box. The original structure was constructed in 1994.

The structure is not listed as structurally deficient or functionally obsolete. The last inspection performed was on August 31, 2017 with the current/existing inspection cycle of 24 months.

Starview Road (S.R. 1018) over Norfolk Southern Railroad (BMS# 66-1018-0010-0518)
The structure carries Starview Road over the Norfolk Southern Railroad and is located approximately 460 feet northeast of the signalized intersection of North George Street & Church Road/Starview Road. The single-span structure is not posted for load, has a total length of 60 feet with a curb-to-curb and out-to-out width of 29.8 feet and 32.5 feet, respectively. The ADT for the structure is 2,757 vehicles and the ADTT is 28 trucks. The structure consists of prestressed concrete multiple box beam. The original structure was constructed in 1987.

The structure is not listed as structurally deficient; however, it is listed as functionally obsolete. The last inspection performed was on September 27, 2017 with the current/existing inspection cycle of 24 months.
North George Street (S.R. 0181) over Tributary to Codorus Creek (BMS# 66-0181-0080-1577)
The structure carries North George Street over a Tributary to Codorus Creek and is located approximately 450 feet south of the signalized intersection of North Street & Church Road/Starview Road. The single-span structure is not posted for load, has a total length of 26 feet with a curb-to-curb width of 30.2 feet. The ADT for the structure is 14,665 vehicles and the ADTT is 1,320 trucks. The structure consists of a concrete culvert. The original structure was constructed in 2012.

The structure is not listed as structurally deficient; however, it is listed as functionally obsolete. The last inspection performed was on August 31, 2016 with the current/existing inspection cycle of 24 months.

Starview Road (S.R. 1010) over Norfolk Southern Railroad (BMS# 66-1010-0010-0518)
The structure carries Starview Road over the Norfolk Southern Railroad and is located approximately 460 feet northeast of the signalized intersection of North George Street & Church Road/Starview Road. The single-span structure is not posted for load, has a total length of 60 feet with a curb-to-curb and out-to-out width of 29.8 feet and 32.5 feet, respectively. The ADT for the structure is 2,757 vehicles and the ADTT is 28 trucks. The structure consists of prestressed concrete multiple box beam. The original structure was constructed in 1987.

The structure is not listed as structurally deficient; however, it is listed as functionally obsolete. The last inspection performed was on September 27, 2017 with the current/existing inspection cycle of 24 months.
Norfolk Southern Railroad over Emig Road (SR 1012) (BMS# 66-1012-0010-0701)

The structure carries the Norfolk Southern Railroad over Emig Road and is located approximately 680 feet east of the signalized intersection of North George Street & Emig Road. The structure has a total length of 23 feet and consists of a steel girder floorbeam. The original structure was constructed in 1896. Due to this overpass, Emig Road narrows to one-lane below the overpass causing vehicular delay.

The structure is not listed as structurally deficient and meets FHWA requirements for rehab/replacement. The last inspection was on September 21, 2017 with the current/existing inspection cycle of 24 months.

Emig Road (S.R. 1012) over Tributary to Codorus Creek (BMS# 66-1012-0010-0864)

The structure carries Emig Road over a Tributary to Codorus Creek and is located approximately 200 feet east of the Norfolk Southern Railroad Overpass. The single span structure is in fair condition and is not posted for load. The structure has a total length of 24 feet and has a curb-to-curb and out-to-out width of 41.1 feet and 42.8 feet, respectively. The ADT for the structure is 10,227 vehicles and the ADTT is 920 trucks. The structure consists of prestressed concrete multiple box beam. The original structure was constructed in 1956.

The structure is not listed as structurally deficient or functionally obsolete. The last inspection performed was on September 21, 2017 with the current/existing inspection cycle of 24 months.
The structure carries I-83 over Canal Road (S.R. 0921), and it is located 2.1 miles north of Exit 24 on I-83 in East Manchester Township. The structure is in fair overall condition and is not posted for load (weight restriction). The three-span structure has a total length of 118 feet, and it has an out-to-out width of 91 feet. The structure consists of sixteen (16) continuous composite rolled steel I-beams, which are supported by two (2) reinforced concrete abutments on spread footings and two (2) reinforced concrete piers on spread footings. The original structure was constructed in 1957 and rehabilitated in 1998.

The structure is currently functional and not listed as structurally deficient. The substructure was originally rated as a 6, but the rating of the substructure was lowered to a 5 after the 2015 inspection due to the random transverse cracking in the underside of the Pier 2 pier cap. Additionally, the top of each abutment footing is exposed, and there is light scaling at the top of the far abutment footing. The last recorded inspection performed was an NBI Element Level completed in August 2017, and the current/existing inspection cycle is 24 months.

The structure carries I-83 over Little Conewago Creek, and it is located 1.5 miles south of Exit 28 on I-83 in Conewago Township. The structure is in good overall condition and is not posted for load (weight restriction). The single span structure has a total length of 120 feet, and it has a barrel length of 107 feet. The structure consists of a reinforced concrete arch that is supported by two (2) reinforced concrete spread footings. The original structure was constructed in 1957.

The structure is currently functional and not listed as structurally deficient. There are random minor cracks throughout the intrados of the arch. The right arch wall contains several minor spalls with several exposed bars that do not exhibit excessive corrosion. Additionally, the spring line of the arch on the far left end is exhibiting minor scaling due to channel flow. The last recorded inspection performed was an NBI Element Level completed August 2017, and the current/existing inspection cycle is 24 months.
I-83 over Tributary to Little Conewago Creek (BMS#: 66-0083-0274-1400)

The structure carries I-83 over a Tributary to Little Conewago Creek, and it is located 0.5 miles south of Exit 28 on I-83 in Conewago Township. The structure is in good overall condition and is not posted for load (weight restriction). The single span structure has a total length of 23 feet, and it has a barrel length of 170 feet. The structure consists of a reinforced concrete arch that is supported by two (2) reinforced concrete spread footings. The original structure was constructed in 1954.

The structure is currently functional and not listed as structurally deficient. There are full-height hairline cracks throughout at the near intrados of segments 4 and 5. There is a 3” deep diameter spall exposed bar on the far right intrados. Additionally, all five joints show signs of seepage and various quantities of delamination. The last recorded inspection performed was an NBI Element Level completed September 2017, and the current/existing inspection cycle is 24 months.

Susquehanna Trail (S.R. 0295) over I-83 (BMS#: 66-0295-0030-0112)

The structure carries Susquehanna Trail (S.R. 0295) over I-83 and it is located 1.6 miles north of Exit 28 on I-83 in East Conewago Township. The structure is in good overall condition and is not posted for load (weight restriction). The three-span structure has a total length of 195 feet, and it has an out-to-out width of 42.9 feet. The structure consists of seven (7) continuous composite rolled steel I-beams, which are supported by two (2) reinforced concrete abutments on steel piles and two (2) reinforced concrete piers on spread footings. The original structure was constructed in 1959 and rehabilitated in 1999. The rehabilitation work included the following: construction of a new deck, wingwalls, top of abutment stems, bearing pedestals, abutment 2 backwall, column jacketing for the piers, installation of elastomeric bearings and repainting/resetting of the existing girders.

The structure is currently functional and not listed as structurally deficient. There are no critical deficiencies worth noting at this time. The last recorded inspection performed was an NBI Element Level completed October 2017 and the current/existing inspection cycle is 24 months.
Susquehanna Trail (S.R. 0295) over Little Conewago Creek: Bridge
The structure is currently not listed as structurally deficient, but it is functionally obsolete. The deck geometry and the approach rail ends are intolerable and requires replacement. The last recorded inspection performed was an NBI Element Level completed March 2017, and the current/existing inspection cycle is 24 months.

Susquehanna Trail over Little Conewago Creek: Bridge deck carries two 11' travel lanes and two 2' shoulders

Canal Road (S.R. 0921) over Tributary to Little Conewago Creek (BMS# 66-0921-0130-1452)
The structure carries Canal Road over a tributary to Little Conewago Creek, which is located beneath I-83 in E. Manchester Township. The structure is in satisfactory overall condition and is not posted for load (weight restriction). The one-cell concrete box culvert that has a structure span of 10 feet with overall length of 340 feet.

Canal Road over Tributary to Little Conewago Creek

Canal Road over Little Conewago Creek
Bridge carries two 10' travel lanes and two 1' shoulders

The structure is currently functional and not listed as structurally deficient. There are no critical deficiencies worth noting at this time. The last recorded inspection performed was an NBI Element Level completed November 2017, and the current/existing inspection cycle is 48 months.

Canal Road (S.R. 0921) over Little Conewago Creek (BMS# 66-0921-0130-0560)
The structure carries Canal Road (S.R. 0921) over Little Conewago Creek, and it is located 2.86 miles south of Exit 28 in E. Manchester Township. The structure is in poor overall condition, but it is not posted for load (weight restriction). The two-span structure has a total length of 147 feet, and it has an out-to-out width of 26 feet. The structure consists of seven (7) rolled steel I-beams, which are supported by two (2) concrete abutments and one (1) reinforced concrete piers. The structure was constructed in 1948.

The structure is currently listed as structurally deficient, due to the condition of deck, superstructure and substructure units. The last recorded inspection performed was an NBI Element Level completed November 2015, and the current/existing inspection cycle is 24 months. This structure is currently on the Transportation Improvement Plan (TIP).
2.4 Pavement Conditions

PennDOT originally constructed this section of I-83 in the late 1950s and since then, there have been various overlay and full depth reconstruction projects completed over the years. Exhibit 1 - Existing Pavement Service Life Diagram depicts the existing pavement conditions including pavement depths and year constructed within the study area. While no significant defects were noted during a field inspection conducted in July of 2017, a majority of the roadways within the study area are reaching the end of their expected service life.

The IRI (International Roughness Index) is a global standard that is defined as an expression of irregularities in the pavement surface that adversely affects ride quality, vehicle delay costs, fuel consumption and maintenance costs. At the end of 2016, York County was reported to have 2.7% of the 79.1 interstate (I-83) network miles to have poor IRI. This was recorded to be above the 1.8% target for poor IRI. Planned resurfacing, along with the North York Widening project programmed on the 2017-2020 TIP is expected to allow the percent of poor IRI to be under target again.

The dark blue, navy blue and light blue areas on the diagram, from the northern study area limit, located north of Exit 28 at Susquehanna Trail (S.R. 0295) to approximately one mile south of the interchange, was totally reconstructed from the subbase up in the mid to late 1990s.

The green area on the diagram, from approximately 0.5 miles north of Exit 24 to the southern study limit which is located approximately 1.25 miles south of the interchange, was totally reconstructed from the subbase up in 1994 and was later overlayed in 2006 and 2011.

The red and orange areas on the diagram represent those areas reaching the end of their service life. This is an almost 3 mile section from approximately one mile south of Exit 28 to approximately 0.5 miles north of Exit 24 that continues to run on its original pavement base section. While there have been periodic overlays of this area the base section is 60 years old according to the PennDOT pavement records.

Existing Pavement Data was obtained for Church Road, (S.R. 0238) and Susquehanna Trail (S.R. 0295) in the areas adjacent to I-83. No detailed field investigation of these roadways was conducted, as we recommend performing a more detailed pavement investigation in these areas prior to beginning any roadway improvement projects.
2.5 Highway Geometry

Existing horizontal geometry of the northbound and southbound ramps at Exit 24 (Church Road—S.R. 0238) and Exit 28 (Susquehanna Trail—S.R. 0295) do not meet current design criteria found in DM-2 and AASHTO Green Book. Tables 3 through 6 depict the current conditions compared to current design criteria, including radius, intersecting angle, acceleration and deceleration length, taper length, and lane widths.

Along Church Road (S.R. 0238) the existing vertical slope exceeds 6% from east of Board Road (S.R. 1031) to the bridge over I-83. This grade causes heavy trucks to travel slower than they normally would when heading west along Church Road (S.R. 0238) towards the southbound ramps departing Board Road (S.R. 1031) and further complicates traffic congestion in the corridor.

### Table 3 - Exit 24 Acceleration and Deceleration Lanes

<table>
<thead>
<tr>
<th></th>
<th>Existing</th>
<th>Required</th>
<th>Meet Required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Radius</td>
<td>Length</td>
<td>Taper Length</td>
</tr>
<tr>
<td>North-bound</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off</td>
<td>320'</td>
<td>1254'</td>
<td>283'</td>
</tr>
<tr>
<td>On</td>
<td>153'</td>
<td>2413'</td>
<td>482'</td>
</tr>
<tr>
<td>South-bound</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off</td>
<td>409'</td>
<td>1838'</td>
<td>124'</td>
</tr>
<tr>
<td>On</td>
<td>112'</td>
<td>1804'</td>
<td>351'</td>
</tr>
</tbody>
</table>

* See Exhibit 1 — Exit 24 Deficiencies

### Table 4 - Exit 24 Ramp Lane and Shoulders Widths

<table>
<thead>
<tr>
<th></th>
<th>Existing</th>
<th>Required</th>
<th>Meet Required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lane</td>
<td>Right</td>
<td>Left</td>
</tr>
<tr>
<td>North-bound</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off</td>
<td>12'</td>
<td>10'</td>
<td>4'</td>
</tr>
<tr>
<td>On</td>
<td>14'</td>
<td>10'</td>
<td>4'</td>
</tr>
<tr>
<td>South-bound</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off</td>
<td>15'</td>
<td>9'</td>
<td>3.5'</td>
</tr>
<tr>
<td>On</td>
<td>14'</td>
<td>9'</td>
<td>4'</td>
</tr>
</tbody>
</table>

* See Exhibit 1 — Exit 24 Deficiencies

At Exit 24 (Church Road—S.R. 0238), both radii immediately adjacent to the acceleration and deceleration lanes are substandard when compared to current design criteria. Similarly, the existing radius for the I-83 southbound on-ramp does not meet current design criteria.

### Table 5 - Exit 28 Acceleration and Deceleration Lanes

<table>
<thead>
<tr>
<th></th>
<th>Existing</th>
<th>Required</th>
<th>Radius</th>
<th>Length</th>
<th>Taper Length</th>
<th>Radius</th>
<th>Length</th>
<th>Taper Length</th>
<th>Radius</th>
<th>Key</th>
<th>Length</th>
<th>Key</th>
<th>Taper Length</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northbound</td>
<td>Off</td>
<td>3524'</td>
<td>1113'</td>
<td>215'</td>
<td>371'</td>
<td>1200'</td>
<td>250'</td>
<td>YES</td>
<td>—</td>
<td>NO</td>
<td>A</td>
<td>NO</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>1482'</td>
<td>2141'</td>
<td>129'</td>
<td>371'</td>
<td>1200'</td>
<td>425'</td>
<td>YES</td>
<td>—</td>
<td>YES</td>
<td>—</td>
<td>NO</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southbound</td>
<td>Off</td>
<td>3377'</td>
<td>1270'</td>
<td>295'</td>
<td>371'</td>
<td>1200'</td>
<td>250'</td>
<td>YES</td>
<td>—</td>
<td>YES</td>
<td>—</td>
<td>YES</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>3672'</td>
<td>1600'</td>
<td>286'</td>
<td>371'</td>
<td>1200'</td>
<td>425'</td>
<td>YES</td>
<td>—</td>
<td>YES</td>
<td>—</td>
<td>NO</td>
<td>D</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** See Exhibit 2 — Exit 28 Deficiencies

### Table 6 - Exit 28 Ramp Lane and Shoulders Widths

<table>
<thead>
<tr>
<th></th>
<th>Existing</th>
<th>Required</th>
<th>Radius</th>
<th>Lane</th>
<th>Right</th>
<th>Left</th>
<th>Lane</th>
<th>Right</th>
<th>Left</th>
<th>Key</th>
<th>Right</th>
<th>Key</th>
<th>Left</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northbound</td>
<td>Off</td>
<td>15'</td>
<td>10'</td>
<td>6'</td>
<td>15'</td>
<td>8'</td>
<td>4'</td>
<td>YES</td>
<td>—</td>
<td>YES</td>
<td>—</td>
<td>YES</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>14'</td>
<td>11'</td>
<td>4'</td>
<td>15'</td>
<td>8'</td>
<td>4'</td>
<td>NO</td>
<td>E</td>
<td>YES</td>
<td>—</td>
<td>YES</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southbound</td>
<td>Off</td>
<td>14.5'</td>
<td>11.5'</td>
<td>4'</td>
<td>15'</td>
<td>8'</td>
<td>4'</td>
<td>NO</td>
<td>F</td>
<td>YES</td>
<td>—</td>
<td>YES</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>14'</td>
<td>10.5'</td>
<td>4'</td>
<td>15'</td>
<td>8'</td>
<td>4'</td>
<td>NO</td>
<td>G</td>
<td>YES</td>
<td>—</td>
<td>YES</td>
<td>—</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** See Exhibit 2 — Exit 24 Deficiencies

At Exit 28 (Susquehanna Trail—S.R. 0295), while no sight distance issues currently exist at the intersections between the ramps and Susquehanna Trail, the angle of intersection for both the northbound and southbound off ramps are substandard. Taper lengths for three of the four ramp tie-ins currently measure below recommended lengths.
2.0 EXISTING CONDITIONS
This section of the I-83 mainline consists of two travel lanes in each direction, an inside and outside shoulder, and concrete median. Many features of I-83 do not meet the design criteria that exists today. Table 7 depicts the existing geometric cross section elements of I-83 for both directions of travel as compared to current design criteria for the existing I-83 mainline between Exits 24 and 28.

