state college area
CONNECTOR

PennDOT.gov/SCAC

DEIS Alternatives Traffic and Safety Analysis Technical Memorandum

for the State College Area Connector Project

Pennsylvania
Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

July 2025

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LIST OF ACRONYMS

AADT	Annual Average Daily Traffic
ADTT	Average Daily Truck Traffic
BLOS	Bicycle Level of Service
CCMPO	Centre County Metropolitan Planning Organization
CRPA	Centre Regional Planning Agency
D-factor	Peak Hour Directional Factor
EB	Eastbound
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
GIS	Geographic Information Systems
HCM	Highway Capacity Manual
HSM	Highway Safety Manual
I-	Interstate
K-factor	Peak Hour Traffic Factor
LOS	Level of Service
LRTP	Long Range Transportation Plan
mph	Miles per Hour
NB	Northbound
NEPA	National Environmental Policy Act
NHS	National Highway System
PA	Pennsylvania Route
PCIT	Pennsylvania Crash Information Tool
PEL	Planning and Environmental Linkages
PennDOT	Pennsylvania Department of Transportation
PSI	Potential for Safety Improvement

SB	Southbound
SCCCTS	South Central Centre County Transportation Study
T-factor	Peak Hour Truck Factor
TDM	Travel Demand Model
TIP	Transportation Improvement Program
US	U.S. Route
VPD	Vehicles per Day
WB	Westbound

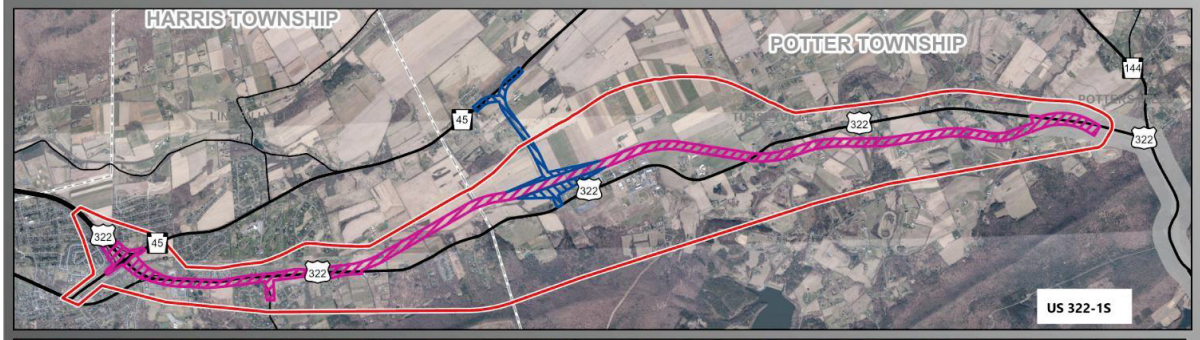
I. Introduction and Background

The Pennsylvania Department of Transportation (PennDOT), in cooperation with the Federal Highway Administration (FHWA) and in coordination with the Centre County Metropolitan Planning Organization (CCMPO), is advancing the transportation studies that were developed during the State College Area Connector Project Planning and Environmental Linkages (PEL) Study which was finalized in June 2023.

This document is a refinement of the traffic engineering and safety analysis performed during the State College Area Connector (SCAC) PEL Study and documented in the supporting Traffic Engineering Memorandum, dated February 2023.

These refinements include supplemental traffic volume data and historical crash data for the project area roadways. The supplemental traffic volume data was needed for additional traffic analysis locations (intersections) included for analysis of the "PEL Study Reasonable Alternatives to Advance for Further Study", which are shown in **Figure 1**. Within this document, these recommended alternatives will be referred to as the EIS Alternatives.

This technical memorandum documents the traffic and safety analyses performed for EIS Alternatives for Future Year (2050 Design Year).



LEGEND

- US 322-1OEX
- US 322-1S
- US 322-5
- Potters Mills Gap Transportation Project
- Township
- Municipality/Borough
- Project Area
- PA 45/Connector/Interchange Removed Post-PEL Study

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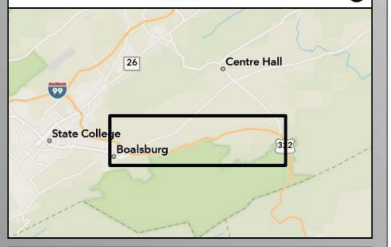
DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA

INDEX MAP



State College Area Connector

PEL STUDY REASONABLE ALTERNATIVES TO ADVANCE FOR FURTHER STUDY

HARRIS AND POTTER TOWNSHIPS
CENTRE COUNTY, PENNSYLVANIA

Figure 1	1 Inch = 4,000 Feet

II. Build Alternatives

A. US 322 / PA 45 Interchange

i. Consideration of US 322/PA 45 Interchange Types

With removal of the PA 45 Connector and Midpoint Interchange from further study on the SCAC project as documented in *Pre-NEPA Activities (Interchange Access Concepts & Analysis) Technical Memorandum, July 2025*, the focus was on the development and detailed analysis associated with advancement of Interchange Concept Scenario B, which involved providing full access interchange movements directly between US 322 and PA 45 (Earlystown Road).

At the outset of the development of interchange alternatives, a sensitive residential community was located along PA 45 directly adjacent to US 322 in the southeast quadrant. It was determined that interchange designs would need to limit impacts to this noted sensitive property. Initial discussions suggested consideration of interchange types that would have a reduced footprint while still providing acceptable traffic operational capacity and efficiency capable of handling the projected design year traffic.

During consideration of various interchange types, it was also noted that high-level constructability impacts should be considered as traffic would need to be maintained on US 322 throughout construction of the interchange. To aid in this, shifts to the US 322 mainline were advanced to better accommodate the construction of a new mainline bridge east of the existing bridge and accommodate a new ramp in the southeast quadrant away from the sensitive property.

Alternative interchange types that were identified for consideration included the following:

- Conventional Diamond (add new ramps to/from east intersecting PA 45 at existing ramp terminals)
- Tight Urban Diamond
- Single Point Urban Interchange (SPUI)
- Diamond Interchange with Roundabouts at Ramp Terminals
- Diverging Diamond

A Diverging Diamond Interchange (DDI) was conceptually considered. However, impacts to all interchange quadrants would be more extensive than the impacts of the other diamond ramp

configurations being considered due to the size (footprint) of a typical DDI layout needed to accommodate horizontal roadway alignment shifts on PA 45, provide channelized islands for left and right turning movements on an off the ramps, and provide adequate storage length for queuing of vehicles between the ramp signalized intersections. These impacts would likely include the sensitive property in the southeast quadrant, as well as impacts to the existing properties along the north sides of PA 45 and US 322 (that could include a Native American area of concern). A DDI would also present conflicts and operational concerns with a new intersection on PA 45 for a new local connection to local 322 (Old 322). Therefore, a DDI interchange was removed from further consideration as a feasible full access interchange alternative.

Preliminary conceptual geometric layouts of the other four interchange types listed above were developed for the PA 45 Interchange area and are shown in **Appendix A**.

ii. Future Design Year (2050) Traffic Volume Refinement

The TDM was utilized to develop and refine Year 2050 Build Traffic volume projections for each of the build alternative(s) layouts discussed above using a similar approach. Network enhancements were coded in the TDM for the build scenarios. The link volumes from each Build Alternative model run were then compared with the corresponding No-Build TDM model run volumes to estimate the change in volume throughout the project area network, with some adjustment using engineering judgement to develop balanced volumes throughout the project area. During refinement of the traffic volume projections several select link analyses were also performed. Select link analyses (SLA) were run from the TDM to aid in developing traffic forecasts. An SLA provides the traffic analyst with origin-destination traffic flows on a single link of a roadway network. The base TDM used for the SCAC project has been calibrated with recent origin-destination data obtained from the Streetlight Data platform. Using the SLA feature of the TDM is a useful tool in predicting/estimating traffic volumes, particularly for a new roadway facility, as the SLA helps analysts understand where traffic comes from and where it is going.

These select link analyses indicated that regardless of the interchange type, a new local roadway connecting existing Route 322 directly to PA 45 to the east of US 322 (between the interchange ramps and Indian Hill Road) would enhance local road network circulation and lessen the burden of additional traffic at the intersection of Business Route 322/PA 45 (Earlystown Road)-Main Street in Boalsburg, as well as reduce the amount of traffic (including local traffic and deliveries on US 322 east of Boalsburg and to Tussey Mountain Ski an Recreation) that would likely use Elks Club Road as a cut-thru.

Another access consideration identified for this area that would affect traffic patterns and volumes at the intersection of Business Route 322 (Boal Avenue)/PA 45/Main Street included the extension of existing Boal Avenue across US 322 to connect as a 'T' intersection with the new Old 322 local connector road, or the cul-de-sacing of existing Boal Avenue on the south side of US 322 (which would eliminate the need for a structure carrying US 322 over Boal Avenue).

Figure 2 below provides an illustration of the new Old 322 Connector Road and the 'T' connection with extension of existing Boal Avenue across US 322.

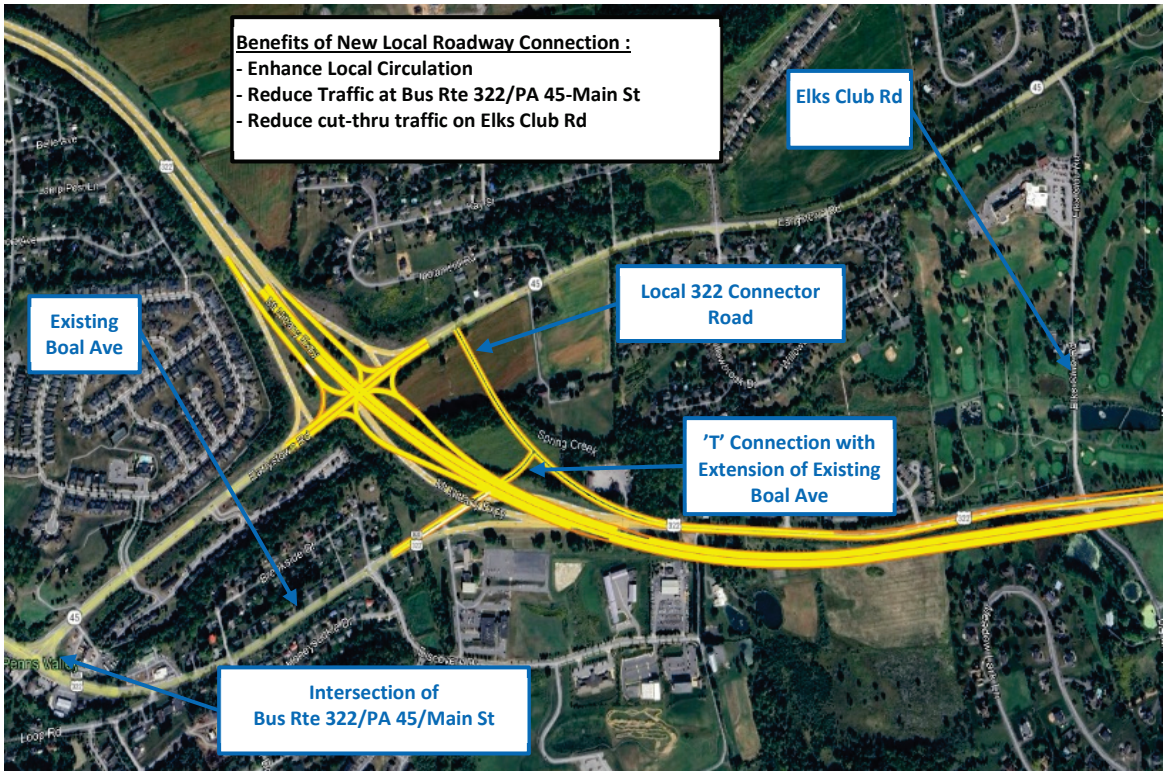


FIGURE 2 – LOCAL 322 CONNECTOR ROAD

Year 2050 AM/PM peak hour volume projections were developed for the PA 45 and Business Route 322 (Boal Avenue) area with and without the new Old 322 local connector road, as well as the extension or cul-de sacing of existing Boal Avenue. These projections are contained in **Appendix B**. **Table 1** provides a comparison of the Year 2050 AM and PM peak hour volumes entering the intersection of Boal Avenue/PA 45/Main Street for No-Build as well as several configurations with and without the Old 322 Connector Road, which shows total volume entering the intersection is

lowest with the Local 322 Connector Road and connection to the existing Boal Avenue/Discovery Drive intersection.

Table 1: Comparison of Boal Avenue/PA 45/Main Street Intersection Volumes

Local Roadway Network Configuration	Sum of Turning Movement Volumes Entering Intersection (Design Year 2050)	
	AM	PM
No-Build	1,560	1,765
With Local 322 Connector Road Extended to PA 45 and 'T'-connection with Boal Avenue	1,340	1,610
With Local 322 Connector Road Extended to PA 45 but no 'T'-connection with Boal Avenue	1,530	1,840
Without Local 322 Connector Road	1,480	1,800

Year 2050 Build traffic volume projections are contained in **Appendix B**. The volume projections for the proposed EB on- and WB off-ramps at PA 45 are consistent and similar to the corresponding SR 3014 Ramp Year 2050 No-Build traffic volume projections The ramp ADT for each ramp is approximately 3,000 vehicles per day (vpd) and design hour volumes are between 300 and 400 vehicles. The majority of traffic utilizing these ramps would come from/head to Business Route 322 (SR 3014). Select link analysis also shows the majority of traffic using the new Local 322 Connector Road would come from or head to US 322 (Mt. Nittany Expressway) on the west.

iii. Future Design Year (2050) Operational Analyses

Traffic operational analyses of PA 45 were performed for the interchange alternatives, with the new Local 322 Connector Road and the 'T' intersection with Boal Avenue, using the Synchro/SimTraffic software for conventional signalized and unsignalized intersection analyses, as well as for single lane roundabout intersection analyses. LOS and delay are based on HCM methodology. Reported vehicle queues for signalized and unsignalized intersections are 95th Percentile Queues results from the Synchro Queue Report. Microsimulation was run for the roundabout queuing evaluation using SimTraffic; five runs were performed with the reported 95th Percentile queue lengths for each roundabout approach determined from an average of the five runs.

The following discussion provides a summary of operational results of the interchange alternatives and intersection options considered/developed for the Boalsburg area; the referenced analysis results (LOS, delay, and queue lengths) are shown in **Table 2**. The detailed HCM and queue reports are contained in **Appendix C**.

PA 45 Interchange

Traffic analysis results of the PA 45/US 322 interchange ramp intersection(s) show acceptable LOS (LOS D or better) for the various interchange alternatives; however, the 95th percentile queue results show extensive queueing of nearly 900 feet from the interchange ramps in the southbound direction without widening PA 45 to provide two through lanes in each direction. The Tight Urban Diamond Alternative would require widening of PA 45 to a six-lane section adjacent to the interchange to accommodate side-by-side left turn lanes. The SPUI Alternative (with Boal Avenue 'T' Connection) would require widening of PA 45 to a five-lane section to accommodate left turns from PA 45 onto the ramps. With widened PA 45, expected 95th percentile queues on PA 45 would be less than 200 feet in either direction for the SPUI interchange alternative. For the Diamond with Roundabouts Interchange queues less than 200 feet would be expected southbound at the interchange ramps and between 300 and 400 feet in the northbound direction.

Local 322 Connector Road

A new intersection of the new Old 322 local connector road at PA 45 considered three types of intersection control; unsignalized, signalized, and roundabout. The unsignalized analyses resulted in unacceptable LOS E conditions. With traffic signal control or as a roundabout, this intersection would operate at acceptable LOS. Comparison of the 95th percentile queue lengths at this intersection indicates that peak hour queuing would be less on all approaches with a roundabout.

Comparison of Interchange/Intersection Configurations

Concern with potential operational issues as a result of vehicle queuing on PA 45 between the SR 322 Interchange ramp intersection(s) and the Local 322 Connector Road intersection has been noted. Therefore, a comparison of the operational results for combinations of interchange and intersection types was made (e.g., Tight Urban Diamond Interchange with Traffic Signal control at Local 322 Connector Road, SPUI Interchange with Roundabout control at Local 322 Connector Road, etc.); which indicates that a roundabout at the Local 322 Connector Road intersection combined with the SPUI Interchange Alternative would result in the least amount of peak hour queuing. Review of the summary table results shown in **Table 2** and the corresponding microsimulation gives no indication of peak hour traffic backups normally occurring on PA 45 between these adjacent intersections that would result in gridlock conditions.

Table 2. US 322/PA 45 Interchange Alternative Levels of Service and Queuing

INTERSECTION					LEVEL OF SERVICE (LOS), DELAY (AVERAGE SECONDS/VEHICLE), AND QUEUES (FEET)																	
					ALT 2 (TIGHT URBAN DIAMOND)						ALT 4 (SPUI WITH CONNECTOR AND T)						DIAMOND WITH ROUNDABOUTS					
					LOS		DELAY (SEC/VEH)		95th %-TILE QUEUE		LOS		DELAY (SEC/VEH)		95th %-TILE QUEUE		LOS		DELAY (SEC/VEH)		95th %-TILE QUEUE	
#	Name	Int. Control	Area Type		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
5	PA 45/US 322 EB Ramps	Signal	Urban/ Suburban	EB Left/Thru/Right	C	D	26.9	52.4	78	**303#**	-	-	-	-	-	-	-	-	-	-	-	-
				NB Thru	B	C	16.0	29.7	94	349	-	-	-	-	-	-	-	-	-	-	-	-
				NB Right	B	B	14.2	19.4	24	44	-	-	-	-	-	-	-	-	-	-	-	-
				SB Left	B	D	12.1	24.1	24	35	-	-	-	-	-	-	-	-	-	-	-	-
				SB Thru	A	A	0.3	0.2	60	58	-	-	-	-	-	-	-	-	-	-	-	-
				INT	**A**	**C**	**8.3**	**27.9**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	PA 45/US 322 WB Ramps	Signal	Urban/ Suburban	WB Left/Thru/Right	D	D	50.7	46.7	242	175	-	-	-	-	-	-	-	-	-	-	-	-
				NB Left	E	D	55.7	53.5	90	122	-	-	-	-	-	-	-	-	-	-	-	-
				NB Thru	A	B	0.1	19.0	38	141	-	-	-	-	-	-	-	-	-	-	-	-
				SB Thru/Right	B	A	11.3	9.5	186	62	-	-	-	-	-	-	-	-	-	-	-	-
				INT	**C**	**C**	**23.0**	**26.0**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 & 6	PA 45/US 322 EB/WB Ramps	SPUI Signal	Urban/ Suburban	NB Left	-	-	-	-	-	-	B	B	19.0	16.2	71	90	-	-	-	-	-	-
				NB Thru	-	-	-	-	-	-	A	B	8.6	11.3	36	104	-	-	-	-	-	-
				NB Right	-	-	-	-	-	-	A	A	0.0	0.0	26	46	-	-	-	-	-	-
				SB Left	-	-	-	-	-	-	B	C	20.0	20.9	41	33	-	-	-	-	-	-
				SB Thru	-	-	-	-	-	-	B	B	11.0	12.7	103	52	-	-	-	-	-	-
				SB Right	-	-	-	-	-	-	A	A	0.0	0.0	55	43	-	-	-	-	-	-
				EB Left	-	-	-	-	-	-	B	B	14.7	13.1	72	227#	-	-	-	-	-	-
				EB Right	-	-	-	-	-	-	A	A	0.0	0.0	0	0	-	-	-	-	-	-
				WB Left	-	-	-	-	-	-	B	B	14.1	14.6	163	99	-	-	-	-	-	-
				WB Right	-	-	-	-	-	-	A	A	0.0	0.0	0	0	-	-	-	-	-	-
				INT	-	-	-	-	-	-	**B**	**B**	**12.9**	**13.2**	-	-	-	-	-	-	-	-
100	PA 45/Old 322 Connector	Signal	Urban/ Suburban	WB Left/Right	D	D	45.0	51.5	154	154	C	B	23.8	18.5	88	82	-	-	-	-	-	-
				NB Thru	A	A	5.5	5.8	26	386	A	A	4.3	7.7	70	256	-	-	-	-	-	-
				NB Right	A	A	4.7	3.5	1	21	A	A	3.8	4.7	12	20	-	-	-	-	-	-
				SB Left	A	A	6.1	8.4	11	30	A	B	4.9	11.7	11	29	-	-	-	-	-	-
				SB Thru	B	A	12.3	3.8	462	93	B	A	10.7	5.0	**523#**	83	-	-	-	-	-	-
				INT	**B**	**B**	**14.8**	**11.1**	-	-	**B**	**A**	**10.9**	**8.4**	-	-	-	-	-	-	-	-
100	PA 45/Old 322 Connector	Roundabout (95th %-tile Queue from Simtraffic)	Urban/ Suburban	WB Left/Right	A	A	4.9	8.6	47	63	A	A	4.9	8.6	41	57	A	A	4.9	8.6	52	60
				NB Thru	A	A	4.2	8.9	27	119	A	A	4.2	8.9	13	103	A	B	4.6	11.5	16	86
				NB Right	A	A	3.0	3.8	6	18	A	A	3.0	3.8	0	14	-	-	-	-	-	-
				SB Left/Thru	C	A	17.2	5.7	513	62	C	A	17.2	5.7	433	52	C	A	17.2	5.7	489	54
				INT	**B**	**A**	**13.0**	**7.5**	-	-	**B**	**A**	**13.0**	**7.5**	-	-	**B**	**A**	**13.1**	**9.7**	-	-
5	PA 45/US 322 EB Ramps	Roundabout (95th %-tile Queue from Simtraffic)	Urban/ Suburban	EB Left/Thru/Right	-	-	-	-	-	-	-	-	-	-	-	-	B	B	12.3	12.4	94	210
				NB Left/Thru	-	-	-	-	-	-	-	-	-	-	-	-	A	B	4.9	14.0	36	394
				NB Right (bypass)	-	-	-	-	-	-	-	-	-	-	-	-	A	A	0.0	0.0	-	-
				SB Left/Thru/Right	-	-	-	-	-	-	-	-	-	-	-	-	A	A	9.7	5.3	50	16
				INT	-	-	-	-	-	-	-	-	-	-	-	-	**A**	**A**	**8.6**	**8.9**	-	-
6	PA 45/US 322 WB Ramps	Roundabout (95th %-tile Queue from Simtraffic)	Urban/ Suburban	WB Left/Thru/Right	-	-	-	-	-	-	-	-	-	-	-	-	A	C	7.8	15.7	102	97
				NB Left/Thru/Right	-	-	-	-	-	-	-	-	-	-	-	-	A	B	5.0	12.1	42	306
				SB Left/Thru	-	-	-	-	-	-	-	-	-	-	-	-	B	A	12.3	6.2	112	57
				SB Right (bypass)	-	-	-	-	-	-	-	-	-	-	-	-	A	A	0.0	0.0	-	-
				INT	-	-	-	-	-	-	-	-	-	-	-	-	**A**	**B**	**6.3**	**10.4**	-	-

Notes:
- 95th %tile volume exceeds capacity, queue may be longer.

iv. Future Design Year (2050) HSM Analyses

Highway Safety Manual (HSM) analyses were completed for the Design Year (2050) to evaluate the safety performances of three different interchange facility types. As noted earlier in this document, the HSM provides analytical tools and techniques to evaluate how design elements impact safety before design decisions are made during the planning and preliminary design phases. These HSM analyses were performed in accordance with HSM procedures in the HSM Manual and PennDOT Publication 638A. PennDOT Toolbox A spreadsheet was utilized for analysis of non-limited access facilities, consisting of rural two-lane roadways and urban/suburban arterials. The interchange Safety Analysis Tool Enhanced (ISATe) spreadsheet was utilized to analyze limited access freeways, including interchange ramps and ramp terminals. For each alternative, HSM methodologies and tools were utilized to determine Design Year (2050) Predicted crash frequencies for various roadways and facility types within the project limits.

Diamond Interchange (conventional or tight urban)

Safety analysis for this alternative at US 322 and PA 45 was performed utilizing the ISATe spreadsheet. It should be noted that since the existing interchange is a partial diamond, safety analysis of the Diamond Interchange ramp terminals were performed using the ramp terminal analysis procedure in ISATe for the conceptual full diamond interchange developed, with no Crash Modification Factor (CMF) adjustment applied.

Diamond with Roundabouts at Ramp Terminals

Safety analysis for this alternative at US 322 and PA 45 was also performed utilizing the ISATe spreadsheet (freeway and ramps segments only). The current version of the HSM does not include Safety Performance Functions (SPFs) to analyze roundabouts at ramp terminals. Roundabouts are typically analyzed by applying an appropriate CMF to signalized or unsignalized intersections. For the purpose of this analysis, it was assumed that predicted crashes on the freeway and ramp segments of the Diamond and Diamond with Roundabout alternatives would be similar, since both are similar in geometry, traffic volume, etc. A CMF from the CMF Clearinghouse (CMF ID 11132) with a value of 0.604 was then applied to the predicted crash frequencies from the ramp terminals of the Diamond interchange to develop predicted crash frequencies at the ramp terminals (roundabouts). This CMF was selected partly because it applies to all crash types and severities and has a high total rating score of 95. Three additional similar CMFs were also compared to the selected CMF. Summary of all four CMFs is provided in **Appendix D**.

Single-Point Urban Interchange (SPUI)

Safety analysis for this alternative at US 322 and PA 45 was performed utilizing the ISATe spreadsheet (freeway and ramps segments only). The current version of the HSM does not include Safety Performance Functions (SPFs) to analyze this type of interchange. In addition,

there are no CMFs in the HSM or on the CMF Clearinghouse website to address this issue. Similar to the Diamond with Roundabouts alternative, it was assumed that crashes on the freeway and ramp segments of the Diamond and SPUI interchange types would be similar, since both are similar in geometry, traffic volume, etc. For the ramp terminals, a SPF was utilized to develop predicted crash frequencies at the intersections. Development and applicability of the SPF is described in Chapter 8 of the NCHRP Document 297 *"Intersection Crash Prediction Methods for the Highway Safety Manual (2021)"*. This document was recommended to the design team by Kittleson & Associates, Inc., who work directly with the PennDOT Safety Engineering & Risk Management Unit in developing, updating, and providing training on the use of the PennDOT HSM Tools. Chapter 8 of the document is provided in **Appendix D**. The complete document can be viewed by clicking on the following link on the National Academies link:

https://nap.nationalacademies.org/catalog/26153/intersection-crash-prediction-methods-for-the-highway-safety-manual

Table 3 below provides a summary comparison of the HSM results (Predicted Number of Annual Crash Frequencies) of the Ramp Terminals for the three analysis types analyzed, with the breakdown of All Crashes, Fatal/Injury Crashes, and Property Damage Only (PDO) Crashes shown. These results indicate that the crash frequencies for the SPUI would be the lowest, followed by the Diamond with Roundabouts. The Diamond Interchange would have the highest crash frequencies.

Table 3: HSM Analysis of US 322/PA 45 Interchange Alternatives

Roadway Facility	Predicted Number of Annual Crashes (Design Year 2050)		
	Diamond Interchange	Diamond Interchange with Roundabouts	SPUI Interchange
Predicted Crash Frequency (All crashes)	4.7	2.8	2.0
Predicted Crash Frequency (Fatal & Injury crashes)	2.3	1.4	0.6
Predicted Crash Frequency (PDO crashes)	2.4	1.4	1.4

B. US 322 / PMG Interchange

Modifications at the eastern end of the project are necessary to tie in the limited-access roadway with the existing PMG Interchange and provide the necessary local east-west roadway access in this area. The following three scenarios were considered for the local road connections in the Potters Mills area.

- Reconfiguration of the existing PMG Interchange roundabout with connections to the westbound ramps into a 5-leg roundabout
- Reconfiguration of the westbound ramps and replacement of the roundabout with a traditional T-intersection
- Maintain existing PMG Interchange and tie new ramps to the existing roundabout with connection to local 322 from the westbound ramp

Evaluation of these scenarios showed all the concepts were feasible; however, some operational concerns were noted with the traditional T-intersection due to the close spacing between the westbound ramp's intersection and the intersection with Old Route 322. In addition, with no noted operational or safety deficiency with the existing configuration, it did not seem economically prudent to modify the recently constructed existing roundabout. Therefore, it was decided to advance the project by keeping the existing roundabout and interchange configuration, except with modifications of the tie-in to the western leg of the roundabout a few hundred feet to the west to provide US 322 WB on-ramp and Local 322 access.

C. New US 322 Limited Access Facility and Local Roadways

i. Traffic Access, Circulation, and Design Year (2050) Traffic Volumes

With no additional interchange access to the new four-lane limited access US 322 roadway between the PA 45 and Potters Mills Gap (PMG) Interchanges, travel patterns and access within this section of the US 322 corridor will be the same regardless of the EIS Alternative. Even though areas of reconstruction/relocation of the existing two-lane "Old Route 322" roadway vary between the Alternatives, there are no major changes in traffic access and circulation within the project area.

ADT's and AM and PM peak hour volumes were developed for the project area roadways intersections per the methodology described earlier in Section II.A.ii. **Table 4** shows Year 2050 No-Build and Build ADT volumes for project area roadways. **Appendix B** contains figures showing the AM and PM peak hour volumes.

Table 4: Year 2050 Volume Summary (Segment ADT) for No-Build and Build

Roadway	Segment		ADT Volume (% trucks)	
	From	To	Year 2050 No-Build	Year 2050 Build
US 322	SR 3010 I/C	PA 45 I/C	**22,700** *(20%)*	**26,200** *(20%)*
	PA 45 I/C	PMG I/C	**13,650-18,350** *(23-29%)*	**26,400** *(24%)*
	PMG I/C	Seven Mtns I/C	**23,900** *(22%)*	**23,900** *(22%)*
PA 45	Boalsburg Rd	Boal Ave	**13,350** *(3%)*	**13,500** *(3%)*
	Bus Rte 322	US 322 I/C Ramps	**8,400** *(4%)*	**11,200** *(3%)*
	US 322 I/C Ramps	New Old Rt 322 Connector Rd	**10,450** *(5%)*	**12,400** *(5%)*
	New Old Rt 322 Connector Rd	Indian Hill Rd	**10,450** *(5%)*	**9,800** *(5%)*
Boal Avenue	PA 45	US 322/Old Rt 322	**7,850** *(4%)*	**3,400** *(5%)*
Old Rt 322	PA 45	Elks Club Rd	**18,350** *(23%)*	**3,400** *(5%)*
	Elks Club Rd	Wagner Rd/Taylor Hill Rd	**17,400** *(24%)*	**2,000-2,400** *(5%)*
	Wagner Rd/Taylor Hill Rd	Mountain Back Rd/ Red Mill Rd	**17,400** *(24%)*	**1,000** *(5%)*

ii. Design Year (2050) Operational Analyses

Capacity analyses were performed for the project area intersections and roadways for the Year 2050 Build volumes. The results of these analyses are summarized in the tables below (**Table 5** and **Table 6**). Detailed HCM worksheets are contained in **Appendix C**. As illustrated in **Figure 3**, these results show that all project area intersections and the proposed US 322 limited access roadway sections and ramp entrances and exits will operate at acceptable LOS.

Table 5: Year 2050 Intersection Levels of Service Summary (No-Build and Build)

Intersection	Design Year (2050) No-Build		Design Year (2050) Build	
	Morning	Evening	Morning	Evening
Bus Rt 322 (Boal Ave) & PA 45 (Earlystown Rd)-Main St	A	A	A	A
Bus Rt 322 (Boal Ave) & Discovery Dr	A	A	A	A
PA 45 & US 322 EB Ramp	A	C	B	B
PA 45 & US 322 WB Ramp	a	a		
PA 45 & Old Rt 322 Connector Rd**	-	-	b	a
Old Rt 322 Connector Rd & Boal Ave	-	-	b	a
US 322 & Elks Club Road-Bear Meadows Rd	f	f	a	b
US 322 & Wagner Rd	d	f	a	a
US 322 & Taylor Hill Rd	e	f	a	a
US 322 & Neff Rd	c	c	a	a
US 322 & Church Hill Rd	d	e	a	a
US 322 & Dogtown Rd	c	c	a	a
US 322 & Red Mill Rd-Mountain Back Rd	d	f	a	a
Old Rt. 322 & US 322 EB Ramps	b	b	a	b
Old Rt 322 & US 322 WB Off-ramp (existing roundabout)	a	a	a	a
Old Rt 322 & PA 144	a	b	b	b
Old Rt 322 & US 322 WB On-ramp (PMG)	-	-	a	a

A – Signalized Level of Service (Expected Delay (seconds))

a – Unsignalized Level of Service

red – LOS Unacceptable

Table 6: Year 2050 Segment and Freeway Levels of Service Summary (No-Build and Build)

Roadway	Segment		Facility Type	Design Year (2050) No-Build		Design Year (2050) Build	
	From	To		Morning (EB/WB)	Evening (EB/WB)	Morning (EB/WB)	Evening (EB/WB)
US 322 Mainline	SR 3010 I/C	PA 45 I/C	Basic Freeway	A / B	B / A	A / B	B / A
	PA 45 I/C	PMG I/C	Basic Freeway	-	-	A / B	B / B
	PMG I/C	Seven Mtns I/C	Basic Freeway	A / A	A / A	A / B	B / B
PA 45 I/C Ramps	EB Off Ramp		Ramp Diverge	A / -	B / -	A / -	B / -
	EB On Ramp		Ramp Merge	- / -	- / -	A / -	B / -
	WB On Ramp		Ramp Merge	- / A	- / A	- / A	- / A
	WB Off Ramp		Ramp Diverge	- / -	- / -	- / A	- / A
PMG I/C Ramps	EB Off Ramp		Ramp Diverge	A / -	B / -	A / -	B / -
	EB On Ramp		Ramp Merge	A / -	A / -	A / -	B / -
	WB On Ramp		Ramp Merge	- / B	- / A	- / B	- / B
	WB Off Ramp		Ramp Diverge	- / A	- / A	- / A	- / A

iii. HSM Analyses

A Highway Safety Manual (HSM) analysis was performed for each EIS Build Alternative using PennDOT's HSM Safety Analysis Tool. The objective of this analysis was to evaluate the existing Local 322 and the new build alternative roadway with the corresponding ADT volume projections, calculating predicted crash frequencies for the roadways to compare the alternatives from a predicted safety perspective. This comparison would determine the quantitative predicted crash frequencies (of all crashes and of fatal and injury crashes) on the same roadways that could be attributable to the alternative.

The analysis utilized PennDOT's Toolbox A for analyzing all rural and urban two-lane and multi-lane arterial facilities. Interchange Safety Analysis Tool Enhanced (ISATe (PA-Calibrated)) was utilized for evaluating existing or proposed freeway/limited access facilities. Roadway design criteria (e.g., horizontal curvature, median width, shoulder width, lane width, lateral offset to obstructions such as concrete barrier) were determined from the conceptual preliminary alignments for each alternative and used as input(s) in Toolbox A or ISATe, as well as the ADT volume projections (which are identical for all alternatives). All HSM analysis worksheets are contained in **Appendix E**.