The specific geometric safety issues include substandard I-83 cross-section including shoulder and median widths; and substandard ramp design, including shoulder width, horizontal radii, and storage lengths. The existing typical section of I-83 is graphically provided below in Figure 5.

**Figure 5 – Existing Typical Section**

The Table 8 provides the I-83 mainline highway and ramp geometry design criteria.

**Table 8 - Design Criteria (I-83 Mainline)**

<table>
<thead>
<tr>
<th>Design Criteria</th>
<th>Required</th>
<th>Utilized</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Lanes</td>
<td>4+</td>
<td>6</td>
<td>DM-2 Table 1.8</td>
</tr>
<tr>
<td>Lane Widths</td>
<td>12’</td>
<td>12’</td>
<td>DM-2 Table 1.8</td>
</tr>
<tr>
<td>Shoulder Widths</td>
<td>10’</td>
<td>12’</td>
<td>DM-2 Table 1.8</td>
</tr>
<tr>
<td>Left with Median</td>
<td>4’</td>
<td>8’</td>
<td>NA</td>
</tr>
<tr>
<td>Median Width</td>
<td>10’</td>
<td>20’</td>
<td>DM-2 Table 1.8</td>
</tr>
<tr>
<td>Cross Slopes</td>
<td>Min 2%</td>
<td>2%</td>
<td>DM-2 Table 1.8</td>
</tr>
<tr>
<td></td>
<td>Max 6%</td>
<td>6%</td>
<td>DM-2 Table 1.8</td>
</tr>
<tr>
<td>Bridge Widths</td>
<td>Lanes plus Shoulders As required</td>
<td>DM-2 Table 1.8</td>
<td></td>
</tr>
<tr>
<td>Vertical Grades</td>
<td>Min 0.50%</td>
<td>T.B.D.</td>
<td>DM-2 Table 1.8</td>
</tr>
<tr>
<td>Max (Rolling)</td>
<td>4.00%</td>
<td>T.B.D.</td>
<td>AASHTO Green Book Table 8-1</td>
</tr>
<tr>
<td>Vertical Clearance</td>
<td>Min 16’-6”</td>
<td>16’-6”</td>
<td>DM-2 Table 1.8</td>
</tr>
<tr>
<td>Clear Zone</td>
<td>30’</td>
<td>30’</td>
<td>DM-2 Table 12.1</td>
</tr>
<tr>
<td>Right-of-Way Widths</td>
<td>Varies</td>
<td>T.B.D.</td>
<td>DM-2 Table 1.8</td>
</tr>
<tr>
<td>Design Speed</td>
<td>70 MPH</td>
<td>70 MPH</td>
<td>DM-2 Table 1.8</td>
</tr>
<tr>
<td>Stopping Sight Distances</td>
<td>75’</td>
<td>T.B.D.</td>
<td>AASHTO Green Book Table 3-34</td>
</tr>
<tr>
<td>Minimum Curve Radius</td>
<td>533’</td>
<td>NA</td>
<td>AASHTO Green Book Table 3.7</td>
</tr>
</tbody>
</table>

T.B.D.—To be determined during detailed design phase
## Table 8 (continued) - Design Criteria (I-83 Ramps)

<table>
<thead>
<tr>
<th>Design Criteria</th>
<th>Required</th>
<th>Utilized</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design Speed</td>
<td>35 MPH</td>
<td>35 MPH</td>
<td>AASHTO Green Book Table 10.1</td>
</tr>
<tr>
<td>Horizontal Curve</td>
<td>371’ min.</td>
<td>371’ min.</td>
<td>AASHTO Green Book Table 3.7</td>
</tr>
<tr>
<td>Lane Width</td>
<td>13’-15’</td>
<td>13’-15’</td>
<td>AASHTO Green Book Table 3.29</td>
</tr>
<tr>
<td>Shoulder Width</td>
<td></td>
<td></td>
<td>DM-2 Typical Sections</td>
</tr>
<tr>
<td>Right</td>
<td>8’</td>
<td>8’</td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>4’</td>
<td>4’</td>
<td></td>
</tr>
<tr>
<td>Acceleration Lane</td>
<td></td>
<td></td>
<td>AASHTO Green Book Table 10.3</td>
</tr>
<tr>
<td>Length</td>
<td>1200’</td>
<td>1200’</td>
<td></td>
</tr>
<tr>
<td>Taper</td>
<td>50:1</td>
<td>50:1</td>
<td></td>
</tr>
<tr>
<td>Deceleration Lane</td>
<td></td>
<td></td>
<td>AASHTO Green Book Table 10.4</td>
</tr>
<tr>
<td>Length</td>
<td>800’</td>
<td>800’</td>
<td></td>
</tr>
<tr>
<td>Taper</td>
<td>25:1</td>
<td>25:1</td>
<td></td>
</tr>
</tbody>
</table>

Intentionally left blank
2.6 Crash Analysis

This section of I-83 between the Exit 24 (Church Road—S.R. 0238) Interchange and Exit 28 (Susquehanna Trail—S.R. 0295) Interchange, along with adjacent sections further south and north, has not been reconstructed since it was built in the late 1950's. As such, it was designed to former highway design standards which include narrow medians and shoulders, low pavement performance, as well as short acceleration and deceleration lanes at the on/off ramps. Specific safety issues along I-83 include:

- The current I-83 cross-section is not designed to current PennDOT standards,
- The ramps for Exit 24 (Church Road – S.R. 0238) do not meet current design criteria for horizontal geometry including the radii and tapers lengths,
- Both northbound and southbound ramps at Exit 28 (Susquehanna Trail – S.R. 0295) have substandard intersecting angles and the taper lengths for three of the four ramp tie-ins currently measure below recommended lengths,
- Deteriorating pavement conditions,
- Crash rates are twice as high as the statewide average for similar highway segments (see Table 10 —Crash Rate along I-83),
- Over the course of the most recent five-year period, 261 crashes occurred along this section of I-83, including 2 fatalities. The fatal crashes included a vehicle striking a pedestrian in the northbound travel lanes just south of Exit 24, and a vehicle traveling southbound along I-83 near Little Conewago Creek and driving into an embankment, and
- Three additional fatalities occurred at the other network intersections (not along I-83).

I-83 Evaluation

Crash data was collected from PennDOT for five years between January 2011 and December 2015. The crash data consisted of reportable crashes only, which are crashes in which personal injuries occur or the vehicle(s) must be towed from the scene. The crash data indicates there were a total of 261 reportable crashes along this section of I-83. A comparison was made between the crash rate for this section of I-83 and that of similar roadways throughout Pennsylvania. Table 9 depicts the calculated crash rate for this section of I-83.

As shown in Table 10, the calculated crash rate is almost twice as high as reported in the Homogeneous Report, meaning this roadway section experiences more crashes than the statewide average.

The majority of the crashes along I-83 mainline involved vehicles hitting the center concrete median barrier or rear-end crashes. These types of crashes could be caused by the narrow inside shoulder widths, and the severe congestion and tailgating that occurs.

Table 9 - Crash Rate along I-83

<table>
<thead>
<tr>
<th>Roadway</th>
<th>2011-2015 (Mainline Crashes)</th>
<th>Distance (miles)</th>
<th>ADT (1) (vehicles/ day)</th>
<th>Crash Rate (Crashes/million vehicle miles/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstate 83 (2)</td>
<td>261</td>
<td>4.8</td>
<td>42,914</td>
<td>0.69</td>
</tr>
</tbody>
</table>

(1) Classified as an Urban, full access control, divided highway with an ADT of between 1 and 99,999.
(2) From PennDOT ITMS Website
(3) Calculated Crash Rate = (Number of crashes past five years x 1,000,000)/(ADT x 365 days x 5 years x segment length in miles)

The data was further examined for crash types and their specific causes. Table 10 provides a summary of the types of reportable crashes that occurred along I-83.

Table 10 - Crash Types

<table>
<thead>
<tr>
<th>Type of Crash</th>
<th>Hit Fixed Object</th>
<th>Rear End</th>
<th>Non-Collision</th>
<th>Angle</th>
<th>Hit Deer</th>
<th>Same Direction/Sideswipe</th>
<th>Unknown</th>
<th>Pedestrian</th>
<th>Head-on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>114</td>
<td>67</td>
<td>19</td>
<td>17</td>
<td>16</td>
<td>15</td>
<td>8</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Using data provided from the Crash Modification Clearinghouse online database, a Crash Modification Factor (CMF) was identified to estimate the effectiveness of the improvements proposed along I-83 and the crashes expected after implementation. The crash modification factor for widening a section of highway from 4 to 6 lanes is estimated to be 0.80 (or a 20 percent reduction in crashes). Consequently, the expected number of crashes after implementation would be reduced from 52 crashes per year to 42 (10 less crashes per year).

Interchanges and other Network Intersections Evaluation

The crash data was examined to see if there were any crash clusters within the study area limits, outside of I-83, and to identify any collision patterns. A cluster is defined as five crashes within 100 feet of each other within one 12-month period at an intersection.
Crash clusters were found at five (5) intersections within the study area. A cluster is defined as five crashes within 100 feet of each other at an intersection within one 12-month period.

- **Canal Road (S.R. 921)/Susquehanna Trail (S.R. 295)** – Three (3) separate crash clusters occurred at this intersection between 2011-2013, when the intersection was controlled by stop-signs on all 4 approaches. Following the installation of a traffic signal, crashes at this intersection significantly declined. The crashes that occurred at the intersection following the installation of the traffic signal were angle type crashes. These types of crashes can potentially be mitigated with the addition of left-turn lanes, along with advanced phasing.

- **Board Road (S.R. 1031)/Willow Springs Lane (T41)** – A crash cluster with 6 crashes occurred at this signalized, t-intersection. The majority of these crashes were caused by vehicles speeding with no clear pattern, solely driver error.

- **Church Road (S.R. 238)/Susquehanna Trail (S.R. 4005)/Farmtrail Road** – The six (6) crashes that occurred at this intersection indicated no clear pattern; however all were caused my improper/careless turns. Optimizing traffic signal timings and providing more green time for the advanced left-turn phases would improve capacity at this intersection and reduce crashes. Furthermore, additional travel lanes would also reduce congestion and improve motorist behavior.

- **North George Street (S.R. 181)/Emig Road (S.R. 1012)** – Two (2) separate crash clusters occurred at this signalized, t-intersection. The majority of these crashes were rear-end and angle type crashes. This intersection currently experiences long queues and high delay during the peak hours, causing motorists to tailgate and make reckless turns. Providing additional travel lanes and/or turn lanes would improve traffic flow and safety at this intersection.

- **North George Street (S.R. 0181)/Starview Road (S.R. 1018)/Church Road (S.R. 238)** – The crashes that occurred at this intersection were caused by motorists making improper/careless turns; most likely due to the unconventional geometry of the intersection. It is reasonable to presume that relocation/realignment of Starview Road (S.R. 1018) would eliminate driver confusion and reduce crashes.

Within the five years studied, three crashes resulting in a fatality occurred at the other network intersections at nearby study intersections. A fatal crash occulted along Canal Road where a motorcyclist was speeding and failed to negotiate the curve at Zions View Road. Another motorcycle related fatality occurred along N. George Street just past High Street, where the motorist failed to negotiate the curve and struck a guide rail. A crash along Emig Road at Mundis Race Road involved a truck running a stop sign and being hit by a large truck traveling southbound along Emig Road. The detailed Safety Study is included in Appendix B.

### 2.7 Traffic Signals and Intelligent Transportation Systems (ITS)

The majority of traffic signals along Susquehanna Trail (S.R. 0295) and Church Road (S.R. 0238) within the study limits are outdated, which includes the equipment, signal timing plans, lack of ADA compliant pedestrian facilities, as well as the design of the detection. Most of the signal plans and timings were last updated 15 years ago.

Canal Road (S.R. 0921) has two locations where traffic signals were recently installed. The signal at Canal Road (S.R. 0291) and Espresso Way (T838), which leads to the Starbucks Warehouses, was installed in the summer of 2016, and a traffic signal was recently installed to replace the all-way stop control at Canal Road (S.R. 0291) and Susquehanna Trail (S.R. 0295).

The two signals along Susquehanna Trail (S.R. 0295) at the ramp intersections are controlled by one controller (clustered) and operate in an isolated system, as the closest signals are over a mile away. The system operates with a weekday morning timing plan, and a separate timing plan for the remainder of the day. The signals along Church Road (S.R. 0238) operate on a coordinated system, with three separate time-of-day plans.
The traffic signal at George Street and Emig Road operates as a three-phase, semi-actuated uncoordinated traffic signal with volume density operation. The intersection includes pedestrian signal heads (non-countdown) and pedestrian push buttons. The permit plan indicates a last revision date of July 2002.

The traffic signal at George Street and Church Road/Starview Road operates as a four-phase, semi-actuated uncoordinated traffic signal with volume density operation. Pedestrian crossings are prohibited at the intersection. The permit plans indicate a last revision date of November 2008.

Traffic Signal at George Street and Church Road/Starview Road

Today, PennDOT maintains and operates a variety of standard ITS devices along the I-83 corridor for purposes of managing recurring and non-recurring congestion.

There are closed circuit television (CCTV) cameras currently located at both Exit 24 Interchange and the Exit 28 Interchange (one camera at each location). The dome style cameras are Cohu brand cameras with pan-tilt-zoom functionality and lowering devices for easier maintenance. These cameras are connected to the Regional Transportation Management Center (RTMC) in Harrisburg via leased T-1 copper communication lines. Including these two cameras, there are approximately 28 total cameras along I-83 maintained and operated by PennDOT District 8.

There are approximately 14 PennDOT dynamic message signs located along the I-83 corridor from the Maryland line to Harrisburg. The signs are full-matrix walk-in Daktronics brand signs and communicate to the RTMC via cellular modem (CDMA). The signs closest to this project corridor are located at mile marker 20 for northbound traffic and at mile marker 31 for southbound traffic.