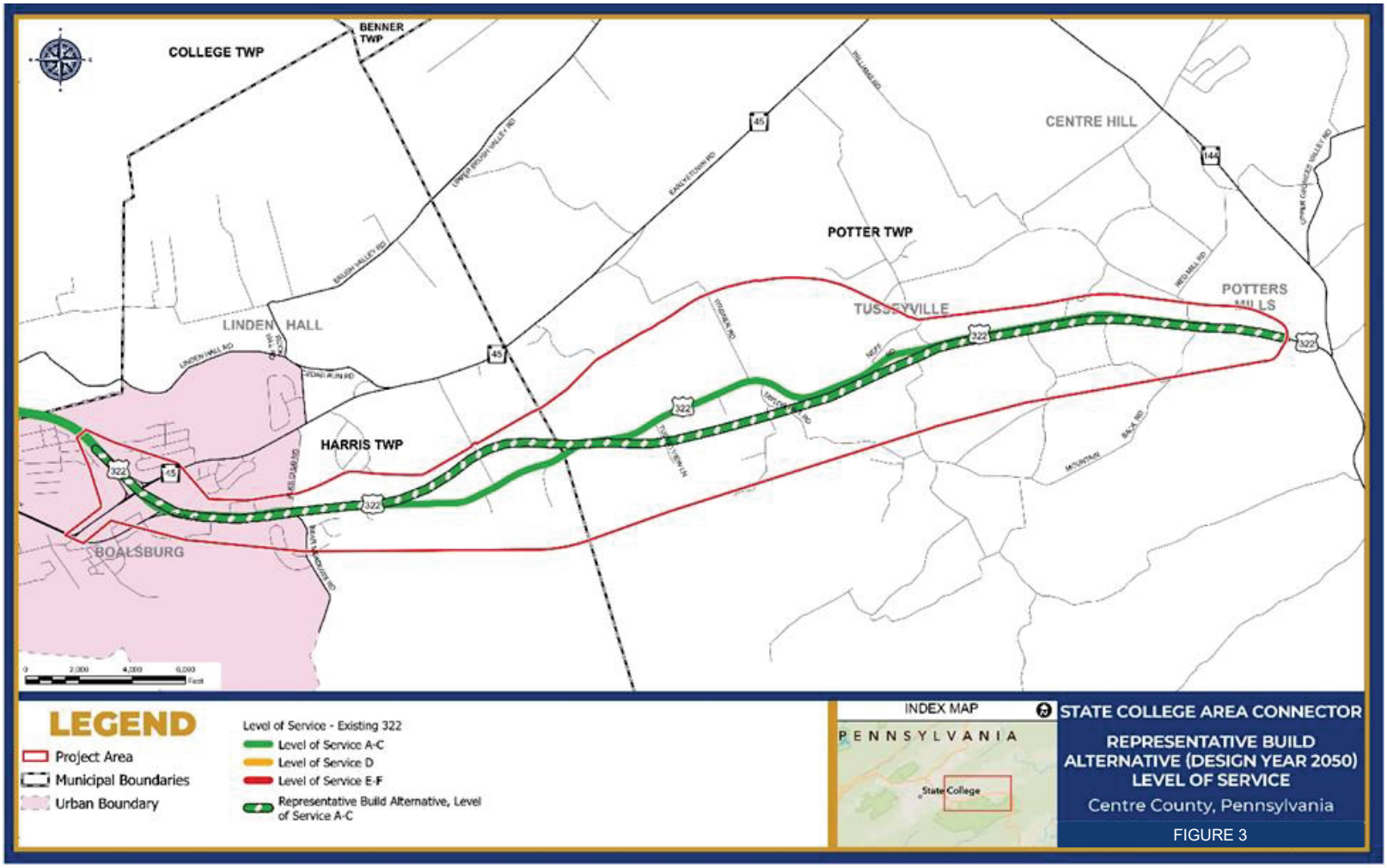

COLLEGE TWP
BENNER TWP
POTTER TWP
HARRIS TWP
CENTRE HILL
LINDEN HALL
TUSSEYVILLE
POTTERS MILLS
BOALSBURG
45
322
144
222
LEGEND
Project Area
Municipal Boundaries
Urban Boundary
Level of Service - Existing 322
Level of Service A-C
Level of Service D
Level of Service E-F
Representative Build Alternative, Level of Service A-C
INDEX MAP
PENNSYLVANIA
State College
STATE COLLEGE AREA CONNECTOR
REPRESENTATIVE BUILD ALTERNATIVE (DESIGN YEAR 2050) LEVEL OF SERVICE
Centre County, Pennsylvania

FIGURE 3

The results of the HSM analyses of each build alternative and the Year 2050 No-Build are summarized by interchange type (tight diamond, SPUI, and diamond with roundabouts) in **Table 7 thru Table 9;** each showing a comparison of the predicted number of annual crash frequencies (All Crashes and Fatal & Injury Crashes). Review of these results indicates that there is negligible difference in safety among the alternatives. Therefore, safety will not be a differentiator in the selection of a preferred alternative.

Table 7: HSM Analysis of EIS Alternatives for Tight Diamond at PA 45

Roadway Facility	Predicted Number of Annual Crashes (Design Year 2050)			
	No-Build	North Alternative	Central Alternative	South Alternative
Predicted Crash Frequency (All crashes)				
*Local 322**	*38*	*11*	*11*	*11*
New US 322 Limited Access Rdwy	*-*	*30*	*29*	*29*
Predicted Crash Frequency (Fatal & Injury crashes)				
*Local 322**	*20*	*6*	*6*	*6*
New US 322 Limited Access Rdwy	*-*	*13*	*13*	*13*

* Includes Local 322, new Local 322 Connector Road, and Boal Avenue

Table 8: HSM Analysis of EIS Alternatives for SPUI at PA 45

Roadway Facility		Predicted Number of Annual Crashes (Design Year 2050)		
	No-Build	North Alternative	Central Alternative	South Alternative
Predicted Crash Frequency (All crashes)				
*Local 322**	*38*	*11*	*11*	*11*
New US 322 Limited Access Rdwy	*-*	*30*	*29*	*29*
Predicted Crash Frequency (Fatal & Injury crashes)				
*Local 322**	*20*	*6*	*6*	*6*
New US 322 Limited Access Rdwy	*-*	*13*	*13*	*13*

* Includes Local 322, new Local 322 Connector Road, and Boal Avenue

Table 9: HSM Analysis of EIS Alternatives for Diamond with Roundabouts at PA 45

Roadway Facility		Predicted Number of Annual Crashes (Design Year 2050)		
	No-Build	North Alternative	Central Alternative	South Alternative
Predicted Crash Frequency (All crashes)				
*Local 322**	*38*	*11*	*11*	*11*
New US 322 Limited Access Rdwy	-	*30*	*29*	*29*
Predicted Crash Frequency (Fatal & Injury crashes)				
*Local 322**	*20*	*6*	*6*	*6*
New US 322 Limited Access Rdwy	-	*13*	*13*	*13*

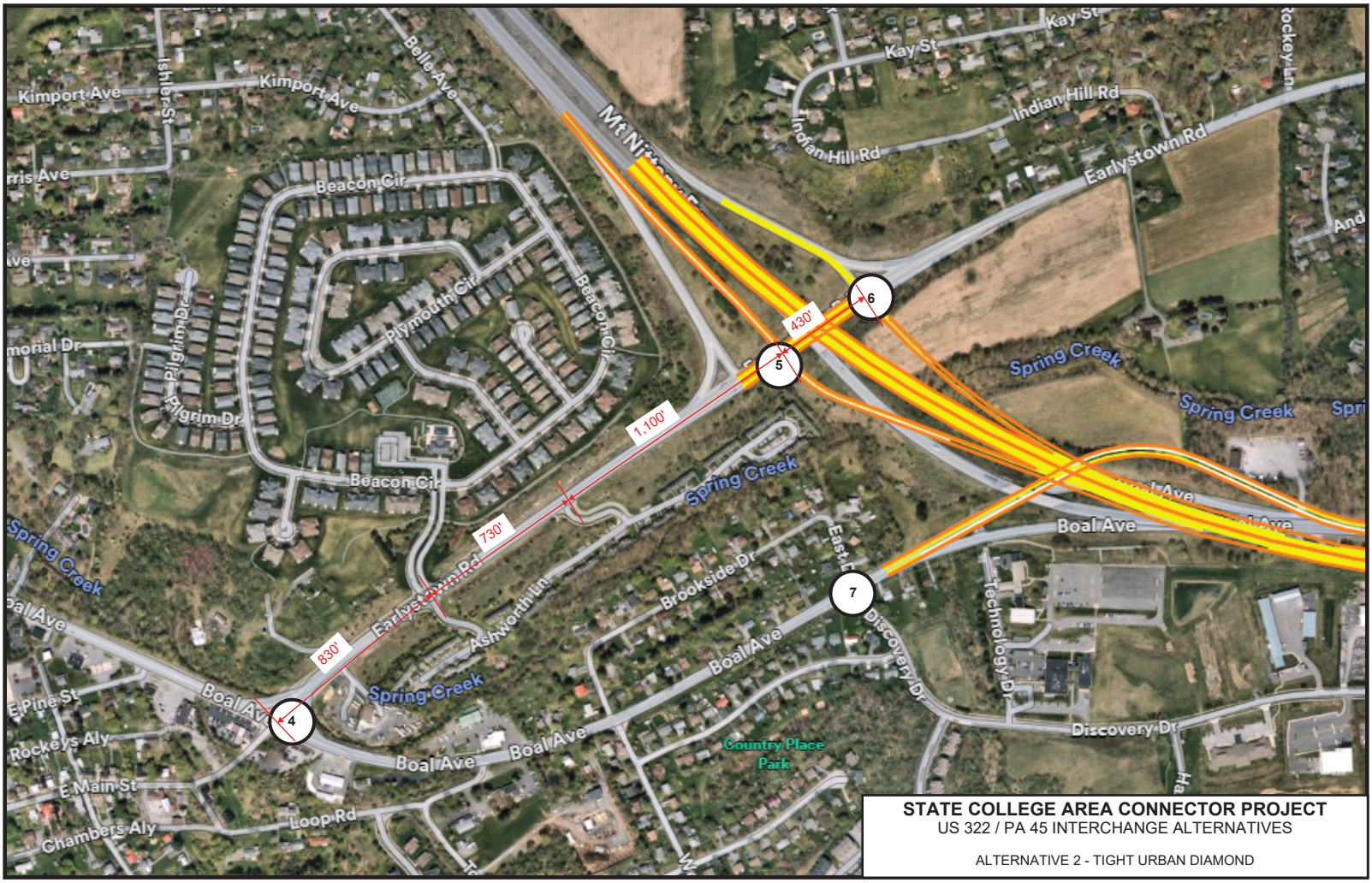
* Includes Local 322, new Local 322 Connector Road, and Boal Avenue

APPENDIX A

US 322 / PA 45 Interchange Alternatives

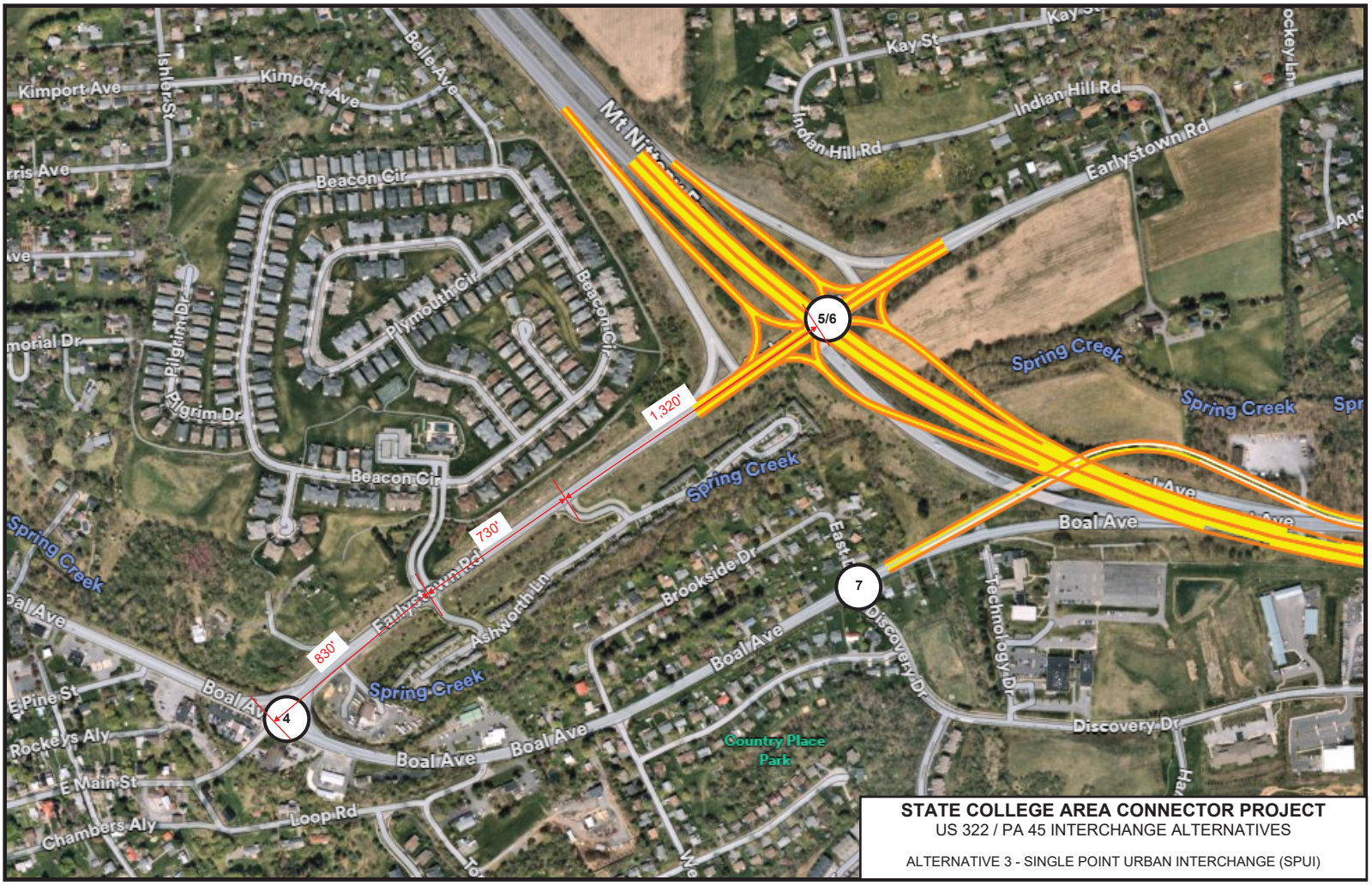
STATE COLLEGE AREA CONNECTOR PROJECT
US 322 / PA 45 INTERCHANGE ALTERNATIVES

ALTERNATIVE 1 - CONVENTIONAL DIAMOND



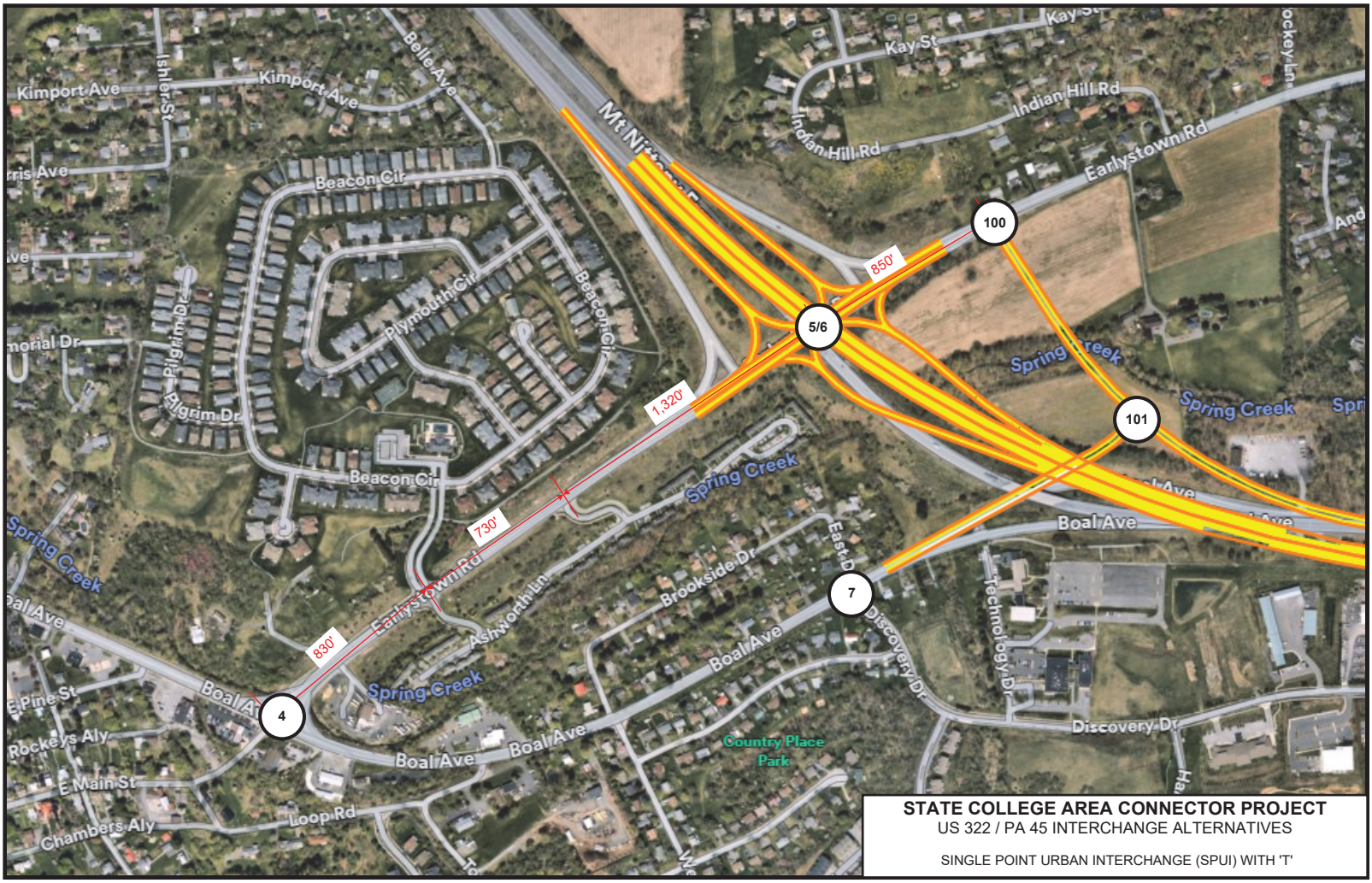
STATE COLLEGE AREA CONNECTOR PROJECT
US 322 / PA 45 INTERCHANGE ALTERNATIVES

ALTERNATIVE 2 - TIGHT URBAN DIAMOND



STATE COLLEGE AREA CONNECTOR PROJECT
US 322 / PA 45 INTERCHANGE ALTERNATIVES

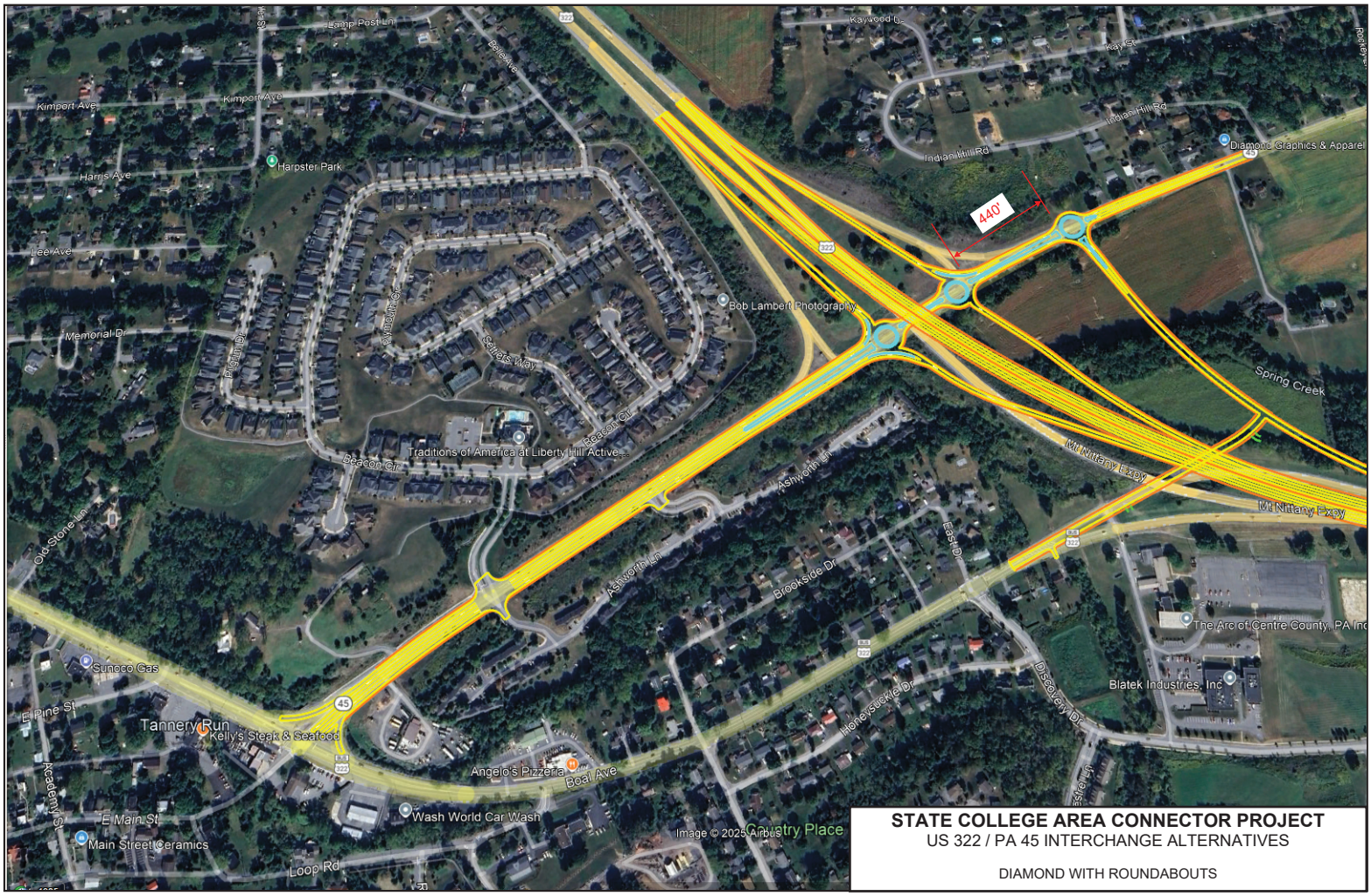
ALTERNATIVE 3 - SINGLE POINT URBAN INTERCHANGE (SPUI)



STATE COLLEGE AREA CONNECTOR PROJECT

US 322 / PA 45 INTERCHANGE ALTERNATIVES

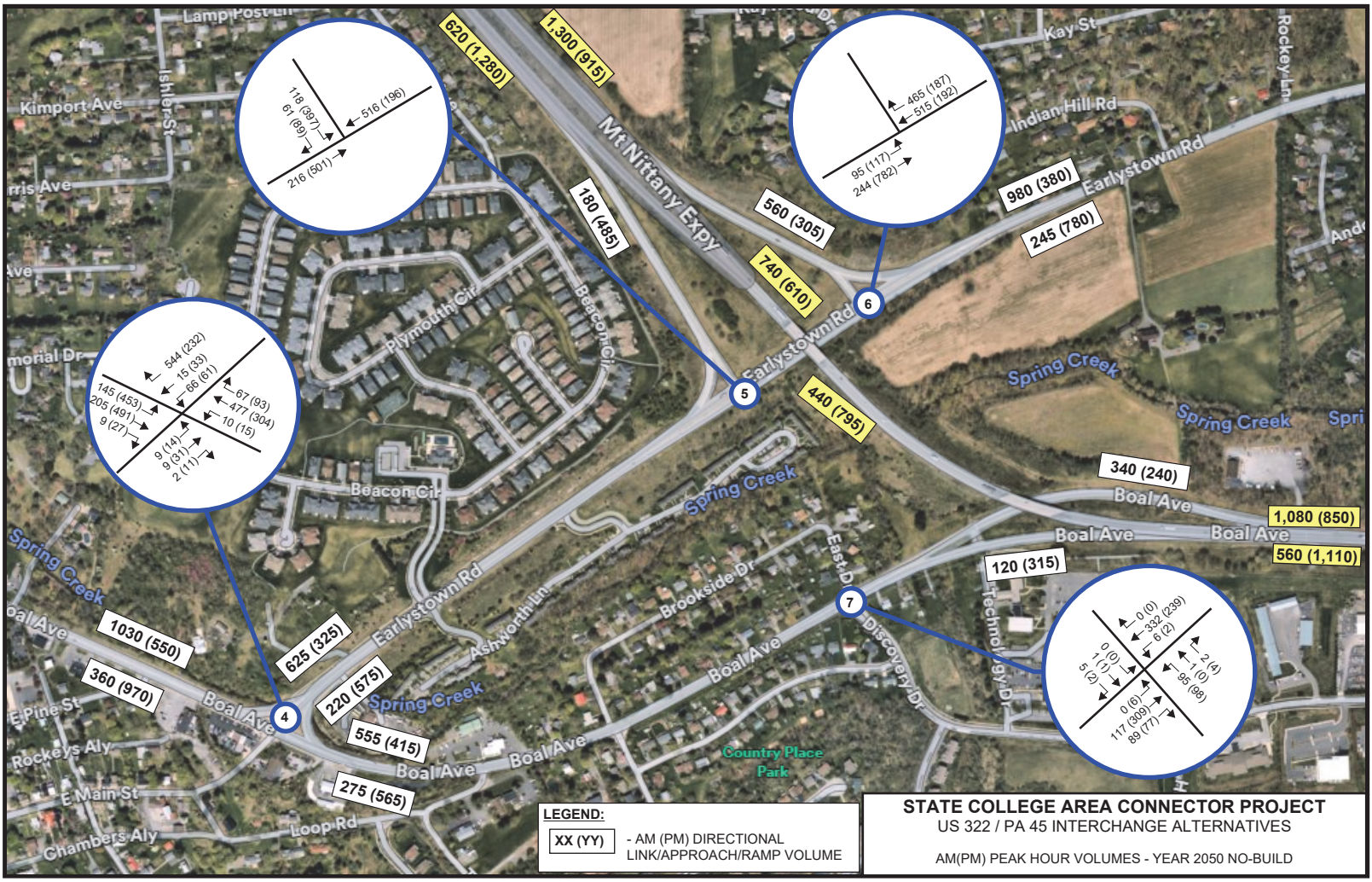
SINGLE POINT URBAN INTERCHANGE (SPUI) WITH 'T'



STATE COLLEGE AREA CONNECTOR PROJECT

US 322 / PA 45 INTERCHANGE ALTERNATIVES

DIAMOND WITH ROUNDABOUTS



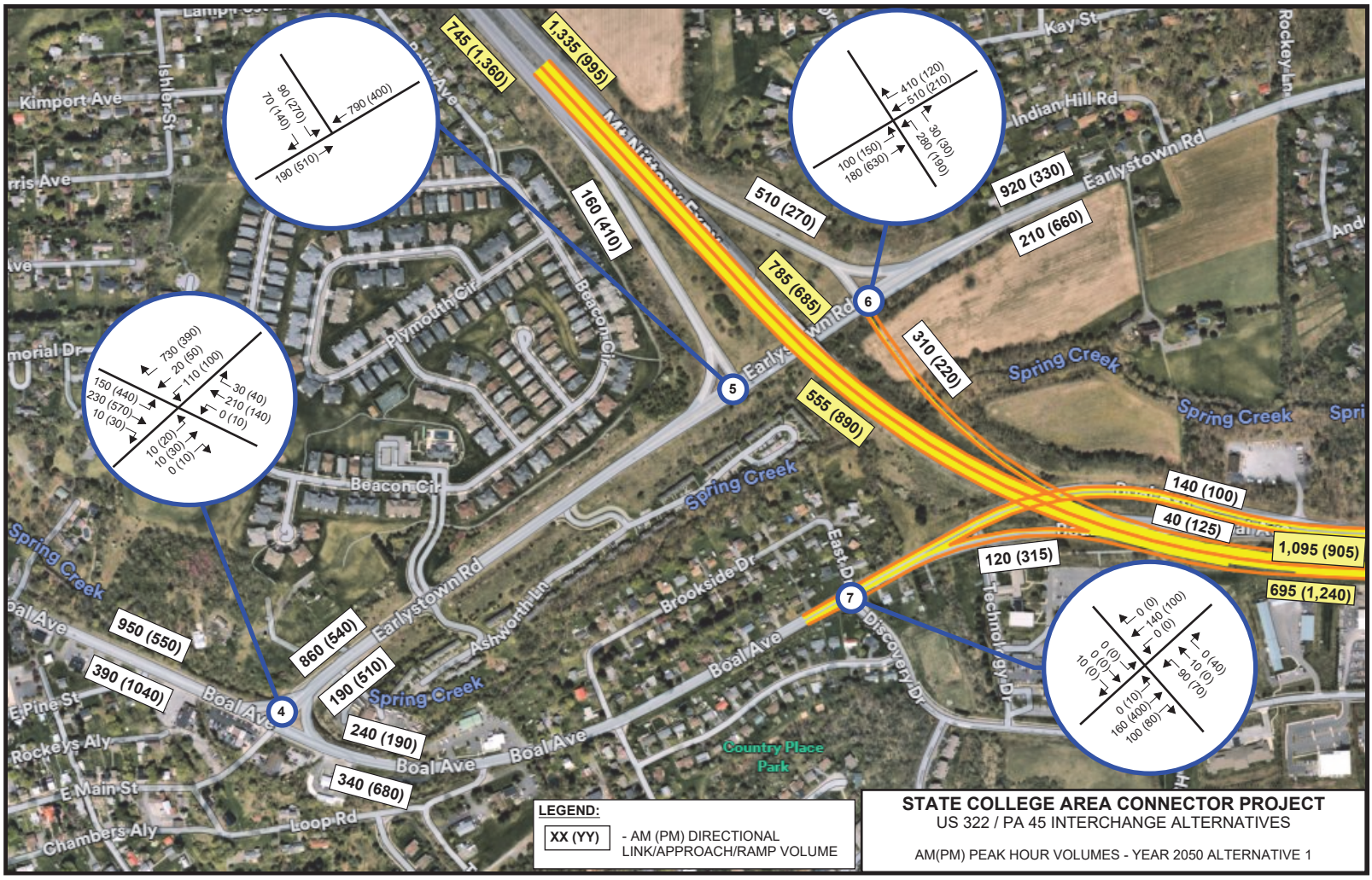
LEGEND:

XX (YY) - AM (PM) DIRECTIONAL LINK/APPROACH/RAMP VOLUME

STATE COLLEGE AREA CONNECTOR PROJECT

US 322 / PA 45 INTERCHANGE ALTERNATIVES

AM(PM) PEAK HOUR VOLUMES - YEAR 2050 NO-BUILD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1,335 (995)
160 (410)
510 (270)
785 (685)
555 (890)
920 (330)
210 (660)
310 (220)
140 (100)
40 (125)
120 (315)
1,095 (905)
695 (1,240)
950 (550)
390 (1040)
860 (540)
190 (510)
240 (190)
340 (680)
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70 (140)
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190 (510)
410 (120)
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100 (150)
180 (630)
30 (30)
280 (190)
730 (890)
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110 (100)
150 (440)
230 (570)
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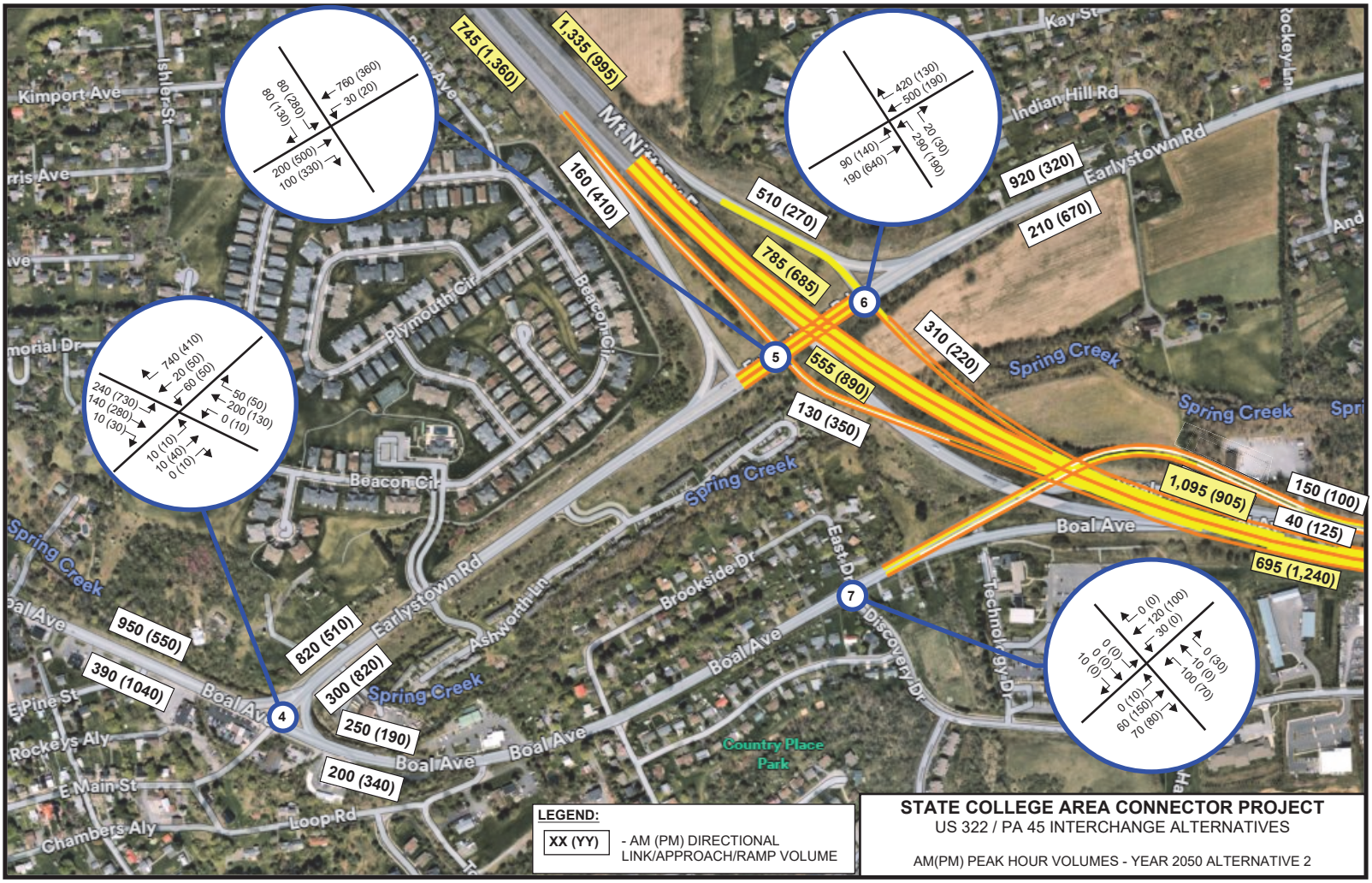
0 (40)
10 (0)
90 (70)
0 (10)
160 (400)
100 (80)
Kimport Ave
Kay St
Indian Hill Rd
Earlystown Rd
Plymouth Cir
Beacon Cir
Spring Creek
Brookside Dr
East Discovery Dr
Technology Dr
Boal Ave
E Pine St
Rockeys Aly
E Main St
Chambers Aly
Loop Rd
Country Place Park
4
5
6
7
LEGEND:
XX (YY) - AM (PM) DIRECTIONAL LINK/APPROACH/RAMP VOLUME
STATE COLLEGE AREA CONNECTOR PROJECT
US 322 / PA 45 INTERCHANGE ALTERNATIVES
AM(PM) PEAK HOUR VOLUMES - YEAR 2050 ALTERNATIVE 1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510 (270)
785 (685)
920 (320)
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820 (510)
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Kimport Ave
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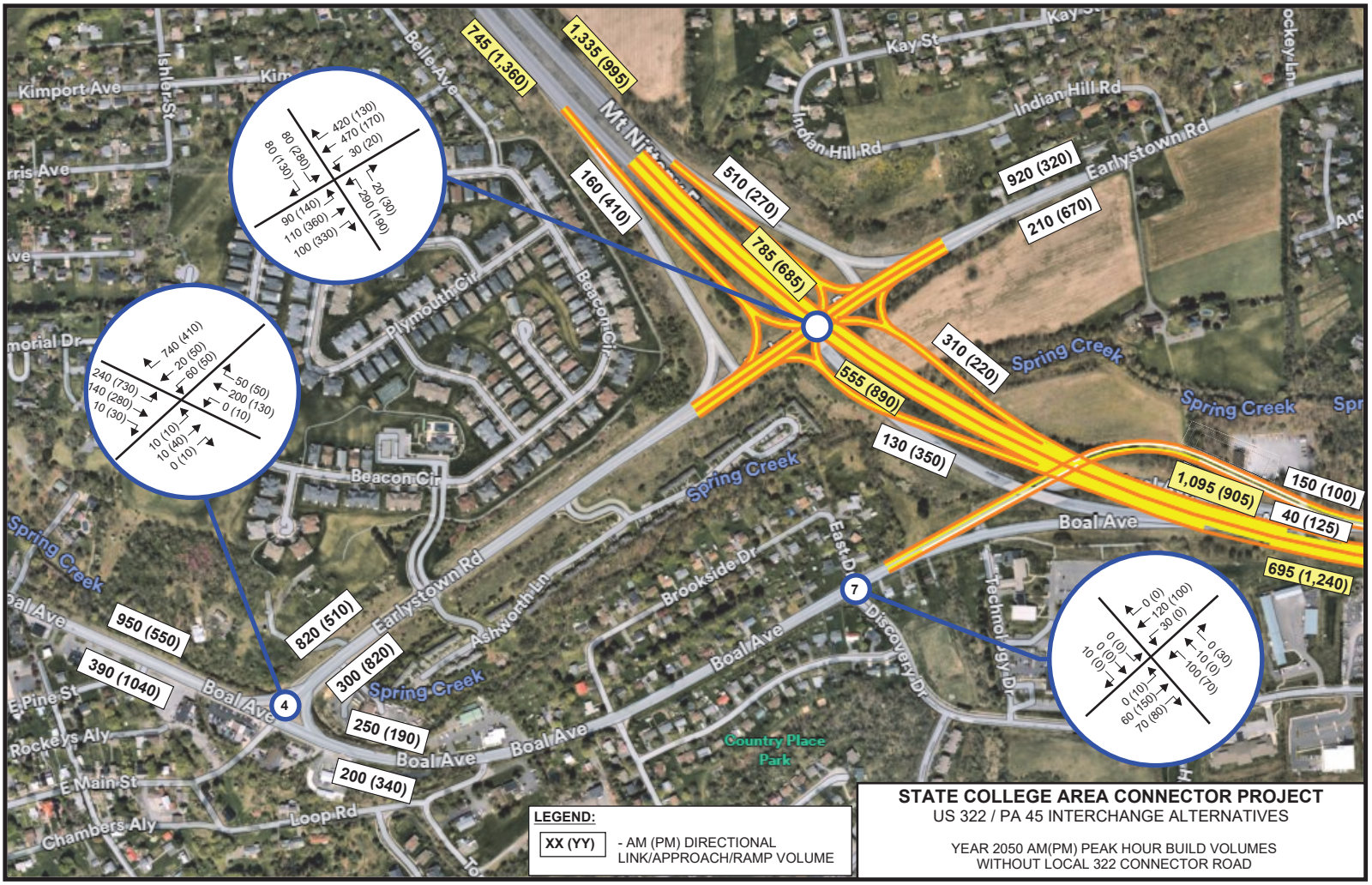
Kay St
Indian Hill Rd
Earlystown Rd
Plymouth Cir
Beacon Cir
Spring Creek
Boal Ave
Brookside Dr
East Dr
Discovery Dr
Ashworth Ln
E Pine St
Rockeys Aly
E Main St
Chambers Aly
Loop Rd
Country Place Park
LEGEND:
XX (YY) - AM (PM) DIRECTIONAL LINK/APPROACH/RAMP VOLUME
STATE COLLEGE AREA CONNECTOR PROJECT
US 322 / PA 45 INTERCHANGE ALTERNATIVES
AM(PM) PEAK HOUR VOLUMES - YEAR 2050 ALTERNATIVE 2