Highway advisory radio (HAR) is also deployed along the I-83 corridor. There are approximately six HIS brand transmitters and 17 beacon signs. The system generally uses CDMA for communications but some use RV50 digital cellular or Ethernet. The closest transmitters to the project corridor are at mile marker 22 just to the south and mile marker 33, to the north of the Exit 28 Interchange.
2.8 Traffic Conditions

2.8.1 Existing Traffic Congestion and Level of Service (LOS)

Traffic data collection was conducted in November 2016 to collect traffic volumes, pedestrian volumes, vehicle classifications, and travel speeds. Traffic counts were conducted along I-83 in the vicinity of Canal Road (S.R. 0921) as well as the key roadways in the project area including Susquehanna Trail (S.R. 0295), Church Road (S.R. 0238) Board Road (S.R. 1031) Canal Road (S.R. 0921), and Willow Springs Lane (T941). During a typical weekday, I-83 carries approximately 48,000 vehicles per day (total in both directions), of which approximately 18% percent are classified as heavy vehicles. The posted speed limit along I-83 is 65 miles per hour, while the 85th percentile travel speeds along I-83 is 75 miles per hour in the northbound direction and 65 miles per hour in the southbound direction.

Manual turning movement traffic counts were conducted in November and December 2016 during the weekday morning (6:00 AM to 9:00 AM) and weekday afternoon (4:00 PM to 6:00 PM) peak commuter periods. The four highest consecutive 15-minute peak intervals during these traffic count periods constitute the peak hours that are the basis of this traffic analysis. The peak hour volumes were conservatively balanced throughout the study area, where applicable. The weekday morning and afternoon peak hour traffic volumes are depicted in the figures located in Appendix A: Traffic Analysis Summary.

Most agencies, including PennDOT, identify LOS A through D as constituting acceptable operating conditions for peak hour periods. LOS E represents operating conditions where traffic volumes are approaching capacity, and is often considered the threshold of acceptable peak hour operating conditions for lane groups. LOS F represents failure, or operating conditions where volume demand exceeds capacity, and vehicle delays and queues are significant. For these reasons, an overall LOS D and a lane group of LOS E, were selected as the acceptable LOS for the study area in determining appropriate future recommendations.

Currently, the existing I-83 mainline corridor as well as the ramp merge and diverge areas operate with reasonable free-flow operations with smooth transitions with on and off-ramps (LOS A or B) under existing conditions with no traffic incidents. However, any traffic incident along I-83 can cause long-lasting gridlock given the high volume of traffic.

The following intersections or lane groups are currently operating at capacity or over capacity (LOS E or F) during existing worst case peak hour conditions:

1. Southbound movements of Susquehanna Trail (S.R. 0295) at Church Road (S.R. 0238)
2. Northbound movements of Susquehanna Trail (S.R. 0295) at Church Road (S.R. 0238)
3. The intersection of Church Road (S.R. 0238) and I-83 Southbound ramps
4. The I-83 southbound ramps at the intersection of Church Road (S.R. 0238)
5. The intersection of Church Road (S.R. 0238) and I-83 northbound ramps/Board Road
6. The northbound movements of Willow Springs Lane at the unsignalized intersection with Canal Road (S.R. 0921)
7. The I-83 southbound off-ramp at Susquehanna Trail (S.R. 0295)

Figure 6 contains overall level of service (LOS) and queuing information for existing conditions. “Excessive Queuing” as noted on the overall report figures indicates queuing that significantly exceeds available storage and has substantial impacts on LOS/operations for an entire approach or intersection which is often typical for movements/approaches that are operating over capacity.

More detailed information, including figures with overall LOS and maximum 95th percentile queues are located in Appendix A.
2.8.2 Truck and Local Traffic Conflicts

An origin-destination study was conducted during the spring of 2015. During this time Bluetooth data was used to determine the origin and destinations of local traffic using I-83. As a result of the O-D study, it was estimated that over seventy percent of the traffic using Exit 24 and over fifty percent of the traffic using Exit 28, had a destination within 1 mile of the respective interchange. As such, it is evident that the project study area between Exit 24 and Exit 28 is used not only as a regional route, but also by local traffic generated by people who live and work in the area.

In addition, many trucks utilize both Exit 24 and Exit 28 to travel along local roads to access the adjacent industrial areas. The high traffic volume, combined with the high truck percentages create conflicts between local and through traffic. Specifically, the other network intersections and road system appear to be overburdened by traffic servicing the industries along Board Road (S.R. 1031), Willow Springs Lane (T941) and Espresso Way (T838).

There are currently more than 5 million square feet of approved or proposed industrial development in the study area since 2016. Projections gathered for this project determined that the northern project limits could see approximately 1400 peak hour trips entering and exiting the project area, and the southern project limits could see 850 peak hour trips entering and exiting the project area. As the industrial zoned land continues to develop, truck volumes will continue to increase on these local roads accessing Canal Road (S.R. 0921), Susquehanna Trail (S.R. 0295), and Church Road (S.R. 0238) as well as between Exits 24 and 28. Hence, long range planning will need to consider restrictions to area zoning to discourage major traffic generators or transportation improvements that accommodate the potential for growth. Some of these improvements that will have this type of impact include, a potential interchange at Canal Road (S.R. 0921) and improvements or reconfiguration to the existing interchanges and connected roadways.

2.8.3 Roadway Connectivity and Traffic Demand

To establish the future traffic demand for the 2027 and 2047 analysis years, traffic demand models were developed in coordination with York County Planning Commission (YCPC). The traffic demand model has the ability to redistribute traffic volumes from a regional perspective considering changes to the transportation network, such as new interchange connections or modified interchange ramp locations. The YCPC model was used as a base, then the model was refined based on the existing traffic data collection and proposed known area developments. Next, the 2047 projections were developed considering the scenarios where there would be no new future interchange, as well as potential full and partial interchange configurations at Canal Road (S.R. 0921). Once the 2047 traffic volumes were established from this modeling, the 2027 traffic volumes were estimated by applying the proportionate increase in the traffic volume from existing to 2047 based on YCPC population and employment demographic projections.
2.9 Commuting Trends

Based on U.S. Census data, over 20,900 people living in the study area commuted outside of the study area for work, with 12% traveling south to jobs in the City of York. Figure 7 displays the density of jobs per square mile for locations where residents living in the study area travel to and from work. An estimated 36,000 people commute into the study area for work, with 45% traveling from housing locations to the west or south. Given the north-south orientation of I-83 and the commute patterns, it is an important corridor for providing access jobs for people that live or work in the study area.

Also based on U.S. Census data, an estimated 43,500 people are employed in the study area and 33% work in manufacturing or transportation and warehousing. These leading industry sectors of employment reflect the concentration of light industrial and warehouse facilities in the area. These industries generate and rely on the movement of goods and materials by truck. Having transportation infrastructure that supports the efficient movement of goods is important to supporting the existing employment centers and future economic development in the area.

Figure 7 – Demographic and Employment Statistics


2.10 Other Modes of Transportation

2.10.1 Pedestrian and Bicycle Facilities

There are two major trails in the York/Manchester area: The Heritage Trail, which was recognized as the 2015 Pennsylvania Trail of the Year, and the Mason Dixon Trail. The Heritage Trail is a 25-mile trail with ADA Access and provides users with the ability to bike, cross-country ski, and horseback ride. The trail runs on the eastern side of I-83 in the North York and Emigsville area. The Mason Dixon Trail is a 188-mile trail in which part of it runs through the Manchester and Conewago Townships. Although the area has abundant recreational facilities for pedestrians and bicyclists, sidewalks are not consistent throughout the project area. In addition neither existing interchange bridge has sidewalks or bike lanes. Figure 8 depicts York County’s Existing Trails.

Figure 8 – York County Trail Map

(Source: York County Economic Alliance, July 2015)
Source: http://www.yorkcountytrails.org/trails/
2.10.2 Transit

There are a few different modes of public transportation in York County, PA. They include Intercity Passenger Rail, Fixed Route Buses, and a Shared Ride/Demand Response Program. The intercity passenger rail refers to Amtrak stations in Lancaster, Harrisburg, Middletown, Elizabethtown, and Mount Joy PA. This rail system is generally used for longer length trips between more populated areas. The fixed route bus system in York County offers transport through the York County Transportation Authority out of York, PA as well as the Capitol Bus Company out of Harrisburg, PA. These buses generally serve more of the local traffic in York County around the Harrisburg and York areas.

CPTA (known as rabbittransit) runs two bus routes through the project area. Route 83N serves the Emigsville area and has a park and ride located directly off of Church Road near I-83 Exit 24. This has arrivals and departures 8 times a day and serves the Harrisburg area included Harrisburg Area Community College, downtown area and the transfer center. Bus Route 14N serves Manchester Borough and stops at Espresso Way off of Canal Road.

A ride/demand response service is also run by rabbittransit which offers riders from different areas within the York County area the opportunity to carpool together in a smaller bus that is run and operated by rabbittransit. York County used to provide this service but rabbittransit has since taken over and has expanded the travel area and service hours. More extensive travel is offered by bus charters and tours via the Capitol Bus Company out of Harrisburg.

According to the 2017 Transit Development Plan (TDP) produced by York County Planning Commission, total ridership has increased each year since the 2011 TDP. In 2014 to 2015, rabbittransit provided more than 1.5 million rider trips. Radial bus routes that extend further into suburban and rural areas of York County, have nearly doubled in their share of total ridership from 6.6% to 11.7%. This is largely due the addition of a new Route 105 that serves York City to Dallastown and Red Lion boroughs.

2.11 Environmental Resources

The Environmental Resources section outlines the methodologies and results for studies to confirm, identify, and delineate the exiting natural, cultural and socioeconomic resources in the project study area. The level of resource investigation generally included a desktop review of existing data and field reconnaissance. For environmental impacts, a study area of 250 feet from centerline of I-83, and 50 feet from the edge of pavement on the local roads was identified. The identified resources are depicted in Appendix D: Environmental Studies.

2.11.1 Natural Resources

a. Surface Waters

The identification of surface waters was completed through review of USGS topographic mapping as well as GIS Historic Stream data created by the PA Department of Environmental Protection (PADEP). Additional GIS data sources investigated included PADEP Chapter 93 Designations, PA Fish and Boat Commission (PFBC) data for Approved Trout Waters, Class A Wild Trout Streams, and Impaired Waters, as well as the PFBC website to identify Special Regulation waters. Surface waters were field verified and GIS data was adjusted as required to “best fit” detailed topographic contours developed for the project. The 2016 Final Pennsylvania Integrated Water Quality Monitoring and Assessment Report was reviewed to ascertain the water quality of study area streams.

All streams identified are listed as WWF-MF (Warm Water Fishes, Migratory Fishes) or TSF-MF (Trout Stocking, Migratory Fishes) in Chapter 93. None of the study area streams were identified on the Clean Water Act Section 303(d) list of Impaired Priority Waters. However, there were several streams PADEP identified as impaired waters for several assessed uses, as described below. The following basins were identified in the project study area: Conewago Creek, Little Conewago Creek, Musser Run, Codorus Creek and Hartman Run. Additional information regarding these waterways including specific and classification information, is located in Appendix D.

Conewago Creek – Located north of the project study area, no identified streams are within the basin of this stream, although most of the streams drain into it. The main stem within this section of stream, and all of its unnamed tributaries, are classified as WWF-MF. There are no Wild or Approved Trout Waters within this section. The water quality for the portion of the Conewago Creek basin in the study area was listed as supporting for aquatic life, recreational, and fish consumption. Conewago Creek is a tributary to the Susquehanna River.
Little Conewago Creek – Located near the center of the project study area and crossing under I-83, this stream and basin comprise a majority of the identified stream channels. The entire basin of this stream is listed as TSF-MF. There are no Wild or Approved Trout Waters within this section. Throughout the Little Conewago Creek basin the recreational use assessment determined the streams were impaired due to the presence of pathogens from an unknown source. Several streams are listed as impaired for aquatic life use due to urban runoff and storm sewers, including these unnamed tributaries: 08313, 08314, 08315, 08316, 08317, 08318, 08319, 08320, 08321, and 08322. The remaining tributaries and the main stem of Little Conewago Creek were assessed to be supporting the aquatic life use. Little Conewago Creek is a tributary to Codewo Creek.

Musser Run – Located along the east side of the study area along Musser Street, this stream and basin are classified as WWF-MF. This stream basin does not contain any Wild or Approved Trout Waters. The water quality of the portion of the Musser Run basin in the study area shows impairment of the aquatic life use due to agricultural and other sources of suspended solids. However, regarding the fish consumption use, the study area streams in this basin are listed as supporting this use. Note, the study area streams in the Musser Run basin were not assessed for other uses. Musser Run is a tributary to Codorus Creek.

Hartman Run – Located east of the study area, no tributaries to this stream were identified within the study area, although the drainage basin does encompass portions of George Street and Musser Street. This stream and basin are classified as WWF-MF. There are no Wild or Approved Trout Waters within this section. The water quality of the Hartman Run basin is recreationally impaired, due to unknown pathogens. However, the basin is listed as supporting the aquatic life use. Hartman Run is a tributary to Codorus Creek.

The streams that are part of the Codorus Creek basin and are listed as WWF-MF (Warm Water Fishes, Migratory Fishes) in Chapter 93. Codorus Creek, while outside of the project study area, is connected to the tributaries within the project study area, has been PADEP identified as impaired waters for several assessed uses. Tributary 08049 to Codorus Creek, running through the project study area was identified on the Clean Water Act Section 303(d) list of Impaired Priority Waters for recreational use due to presence of pathogens from an unknown source.

Codorus Creek – Located south of the project study area, one tributary to Codorus Creek extends through the project study area. This stream and basin are classified as WWF-MF. There are no Wild or Approved Trout Waters within this section. The water quality assessment for Codorus Creek tributaries within the project study area streams indicate support of the aquatic life use. The recreational use assessment determined these streams were impaired due to the presence of pathogens from an unknown source.

Overall, the Codorus Creek basin is listed as supporting the fish consumption use. Note, the main stem of Codorus Creek, located outside the project study area, is listed as impaired for the aquatic life use due to channelization, urban runoff, and storm sewers. Codorus Creek is a tributary to the Susquehanna River.

b. Wetlands

The U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) GIS layer was used to identify any historic wetlands within the study area. Potential wetland areas were identified in the study area based on limited field views. The limits of the potential wetlands were field sketched using detailed topographic survey and aerial photographs. Three freshwater ponds and 9 wetlands were identified, although the field view revealed that one of the ponds has subsequently been filled. No formal delineation was conducted at this time.

c. Threatened and Endangered Species

A preliminary review of threatened and endangered species was conducted utilizing the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Tool. Based on the results of the query, the project is within the range of the Indiana Bat (Myotis sodalist) and the northern long-eared bat (Myotis septentrionalis). The USFWS provided an Avoidance Measure, “Conduct any tree cutting, disturbance, inundation (flooding) and prescribed burning from October 1 to March 31”. It is anticipated that the avoidance measure will need to be implemented in order to obtain environmental clearance, although no further coordination with the USFWS will be required.

2.11.2 Cultural Resources

a. Above Ground Historic Resources

The identification of above ground historic resources was conducted through the examination of historic mapping, review of information available within the PA SHPO’s CRGIS database regarding resources eligible or listed in the National Register of Historic Places (NRHP), and the completion of a windshield survey of the study area to identify resources 50 years or older that have not been evaluated. Resources that appear to have integrity and could be associated with an important trend may require further study and research to determine their eligibility for listing in the NRHP.

Farms and former agricultural properties represent over half of the resources recommended for further study, and residential properties represent the next largest group of resources. Additional property types include twentieth-century industrial and commercial resources, churches and cemeteries, one-room school/meeting houses, a motel, a mill, and a springhouse. A post-World War II neighborhood in East Manchester Township may constitute a historic district.
Coordination with the District 8-0 architectural historian and the PA SHPO would be required to determine the exact level of documentation, which may depend upon the nature of the proposed improvements. Resources would be documented on either an abbreviated or a standard Historic Resource Survey (HRS) form, and farms would be evaluated using the statewide agricultural context.