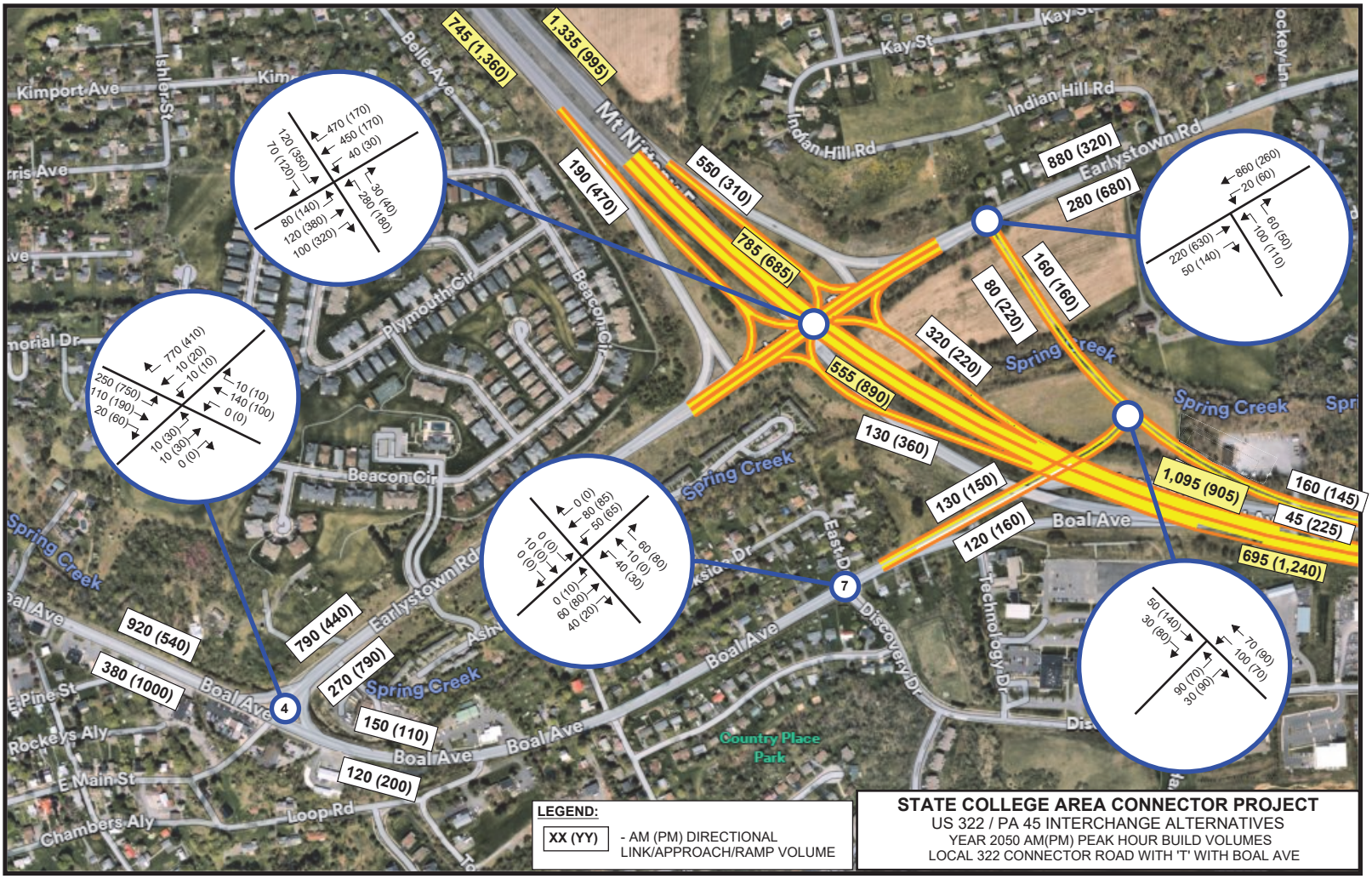
LEGEND:

XX (YY) - AM (PM) DIRECTIONAL LINK/APPROACH/RAMP VOLUME

STATE COLLEGE AREA CONNECTOR PROJECT

US 322 / PA 45 INTERCHANGE ALTERNATIVES

YEAR 2050 AM(PM) PEAK HOUR BUILD VOLUMES
WITHOUT LOCAL 322 CONNECTOR ROAD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695 (1,240)
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30 (90)
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Kimport Ave
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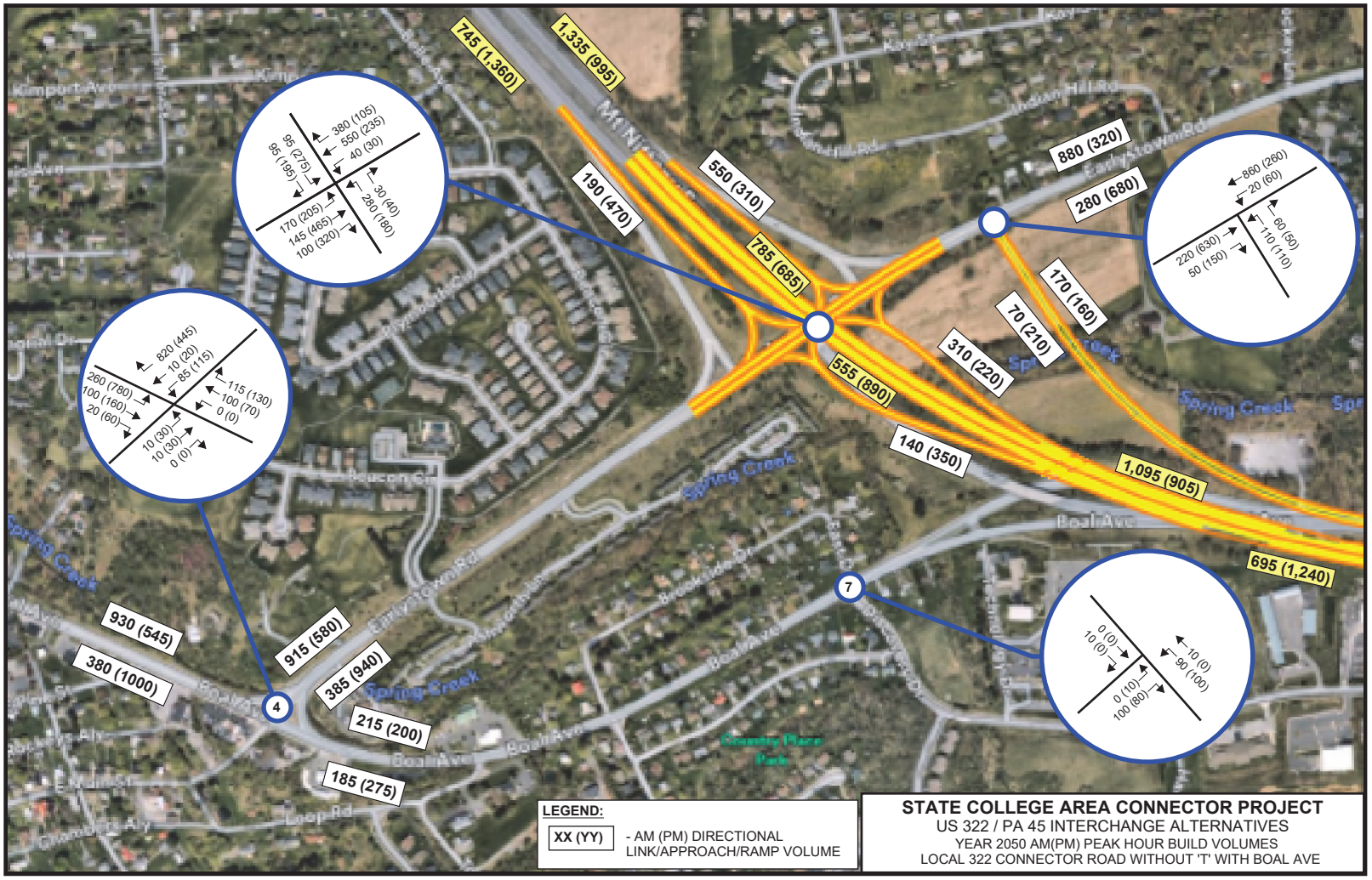
Beacon Cir
Spring Creek
Boal Ave
Discovery Dr
Technology Dr
Country Place Park
E Pine St
Rockeys Aly
E Main St
Chambers Aly
Loop Rd
4
7
LEGEND:
XX (YY) - AM (PM) DIRECTIONAL LINK/APPROACH/RAMP VOLUME
STATE COLLEGE AREA CONNECTOR PROJECT
US 322 / PA 45 INTERCHANGE ALTERNATIVES
YEAR 2050 AM(PM) PEAK HOUR BUILD VOLUMES
LOCAL 322 CONNECTOR ROAD WITH 'T' WITH BOAL AVE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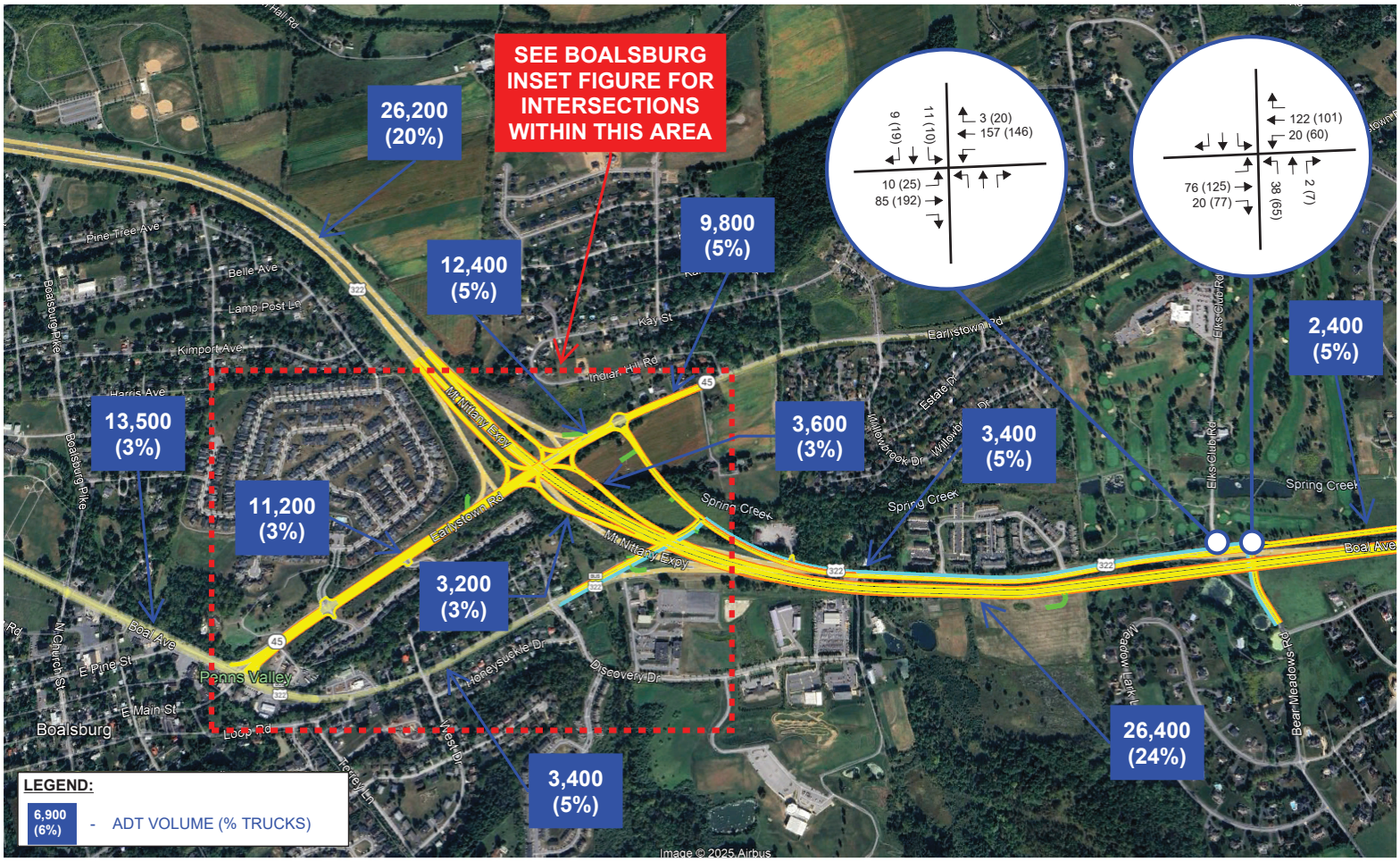
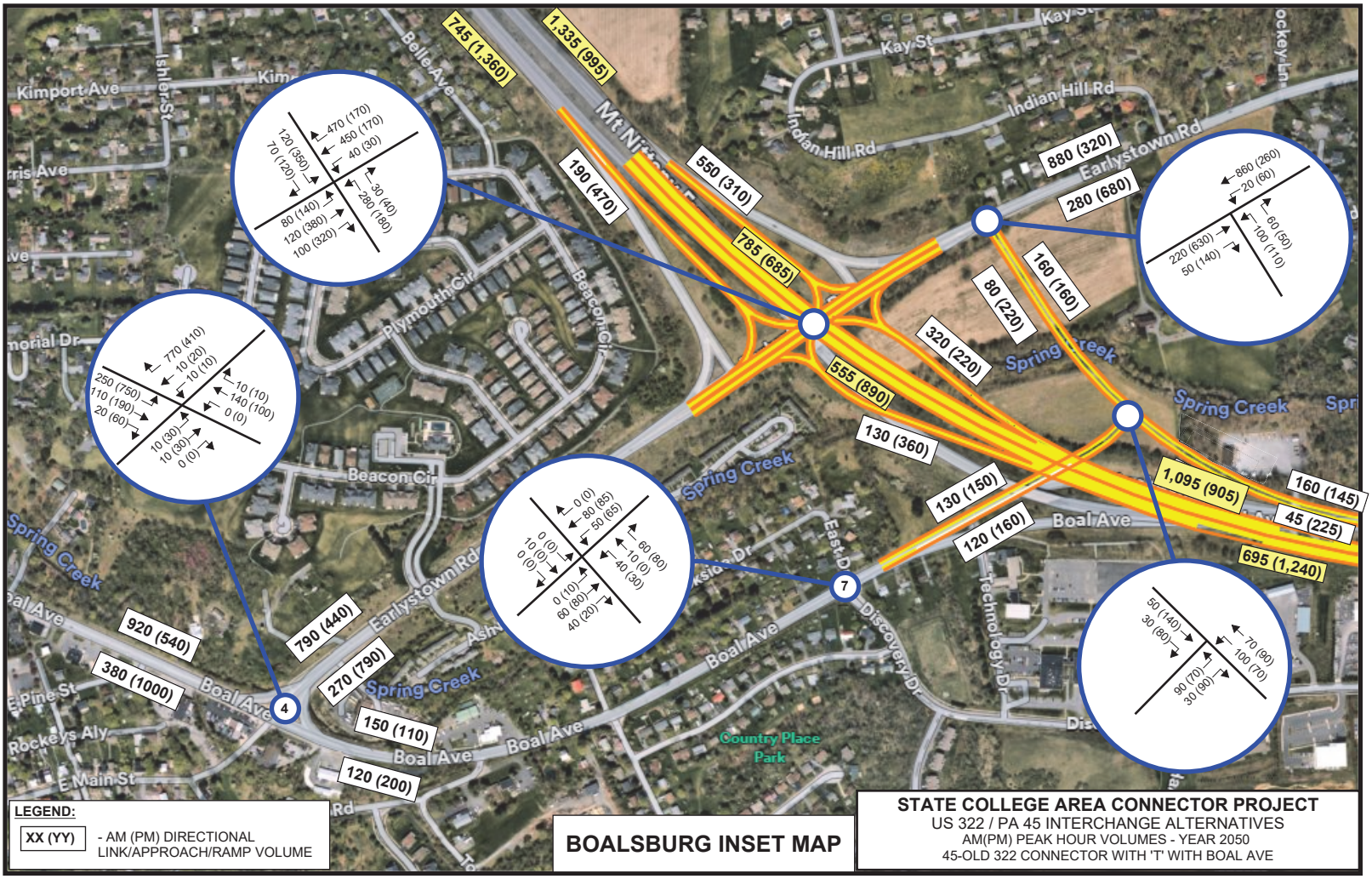
Boal Ave
Beaver Cir
Country Place Park
Loop Rd
LEGEND:
XX (YY) - AM (PM) DIRECTIONAL LINK/APPROACH/RAMP VOLUME
STATE COLLEGE AREA CONNECTOR PROJECT
US 322 / PA 45 INTERCHANGE ALTERNATIVES
YEAR 2050 AM(PM) PEAK HOUR BUILD VOLUMES
LOCAL 322 CONNECTOR ROAD WITHOUT 'T' WITH BOAL AVE

APPENDIX B

Year 2050 Build Traffic Volume Projections

FUTURE YEAR (2050) BUILD TRAFFIC VOLUMES





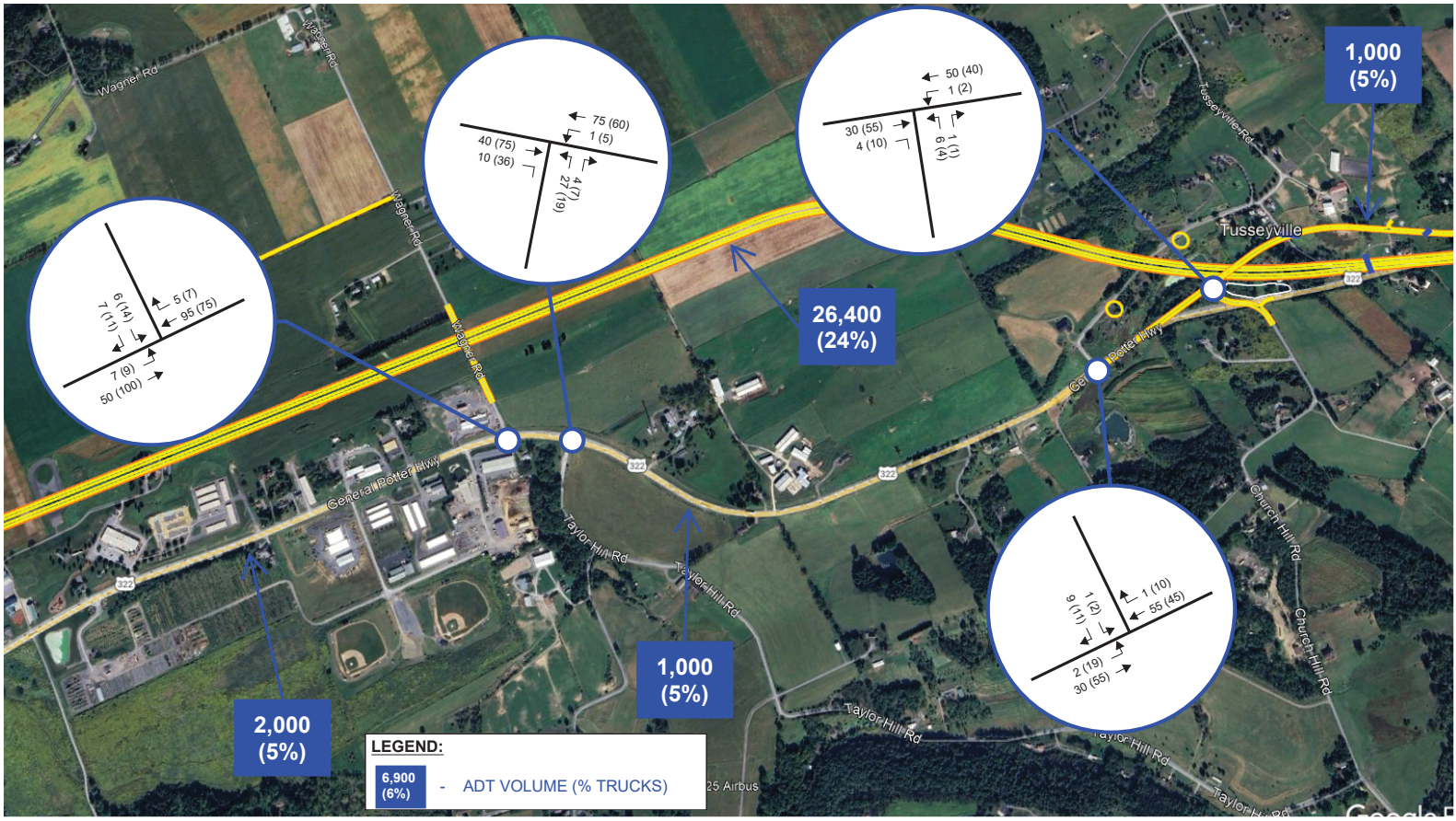
LEGEND:

XX (YY) - AM (PM) DIRECTIONAL LINK/APPROACH/RAMP VOLUME

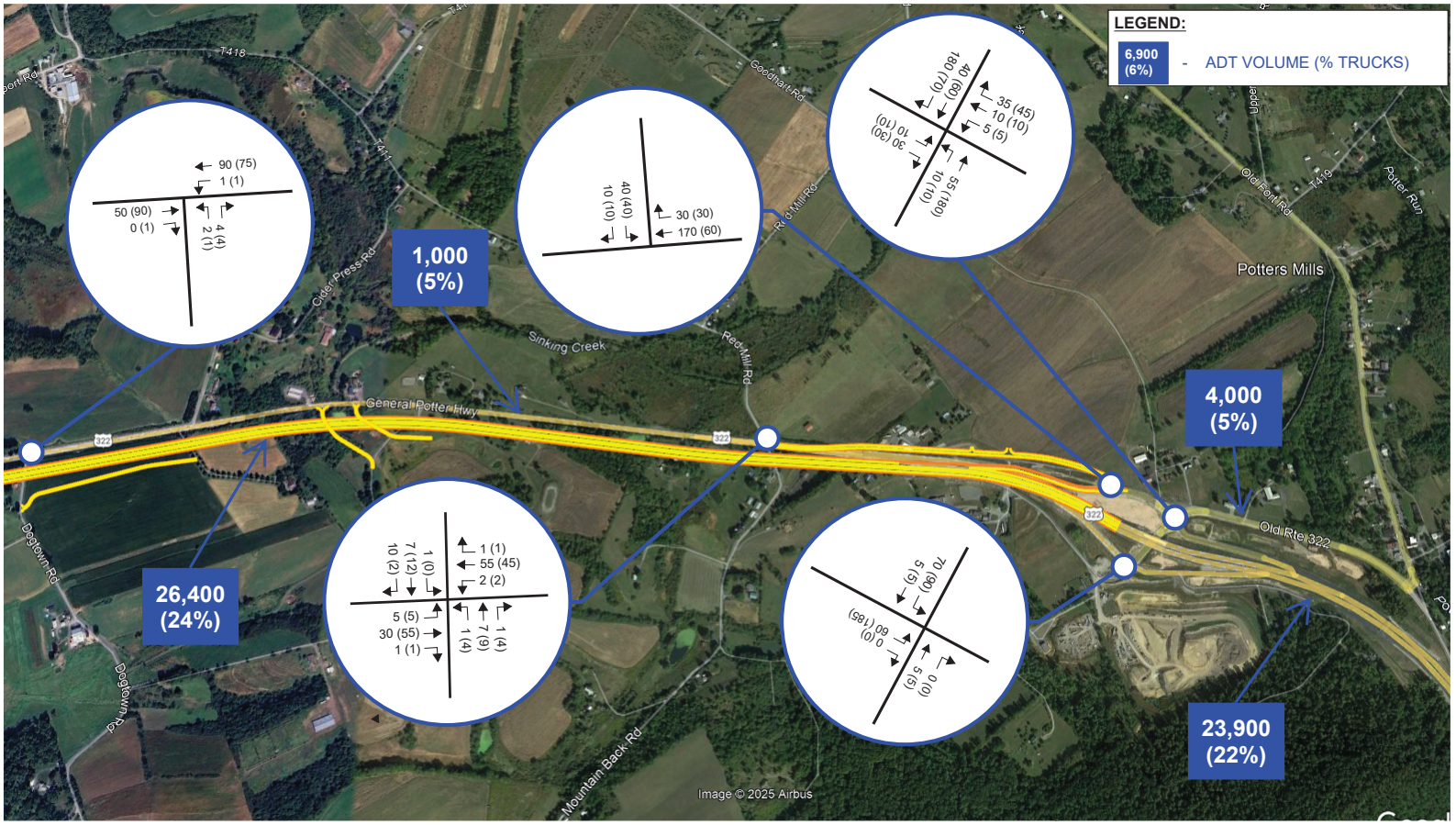
BOALSBURG INSET MAP

STATE COLLEGE AREA CONNECTOR PROJECT
US 322 / PA 45 INTERCHANGE ALTERNATIVES
AM(PM) PEAK HOUR VOLUMES - YEAR 2050
45-OLD 322 CONNECTOR WITH 'T' WITH BOAL AVE

FUTURE YEAR (2050) BUILD TRAFFIC VOLUMES



FUTURE YEAR (2050) BUILD TRAFFIC VOLUMES



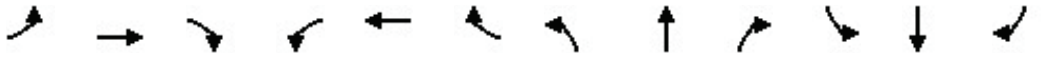
APPENDIX C

Year 2050 Build Capacity Analyses

2050 BUILD

INTERSECTIONS

SPUI INTERCHANGE ALTERNATIVE



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	250	110	20	0	140	10	10	10	0	10	10	770
Future Volume (veh/h)	250	110	20	0	140	10	10	10	0	10	10	770
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1822	1795	1795	1866	1786	1786	1786	1959	1959	1959
Adj Flow Rate, veh/h	272	120	22	0	152	0	11	11	0	11	11	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	1	1	1	2	2	2
Cap, veh/h	839	1122	989	224	613		218	50	0	223	55	
Arrive On Green	0.17	0.64	0.64	0.00	0.34	0.00	0.03	0.06	0.00	0.03	0.06	0.00
Sat Flow, veh/h	1669	1752	1544	1196	1795	0	820	820	0	899	899	1660
Grp Volume(v), veh/h	272	120	22	0	152	0	22	0	0	22	0	0
Grp Sat Flow(s),veh/h/ln	1669	1752	1544	1196	1795	0	1639	0	0	1798	0	1660
Q Serve(g_s), s	2.5	0.9	0.2	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.5	0.9	0.2	0.0	2.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.50		0.00	0.50		1.00
Lane Grp Cap(c), veh/h	839	1122	989	224	613		218	0	0	222	0	
V/C Ratio(X)	0.32	0.11	0.02	0.00	0.25		0.10	0.00	0.00	0.10	0.00	
Avail Cap(c_a), veh/h	860	1764	1555	647	1249		1218	0	0	1320	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	3.6	2.2	2.1	0.0	7.6	0.0	14.6	0.0	0.0	14.6	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.1	0.0	0.0	0.6	0.0	0.2	0.0	0.0	0.2	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.1	0.0	0.0	0.6	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	3.7	2.4	2.1	0.0	8.2	0.0	14.8	0.0	0.0	14.8	0.0	0.0
LnGrp LOS	A	A	A		A		B			B		
Approach Vol, veh/h		414			152			22			22	
Approach Delay, s/veh		3.2			8.2			14.8			14.8	
Approach LOS		A			A			B			B	

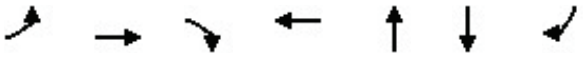
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	9.6	15.3		7.3		24.9		7.3				
Change Period (Y+Rc), s	5.0	5.3		6.3		5.3		6.3				
Max Green Setting (Gmax), s	5.0	21.4		22.0		31.4		22.0				
Max Q Clear Time (g_c+I1), s	5.0	4.5		2.5		3.4		2.5				
Green Ext Time (p_c), s	0.0	2.5		0.0		3.1		0.0				

Intersection Summary		
HCM 6th Ctrl Delay, s/veh		5.3
HCM 6th LOS		A

Notes

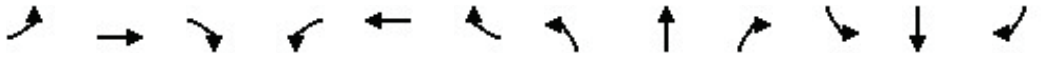
User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	272	120	22	163	22	22	837
v/c Ratio	0.32	0.08	0.02	0.21	0.05	0.05	0.49
Control Delay (s/veh)	2.9	1.8	0.6	7.2	11.4	11.4	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	2.9	1.8	0.6	7.2	11.4	11.4	1.0
Queue Length 50th (ft)	0	0	0	9	2	2	0
Queue Length 95th (ft)	53	25	2	58	18	18	0
Internal Link Dist (ft)		1516		873	369	770	
Turn Bay Length (ft)	250						
Base Capacity (vph)	864	1646	1496	1323	1438	1543	1725
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.07	0.01	0.12	0.02	0.01	0.49

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	0	70	280	0	30	80	120	100	40	450	470
Future Volume (veh/h)	120	0	70	280	0	30	80	120	100	40	450	470
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1716	1716	1716	1772	0	1772	1766	1766	1766	1786	1786	1786
Adj Flow Rate, veh/h	130	0	0	304	0	0	87	130	0	43	489	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	6	6	2	0	2	2	2	2	1	1	1
Cap, veh/h	244	0		411	0		140	859		84	892	
Arrive On Green	0.15	0.00	0.00	0.24	0.00	0.00	0.08	0.30	0.00	0.05	0.26	0.00
Sat Flow, veh/h	1634	130		1688	304		1682	2897	1497	1701	3393	1514
Grp Volume(v), veh/h	130	14.7		304	14.1		87	130	0	43	489	0
Grp Sat Flow(s),veh/h/ln	1634	B		1688	B		1682	1448	1497	1701	1697	1514
Q Serve(g_s), s	2.4			5.5			1.6	1.1	0.0	0.8	4.1	0.0
Cycle Q Clear(g_c), s	2.4			5.5			1.6	1.1	0.0	0.8	4.1	0.0
Prop In Lane	1.00			1.00			1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	244			411			140	859		84	892	
V/C Ratio(X)	0.53			0.74			0.62	0.15		0.51	0.55	
Avail Cap(c_a), veh/h	919			949			332	1946		305	2218	
HCM Platoon Ratio	1.00			1.00			1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00			1.00			1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.9			11.5			14.6	8.5	0.0	15.2	10.4	0.0
Incr Delay (d2), s/veh	1.8			2.6			4.4	0.1	0.0	4.8	0.5	0.0
Initial Q Delay(d3), s/veh	0.0			0.0			0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8			1.8			0.6	0.2	0.0	0.3	1.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	14.7			14.1			19.0	8.6	0.0	20.0	11.0	0.0
LnGrp LOS	B			B			B	A		B	B	
Approach Vol, veh/h								217			532	
Approach Delay, s/veh								12.8			11.7	
Approach LOS								B			B	

Timer - Assigned Phs	1	2	3		5	6	7					
Phs Duration (G+Y+Rc), s	6.1	14.3	12.5		7.2	13.1	9.4					
Change Period (Y+Rc), s	4.5	4.5	4.5		4.5	4.5	4.5					
Max Green Setting (Gmax), s	5.9	22.1	18.5		6.5	21.5	18.5					
Max Q Clear Time (g_c+I1), s	2.8	3.1	7.5		3.6	6.1	4.4					
Green Ext Time (p_c), s	0.0	0.6	0.7		0.0	2.6	0.3					

Intersection Summary	
HCM 6th Ctrl Delay, s/veh	12.9
HCM 6th LOS	B

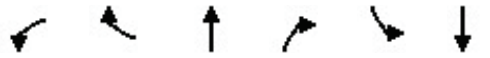
Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	130	76	304	33	87	130	109	43	489	511
v/c Ratio	0.27	0.05	0.61	0.02	0.36	0.11	0.16	0.19	0.39	0.58
Control Delay (s/veh)	15.8	0.1	21.1	0.0	26.6	10.9	4.1	24.9	13.7	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	15.8	0.1	21.1	0.0	26.6	10.9	4.1	24.9	13.7	4.8
Queue Length 50th (ft)	28	0	74	0	23	9	0	11	58	0
Queue Length 95th (ft)	72	0	163	0	#71	36	26	41	103	55
Internal Link Dist (ft)						1205			723	
Turn Bay Length (ft)		300		250	200		200	200		200
Base Capacity (vph)	704	1443	731	1500	255	1545	851	235	1717	1020
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.05	0.42	0.02	0.34	0.08	0.13	0.18	0.28	0.50