2.11.3 Socioeconomic Resources

a. Groundwater Resources

Public and private groundwater wells were identified from the Pennsylvania Groundwater Information System (PAGWIS), a repository of water wells managed by the PADNR, and from eMapPA, a GIS mapping website run by the PA Department of Environmental Protection. Approximately 45 wells were identified within the project study area. Additionally, one Public Water Supply Service Area, the York Water Company, was identified within the project study area using eMapPA.

b. Geologic Resources

Geologic resources were investigated using the PaGEODE, the Pennsylvania Geologic Data Exploration interactive map from the PA DCNR. No outstanding or limiting geologic features were identified within the vicinity of the project study area.

c. Parks and Recreational Facilities

Parks and recreational facilities were investigated using the Grants Interactive Map, administered by The Bureau of Recreation and Conservation, a division of the PA DCNR, and the PA Explore Local Parks map, administered by the PA Parks and Recreation Society in partnership with the PA DCNR. The public Emigsville Park was identified within the project study area.

d. Community Resources

Properties surrounding the study area was investigated for socioeconomic resources. A few churches and cemeteries were identified. A community Park and Ride Lot is located at I-83 Exit 24 and is accessed from Board Road. No schools, hospitals or government offices were located within the project study area limits.

e. Farmland Resources

Productive agricultural land and Productive Agricultural Security Areas were identified through a review of aerial mapping, field views, and GIS data files from York County. There are some productive agricultural lands within the project area.

The area south of Sinking Springs Lane at the very southern part of the project area is predominantly in agricultural production and it is also the only Agricultural Security Area in the project study area. The other larger area of productive agricultural land is on the eastern side of I-83 from Canal Road north. The final large area of productive agricultural land is on the west side of I-83 in the area of Canal Road. Much of the farmland immediately adjacent to I-83 and at the interchanges have been developed in the past.

f. Hazardous and Residual Wastes

A Hazardous and Residual Waste Site Screening was conducted to identify potential sensitive waste sites in proximity to the study area, that have the potential to influence the design of alternatives for this project. This screening was a broad, information gathering study, based upon a review of readily available sensitive waste records maintained by the Pennsylvania Department of Environmental Project (PADEP) and the U.S. Environmental Protection Agency (USEPA). A cursory field reconnaissance was conducted to confirm locations of sites identified during the records review.

Field sampling or laboratory testing was not conducted; properties/structures were not entered; city directories were not reviewed; interviews were not conducted; and a PADEP file review was not conducted. There are no recommendations as to a site’s potential to affect the project. These investigations generally followed PennDOT guidelines (Publication 281, The Transportation Project Development Process, Waste Site Evaluation Procedure Handbook, Volumes I and II, PennDOT Bureau of Environmental Quality, 2012).

For the purposes of this Sensitive Waste Screening, the regulatory records search included an additional 500 feet extended outward from the study area. This ensured all properties with records with the potential to adversely affect the project would be identified. This inventory of potential sensitive waste sites was then narrowed to focus on those properties that are within or adjacent to the project study area. The regulatory records review of available PADEP and USEPA databases was conducted by Lotus on April 9, 2017, as well as September 18 and 19, 2017 Additional information regarding specific databases as well as project mapping and Figures, please Appendix D.

Note, there were several sites that could not be located in the study area due to inadequate addressing, or perhaps the facilities have moved or closed. These facilities may warrant additional investigation during the advanced phases of this project.

- Conewago Twp Sewer Auth/STP Property Sludge Site
  PADEP Municipal Waste Operations/ PADEP Site ID 542649
Emigsville, abandoned landfill  
PADEP Municipal Waste Operations/PADEP Site ID 616388

Springettsbury Twp, York Cnty, William Conley Farm Sludge Site  
PADEP Municipal Waste Operations/PADEP Site ID 542687

Springettsbury Twp, York Cnty, Osinski Farm 1 Sludge Site  
PADEP Municipal Waste Operations/PADEP Site ID 542703

Springettsbury Twp, York Cnty, Osinski Farm 2 Sludge Site  
PADEP Municipal Waste Operations/PADEP Site ID 542704

Texas Eastern Trans LP./Tetco M & R 1219 Pipeline  
PADEP Captive Hazardous Waste Operations/PADEP Site ID 488483

As the project progresses through the design process, further studies may be necessary as a result of this screening process, a Phase I Environmental Site Assessment (ESA) may be required. This would include a more in-depth evaluation of the regulatory records, site reconnaissance, a PADEP File Review, and review of historic land use (including review of historic aerial photographs and historic topographic maps). A Phase I ESA would discern if any sites would adversely affect the project, and recommendations would be made regarding additional studies or testing that should be completed as part of a Phase II or Phase III ESA to adequately address the waste related concern(s).

2.12 Utilities

To identify the presence of major utility facilities, the design team performed a PA 1 Call and completed a visual inspection of the study corridor. A variety of above-ground and underground facilities are present, including sanitary sewer, water, gas, petroleum, telephone, cable, and electric (low and high voltage). The municipal authorities own several of these facilities.

There are currently main transmission lines crossing I-83 approximately 0.65 miles south of the Susquehanna Trail Interchange (Exit 28). In addition, there are also main transmission lines near the proposed Canal Road Interchange (Future Exit 26). These lines start less than 0.2 of a mile east of the interstate and follow along Canal Road before crossing the interstate 0.10 of a mile south of Canal Road. Although these lines cross the interstate, the poles are out of the project limits, and should not have any impact on the project.
PennDOT has committed to bettering our transportation system and our communities through collaborative planning through the PennDOT Connects Program. PennDOT is committed to improving the planning process to reflect changing demographics and technological innovation by considering community needs at the beginning of the planning process to ensure the best allocation of our resources. This new approach includes the collaboration with Metropolitan Planning Organizations (MPOs), Rural Planning Organizations (RPO) and local governments. Collaboration provides the opportunity for details unique to communities to be identified and discussed for each project in planning, prior to developing project scopes and cost estimates.

Based on this policy, the project team coordinated with several key project stakeholders to gather input on the transportation needs and issues. First, meetings were held with representatives from each of the six municipalities within or near the study area. The purpose of these meetings was to gather input on transportation needs and issues, as well as existing and future land uses, from the municipalities that are most directly impacted by this section of I-83 and the Church Road (S.R. 0238) Corridor. Other topics discussed in the municipal meetings included previous transportation plans, recent transportation improvements, and potential land development projects.

Secondly, an Intermunicipal Coordinating Committee (ICC) for the project was formed. The ICC includes representatives from each of the study area municipalities, York County Planning Commission, York Adams Transportation Authority (Rabbit Transit), York County Economic Alliance, PA Motor Truck Association, and state legislators that represent the area. Two ICC meetings were held in May and October 2016. The purpose of the ICC meetings was to report on the project status and gather input on transportation needs. In addition to the ICC, project overview presentations were provided and input was gathered at a YAMPO Technical Committee Meeting and a York County Transportation Coalition Meeting. Finally, individual stakeholder interviews were conducted with representatives from York Adams Transportation Authority (Rabbit Transit), York County Economic Alliance, and key warehouse/industrial facilities.

The following concerns and key issues were identified through the stakeholder outreach process and helped to shape the development of improvement alternatives:

1. Chronic congestion at several locations, including:
   - Church Road between Susquehanna Trail and N. George Street (Exit 24)
   - Board Road between Church Road and Willow Springs Lane (Exit 24)
   - North George Street (S.R. 0181) at Emig Road
   - Norfolk Southern Over Emig Road
   - Susquehanna Trail south of Cloverleaf Road and north of Locust Point Road (Exit 28)

2. Safety issues at the intersections for interchange ramps at both Exits 24 and 28, as well as the intersections of Canal Road (S.R. 0921)/Copenhaffer Road (T928), and Cloverleaf Road/Locust Point Road

3. Access issues caused by the truck restrictions on Canal Road (S.R. 0921) and the single lane and height restrictions at the Norfolk Southern Overpass over Emig Road

4. Requested an evaluation of a full range of alternatives, including potential widening of I-83 to three lanes in each direction, as well as a new interchange at Canal Road

Table 11 lists the various meetings and presentations that were part of the ongoing stakeholder outreach for the project.

<table>
<thead>
<tr>
<th>Meetings and Coordination</th>
<th>Date</th>
</tr>
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<tbody>
<tr>
<td>State Legislators Letter</td>
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<td>Municipal Staff Meetings</td>
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<td>Conewago Township</td>
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<td>York County Transportation Coalition Meeting</td>
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<tr>
<td>Intermunicipal Coordinating Committee (ICC) Meetings</td>
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<td>PennDOT/FHWA Status Meeting</td>
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4.1 Corridor-Wide Needs

Upon completion of the initial public involvement process and data collection efforts, the project team went through the process of determining the basic overall needs of the project area. These were determined to be Safety, Traffic Congestion, Truck and Local Traffic Conflicts, and Future Land Use and Planning.

1. Safety Needs:
   - Substandard I-83 cross-section
   - Inadequate turning radii and/or geometrics at interchanges
   - Roadway pavement reaching the end of expected service life
   - Crash rates twice as high as the statewide average
   - Five fatalities in study area
   - Crash patterns at other network intersections

2. Traffic Congestion
   - Excessive queuing and delay at the interchanges
   - Multiple intersections operating at capacity
   - Any traffic incident causes long-lasting gridlock
   - High projected traffic volumes along I-83
   - Traffic flow on portions of I-83 expected to become oversaturated in the future

3. Truck and Local Traffic Conflicts
   - High traffic volume and high truck percentage create conflicts between local and through traffic
   - Traffic using interchanges have a destination within 1 mile
   - Local road system overburdened by traffic servicing the industries along Board Road (S.R. 1031), Willow Springs (T941), and Espresso Roads (T838)

4. Local Land Use and Planning:
   - More than 5 million square feet of approved or proposed industrial development in the study area
   - Manchester Township, North York Borough, and Conewago Township Comprehensive Plan noted transportation concerns
   - I-83 corridor identified as a targeted economic development area
   - Support a new interchange at Canal Road (S.R. 0921)

4.2 Preliminary Improvement Concepts

These needs became the basis for project goals that the team utilized to vet the merits of the preliminary improvement concepts. The project team developed a matrix to aid in the vetting of each concept. An example is shown in Table 12.

<table>
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<tr>
<th>Concept</th>
<th>Addresses Safety Issues</th>
<th>Addresses Congestion Issues</th>
<th>Addresses Access/Mobility Issues</th>
<th>Addresses Project Goals</th>
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A primary goal is providing a transportation system that will meet both the immediate and long term demands. With this knowledge in hand, the project team went through an analysis process to provide a range of concepts to PennDOT that would solve the issues plaguing the project area. The concepts noted in this section are focused on immediate solutions, in addition to long range planning.

The development of the preliminary improvement concepts began with the long range look at the corridor and interchanges, concentrating on a design year of 2047, 30 years from today. The project team began with determining if the projected traffic volumes would necessitate a six lane cross-section along I-83 mainline, adding a new interchange at Canal Road, and if different interchange configurations at Exit 24 and Exit 28 would alleviate congestion.

Since introducing a full or partial interchange at Canal Road would impact overall travel patterns in the study area, the project team developed four scenarios of future traffic projections. The future traffic volume scenarios that were developed for the design year of 2047 include:

- No-Build—no improvements and no new interchange at Canal Road (S.R. 0921),
- Conventional Improvements with a complete interchange at Canal Road (S.R. 0921) interchange,
- Conventional Improvements with a partial (three out of four possible movements) Canal Road (S.R. 0921) interchange, and
- Conventional Improvements with a partial (two out of four possible movements) interchange at Canal Road (S.R. 0921).

4.3 Concepts Considered but Dismissed

Several improvement concepts for Exit 24, Exit 26 and Exit 28 were dismissed through this process because they did not adequately address the project area needs and goals, or due to environmental or right-of-way constraints.
Exit 24 (Church Road -S.R. 0238) Interchange

Alternatives considered and dismissed at the Church Road interchange include: a Bow Tie configuration, where roundabouts are installed at the on/off-ramp; a Diverging Diamond Interchange (DDI), which reduces the number of conflict points with directional crossovers; and a conventional improvement alternative that included a realignment with Crone Road.

Table 13 - Exit 24 (Church Road -S.R. 0238) Concept Comparison Matrix

<table>
<thead>
<tr>
<th></th>
<th>Addresses Safety Issues</th>
<th>Addresses Congestion Issues</th>
<th>Addresses Access/ Mobility Issues</th>
<th>Addresses Project Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bow-tie</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>DDI</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Crone Road</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Improvements that should be looked in more detail during the next stage of study include upgrading the interchange with conventional improvements (including upgrading acceleration and deceleration lanes, adding turning lanes and upgrading the signals), and a Single Point Urban Interchange (SPUI) which minimizes the footprint and provides a single traffic signal at the center of the interchange.
Exit 28 (Susquehanna Trail - S.R. 0295) Interchange

Alternatives considered and dismissed at the Susquehanna Trail interchange include a Bow Tie configuration, a Diverging Diamond Interchange (DDI), and a Cloverleaf option that included a direct connection to Board Road.

Table 14 - Exit 28 (Susquehanna Trail - S.R. 0295) Concept Comparison Matrix

<table>
<thead>
<tr>
<th></th>
<th>Addresses Safety Issues</th>
<th>Addresses Congestion Issues</th>
<th>Addresses Access/Mobility Issues</th>
<th>Addresses Project Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDI</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Bow-tie</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Cloverleaf</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Similar to the Church Road interchange, improvements that should be looked at in more detail in the next stage of study include upgrading the interchange with conventional improvements (including upgrading the acceleration and deceleration lanes, adding turning lanes and upgrading the signals) and a Single Point Urban Interchange (SPUI).

Exhibit 6 — Exit 28 Concept Dismissed (Bow-tie)

Exhibit 7 — Exit 28 Concept Dismissed (DDI)
Exit 26 (Canal Road - S.R. 0921) Interchange

Alternatives considered and dismissed at Canal Road include: a 2-leg diamond interchange which is formed by a one-way northbound off-ramp and one-way southbound on-ramp; a partial cloverleaf interchange with a one-way northbound off-ramp and southbound looped on-ramp; and a 2nd partial cloverleaf option with a one-way northbound off-ramp, southbound looped on-ramp and a one-way southbound off-ramp.

Table 15 — Canal Road (S.R. 0921) Concept Comparison Matrix

<table>
<thead>
<tr>
<th></th>
<th>Addresses Safety Issues</th>
<th>Addresses Congestion Issues</th>
<th>Addresses Access/Mobility Issues</th>
<th>Addresses Project Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Leg Diamond</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Partial Cloverleaf</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Partial Cloverleaf (3 ramps)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Larger scale improvements that should be looked at in more detail for the year 2047 include building a full diamond interchange at Canal Road (S.R. 0921) which would fully address the access and mobility needs throughout the study area and would also reduce the scope of the improvements at Exits 24 and 28. Although the full diamond interchange concept should ultimately be constructed at Canal Road, budget and/or program funding may necessitate an incremental approach to the interchange recommended improvements; beginning with construction of a northbound off-ramp.

Exhibit 8 — Exit 26 Concept Dismissed (2-leg Diamond)

Exhibit 9 — Exit 26 Concept Dismissed (Partial Cloverleaf)

Exhibit 10 — Exit 26 Concept Dismissed (Partial Cloverleaf — 3 ramps)
Future traffic volumes were derived by utilizing a combination of the York County Planning Commission (YCPC) Travel Demand model, Bluetooth origin-destination data, as well as future land use considerations.

The I-83 Regional Analysis is based on the York Area MPO (YAMPO) model which was obtained from YCPC in May 2017 provided through Michael Baker Company, the creator and keeper of the model. The travel demand model is a traditional four-step model that includes the I-83 area between Exits 24 and 28. The model is coded in TransCAD and executed through an interface program called CENTRAL.

To establish the future traffic demand for the 2027 and 2047 analysis years, the project team developed traffic demand models in coordination with YCPC. The traffic demand model has the ability to redistribute traffic volumes from a regional perspective considering changes to the transportation network, such as new interchange connections or modified interchange ramp locations. The YCPC model was used as a base and the model refined the existing traffic data collection and proposed known area developments. Then the 2047 projections were developed considering the scenarios where there would be no future interchange, as well as full and partial interchange configurations at Canal Road. Once the 2047 traffic volumes were established from this modeling, the 2027 traffic volumes were estimated by applying the proportionate increase in the traffic volume from existing conditions to 2047 based on YCPC population and employment demographic projections.

The YAMPO model was provided with the latest Air Quality runs and the team was provided with data inputs for the years 2010, 2017, 2025 and 2040. A full run (inputs and outputs) was provided for 2017 YAMPO model run and “pin for pin” was executed and replicated matching results for:

- Trip generation,
- Trip distribution,
- Mode split, and
- Assigned volumes.

Where model discrepancies were noted in the distribution of municipal employment data to TAZ’s in the YAMPO model for 2017, corrections were made before model validation was attempted. The regional enhanced model was run for 2017 and compared against morning and evening peak hour existing traffic volumes (grown to 2017). The model was not re-estimated to calibrate inputs and instead the difference between the assigned turning movement volume and the existing turning movement volumes was carried through the process as a “validation correction” which was used to correct future model forecasts.

As interstate improvements typically take several years to evaluate, design and construct, as well as the understanding that these improvements should accommodate traffic volume 20 years beyond construction, 2047 (20 years beyond construction) was selected as the future forecast year. Since the latest model inputs for the YAMPO model only project out to 2040, it was decided that the team would use 2017 and 2040 model inputs to extrapolate out to 2047.

The model was provided by YCPC’s consultant, Michael Baker, with inputs for the years 2017 and 2040. Subsequent socioeconomic data for 2017 was provided by YCPC staff to create an updated 2017 base year. Also, specific municipal planned land developments were accounted for in the model. These developments were in addition to the socioeconomic data provided in the YAMPO model. They were placed into two categories and added to the model inputs as “completed before 2027” or “completed after 2027”.

The team examined the roadway network of the YAMPO model. A list of TIP and planned projects were examined and checked to be sure they were included in the 2027 and 2047 networks. In the primary study area the roadway network was reconciled with the local operational model (Synchro) used for capacity and design analysis. All the “key” analysis intersections were in the network as well as nearby intersections and roadway connections that were needed to evaluate traffic circulation and congestion in the study area in and around Exits 24 and 28. Roadway characteristics were also checked in the study area including:

- Turning movement restrictions,
- Traffic control (signals and stop signs),
- One or two-way approaches,
- Intersection and ramp connections and configurations, and
- Free flow speeds.

Transit trips in this area are considered to be negligible. Therefore, no changes were attempted to be made to the transit network.

Having examined future development, it was determined that the existing highway network and Traffic Analysis Zones (TAZ’s) structure was insufficient for this analysis. The team had a work session with YCPC staff to map future land use and determine where those land uses would access the roadway system.

The highway and TAZ systems were enhanced to match the land use and operational flow patterns in primary study area. The result is a regional model containing sufficient detail to generate turning movements that can be fed into the operational model (Synchro) for intersection LOS and design.
Several different combinations of roadway configurations were tested for 2027 and 2047 including:

- changes to the number of lanes on I-83 mainline
- various configurations at Exit 24 (Church Road—S.R. 0238) and Exit 28 (Susquehanna Trail—S.R. 0295)
- various configurations at the proposed Exit 26 (Canal Road - S.R. 0921) interchange

Using the future traffic volumes forecasted, 2047 future traffic projections were developed to evaluate the various mainline and interchange alternatives. Analysis was first completed for the future year of 2047 for No-Build Conditions as well as various build conditions, both with, and without a new interchange at Exit 26 (Canal Road—S.R. 0921).

Using both the existing volumes and the future 2047 volumes developed, the project team forecast 2027 volumes for the No-Build Traffic Conditions as well as the following future build conditions—2027 without an Exit 26 (Canal Road) Interchange, 2027 with a partial interchange at Exit 26 (Canal Road), and 2027 with a full interchange at Exit 26 (Canal Road).

Capacity analysis identified the need for three lanes in each direction between Exit 24 (Church Road—S.R. 0238) and Exit 28 (Susquehanna Trail—S.R. 0295) by 2047. It is expected that two lanes in each direction will still yield acceptable results of LOS C or better for all segments within the study area through 2027.

The York County Planning Commission (YCPC) provides population projections based on US census numbers, total households and household size, planned land development and subdivision reviews. As shown in Table 16, population is expected to keep growing throughout the year 2040. Figure 9 depicts industrial development in the area that were built or proposed since 2016.

### Table 16 - Population Projections

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchester Borough</td>
<td>2,763</td>
<td>2,800</td>
<td>2,837</td>
<td>2,866</td>
</tr>
<tr>
<td>Manchester Township</td>
<td>18,161</td>
<td>20,061</td>
<td>22,392</td>
<td>26,432</td>
</tr>
<tr>
<td>East Manchester Township</td>
<td>7,264</td>
<td>8,024</td>
<td>9,296</td>
<td>10,537</td>
</tr>
<tr>
<td>Spring Garden Township</td>
<td>12,578</td>
<td>12,651</td>
<td>12,904</td>
<td>13,420</td>
</tr>
<tr>
<td>Sprigettsbury Township</td>
<td>26,668</td>
<td>28,730</td>
<td>30,313</td>
<td>32,882</td>
</tr>
<tr>
<td>Mount Wolf Borough</td>
<td>1,393</td>
<td>1,411</td>
<td>1,404</td>
<td>1,370</td>
</tr>
<tr>
<td>Conewago Township</td>
<td>9,510</td>
<td>10,219</td>
<td>10,158</td>
<td>11,570</td>
</tr>
</tbody>
</table>

*York County Population Projections (YCPC October 2011)*

---

**Figure 9—Industrial Development Projects Built or Proposed since 2016**

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kinsley</td>
<td>Proposed</td>
<td>2,000,000 SF Pad Site</td>
</tr>
<tr>
<td>2</td>
<td>Kinsley - Orchard Park Phase 2</td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Starbucks Distribution Center</td>
<td>Built 2016</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Hillwood - Gross Farm</td>
<td>Proposed</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Stewart - Zions View Business Park</td>
<td>Proposed</td>
<td>800,000 SF Pad Site</td>
</tr>
<tr>
<td>6</td>
<td>Dermody</td>
<td>Proposed</td>
<td>875,520 SF</td>
</tr>
<tr>
<td>7</td>
<td>Farmbrook Industrial Park Expansion</td>
<td>Proposed</td>
<td>150,000 SF Pad Site</td>
</tr>
<tr>
<td>8</td>
<td>Berkshire Business Park Expansion</td>
<td>Proposed</td>
<td>100,000 SF Proposed + 70,000 SF In Progress</td>
</tr>
<tr>
<td>9</td>
<td>Orchard Park Phase 1</td>
<td>In Progress</td>
<td>900,000 + 600,000 SF Pad Sites</td>
</tr>
</tbody>
</table>

---

5.0 Future Traffic Volumes
Peak hour traffic volumes were analyzed to determine future 2027 and 2047 no-build operating conditions (no new Exit 26 (Canal Road—S.R. 0921) Interchange, or any improvements at the study intersections) in accordance with the standard techniques contained in the Highway Capacity Manual (2010). These standard capacity/level-of-service analysis techniques, which calculate total control delay, or density, are more thoroughly described in Appendix A: Traffic Analysis Summary for both signalized and unsignalized intersections, and freeway/ramp segments, as well as the correlation between average total control delay or density and the respective level-of-service criteria for each intersection type.

6.1 2027 No-Build Conditions

It is anticipated that twelve (12) intersections within the study area are expected to operate at overall LOS E or LOS F in 2027 if no improvements are completed.

Without adding capacity (ie: maintaining the existing cross section of 2-lanes in each direction) the mainline segment of I-83 is expected to operate at level of service C or better under typical conditions with no traffic incidents in 2027. Nevertheless, due to the high traffic volumes during the peak commuter periods, any incident (crash, disabled vehicle) has the potential to cause long-lasting gridlock.

Figure 10 indicates the level of service conditions expected along the freeway, interchanges, and other network intersections in 2027 if no improvements are implemented.
6.2 2047 No-Build Conditions

It is anticipated that the majority of intersections within the study area are expected to fail if no improvements are completed.

During the future 2047 No-Build conditions, the traffic flow along portions of I-83 is expected to become oversaturated, with minimal usable gaps in the traffic stream. The operations of the on- and off-ramps are controlled by the capacity of the freeway. Therefore, given the likelihood of congestion along I-83, the merge and diverge segments will also experience heavy queues during peak commuter periods.

Figure 11 indicates the level of service conditions expected along the freeway, ramp segments and project intersections in 2047 if no improvements are implemented.
As discussed, various improvement scenarios were evaluated including no Exit 26 (Canal Road—S.R. 0921), partial interchange and a full interchange Exit 26 (Canal Road—S.R. 0921).

Constructing an Exit 26 (Canal Road—S.R. 0921) Interchange appears to have the largest impact on Exit 28 (Susquehanna Trail—S.R. 0295) and the adjacent intersections. The footprint of the improvements needed to provide LOS D overall and lane group LOS E or better for the intersections in the vicinity of Exit 28 (Susquehanna Trail—S.R. 0295) are substantially reduced when a Full Interchange is built at Exit 26 (Canal Road—S.R. 0921) when compared to no interchange at Exit 26 (Canal Road—S.R. 0921), or even with a partial interchange at Exit 26 (Canal Road—S.R. 0921).

Similarly, the improvements needed to provide LOS D overall and lane group LOS E or better are reduced for the Exit 24 (Church Road—S.R. 0238) study intersections when a Full Interchange is built at Exit 26 (Canal Road—S.R. 0921), when compared to no interchange at Exit 26 (Canal Road—S.R. 0921), or even with a partial interchange at Exit 26 (Canal Road—S.R. 0921). Also, where roadway improvements were not reduced, the delay and queuing decreases as the scope of the Canal Road (S.R. 0921) Interchange increases. For example, in general, most queues are higher in the scenarios when there is no Exit 26 (Canal Road) Interchange built at all. Detailed volume, level of service and queuing figures are available in Appendix A: Traffic Analysis Summary.

All intersection improvements were intended to allow the intersection to operate at overall LOS D or better with a lane group LOS E or better by 2047.

Figure 12 indicates what type of level of service and queuing conditions are expected along the freeway and project intersections in 2047 if no Exit 26 (Canal Road) Interchange is built.

Figure 13 indicates what type of level of service and queuing conditions are expected along the freeway and project intersections in 2047 if a Partial Exit 26 (Canal Road) Interchange is built.

Figure 14 indicates what type of level of service and queuing conditions are expected along the freeway and project intersections in 2047 if a Full Interchange at Exit 26 (Canal Road) is built.
Figure 13 — 2047 Conditions with I-83 widening/intersection improvements with partial Canal Road Interchange

Figure 14 — 2047 Conditions with I-83 widening/intersection improvements with a full Canal Road Interchange

7.0 FUTURE 2047 TRAFFIC CONDITIONS
7.1 Summary of Potential Impacts and Costs

Impacts

Potential impacts were calculated for the conceptual improvements identified for each of the five project sections. The environmental features evaluated were based upon the mapping prepared by Lotus during the Fall of 2017.

Environmental features were not investigated in detail and additional studies must be conducted before understanding the complete impacts from any of the conceptual improvements. The impacts for each of the interchange improvements do not include any potential improvement to the main line section of I-83 and should be considered stand alone. Likewise, the impacts calculated for the proposed 6-lane widening of the main line do not include any improvements to the interchanges and should also be considered stand alone. By listing the impacts in this manner, it provides a true comparison for each interchange alternative and allows the mainline widening to be viewed as an independent study area.

Once complete alternatives are developed, the impact numbers will need to be reevaluated as one project. Generally, the impacts were calculated using GIS data. This data was used to calculate the resource impacts within the limits of disturbance. The impacts were visually cross-checked by reviewing mapping of the alternative options on the environmental features mapping.

Generally, there does not seem to be any significant impacts from the conceptual alternatives. However, as noted above, the environmental features identified within the impacted area have not been studied in detail. Detailed investigations must be conducted before it can be determined whether the resource does exist and what the limits are for the resource. In particular, it is not known at this time which of the above ground structures that are >50 years old are eligible for the National Register of Historic Places. For the purposes of comparing the alternatives, it was presumed that all the potentially impacted above ground structures that are >50 years old are eligible and therefore would also be considered a Section 4(f) resource. In addition, detailed studies and research has not be conducted for the potential waste sites. The impacts simply note if the properties with a waste record on file. An investigation will need to be conducted before determining if the sites pose a concern to the project.

This study did not prepare an assessment of noise impacts or stormwater management facilities. It is likely that the assessment of these facilities will require additional impact that may extend beyond the current impact boundary.

Costs

These planning level cost estimates include construction costs for roadway items such as pavement, excavation, bridges, culverts, removal of existing structures, signing, pavement markings, traffic signals, drainage, stormwater management, erosion and sediment pollution control, traffic control during construction, and other miscellaneous work (highway lighting, demolition, utilities, and remediation). Unit costs for the major construction items were developed based on average unit prices for PennDOT projects bid over the last two years. Costs from other projects of similar size and scope were used whenever possible.

Costs for structures were developed primarily based on square footage of deck area as well as similar bridges from prior projects. Right-of-way costs are based on assumptions on the number of property takes and varieties of property impacted.

While in the alternatives analysis study phase, a 25% contingency was added to all estimates to account for the level of unknowns and higher risk associated with a complex project at this early stage of design. The costs for construction inspection were estimated at 10% of the total construction cost. An approximate count of utility facilities was used to establish utility costs based on anticipated impacts.

The costs were established for the current year 2017 based on the plan of each alternative presented in the previous sections. The final construction limits could differ from this alternatives study due to sequencing of traffic, right-of-way complexity, mitigation and permitting considerations. An escalation of construction costs was calculated based on a reasonable construction starting date which factored in time for design, permitting, and obtaining of funding. While a 3% per year for 10 year rate was used for this study that calculation should be reconsidered as planning continues.

A summary of the impacts and associated costs for each interchange is provided in the detailed project sections.
The Exit 24 (Church Road) interchange section includes the two signalized intersections along Church Road and the I-83 on/off ramps. The Church Road interchange ramps operate with congestion, both northbound and southbound, including congestion along Church Road. A major contributor to the congestion are the high traffic volumes to/from the industrial uses along Board Road.

Larger scale design concepts were examined both from a traffic analysis and a design standpoint to accommodate the design year 2047 traffic volumes. However, short-term needs were compared against the long range goals and 2027 improvement recommendations were also developed. The following short-term and larger scale improvements were identified with or without an Exit 26 (Canal Road—S.R. 0921) Interchange. As they move into more detailed design, some of these improvements may be deemed infeasible due to right-of-way concerns, environmental impacts or other practical considerations. Most of the larger scale improvements would build on the 2027 improvements as shown in Exhibit 11.

**Short-term (2027)**
- Updated traffic signal improvements
- Traffic signal optimization
- Advanced signal control (adaptive)
- Roadway and Ramp improvements

**8.1 Improvements necessary without Exit 26 (Canal Road—S.R. 0921) Interchange**

The following improvements would be necessary by 2047 at Exit 24 (Church Road—S.R. 0238) to operate acceptably if no Exit 26 interchange was constructed at Canal Road—S.R. 0921.

**Larger Scale (2047)**
- Replacing the Church Road bridge over I-83 to provide additional lanes and proper shoulder width.
- Additional eastbound and westbound through lanes along Church Road (S.R. 0238) beginning west of Susquehanna Trail (S.R. 0295) and ending at Board Road (S.R. 1031)/I-83 Northbound ramps.
- Additional through lane to Board Road along northbound I-83 off-ramps.
- Along eastbound Church Road (S.R. 0238) at Board Road (S.R. 1031)/I-83 northbound ramps: dual left-turn lanes onto Board Road (S.R. 1031) and a separate right-turn lane.