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	100	60	220	50	20	860
Future Volume (veh/h)	100	60	220	50	20	860
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1864	1864	1870	1870
Adj Flow Rate, veh/h	109	65	239	54	22	935
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	143	85	1111	942	774	1115
Arrive On Green	0.13	0.13	0.60	0.60	0.60	0.60
Sat Flow, veh/h	1061	633	1864	1580	1141	1870
Grp Volume(v), veh/h	175	0	239	54	22	935
Grp Sat Flow(s),veh/h/ln	1703	0	1864	1580	1141	1870
Q Serve(g_s), s	4.4	0.0	2.6	0.6	0.4	18.0
Cycle Q Clear(g_c), s	4.4	0.0	2.6	0.6	3.1	18.0
Prop In Lane	0.62	0.37		1.00	1.00	
Lane Grp Cap(c), veh/h	229	0	1111	942	774	1115
V/C Ratio(X)	0.76	0.00	0.22	0.06	0.03	0.84
Avail Cap(c_a), veh/h	688	0	1465	1242	991	1470
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.6	0.0	4.2	3.8	4.9	7.3
Incr Delay (d2), s/veh	5.2	0.0	0.1	0.0	0.0	3.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	0.4	0.1	0.1	5.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	23.8	0.0	4.3	3.8	4.9	10.7
LnGrp LOS	C		A	A	A	B
Approach Vol, veh/h	175		293			957
Approach Delay, s/veh	23.8		4.2			10.6
Approach LOS	C		A			B

Timer - Assigned Phs		2				6	8
Phs Duration (G+Y+Rc), s		32.5				32.5	12.0
Change Period (Y+Rc), s		6.0				6.0	6.0
Max Green Setting (Gmax), s		35.0				35.0	18.0
Max Q Clear Time (g_c+I1), s		4.6				20.0	6.4
Green Ext Time (p_c), s		1.4				6.6	0.4

Intersection Summary	
HCM 6th Ctrl Delay, s/veh	10.9
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	174	239	54	22	935
v/c Ratio	0.52	0.19	0.05	0.03	0.72
Control Delay (s/veh)	22.3	5.7	2.1	5.4	14.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	22.3	5.7	2.1	5.4	14.0
Queue Length 50th (ft)	42	30	0	2	207
Queue Length 95th (ft)	88	70	12	11	#523
Internal Link Dist (ft)	958	723			853
Turn Bay Length (ft)				75	
Base Capacity (vph)	600	1249	1080	766	1256
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.29	0.19	0.05	0.03	0.74

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection	
Intersection Delay, s/veh	13.0
Intersection LOS	B

Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	174	293	957
Demand Flow Rate, veh/h	177	299	976
Vehicles Circulating, veh/h	244	22	111
Vehicles Exiting, veh/h	22	1065	310
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	4.9	4.0	17.2
Approach LOS	A	A	C

Lane	Left	Left	Bypass	Left
Designated Moves	LR	T	R	LT
Assumed Moves	LR	T		LT
RT Channelized			Yield	
Lane Util	1.000	1.000		1.000
Follow-Up Headway, s	2.609	2.609		2.609
Critical Headway, s	4.976	4.976		4.976
Entry Flow, veh/h	177	244	55	976
Cap Entry Lane, veh/h	1076	1349	1349	1232
Entry HV Adj Factor	0.983	0.980	0.980	0.981
Flow Entry, veh/h	174	239	54	957
Cap Entry, veh/h	1058	1323	1323	1209
V/C Ratio	0.165	0.181	0.041	0.792
Control Delay, s/veh	4.9	4.2	3.0	17.2
LOS	A	A	A	C
95th %tile Queue, veh	1	1	0	9

Intersection: 44: Willowbrook Drive/Rocky Ridge Road & Earlystown Rd (S.R. 0045)/Earlystown Road (S.

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 51: West Drive & Boal Ave (S.R. 3014)/Boal Ave (S.R. 0322)

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 100: Earlystown Rd (S.R. 0045) & Old 322 Connector

Movement	WB	NB	SB
Directions Served	LR	T	LT
Maximum Queue (ft)	46	25	451
Average Queue (ft)	17	2	181
95th Queue (ft)	41	13	433
Link Distance (ft)	932	657	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	750	190	60	0	100	10	30	30	0	10	20	410
Future Volume (veh/h)	750	190	60	0	100	10	30	30	0	10	20	410
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1780	1780	1852	1823	1823	1896	1772	1772	1772	1959	1959	1959
Adj Flow Rate, veh/h	815	207	65	0	109	0	33	33	0	11	22	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	2	2	2
Cap, veh/h	1057	1277	1125	150	417		177	65	0	144	111	
Arrive On Green	0.41	0.72	0.72	0.00	0.23	0.00	0.06	0.08	0.00	0.06	0.08	0.00
Sat Flow, veh/h	1696	1780	1569	1079	1823	0	783	783	0	535	1333	1660
Grp Volume(v), veh/h	815	207	65	0	109	0	66	0	0	33	0	0
Grp Sat Flow(s),veh/h/ln	1696	1780	1569	1079	1823	0	1567	0	0	1868	0	1660
Q Serve(g_s), s	14.0	1.8	0.6	0.0	2.4	0.0	1.2	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	14.0	1.8	0.6	0.0	2.4	0.0	1.9	0.0	0.0	0.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.50		0.00	0.33		1.00
Lane Grp Cap(c), veh/h	1057	1277	1125	150	417		210	0	0	216	0	
V/C Ratio(X)	0.77	0.16	0.06	0.00	0.26		0.31	0.00	0.00	0.15	0.00	
Avail Cap(c_a), veh/h	1462	2124	1872	405	849		807	0	0	907	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	5.3	2.2	2.0	0.0	15.2	0.0	21.3	0.0	0.0	20.7	0.0	0.0
Incr Delay (d2), s/veh	1.1	0.2	0.1	0.0	1.0	0.0	0.8	0.0	0.0	0.3	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.2	0.1	0.0	0.9	0.0	0.7	0.0	0.0	0.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.4	2.3	2.1	0.0	16.2	0.0	22.2	0.0	0.0	21.0	0.0	0.0
LnGrp LOS	A	A	A		B		C			C		
Approach Vol, veh/h		1087			109			66			33	
Approach Delay, s/veh		5.3			16.2			22.2			21.0	
Approach LOS		A			B			C			C	

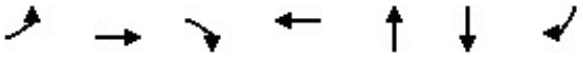
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	23.5	15.3		9.3		38.8		9.3				
Change Period (Y+Rc), s	5.0	5.3		6.3		5.3		6.3				
Max Green Setting (Gmax), s	30.0	21.4		22.0		56.4		22.0				
Max Q Clear Time (g_c+I1), s	16.5	4.9		2.8		4.3		3.9				
Green Ext Time (p_c), s	2.0	1.6		0.1		8.2		0.2				

Intersection Summary												
HCM 6th Ctrl Delay, s/veh			7.5									
HCM 6th LOS			A									

Notes

User approved pedestrian interval to be less than phase max green.

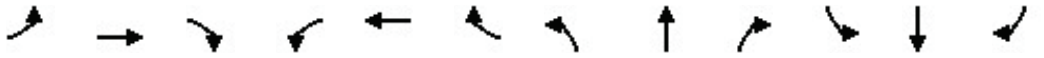
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	815	207	65	120	66	33	446
v/c Ratio	0.76	0.14	0.05	0.28	0.27	0.12	0.26
Control Delay (s/veh)	11.1	3.2	1.1	23.6	29.0	26.9	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	11.1	3.2	1.1	23.6	29.0	26.9	0.4
Queue Length 50th (ft)	138	21	0	40	25	12	0
Queue Length 95th (ft)	#389	47	9	88	62	37	0
Internal Link Dist (ft)		1516		873	369	770	
Turn Bay Length (ft)	250						
Base Capacity (vph)	1212	1579	1439	747	652	739	1725
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.13	0.05	0.16	0.10	0.04	0.26

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	350	0	120	180	0	40	140	380	320	30	170	170
Future Volume (veh/h)	350	0	120	180	0	40	140	380	320	30	170	170
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	0	1772	1780	1780	1780	1758	1758	1758
Adj Flow Rate, veh/h	380	0	0	196	0	0	152	413	0	33	185	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	0	2	1	1	1	3	3	3
Cap, veh/h	494	0		306	0		235	729		66	514	
Arrive On Green	0.29	0.00	0.00	0.18	0.00	0.00	0.14	0.25	0.00	0.04	0.15	0.00
Sat Flow, veh/h	1688	380		1688	196		1696	2884	1509	1674	3340	1490
Grp Volume(v), veh/h	380	13.1		196	14.6		152	413	0	33	185	0
Grp Sat Flow(s),veh/h/ln	1688	B		1688	B		1696	1442	1509	1674	1670	1490
Q Serve(g_s), s	6.7			3.5			2.8	4.1	0.0	0.6	1.6	0.0
Cycle Q Clear(g_c), s	6.7			3.5			2.8	4.1	0.0	0.6	1.6	0.0
Prop In Lane	1.00			1.00			1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	494			306			235	729		66	514	
V/C Ratio(X)	0.77			0.64			0.65	0.57		0.50	0.36	
Avail Cap(c_a), veh/h	960			960			449	1979		294	1993	
HCM Platoon Ratio	1.00			1.00			1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00			1.00			1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	10.5			12.3			13.3	10.6	0.0	15.3	12.3	0.0
Incr Delay (d2), s/veh	2.6			2.2			3.0	0.7	0.0	5.7	0.4	0.0
Initial Q Delay(d3), s/veh	0.0			0.0			0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1			1.2			0.9	0.8	0.0	0.3	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	13.1			14.6			16.2	11.3	0.0	20.9	12.7	0.0
LnGrp LOS	B			B			B	B		C	B	
Approach Vol, veh/h								565			218	
Approach Delay, s/veh								12.6			14.0	
Approach LOS								B			B	

Timer - Assigned Phs	1	2	3		5	6	7					
Phs Duration (G+Y+Rc), s	5.8	12.7	10.4		9.0	9.5	14.0					
Change Period (Y+Rc), s	4.5	4.5	4.5		4.5	4.5	4.5					
Max Green Setting (Gmax), s	5.7	22.3	18.5		8.6	19.4	18.5					
Max Q Clear Time (g_c+I1), s	2.6	6.1	5.5		4.8	3.6	8.7					
Green Ext Time (p_c), s	0.0	2.2	0.4		0.1	0.8	0.9					

Intersection Summary												
HCM 6th Ctrl Delay, s/veh			13.2									
HCM 6th LOS			B									

Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	380	130	196	43	152	413	348	33	185	185
v/c Ratio	0.68	0.09	0.35	0.03	0.41	0.38	0.45	0.15	0.27	0.41
Control Delay (s/veh)	22.7	0.1	15.4	0.0	21.3	13.0	4.1	23.9	19.3	7.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	22.7	0.1	15.4	0.0	21.3	13.0	4.1	23.9	19.3	7.2
Queue Length 50th (ft)	83	0	37	0	36	38	0	8	22	0
Queue Length 95th (ft)	#227	0	99	0	90	104	46	33	52	43
Internal Link Dist (ft)						1205			723	
Turn Bay Length (ft)		300		250	200		200	200		200
Base Capacity (vph)	756	1500	756	1500	408	1562	978	230	1570	799
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.09	0.26	0.03	0.37	0.26	0.36	0.14	0.12	0.23

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	110	50	630	140	60	260
Future Volume (veh/h)	110	50	630	140	60	260
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1864	1864	1870	1870
Adj Flow Rate, veh/h	120	54	685	152	65	283
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	160	72	929	788	355	932
Arrive On Green	0.14	0.14	0.50	0.50	0.50	0.50
Sat Flow, veh/h	1177	530	1864	1580	657	1870
Grp Volume(v), veh/h	175	0	685	152	65	283
Grp Sat Flow(s),veh/h/ln	1716	0	1864	1580	657	1870
Q Serve(g_s), s	3.2	0.0	9.6	1.8	2.9	2.9
Cycle Q Clear(g_c), s	3.2	0.0	9.6	1.8	12.4	2.9
Prop In Lane	0.69	0.31		1.00	1.00	
Lane Grp Cap(c), veh/h	233	0	929	788	355	932
V/C Ratio(X)	0.75	0.00	0.74	0.19	0.18	0.30
Avail Cap(c_a), veh/h	941	0	1704	1444	628	1710
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.6	0.0	6.5	4.6	11.4	4.9
Incr Delay (d2), s/veh	4.8	0.0	1.2	0.1	0.2	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	1.4	0.2	0.3	0.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	18.5	0.0	7.7	4.7	11.7	5.0
LnGrp LOS	B		A	A	B	A
Approach Vol, veh/h	175		837			348
Approach Delay, s/veh	18.5		7.1			6.3
Approach LOS	B		A			A

Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		22.4			22.4	10.5
Change Period (Y+Rc), s		6.0			6.0	6.0
Max Green Setting (Gmax), s		30.0			30.0	18.0
Max Q Clear Time (g_c+I1), s		11.6			14.4	5.2
Green Ext Time (p_c), s		4.6			1.9	0.4

Intersection Summary	
HCM 6th Ctrl Delay, s/veh	8.4
HCM 6th LOS	A

Notes

User approved volume balancing among the lanes for turning movement.

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	174	685	152	65	283
v/c Ratio	0.45	0.58	0.14	0.17	0.24
Control Delay (s/veh)	17.9	10.4	1.8	7.8	6.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	17.9	10.4	1.8	7.8	6.7
Queue Length 50th (ft)	31	115	0	8	36
Queue Length 95th (ft)	82	256	20	29	83
Internal Link Dist (ft)	958	723			853
Turn Bay Length (ft)				75	
Base Capacity (vph)	738	1273	1130	403	1280
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.24	0.54	0.13	0.16	0.22

Intersection Summary

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	174	837	348
Demand Flow Rate, veh/h	177	854	355
Vehicles Circulating, veh/h	699	66	122
Vehicles Exiting, veh/h	66	411	754
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.6	8.0	5.7
Approach LOS	A	A	A

Lane	Left	Left	Bypass	Left
Designated Moves	LR	T	R	LT
Assumed Moves	LR	T		LT
RT Channelized			Yield	
Lane Util	1.000	1.000		1.000
Follow-Up Headway, s	2.609	2.609		2.609
Critical Headway, s	4.976	4.976		4.976
Entry Flow, veh/h	177	699	155	355
Cap Entry Lane, veh/h	676	1290	1290	1218
Entry HV Adj Factor	0.983	0.980	0.980	0.981
Flow Entry, veh/h	174	685	152	348
Cap Entry, veh/h	665	1265	1265	1196
V/C Ratio	0.262	0.542	0.120	0.291
Control Delay, s/veh	8.6	8.9	3.8	5.7
LOS	A	A	A	A
95th %tile Queue, veh	1	3	0	1

Intersection: 44: Willowbrook Drive/Rocky Ridge Road & Earlystown Rd (S.R. 0045)/Earlystown Road (S.

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

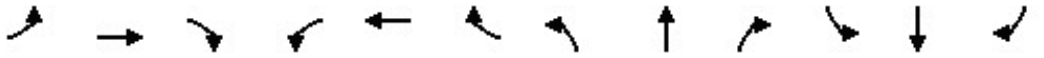
Intersection: 51: West Drive & Boal Ave (S.R. 3014)/Boal Ave (S.R. 0322)

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 100: Earlystown Rd (S.R. 0045) & Old 322 Connector

Movement	WB	NB	NB	SB
Directions Served	LR	T	R	LT
Maximum Queue (ft)	80	147	32	70
Average Queue (ft)	25	38	2	16
95th Queue (ft)	57	103	14	52
Link Distance (ft)	932	657	657	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

TIGHT DIAMOND INTERCHANGE ALTERNATIVE



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	250	110	20	0	140	10	10	10	0	10	10	770
Future Volume (veh/h)	250	110	20	0	140	10	10	10	0	10	10	770
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1822	1795	1795	1866	1786	1786	1786	1959	1959	1959
Adj Flow Rate, veh/h	272	120	22	0	152	0	11	11	0	11	11	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	1	1	1	2	2	2
Cap, veh/h	839	1122	989	224	613		218	50	0	223	55	
Arrive On Green	0.17	0.64	0.64	0.00	0.34	0.00	0.03	0.06	0.00	0.03	0.06	0.00
Sat Flow, veh/h	1669	1752	1544	1196	1795	0	820	820	0	899	899	1660
Grp Volume(v), veh/h	272	120	22	0	152	0	22	0	0	22	0	0
Grp Sat Flow(s),veh/h/ln	1669	1752	1544	1196	1795	0	1639	0	0	1798	0	1660
Q Serve(g_s), s	2.5	0.9	0.2	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.5	0.9	0.2	0.0	2.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.50		0.00	0.50		1.00
Lane Grp Cap(c), veh/h	839	1122	989	224	613		218	0	0	222	0	
V/C Ratio(X)	0.32	0.11	0.02	0.00	0.25		0.10	0.00	0.00	0.10	0.00	
Avail Cap(c_a), veh/h	860	1764	1555	647	1249		1218	0	0	1320	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	3.6	2.2	2.1	0.0	7.6	0.0	14.6	0.0	0.0	14.6	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.1	0.0	0.0	0.6	0.0	0.2	0.0	0.0	0.2	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.1	0.0	0.0	0.6	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	3.7	2.4	2.1	0.0	8.2	0.0	14.8	0.0	0.0	14.8	0.0	0.0
LnGrp LOS	A	A	A		A		B			B		
Approach Vol, veh/h		414			152			22			22	
Approach Delay, s/veh		3.2			8.2			14.8			14.8	
Approach LOS		A			A			B			B	

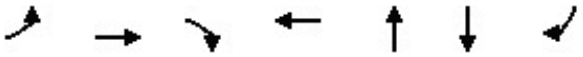
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	9.6	15.3		7.3		24.9		7.3				
Change Period (Y+Rc), s	5.0	5.3		6.3		5.3		6.3				
Max Green Setting (Gmax), s	5.0	21.4		22.0		31.4		22.0				
Max Q Clear Time (g_c+I1), s	5.0	4.5		2.5		3.4		2.5				
Green Ext Time (p_c), s	0.0	2.5		0.0		3.1		0.0				

Intersection Summary		
HCM 6th Ctrl Delay, s/veh		5.3
HCM 6th LOS		A

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	272	120	22	163	22	22	837
v/c Ratio	0.32	0.08	0.02	0.21	0.05	0.05	0.49
Control Delay (s/veh)	2.9	1.8	0.6	7.2	11.4	11.4	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	2.9	1.8	0.6	7.2	11.4	11.4	1.0
Queue Length 50th (ft)	0	0	0	9	2	2	0
Queue Length 95th (ft)	53	25	2	58	18	18	0
Internal Link Dist (ft)		1516		873	369	770	
Turn Bay Length (ft)	250						120
Base Capacity (vph)	864	1646	1496	1323	1438	1543	1725
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.07	0.01	0.12	0.02	0.01	0.49