**8.2 Improvements necessary with Exit 26 (Canal Road—S.R. 0921) Interchange**

**8.2.1 Improvements with a partial interchange at Exit 26 (Canal Road—S.R. 0921)**

With a partial Exit 26 (Canal Road—S.R. 0921) Interchange, the number and location of additional lanes through the interchange intersections are similar as without Exit 26 (Canal Road—S.R. 0921) Interchange, however lane use varies at the intersection of Church Road (S.R.0238) and the I-83 Northbound ramps/Board Road (S.R. 1031).

**Larger Scale (2047)**
- Replacing the Church Road bridge over I-83 to provide additional lanes and proper shoulder width.
- Additional eastbound through lane along Church Road (S.R. 0238) beginning west of Susquehanna Trail (S.R. 4005) and ending east of Board Road (S.R. 1031)/I-83 Northbound ramps.
- Additional westbound through lane along Church Road (S.R. 0238) beginning west of the I-83 southbound ramps and ending at Farmtrail Road.
- Dual left-turn lanes are not necessary along eastbound Church Road (S.R. 0238) at Board Road (S.R. 1031).

**8.2.2 Improvements with a full interchange at Exit 26 (Canal Road—S.R. 0921)**

If a full interchange was constructed at Canal Road (S.R. 0921) these additional improvements would be necessary by 2047 at Exit 24 (Church Road—S.R. 0238) (Exhibit 7).

**Larger Scale (2047)**
- Replacing the Church Road bridge over I-83 to provide additional lanes and proper shoulder width.
- Additional eastbound through lane along Church Road (S.R. 0238) beginning west of Susquehanna Trail (S.R. 4005) and ending east of Board Road (S.R. 1031)/I-83 Northbound ramps.
- Additional westbound through lane along Church Road (S.R. 0238) beginning west of the I-83 southbound ramps and ending at Farmtrail Road.
- Dual left-turn lanes are not necessary along eastbound Church Road (S.R. 0238) at Board Road (S.R. 1031).
8.3 Single Point Urban Interchange (SPUI) at Exit 24 with or without Exit 26 (Canal Road—S.R. 0921) Interchange

- The SPUI would need the following configuration by 2047 to operate acceptably (Exhibit 8)
  - Both southbound and northbound ramps meet at a single, signalized intersection
  - 4/5-lane cross-section along Church Road (S.R. 0238) at SPUI intersection includes an exclusive eastbound left-turn lane, one eastbound through lane and one channelized right turn lane, dual westbound left-turn lanes and one through lane
  - SB off-ramp includes an exclusive left-turn lane and an exclusive channelized right-turn lane that operates as a yield controlled movement onto Church Road (S.R. 0238).
  - NB off-ramp includes an exclusive left-turn lane and an exclusive right-turn lane onto Church Road (S.R. 0238).
  - Total Replacement of bridge over I-83

This improvement concept was later eliminated due to significant ROW and environmental impacts.

8.4 Traffic Signal Design

The traffic signal improvements for the Church Road corridor will consider and evaluate the need of the latest technologies for traffic signal operations and safety at the time of their installation including: advanced transportation controllers (ATCs); use of automated traffic signal performance measures (ATSPMs); adaptive signal control (ASC) operation; non-intrusive vehicular and pedestrian detection methods such as thermal imaging and others; communications infrastructure such as fiber optic cable or wireless methods; battery back-up systems; ramp queue preemption; etc. Other considerations for the future include the use of connected vehicle technologies such as DSRC radios.
8.0 DETAILED EXIT 24 (CHURCH ROAD—S.R. 0238) INTERCHANGE SECTION
Exhibit 12 — 2047 Exit 24 (Church Road—S.R. 0238) Larger Scale Improvements

8.0 DETAILED EXIT 24 (CHURCH ROAD—S.R. 0238) INTERCHANGE SECTION
Exhibit 13 — 2047 Exit 24 (Church Road—S.R. 0238) SPUI configuration

8.0 DETAILED EXIT 24 (CHURCH ROAD—S.R. 0238) INTERCHANGE SECTION
8.5 Short-term 2027 Improvement Costs

Table 17 details the summary of costs associated with the 2027 short-term improvements at the Church Road interchange.

Table 17 - Exit 24 (Church Road—S.R. 0238) Interchange 2027 Improvements and Estimated Costs

<table>
<thead>
<tr>
<th>Location</th>
<th>Improvement</th>
<th>Estimated Cost</th>
<th>Exhibit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Church Road (S.R. 0238) and I-83 southbound and northbound ramps</td>
<td>Signal Optimization</td>
<td>$15,000</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Automated Traffic Signal Performance Measures</td>
<td>$87,500</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Advanced Signal Control (Adaptive)</td>
<td>$150,000</td>
<td>11</td>
</tr>
<tr>
<td>Church Road (S.R. 0238) and I-83 southbound ramps</td>
<td>Updated signal and corresponding ramp improvements</td>
<td>$2.2 million</td>
<td>11</td>
</tr>
<tr>
<td>Church Road and I-83 northbound ramps</td>
<td>Roadway and Ramp Improvements</td>
<td>$2.5 million</td>
<td>11</td>
</tr>
<tr>
<td>Church Road (S.R. 0238) and I-83 northbound ramps/Board Road</td>
<td>Updated signal and corresponding roadway improvements</td>
<td>$1.1 million</td>
<td>11</td>
</tr>
</tbody>
</table>
8.6 Larger Scale Improvement Potential Impacts and Costs

Potential impacts were calculated for the conceptual improvements identified for the Church Road interchange. The environmental features evaluated were based upon the mapping prepared by Lotus during the Fall of 2017. The planning level cost estimates include construction costs for roadway items.

Table 18 summarizes impacts associated only with alternatives that were selected to be studied in detail which are the larger scale improvements including the Church Road bridge replacement and Single Point Urban Interchange (SPUI).

<table>
<thead>
<tr>
<th></th>
<th>Conventional Improvements</th>
<th>SPUI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Wetlands (acres)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Stream Crossings (linear ft.)</td>
<td>383.3</td>
<td>315.7</td>
</tr>
<tr>
<td>Potential Sensitive Waste Sites (# of properties)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Listed/Eligible Above Ground Historic Places (# of properties)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Above Ground Structures &gt;50 years old (# of properties)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Productive ASA</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Productive Agricultural Land</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Threatened and Endangered Species</td>
<td>1 conflict</td>
<td>1 conflict</td>
</tr>
<tr>
<td>Section 4(f) - Parks</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Section 4(f) - Historic/Potential Historic</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Impacted Parcels</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Significantly Impacted Parcels</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Construction &amp; Inspection</td>
<td>$23,700,000</td>
<td>$38,000,000</td>
</tr>
<tr>
<td>Utilities</td>
<td>$1,900,000</td>
<td>$1,900,000</td>
</tr>
<tr>
<td>Right-of-Way</td>
<td>$1,000,000</td>
<td>$2,500,000</td>
</tr>
<tr>
<td>Total</td>
<td>$26,600,000</td>
<td>$42,400,000</td>
</tr>
</tbody>
</table>
Currently, Canal Road does not have direct access to northbound or southbound I-83. However, there has been an increasing demand for a new interchange at Canal Road (S.R. 0921) largely due to the current zoning and planned industrial developments of more than 5 million square feet adjacent to the study area.

Long term improvements were identified for Canal Road to accommodate the future (2047) traffic demand. This concept included a full diamond interchange at Canal Road, and widening Canal Road. This improvement concept provides for the biggest footprint, therefore budget and constructability constraints may necessitate a more realistic and incremental approach to the improvements at this location. As such, short-term needs were evaluated and improvements developed.

Additional traffic analysis was completed for various partial interchanges at Canal Road. These details can be found in Appendix A.

**Short-term (2027)**

- One-way northbound off-ramp (Exhibit 7)
- Northbound off-ramp and southbound on-ramp

It is anticipated that the northbound off-ramp would be constructed first as it would have the greatest impact of relieving the undesirable conditions at the Church Road (Exit 24) and Susquehanna Trail (Exit 28) interchanges.

### 9.1 Improvements necessary with a Full Diamond interchange at Exit 26 (Canal Road)

As depicted in Exhibit 6, with a four-ramp design, the following larger scale improvements would be necessary by 2047 at Canal Road (S.R. 0921):

- Construction of four new one-way ramps on/off of I-83; NB on-ramp, NB off-ramp, SB on-ramp, and SB off-ramp
- Replacing the I-83 bridge over Canal Road (S.R. 0921)
- 5-lane cross-section along Canal Road (S.R. 0921) between interchange ramps; containing two travel lanes in each direction and a separate left-turn lane
- Signalized ramp intersections operating under one controller (clustered)
- Separate left and right-turn lanes along NB off-ramp
- Dual left-turn lanes are needed with an exclusive right turn lane along SB off-ramp approaching Canal Road (S.R. 0921)

It should be noted, the construction of a full interchange at Canal Road would reduce the scope of improvements needed at the Exit 24 and Exit 28 interchanges. Passenger vehicles and tractor trailers would utilize Canal Road for a more direct route in lieu of traversing other area roadways at the Church Road and Susquehanna trail interchanges.
9.2 Traffic Signal Design
The traffic signal improvements for the Exit 26 (Canal Road—S.R. 0921) Interchange will consider and evaluate the need of the latest technologies for traffic signal operations and safety at the time of their installation including: advanced transportation controllers (ATCs); use of automated traffic signal performance measures (ATSPMs); adaptive signal control (ASC) operation; non-intrusive vehicular and pedestrian detection methods such as thermal imaging and others; communications infrastructure such as fiber optic cable or wireless methods; battery back-up systems; ramp queue preemption; etc. Other considerations for the future include the use of connected vehicle technologies such as DSRC radios.

9.3 Larger Scale Improvement Potential Impacts and Costs
Potential impacts were calculated for the conceptual improvements identified for a full diamond interchange at Canal Road. The environmental features evaluated were based upon the mapping prepared by Lotus during the fall of 2017. The planning level cost estimates include construction costs for roadway items. Table 19 summarizes impacts and costs associated with construction of a four-ramp design at Canal Road.

<table>
<thead>
<tr>
<th>Potential Wetlands (acres)</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream Crossings (linear ft.)</td>
<td>1292.6</td>
</tr>
<tr>
<td>Potential Sensitive Waste Sites (ft of properties)</td>
<td>0</td>
</tr>
<tr>
<td>Listed/Eligible Above Ground Historic Places (ft of properties)</td>
<td>0</td>
</tr>
<tr>
<td>Above Ground Structures &gt;50 years old (ft of properties)</td>
<td>2</td>
</tr>
<tr>
<td>Productive ASA</td>
<td>No</td>
</tr>
<tr>
<td>Productive Agricultural Land</td>
<td>Yes</td>
</tr>
<tr>
<td>Threatened and Endangered Species</td>
<td>1 conflict</td>
</tr>
<tr>
<td>Section 4(f) - Parks</td>
<td>No</td>
</tr>
<tr>
<td>Section 4(f) - Historic/Potential Historic</td>
<td>2</td>
</tr>
<tr>
<td>Impacted Parcels</td>
<td>10</td>
</tr>
<tr>
<td>Significantly Impacted Parcels</td>
<td>1</td>
</tr>
<tr>
<td>Construction &amp; Inspection</td>
<td>$16,000,000</td>
</tr>
<tr>
<td>Utilities</td>
<td>$700,000</td>
</tr>
<tr>
<td>Right-of-Way</td>
<td>$3,000,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$19,700,000</strong></td>
</tr>
</tbody>
</table>
Exhibit 14 — 2047 Exit 26 (Canal Road—S.R. 0921) Full Diamond Interchange
Table 20 - Canal Road (S.R. 0921) Interchange 2027 Improvements and Estimated Costs

<table>
<thead>
<tr>
<th>Location</th>
<th>Improvement</th>
<th>Estimated Cost</th>
<th>Exhibit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canal Road near the existing Willow Springs Road</td>
<td>Construction of a one-way northbound off-ramp</td>
<td>$3,000,000</td>
<td>15</td>
</tr>
</tbody>
</table>

Exhibit 15 - Canal Road (S.R. 0921) Partial Interchange—Northbound off-ramp
The Exit 28 (Susquehanna Trail) interchange includes the two signalized intersections along Susquehanna Trail and the I-83 on/off-ramps. Within 10 years, the interchange ramps are expected to reach capacity under the existing roadway configuration.

Larger scale (2047) design concepts were examined to accommodate the future design year projected traffic volumes, 30 years from now, in 2047. Short-term improvements were also evaluated for the immediate needs of the interchange. During the detailed design process, some of these improvements may be deemed infeasible due to right-of-way concerns, environmental impacts or other practical considerations. Most of the larger scale improvements would build on the 2027 improvements as shown in Exhibit 17.

Short-term (2027)
- Updated traffic signal improvements and timing optimization
- Advanced signal control (adaptive)
- Roadway and Ramp improvements
- Locust Point Road closure (or left-turn restriction, relocation, or tie-into the existing signalized ramp intersection)

10.1 Improvements necessary without Exit 26 (Canal Road) Interchange

The following configuration would be necessary by 2047 at Exit 28 (Susquehanna Trail) to operate acceptably if an interchange was not constructed at Canal Road.

Larger Scale (2047)
- 6-lane cross-section along Susquehanna Trail (SR 0295) between ramp intersections
- Widening of the structure over I-83 which currently has insufficient deck width for additional lanes.
- Dual left-turn lanes along WB Susquehanna Trail (S.R. 0295) at the I-83 southbound on-ramp
- Dual left-turn lanes along the I-83 southbound off-ramp

10.2 Improvements with Exit 26 (Canal Road—S.R. 0921) Interchange

10.2.1 Improvements with a partial interchange at Exit 26 (Canal Road—S.R. 0921) Interchange

The overall footprint along Susquehanna Trail reduces when a partial Canal Road (S.R. 0921) Interchange is introduced. The traffic demand model projects that a portion of the traffic that had been traveling on Susquehanna Trail (S.R. 0295) would use Exit 26 at Canal Road instead.

Larger Scale (2047)
- Replacing the structure over I-83 which currently has insufficient deck width for additional lanes.
- 5-lane cross-section along Susquehanna Trail (SR 0295) between ramp intersections

These improvements would also accommodate the traffic volumes at the Exit 28 intersections if only a northbound off-ramp is built at Canal Road.
10.2.2 Improvements with a full interchange at Exit 26 (Canal Road—S.R. 0921) Interchange

The overall cross-section along Susquehanna Trail further reduces when a full diamond interchange is constructed at Canal Road. (Exhibit 7)

Larger Scale (2047)

- Widening of the structure over I-83 which currently has insufficient deck width for additional lanes
- 4-lane cross-section along Susquehanna Trail between ramp intersections

10.3 Single Point Urban Interchange (SPUI) at Exit 28 with or without Exit 26 (Canal Road—S.R. 0921) Interchange

The SPUI would need the following configuration by 2047 to operate acceptably (Exhibit 8)

- The southbound and northbound ramps meet at a single, signalized intersection
- 5-lane cross-section along Susquehanna Trail (S.R. 0295)
- SB off-ramp includes an exclusive left-turn lane and an exclusive channelized right-turn lane that operates as a free-flow movement onto Susquehanna Trail
- NB off-ramp includes an exclusive left-turn lane and an exclusive channelized right-turn lane that operates as a free-flow movement onto Susquehanna Trail

10.4 Traffic Signal Design

The traffic signal improvements for the Exit 28 (Susquehanna Trail—S.R. 0238) Interchange will consider and evaluate the need of the latest technologies for traffic signal operations and safety at the time of their installation including: advanced transportation controllers (ATCs); use of automated traffic signal performance measures (ATSPMs); adaptive signal control (ASC) operation; non-intrusive vehicular and pedestrian detection methods such as thermal imaging and others; communications infrastructure such as fiber optic cable or wireless methods; battery back-up systems; ramp queue preemption; etc. Other considerations for the future include the use of connected vehicle technologies such as DSRC radios.

10.5 Larger Scale Improvement Potential Impacts and Costs

Potential impacts were calculated for the conceptual improvements identified for the Susquehanna Trail interchange. The environmental features evaluated were based upon the mapping prepared by Lotus during the Fall of 2017. The planning level cost estimates include construction costs for roadway items.

Table 21 summarizes impacts associated only with alternatives that were selected to be studied in detail which are the larger scale improvements including the Susquehanna Trail bridge replacement and a Single Point Urban Interchange (SPUI).

<table>
<thead>
<tr>
<th>Potential Wetlands (acres)</th>
<th>Conventional Improvements</th>
<th>SPUI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>0.003</td>
</tr>
<tr>
<td>Stream Crossings (linear ft.)</td>
<td>704.8</td>
<td>912.5</td>
</tr>
<tr>
<td>Potential Sensitive Waste Sites (# of properties)</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Listed/Eligible Above Ground Historic Places (# of properties)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Above Ground Structures &gt;50 years old (# of properties)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Productive ASA</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Productive Agricultural Land</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Threatened and Endangered Species</td>
<td>1 conflict</td>
<td>1 conflict</td>
</tr>
<tr>
<td>Section 4(f) - Parks</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Section 4(f) - Historic/Potential Historic</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Impacted Parcels</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Significantly Impacted Parcels</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Construction &amp; Inspection</td>
<td>$19,500,000</td>
<td>$32,000,000</td>
</tr>
<tr>
<td>Utilities</td>
<td>$500,000</td>
<td>$500,000</td>
</tr>
<tr>
<td>Right-of-Way</td>
<td>$700,000</td>
<td>$1,600,000</td>
</tr>
<tr>
<td>Total</td>
<td>$20,700,000</td>
<td>$34,100,000</td>
</tr>
</tbody>
</table>

I-83 Improvement Study (Exits 24 –28)
### 10.6 Short-term 2027 Improvement Costs

Table 22 details the summary of costs associated with the 2027 short-term improvements at the Susquehanna Trail interchange.

#### Table 22 - Exit 28 (Susquehanna Trail—S.R. 0921) Interchange 2027 Improvements and Estimated Costs

<table>
<thead>
<tr>
<th>Location</th>
<th>Improvement</th>
<th>Estimated Cost</th>
<th>Exhibit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Signal Optimization</td>
<td>$20,000</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Signal Automated performance measures</td>
<td>$125,000</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Advanced Signal Optimization (ie. Adaptive)</td>
<td>$180,000</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Upgraded traffic signal and corresponding I-83 SB ramp and roadway improvements</td>
<td>$1.8 million</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Upgraded traffic signal and corresponding I-83 NB ramp and roadway improvements</td>
<td>$1.6 million</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>New traffic signal and road closure</td>
<td>$1.0 million</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Realignment</td>
<td>$175,000</td>
<td>18</td>
</tr>
<tr>
<td>Locust Point Road</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Realignment</td>
<td>$175,000</td>
<td>18</td>
</tr>
</tbody>
</table>
The study section of I-83 extends from Exit 24 (Church Road) to Exit 28 (Susquehanna Trail). The existing roadway configuration can accommodate the current traffic volumes at most locations during typical conditions (no incidents), however the daily commuter can experience severe traffic congestion along the northbound and southbound off-ramps at Church Road. In 30 years by the year 2047 the existing roadway configuration will not accommodate the future traffic volumes and will fail system-wide.

In addition, the section of I-83 has a substandard shoulder and median width that do not meet current design standards. As previously noted, most of the structures and a majority of the existing pavement base were built in the 1950s and as such, are reaching the end of their expected service life. Many sections of pavement will soon be in need of reconstruction. Widening I-83 to three through lanes in each direction would significantly improve overall mobility.

The traffic flow along I-83, as well as the merge (on-ramp) and diverge (off-ramp) areas was also examined utilizing HCS software and HCM 2010 methodology, to determine the future capacity of I-83 and the interchanges for the 2027 and 2047 forecasted traffic volumes. The analysis was conducted under base conditions including good weather and visibility and no incidents or accidents. Incidents along I-83 significantly affect the traffic flow, as closing the shoulder or a travel lane is usually necessary.

11.0 DETAILED I-83 MAINLINE SECTION

11.1 2027 conditions
It was determined during future 2027 base conditions, I-83 will start to see a decline in vehicle speed, while the ability to maneuver within the traffic stream will be slightly restricted. Any incident along I-83 will create significant queueing. The ramp merge and diverge influence areas are also expected to see a slight decline in vehicle speeds in order to accomplish a smooth transition on and off the interstate.

11.2 2047 conditions
Based on projected volumes, by the year 2047, the traffic demand along I-83 will exceed the available capacity. Traffic flow along I-83 will be disrupted from vehicles merging onto the interstate from the interchanges, as well as the lane changes made by vehicles exiting the interstate via the off-ramps. Ramp queues will often form at the interchanges, particularly at locations with high truck volume and back up to mainline I-83.

11.3 Mainline reconstruction 4-lane vs 6-lane section
When it is time for the total reconstruction of the I-83 mainline, safety in the work zones will be the highest priority. As such, the protection of the traveling public and the workers will be considered by evaluating work zone safety and work zone congestion reduction guidelines. The reconstruction of I-83 will require the use of temporary concrete barriers due to the prevailing speed limit, proximity of workers to live traffic, and activities lasting more than two weeks. The reconstruction of I-83 must maintain all travel lanes to avoid significant congestion typically associated with lane reductions. Improved traffic flow in the work zone can be obtained by maintaining all travel lanes through widening the shoulders, to completely remove traffic from the work area. While material costs may be higher, it can simplify construction and temporary traffic control measures.

Based on these factors as well as the traffic demand discussed earlier, when reconstructing I-83 the final cross section should include three 12' lanes in each direction, 12' shoulders that can support traffic during construction, and a 20' median with concrete barrier. By maintaining traffic on the original inside 4 lanes, while constructing 24' of new pavement outside the travel lanes, traffic congestion will be minimized and work zone safety will be maintained.

If the existing bridges within the I-83 corridor are scheduled for replacement prior to a mainline widening project, it would be prudent to plan for a 6-lane section along the I-83 mainline. The bridges over I-83 (Sinking Springs Lane, Church Road, and Susquehanna Trail) have insufficient width under the bridge for a potential 6-lane section along I-83. Additionally, the bridges carrying I-83 (over Canal Road, Over Little Conewago Creek, and over a tributary to Little Conewago Creek) are not wide enough to carry a six lane section. Table 23 compares a 4-lane section to a 6-lane section of I-83.

<table>
<thead>
<tr>
<th>Table 23</th>
<th>4-lane section</th>
<th>6-lane section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>Improved</td>
<td>Improved</td>
</tr>
<tr>
<td>Speed</td>
<td>Reduced</td>
<td>Reduced</td>
</tr>
<tr>
<td>Queueing</td>
<td>Minimized</td>
<td>Minimized</td>
</tr>
</tbody>
</table>

Traffic on the I-83 SB off-ramp at Church Road
Traffic on the I-83 NB off-ramp at Church Road
11.4 Mainline cross-section

Based on 2047 volumes, level of service (LOS) and reconstruction safety and capacity, the mainline cross-section should be six, 12’ travel lanes, two 12’ shoulders, and a 20’ median, for a total pavement width of 116’ (See Figure 15). In addition, this cross section matches the proposed cross section of I-83, section 070, directly south of this study area.

Figure 15—Proposed I-83 Current Typical Section

Table 23 - I-83 Mainline Cross-Section Comparison

<table>
<thead>
<tr>
<th></th>
<th>Addresses Safety Issues</th>
<th>Addresses Congestion Issues*</th>
<th>Addresses Access/Mobility Issues</th>
<th>Addresses Project Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four-Lane Section</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Six-Lane Section</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Further consideration should be given to closing Locust Point road or redirecting traffic to/from this intersection

11.5 Four-lane vs Six-lane Level of Service

Currently, the four-lane cross-section of I-83 between Exit 24 (Church Road—S.R. 0238) and Exit 28 (Susquehanna Trail—S.R. 0295) interchanges is not geometrically adequate. The pavement conditions in some areas may soon begin to deteriorate due to the pavement reaching the end of its service life. Furthermore, the ramp elements are not designed to accommodate the high volume of trucks utilizing the interchanges due to the rise in industrial developments in the area. Reconstructing I-83 to a six-lane cross-section, with wider shoulders and medians, better pavement design, and improved ramp design would significantly improve the safety and operations along this section of I-83 and the interchanges.

Table 24 depicts the I-83 future freeway conditions with a 4-lane vs. 6-lane cross-section. Although widening to 6 lanes would address the capacity needs in the long-term horizon year of 2047, maintaining the 4-lane cross-section for the 10 year horizon of 2027 will continue to produce acceptable results.

Table 24 - I-83 Mainline Future LOS Conditions

<table>
<thead>
<tr>
<th>Mainline Section</th>
<th>2027 Future Conditions (4-lanes without Exit 26)</th>
<th>2047 Future Conditions (4-lanes with Exit 26)</th>
<th>2047 Future Conditions (6-lanes with Exit 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South of Exit 24 (Church Road)</td>
<td>LOS C(C) NB</td>
<td>LOS C(F) NB</td>
<td>LOS B(C) NB</td>
</tr>
<tr>
<td></td>
<td>LOS B(C) SB</td>
<td>LOS C(E) SB</td>
<td>LOS B(C) SB</td>
</tr>
<tr>
<td>Exit 24 (Church Road) to potential Exit 26 (Canal Road)</td>
<td>LOS C(C) NB</td>
<td>LOS C(E) NB</td>
<td>LOS B(C) NB</td>
</tr>
<tr>
<td></td>
<td>LOS B(C) SB</td>
<td>LOS B(D) SB</td>
<td>LOS A(C) SB</td>
</tr>
<tr>
<td>Potential Exit 26 (Canal Road) to Exit 28 (Susquehanna Trail)</td>
<td>LOS C(C) NB</td>
<td>LOS C(E) NB</td>
<td>LOS B(C) NB</td>
</tr>
<tr>
<td></td>
<td>LOS B(C) SB</td>
<td>LOS B(D) SB</td>
<td>LOS B(D) SB</td>
</tr>
<tr>
<td>North of Exit 28 (Susquehanna Trail)</td>
<td>LOS C(C) NB</td>
<td>LOS C(D) NB</td>
<td>LOS B(C) NB</td>
</tr>
<tr>
<td></td>
<td>LOS B(C) SB</td>
<td>LOS B(D) SB</td>
<td>LOS A(C) SB</td>
</tr>
</tbody>
</table>

* AM(PM)
Transportation System Management and Operations Discussion (TSMO)

ITS devices have been deployed along the I-83 corridor to help the Department with several management strategies such as incident management, work zone management, road weather management, planned special events traffic management, freeway, arterial, and corridor management, traveler information, integrated corridor management, active traffic management, connected vehicle operations, transit signal priority, and transit automated vehicle location. The use of CCTV cameras, dynamic message signs, and highway advisory radio allows the Department to provide information to travelers, manage incidents, manage work zones, assist with road weather management, manage planned special events, and manage freeway operations.

Any improvements made to this corridor should consider and evaluate the following TSMO strategies that will allow long term operation of the corridor via PennDOT’s Advanced Transportation Management System (ATMS) operated in the RTMC and the State TMC (STMC).

- Deployment of additional ITS devices (DMS, CCTV, incident detection, travel time readers) to fill in coverage gaps so as to get information to the RTMC and to motorists more quickly.
- Smart work zone technologies to observe and manage work zones in order to provide safer and more efficient work zone operations.
- Road weather information systems (RWIS) to monitor roadway conditions in real time. Data could ultimately be used in a maintenance decision support system (DSS) for making decisions about treating the roadway during weather events.
- Integrated corridor management (ICM) that will ultimately use a DSS provided by the ATMS to help management of incidents. The ICM system would be integrated with traffic signal control of parallel routes to provide alternates to I-83. The system would also disseminate traveler information to the motoring public via PA511, DMS, HAR, Waze partnership, etc.
- Active traffic management such as future hard shoulder running, speed management, and queue warning systems.
- Connected vehicle technologies such as roadside DSRC units and the necessary communications infrastructure to manage and operate such a system. The Department should carefully observe and track the development of 5G wireless technology as either an alternative to DRSC, or as a complement to DSRC technologies.

11.6 Potential Impacts and Costs

Potential impacts were calculated for the proposed long-range I-83 widening. The environmental features evaluated were based upon the mapping prepared by Lotus during the Fall of 2017. These planning level cost estimates include construction costs for roadway items. Table 25 summarizes impacts and costs associated with widening this section of I-83.

<table>
<thead>
<tr>
<th>Table 25 - Summary of Potential Impacts and Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Wetlands (acres)</td>
</tr>
<tr>
<td>Stream Crossings (linear ft.)</td>
</tr>
<tr>
<td>Potential Sensitive Waste Sites (t of properties)</td>
</tr>
<tr>
<td>Listed/Eligible Above Ground Historic Places (t of properties)</td>
</tr>
<tr>
<td>Above Ground Structures &gt;50 years old (t of properties)</td>
</tr>
<tr>
<td>Productive ASA</td>
</tr>
<tr>
<td>Productive Agricultural Land</td>
</tr>
<tr>
<td>Threatened and Endangered Species</td>
</tr>
<tr>
<td>Section 4(f) - Parks</td>
</tr>
<tr>
<td>Section 4(f) - Historic/Potential Historic</td>
</tr>
<tr>
<td>Impacted Parcels</td>
</tr>
<tr>
<td>Significantly Impacted Parcels</td>
</tr>
<tr>
<td>Construction &amp; Inspection</td>
</tr>
<tr>
<td>Utilities</td>
</tr>
<tr>
<td>Right-of-Way</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
Detailed analysis was completed at the other network study intersections, not located along the I-83 corridor or at the interchange intersections, in order to identify improvements that can be implemented within the next 10 years by 2027. Volume, level of service and queuing analysis results are available in Appendix A: Traffic Analysis Summary. The other network intersection areas included:

**Church Road area in Manchester Township**
- Church Road and Susquehanna Trail
- Church Road/Starview Road and George Street
- George Street and Emig Road
- Sinking Spring Road

**Canal Road area in East Manchester Township**
- Canal Road and Zions View Road
- Canal Road and Espresso Way

**Canal Road area in Conewago Township**
- Canal Road and Susquehanna Trail
- Susquehanna Trail and Copenhaffer Road

**Susquehanna Trail area in Conewago Township**
- Susquehanna Trail and Cloverleaf Road
- Locust Point Road

**Manchester Borough Intersections**
- Zions View Road/Musser Street and York Street
- Musser Street and Main Street
- Main Street and York Street/Maple Street

The improvements recommended at the other network intersections would generally address the short-term needs such as congestion and safety issues. As can be seen in Figure 16, the intersections are expected to operate acceptably with the proposed improvements. Each of the other network areas is described in the subsequent sections, including conceptual plans and tables summarizing the costs associated with each improvement.
The current intersection configuration of George Street and Church Road/Starview Road is unconventional, experiences congestion during the commuter peak periods which causes crashes by motorists making improper/careless turns. The following improvements would be necessary by 2027:

- Updated traffic signal and optimized timings
- Widen Emig Road to allow for one exclusive left-turn lane and one exclusive right-turn lane
- Widen northbound George Street to allow for an exclusive right-turn lane

The George Street and Emig Road intersection experiences significant congestion due to high traffic volumes and single lane approaches. The southbound left-turn lane along George Street does not provide enough storage to accommodate the existing vehicles, therefore blocks the through lane. The following improvements would be necessary by 2027:

- Updated traffic signal and optimized timings
- Widen WB Church Road to provide an exclusive right-turn lane
- Extend Sinking Spring Road to provide connection between Church Road and Susquehanna Trail

The Church Road and Susquehanna Trail intersection currently functions poorly along all approaches given the high traffic volumes. The following improvements would be necessary by 2027:

- Updated traffic signal, including traffic signal performance measures and advanced signal control
- Optimized signal timings and coordination
- Widen WB Church Road to provide an exclusive right-turn lane
- Extend Sinking Spring Road to provide connection between Church Road and Susquehanna Trail
<table>
<thead>
<tr>
<th>Location</th>
<th>Improvement</th>
<th>Estimated Cost</th>
<th>Exhibit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Church Road (S.R. 0238) and Susquehanna Trail (S.R. 0295)</td>
<td>Signal Optimization</td>
<td>$10,000</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Automated Traffic Signal Performance Measures</td>
<td>$87,500</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Advanced Signal Control (Adaptive)</td>
<td>$150,000</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Updated traffic signal and corresponding roadway improvements</td>
<td>$1.5 million</td>
<td>19</td>
</tr>
<tr>
<td>Sinking Spring Road Connection to Susquehanna Trail</td>
<td>Sinking Spring Road Connection to Susquehanna Trail</td>
<td>$800,000</td>
<td>20</td>
</tr>
<tr>
<td>Church Road (S.R. 0238)/Starview Road (S.R. 1010) &amp; George Street</td>
<td>Signal Optimization</td>
<td>$20,000</td>
<td>Not Pictured</td>
</tr>
<tr>
<td>George Street (S.R. 0181) &amp; Emig Road (S.R. 1012)</td>
<td>Updated traffic signal and corresponding intersection improvements</td>
<td>$6.7 million</td>
<td>21</td>
</tr>
</tbody>
</table>
Exhibit 19 — Church Road and Susquehanna Trail Improvements

12.0 OTHER NETWORK INTERSECTIONS
I-83 Master Plan (Exits 24 –28)

12.0 OTHER NETWORK INTERSECTIONS

Exhibit 21 — George Street (S.R. 0181) & Emig Road (S.R. 1012) Improvements

---

LEGEND

- PROPOSED SIGNAL
- STREAMS
- POTENTIAL HISTORIC REHAB
- NE LISTED PROPERTY/DISTRICT
- RESIDENTIAL MAST
- PAVING TO BE REMOVED

I-83 IMPROVEMENT STUDY (EXITS 24-28)

CONCEPT PLAN

NORTH GEORGE ST/EMIG RD

IMPROVEMENTS

---
The traffic signal at Canal Road and Espresso Way was installed in 2016. Truck traffic is expected to increase with the development of more warehouse facilities along Espresso Way and Zions View Road. The following improvements would be necessary by 2027:

• Optimized traffic signal timings

The current intersection configuration of Canal Road and Susquehanna Trail provides narrow roadway widths and sight distance limitations. Furthermore, the tight corners make it hard for trucks to navigate through the intersection. The following improvements would be necessary by 2027:

• Updated traffic signal and optimized timings
• Widen all approaches to provide exclusive turning lanes

The Susquehanna Trail and Copenhaffer Road intersection is currently stop-controlled and experiences congestion. The following improvements would be necessary by 2027:

• Installation of a traffic signal
• Widen northbound Susquehanna Trail to provide a separate left-turn lane
• Closure of Copenhaffer Road between Susquehanna Trail and Canal Road

During the stakeholder outreach process, safety concerns were noted at the intersection of Canal Road and Zions View Road. Furthermore, truck traffic is expected to increase with the development of more warehouse facilities. The following improvements would be necessary by 2027:

• Installation of traffic signal
• Realignment of Zions View Road
• Widen all approaches to provide separate turning lanes

The Canal Road study area includes the intersections along Canal Road at Espresso Way and Zions View Road in East Manchester Township. This study area also includes the intersections of Canal Road and Copenhaffer Road, Canal Road and Susquehanna Trail, as well as Susquehanna Trail and Copenhaffer Road in Conewago Township.

Sharp curve along NB Canal Road approach at Zions View Road

Narrow approach along NB Susquehanna Trail

Susquehanna Trail and Copenhaffer Road
### Table 27 - Canal Road (S.R. 0921) Area Improvements and Estimated Costs

<table>
<thead>
<tr>
<th>Location</th>
<th>Improvement</th>
<th>Estimated Cost</th>
<th>Exhibit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susquehanna Trail (S.R. 0295) and Canal Road (S.R. 0921)</td>
<td>Updated signal and corresponding roadway improvement</td>
<td>$1.6 million</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Signal Optimization</td>
<td>$30,000</td>
<td>22</td>
</tr>
<tr>
<td>Susquehanna Trail (S.R. 0295) and Copenhaffer Road</td>
<td>Updated signal and corresponding roadway improvements</td>
<td>$800,000</td>
<td>22</td>
</tr>
<tr>
<td>Copenhaffer Road between Susquehanna Trail (S.R. 0295) and Canal Road (S.R. 0921)</td>
<td>Road closure</td>
<td>$200,000</td>
<td>22</td>
</tr>
<tr>
<td>Canal Road (S.R. 0921) and Zions View Road (S.R. 0921)</td>
<td>New Traffic signal and corresponding roadway improvements</td>
<td>$3.5 million</td>
<td>2</td>
</tr>
<tr>
<td>Canal Road (S.R. 0921) and Expresso Way</td>
<td>Signal Optimization</td>
<td>$30,000</td>
<td>Not pictured</td>
</tr>
</tbody>
</table>
Exhibit 22 — Canal Road (S.R. 0921) & Susquehanna Trail (S.R. 0295) Improvements

12.0 OTHER NETWORK INTERSECTIONS
Exhibit 23 – Canal Road (S.R. 0921) and Zions View Road Improvements
12.3 Susquehanna Trail—S.R. 0921 Area

The Susquehanna Trail study area includes the stop-controlled intersection of Susquehanna Trail and Cloverleaf Road in Conewago Township.

During the stakeholder outreach process, safety concerns were noted at this intersection. Sight distance is limited due to the horizontal curves and steep grades. Future volumes depict heavy traffic volumes, high truck percentages, and congestion. The following improvements would be necessary by 2027:

- Installation of a traffic signal to be in a coordinated system with the signals at the I-83 ramp intersections
- Exclusive left-turn lanes along eastbound and westbound Susquehanna Trail

**Table 28 - Susquehanna Trail (S.R. 0921) and Cloverleaf Road Improvements and Estimated Costs**

<table>
<thead>
<tr>
<th>Location</th>
<th>Improvement</th>
<th>Estimated Cost</th>
<th>Exhibit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susquehanna Trail (S.R. 0295) and Cloverleaf Road</td>
<td>New traffic signal and corresponding roadway improvements</td>
<td>$ 1.0 million</td>
<td>24</td>
</tr>
</tbody>
</table>

WB approach of Cloverleaf Road

SB approach of Susquehanna Trail at Cloverleaf Road
12.4 Manchester Borough Intersections

The Manchester Borough intersections include Zions View Road/Musser Street and York Street, Main Street and Musser Street, and Main Street and Maple Street.

The intersection of Zions View Road/Musser Street and York Street is stop-controlled on all four approaches and operates with high delay and long vehicle queues primarily during the peak commuter hours. The following improvements would be necessary by 2027:

- Installation of a traffic signal

The Musser Street and Main Street signalized intersection currently functions poorly particularly along the eastbound approach of Musser Street given the high traffic volumes and single lane approach. The following improvements would be necessary by 2027:

- Updated traffic signal and optimized signal timings
- Widen Musser Street to provide an exclusive NB left-turn lane and exclusive SB right-turn lane
- Widen northbound Main Street to provide an exclusive left-turn lane

Table 29—Manchester Borough Intersection Improvements and Estimated Costs

<table>
<thead>
<tr>
<th>Location</th>
<th>Improvement</th>
<th>Estimated Cost</th>
<th>Exhibit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zions View Road and York Street</td>
<td>New/updated traffic signal and corresponding roadway improvements</td>
<td>$1 million</td>
<td>25</td>
</tr>
<tr>
<td>Main Street and Musser Street</td>
<td></td>
<td>$1 million</td>
<td>25</td>
</tr>
<tr>
<td>Main Street and York Street/Maple Street</td>
<td></td>
<td>$2.6 million</td>
<td>26</td>
</tr>
</tbody>
</table>

The Musser Street and Main Street signalized intersection currently functions poorly particularly along the southbound approach of Main Street given the high traffic volumes and single lane approach. The following improvements would be necessary by 2027:

- Updated traffic signal and optimized signal timings
- Widen southbound Main Street to provide an exclusive left-turn lane
Exhibit 25 - Musser Street/York Street and Musser Street/Main Street (S.R. 0181) Improvements

12.0 OTHER NETWORK INTERSECTIONS
12.5 Summary of Impacts (2027 Improvements)

The summary of impacts in Table 30 below corresponds to the 2027 improvements for Sinking Spring Road and the Canal Road (S.R. 0921) and Susquehanna Trail (S.R. 0295) intersection. While the impacts associated with the various improvements for both the Church Road and Susquehanna Trail area intersections are not listed here, they will be consistent in nature to a lesser degree to those found in the tables in the detailed interchange sections, which are associated with the larger scale improvements. These are presented as a planning level investigation of potential impacts. When specific projects are anticipated, a detailed evaluation of those impacts will need to be assessed at that time, as it may be prudent to plan for all listed improvements at the inception of the project.

This study did not prepare an assessment of noise impacts or stormwater management facilities. It is likely that the assessment of these facilities will require additional impact that may extend beyond the current impact boundary.

### Table 30 - 2027 Summary of Impacts

<table>
<thead>
<tr>
<th></th>
<th>Sinking Springs</th>
<th>Canal Road &amp; Susquehanna Trail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Wetlands (acres)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Stream Crossings (linear ft.)</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>Potential Sensitive Waste Sites (# of properties)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Listed/Eligible Above Ground Historic Places (# of properties)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Above Ground Structures &gt;50 years old (# of properties)</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Productive ASA</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Productive Agricultural Land</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Threatened and Endangered Species</td>
<td>1 conflict</td>
<td>1 conflict</td>
</tr>
<tr>
<td>Section 4(f) - Parks</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Section 4(f) - Historic/Potential Historic</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Impacted Parcels</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Significantly Impacted Parcels</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

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### 13.0 Summary of Recommended Improvements

This master plan examined both 2047 and 2027 land use and transportation trends. Specific locations were identified and transportation solutions developed and arrayed in a program for implementation by state and local governments, to address current need, as well as long term goals. A summary of the recommended improvements per project section is detailed below:

### I-83 Mainline and Interchange Sections

#### I-83 Mainline Section

- Widen and Reconstruct I-83 to 6-lanes

#### Exit 24 Interchange Section

**Church Road and I-83 ramp signalized intersections**

- Updated traffic signal improvements and timing optimization
- Advanced signal control (adaptive)
- Realignment of on/off ramps (update to current standards)
- Exclusive right-turn lane along SB off-ramp
- Update exclusive westbound right-turn lane along Church Road at SB off-ramp
- Update exclusive southbound right-turn lane along Board Road
- Additional through lane to Board Road along NB off-ramp
- Replacing the Church Road bridge over I-83 to provide additional travel and turning lanes

**Exit 26 Interchange Section**

- New Canal Road interchange interchanges
  - Construction of NB only off-ramp
  - Construction of partial interchange
  - Replacing the I-83 bridge over Canal Road to provide additional travel and turning lanes
  - Construction of a Full Diamond Interchange

**Exit 28 Interchange Section**

**Susquehanna Trail and I-83 ramp signalized intersections**

- Updated traffic signal improvements and timing optimization
- Advanced signal control (adaptive)
- Realignment of on/off ramps (update to current standards)
- Exclusive right-turn lane along SB off-ramp
- Exclusive right-turn lane along EB Susquehanna Trail
- Road closure of Locust Point Road
- Replacing the Susquehanna Trail bridge over I-83 to provide additional travel and turning lanes
- SPUI Configuration

### Other Network Intersections

<table>
<thead>
<tr>
<th>Location</th>
<th>Description of Improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Church Road area in Manchester Township</strong></td>
<td></td>
</tr>
<tr>
<td>Church Road and Susquehanna Trail</td>
<td>Updated traffic signal and optimizing timings</td>
</tr>
<tr>
<td></td>
<td>Exclusive right-turn lane along WB Church Road</td>
</tr>
<tr>
<td></td>
<td><strong>Church Road/Starview Road and George Street</strong></td>
</tr>
<tr>
<td></td>
<td>Updated traffic signal and optimized timings</td>
</tr>
<tr>
<td></td>
<td><strong>George Street and Emig Road</strong></td>
</tr>
<tr>
<td></td>
<td>Updated traffic signal and optimized timings</td>
</tr>
<tr>
<td></td>
<td>Updated traffic signal and optimized timings</td>
</tr>
<tr>
<td></td>
<td>Widen Emig Road to provide separate left and right-turn lanes</td>
</tr>
<tr>
<td></td>
<td>Widen NB George Street to provide exclusive right-turn lane</td>
</tr>
<tr>
<td></td>
<td><strong>Sinking Spring Road</strong></td>
</tr>
<tr>
<td></td>
<td>Extend to provide connection between Church Road and Susquehanna Trail</td>
</tr>
<tr>
<td><strong>Canal Road area</strong></td>
<td></td>
</tr>
<tr>
<td>East Manchester Township</td>
<td>Installation of a traffic signal</td>
</tr>
<tr>
<td>Canal Road and Zion’s View Road</td>
<td>Realignment of Zion’s View Road</td>
</tr>
<tr>
<td></td>
<td>Widen all approaches to provide separate turning lanes</td>
</tr>
<tr>
<td><strong>Canal Road and Espresso Way</strong></td>
<td>Optimized traffic signal timings</td>
</tr>
<tr>
<td><strong>Conewago Township</strong></td>
<td></td>
</tr>
<tr>
<td>Canal Road and Susquehanna Trail</td>
<td>Updated traffic signal and optimizing timings</td>
</tr>
<tr>
<td></td>
<td>Widen all approaches to provide exclusive turning lanes</td>
</tr>
<tr>
<td><strong>Susquehanna Trail and Copenhagen Road</strong></td>
<td>Installation of a traffic signal</td>
</tr>
<tr>
<td></td>
<td>Widen NB Susquehanna Trail to provide a separate left-turn lane</td>
</tr>
<tr>
<td></td>
<td>Closure of Copenhagen Road between Susquehanna Trail and Canal Road</td>
</tr>
</tbody>
</table>

### 13.0 SUMMARY OF RECOMMENDED IMPROVEMENTS
### Other Network Intersections

**Susquehanna Trail area in Conewago Township**
- **Susquehanna Trail and Cloverleaf Road**
  - Installation of a traffic signal to be in a coordination system with the signals at the I-83 ramp intersections
  - Exclusive left-turn lanes along EB and WB Susquehanna Trail

- **Locust Point Road**
  - Road closure

**Manchester Borough Intersections**
- **Zions View Road/Musser Street and York Street**
  - Installation of a traffic signal

- **Musser Street and Main Street**
  - Updated traffic signal and optimizing signal timings
  - Widen Musser Street to provide an exclusive left-turn lane and exclusive right-turn lane
  - Widen NB Main Street to provide an exclusive left-turn lane

- **Main Street and York Street/Maple Street**
  - Updated traffic signal and optimized signal timings
  - Widen SB Main Street to provide an exclusive left-turn lane

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The following photo rendering depicts a section of I-83 before and after it is widened and reconstructed to 6-lanes.

![Before](image1)

![After](image2)

**13.0 SUMMARY OF RECOMMENDED IMPROVEMENTS**