Intersection Summary

HCM 6th Signalized Intersection Summary
5: Earlystown Rd (S.R. 0045) & S.R. 0322 EB Off-Ramp

03/28/2025

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	0	70	0	0	0	0	200	100	40	730	0
Future Volume (veh/h)	120	0	70	0	0	0	0	200	100	40	730	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1789	1789	1789				0	1766	1766	1823	1823	0
Adj Flow Rate, veh/h	130	0	76				0	217	109	43	793	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	6	6				0	2	2	1	1	0
Cap, veh/h	181	0	106				0	618	536	418	2306	0
Arrive On Green	0.17	0.00	0.17				0.00	0.35	0.36	0.48	1.00	0.00
Sat Flow, veh/h	1028	0	601				0	1766	1497	1736	3555	0
Grp Volume(v), veh/h	206	0	0				0	217	109	43	793	0
Grp Sat Flow(s),veh/h/ln	1630	0	0				0	1766	1497	1736	1732	0
Q Serve(g_s), s	7.2	0.0	0.0				0.0	5.5	3.0	0.8	0.0	0.0
Cycle Q Clear(g_c), s	7.2	0.0	0.0				0.0	5.5	3.0	0.8	0.0	0.0
Prop In Lane	0.63		0.37				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	287	0	0				0	618	536	418	2306	0
V/C Ratio(X)	0.72	0.00	0.00				0.00	0.35	0.20	0.10	0.34	0.00
Avail Cap(c_a), veh/h	502	0	0				0	618	536	418	2306	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	1.00	0.77	0.77	0.00
Uniform Delay (d), s/veh	23.6	0.0	0.0				0.0	14.5	13.3	12.0	0.0	0.0
Incr Delay (d2), s/veh	3.4	0.0	0.0				0.0	1.6	0.9	0.1	0.3	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	0.0	0.0				0.0	2.1	1.0	0.3	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	26.9	0.0	0.0				0.0	16.0	14.2	12.1	0.3	0.0
LnGrp LOS	C							B	B	B	A	
Approach Vol, veh/h		206						326			836	
Approach Delay, s/veh		26.9						15.4			0.9	
Approach LOS		C						B			A	

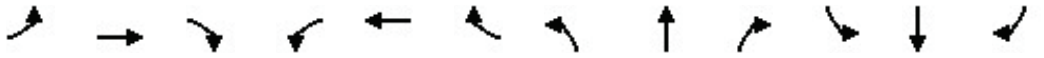
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	18.9	26.0		15.1		44.9						
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5						
Max Green Setting (Gmax), s	6.5	21.5		18.5		32.5						
Max Q Clear Time (g_c+I1), s	2.8	8.5		10.2		3.0						
Green Ext Time (p_c), s	0.0	2.5		0.7		14.9						

Intersection Summary												
HCM 6th Ctrl Delay, s/veh			8.3									
HCM 6th LOS			A									

Lane Group	EBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	206	217	109	43	793
v/c Ratio	0.60	0.20	0.11	0.24	0.34
Control Delay (s/veh)	18.5	8.6	3.0	24.3	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	18.5	8.6	3.0	24.3	2.8
Queue Length 50th (ft)	32	22	0	16	16
Queue Length 95th (ft)	78	94	24	m24	60
Internal Link Dist (ft)	438	1087			312
Turn Bay Length (ft)				100	
Base Capacity (vph)	562	1066	960	184	2316
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.37	0.20	0.11	0.23	0.34

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	280	0	30	80	240	0	0	490	470
Future Volume (veh/h)	0	0	0	280	0	30	80	240	0	0	490	470
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1772	1772	1772	1738	1738	0	0	1786	1786
Adj Flow Rate, veh/h				304	0	33	87	261	0	0	533	0
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				2	2	2	4	4	0	0	1	1
Cap, veh/h				344	0	37	108	1942	0	0	1937	
Arrive On Green				0.23	0.00	0.23	0.13	1.00	0.00	0.00	0.57	0.00
Sat Flow, veh/h				1504	0	163	1655	3164	0	0	3572	0
Grp Volume(v), veh/h				337	0	0	87	261	0	0	533	0
Grp Sat Flow(s),veh/h/ln				1667	0	0	1655	1425	0	0	1697	0
Q Serve(g_s), s				19.5	0.0	0.0	5.1	0.0	0.0	0.0	8.0	0.0
Cycle Q Clear(g_c), s				19.5	0.0	0.0	5.1	0.0	0.0	0.0	8.0	0.0
Prop In Lane				0.90		0.10	1.00		0.00	0.00		0.00
Lane Grp Cap(c), veh/h				382	0	0	108	1942	0	0	1937	
V/C Ratio(X)				0.88	0.00	0.00	0.80	0.13	0.00	0.00	0.28	
Avail Cap(c_a), veh/h				509	0	0	197	1942	0	0	1937	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.99	0.99	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				37.3	0.0	0.0	42.9	0.0	0.0	0.0	10.9	0.0
Incr Delay (d2), s/veh				13.4	0.0	0.0	12.8	0.1	0.0	0.0	0.4	0.0
Initial Q Delay(d3), s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				9.3	0.0	0.0	2.3	0.0	0.0	0.0	2.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh				50.7	0.0	0.0	55.7	0.1	0.0	0.0	11.3	0.0
LnGrp LOS				D			E	A			B	
Approach Vol, veh/h					337			348			533	
Approach Delay, s/veh					50.7			14.0			11.3	
Approach LOS					D			B			B	

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		72.6			11.0	61.6		27.4				
Change Period (Y+Rc), s		4.5			4.5	4.5		4.5				
Max Green Setting (Gmax), s		60.5			11.9	44.1		30.5				
Max Q Clear Time (g_c+I1), s		2.0			7.1	10.0		21.5				
Green Ext Time (p_c), s		1.6			0.1	3.5		1.4				

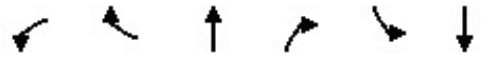
Intersection Summary		
HCM 6th Ctrl Delay, s/veh	23.0	
HCM 6th LOS	C	

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	337	87	261	1044
v/c Ratio	0.80	0.53	0.13	0.55
Control Delay (s/veh)	43.6	54.8	4.6	5.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay (s/veh)	43.6	54.8	4.6	5.9
Queue Length 50th (ft)	166	52	22	19
Queue Length 95th (ft)	242	90	38	186
Internal Link Dist (ft)	616		312	363
Turn Bay Length (ft)		100		
Base Capacity (vph)	553	195	1944	1908
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.61	0.45	0.13	0.55

Intersection Summary



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	100	60	220	50	20	860
Future Volume (veh/h)	100	60	220	50	20	860
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1864	1864	1870	1870
Adj Flow Rate, veh/h	109	65	239	54	22	935
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	191	114	1305	1106	784	1309
Arrive On Green	0.18	0.18	0.70	0.70	0.70	0.70
Sat Flow, veh/h	1061	633	1864	1580	1086	1870
Grp Volume(v), veh/h	175	0	239	54	22	935
Grp Sat Flow(s),veh/h/ln	1703	0	1864	1580	1086	1870
Q Serve(g_s), s	9.4	0.0	4.4	1.1	0.7	30.0
Cycle Q Clear(g_c), s	9.4	0.0	4.4	1.1	5.1	30.0
Prop In Lane	0.62	0.37		1.00	1.00	
Lane Grp Cap(c), veh/h	307	0	1305	1106	784	1309
V/C Ratio(X)	0.57	0.00	0.18	0.05	0.03	0.71
Avail Cap(c_a), veh/h	307	0	1305	1106	784	1309
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.5	0.0	5.2	4.7	6.0	9.0
Incr Delay (d2), s/veh	7.5	0.0	0.3	0.1	0.1	3.3
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.5	0.0	1.4	0.3	0.2	11.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	45.0	0.0	5.5	4.7	6.1	12.3
LnGrp LOS	D		A	A	A	B
Approach Vol, veh/h	175		293			957
Approach Delay, s/veh	45.0		5.3			12.2
Approach LOS	D		A			B

Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		76.0			76.0	24.0
Change Period (Y+Rc), s		6.0			6.0	6.0
Max Green Setting (Gmax), s		70.0			70.0	18.0
Max Q Clear Time (g_c+I1), s		6.4			32.0	11.4
Green Ext Time (p_c), s		1.5			9.6	0.2

Intersection Summary	
HCM 6th Ctrl Delay, s/veh	14.8
HCM 6th LOS	B

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	174	239	54	22	935
v/c Ratio	0.43	0.20	0.05	0.03	0.77
Control Delay (s/veh)	33.9	3.8	0.1	4.9	16.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	33.9	3.8	0.1	4.9	16.6
Queue Length 50th (ft)	86	22	0	4	313
Queue Length 95th (ft)	154	26	m1	11	462
Internal Link Dist (ft)	889	85			775
Turn Bay Length (ft)				75	
Base Capacity (vph)	409	1297	1118	795	1304
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.43	0.18	0.05	0.03	0.72

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Intersection	
Intersection Delay, s/veh	13.0
Intersection LOS	B

Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	174	293	957
Demand Flow Rate, veh/h	177	299	976
Vehicles Circulating, veh/h	244	22	111
Vehicles Exiting, veh/h	22	1065	310
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	4.9	4.0	17.2
Approach LOS	A	A	C

Lane	Left	Left	Bypass	Left
Designated Moves	LR	T	R	LT
Assumed Moves	LR	T		LT
RT Channelized			Yield	
Lane Util	1.000	1.000		1.000
Follow-Up Headway, s	2.609	2.609		2.609
Critical Headway, s	4.976	4.976		4.976
Entry Flow, veh/h	177	244	55	976
Cap Entry Lane, veh/h	1076	1349	1349	1232
Entry HV Adj Factor	0.983	0.980	0.980	0.981
Flow Entry, veh/h	174	239	54	957
Cap Entry, veh/h	1058	1323	1323	1209
V/C Ratio	0.165	0.181	0.041	0.792
Control Delay, s/veh	4.9	4.2	3.0	17.2
LOS	A	A	A	C
95th %tile Queue, veh	1	1	0	9

Intersection: 100: Earlystown Rd (S.R. 0045) & Old 322 Connector

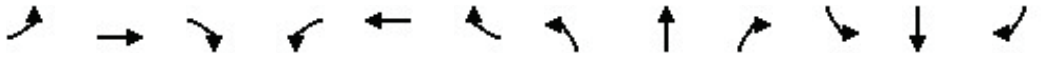
Movement	WB	NB	NB	SB
Directions Served	LR	T	R	LT
Maximum Queue (ft)	67	53	8	438
Average Queue (ft)	19	5	0	254
95th Queue (ft)	47	27	6	513
Link Distance (ft)	868	74	74	
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		0		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 101: Boal Ave (S.R. 0322) & Old 322 Connector

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	78	45
Average Queue (ft)	38	8
95th Queue (ft)	63	32
Link Distance (ft)	1050	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 117: Estate Drive & Earlystown Road (S.R. 0045)

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	750	190	60	0	100	10	30	30	0	10	20	410
Future Volume (veh/h)	750	190	60	0	100	10	30	30	0	10	20	410
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1780	1780	1852	1823	1823	1896	1772	1772	1772	1959	1959	1959
Adj Flow Rate, veh/h	815	207	65	0	109	0	33	33	0	11	22	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	2	2	2
Cap, veh/h	1057	1277	1125	150	417		177	65	0	144	111	
Arrive On Green	0.41	0.72	0.72	0.00	0.23	0.00	0.06	0.08	0.00	0.06	0.08	0.00
Sat Flow, veh/h	1696	1780	1569	1079	1823	0	783	783	0	535	1333	1660
Grp Volume(v), veh/h	815	207	65	0	109	0	66	0	0	33	0	0
Grp Sat Flow(s),veh/h/ln	1696	1780	1569	1079	1823	0	1567	0	0	1868	0	1660
Q Serve(g_s), s	14.0	1.8	0.6	0.0	2.4	0.0	1.2	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	14.0	1.8	0.6	0.0	2.4	0.0	1.9	0.0	0.0	0.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.50		0.00	0.33		1.00
Lane Grp Cap(c), veh/h	1057	1277	1125	150	417		210	0	0	216	0	
V/C Ratio(X)	0.77	0.16	0.06	0.00	0.26		0.31	0.00	0.00	0.15	0.00	
Avail Cap(c_a), veh/h	1462	2124	1872	405	849		807	0	0	907	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	5.3	2.2	2.0	0.0	15.2	0.0	21.3	0.0	0.0	20.7	0.0	0.0
Incr Delay (d2), s/veh	1.1	0.2	0.1	0.0	1.0	0.0	0.8	0.0	0.0	0.3	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.2	0.1	0.0	0.9	0.0	0.7	0.0	0.0	0.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.4	2.3	2.1	0.0	16.2	0.0	22.2	0.0	0.0	21.0	0.0	0.0
LnGrp LOS	A	A	A		B		C			C		
Approach Vol, veh/h		1087			109			66			33	
Approach Delay, s/veh		5.3			16.2			22.2			21.0	
Approach LOS		A			B			C			C	

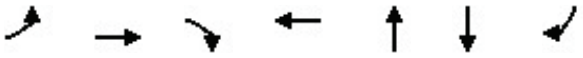
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	23.5	15.3		9.3		38.8		9.3				
Change Period (Y+Rc), s	5.0	5.3		6.3		5.3		6.3				
Max Green Setting (Gmax), s	30.0	21.4		22.0		56.4		22.0				
Max Q Clear Time (g_c+I1), s	16.5	4.9		2.8		4.3		3.9				
Green Ext Time (p_c), s	2.0	1.6		0.1		8.2		0.2				

Intersection Summary			
HCM 6th Ctrl Delay, s/veh		7.5	
HCM 6th LOS		A	

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	815	207	65	120	66	33	446
v/c Ratio	0.76	0.14	0.05	0.28	0.27	0.12	0.26
Control Delay (s/veh)	11.1	3.2	1.1	23.6	29.0	26.9	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	11.1	3.2	1.1	23.6	29.0	26.9	0.4
Queue Length 50th (ft)	138	21	0	40	25	12	0
Queue Length 95th (ft)	#389	47	9	88	62	37	0
Internal Link Dist (ft)		1516		873	369	770	
Turn Bay Length (ft)	250						120
Base Capacity (vph)	1212	1579	1439	747	652	739	1725
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.13	0.05	0.16	0.10	0.04	0.26

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	350	0	120	0	0	0	0	520	320	30	350	0
Future Volume (veh/h)	350	0	120	0	0	0	0	520	320	30	350	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1846	1846	1846				0	1780	1780	1823	1823	0
Adj Flow Rate, veh/h	380	0	130				0	565	348	33	380	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2				0	1	1	1	1	0
Cap, veh/h	392	0	134				0	668	578	145	1847	0
Arrive On Green	0.30	0.00	0.30				0.00	0.38	0.38	0.17	1.00	0.00
Sat Flow, veh/h	1270	0	434				0	1780	1509	1736	3555	0
Grp Volume(v), veh/h	510	0	0				0	565	348	33	380	0
Grp Sat Flow(s),veh/h/ln	1704	0	0				0	1780	1509	1736	1732	0
Q Serve(g_s), s	17.7	0.0	0.0				0.0	17.4	11.1	1.0	0.0	0.0
Cycle Q Clear(g_c), s	17.7	0.0	0.0				0.0	17.4	11.1	1.0	0.0	0.0
Prop In Lane	0.75		0.25				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	526	0	0				0	668	578	145	1847	0
V/C Ratio(X)	0.97	0.00	0.00				0.00	0.85	0.60	0.23	0.21	0.00
Avail Cap(c_a), veh/h	526	0	0				0	668	578	145	1847	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	1.00	0.98	0.98	0.00
Uniform Delay (d), s/veh	20.7	0.0	0.0				0.0	17.2	14.8	23.3	0.0	0.0
Incr Delay (d2), s/veh	31.7	0.0	0.0				0.0	12.6	4.6	0.8	0.2	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.1	0.0	0.0				0.0	8.0	3.8	0.4	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	52.4	0.0	0.0				0.0	29.7	19.4	24.1	0.2	0.0
LnGrp LOS	D							C	B	C	A	
Approach Vol, veh/h		510						913			413	
Approach Delay, s/veh		52.4						25.8			2.2	
Approach LOS		D						C			A	

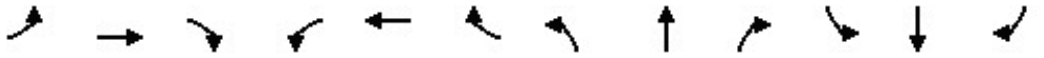
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	9.5	27.5		23.0		37.0
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5
Max Green Setting (Gmax), s	5.0	23.0		18.5		32.5
Max Q Clear Time (g_c+I1), s	3.0	20.4		20.7		3.0
Green Ext Time (p_c), s	0.0	1.8		0.0		6.7

Intersection Summary		
HCM 6th Ctrl Delay, s/veh		27.9
HCM 6th LOS		C

Lane Group	EBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	510	565	348	33	380
v/c Ratio	0.90	0.66	0.38	0.23	0.20
Control Delay (s/veh)	38.6	19.7	3.2	34.1	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	38.6	19.7	3.2	34.1	8.4
Queue Length 50th (ft)	136	127	0	13	46
Queue Length 95th (ft)	#303	#349	44	m35	58
Internal Link Dist (ft)	438	1087			312
Turn Bay Length (ft)				100	
Base Capacity (vph)	587	859	919	141	1864
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.87	0.66	0.38	0.23	0.20

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	180	0	40	140	730	0	0	200	170
Future Volume (veh/h)	0	0	0	180	0	40	140	730	0	0	200	170
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1772	1772	1772	1766	1766	0	0	1758	1758
Adj Flow Rate, veh/h				196	0	43	152	793	0	0	217	0
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				2	2	2	2	2	0	0	3	3
Cap, veh/h				233	0	51	187	2111	0	0	1943	
Arrive On Green				0.17	0.00	0.17	0.04	0.24	0.00	0.00	0.58	0.00
Sat Flow, veh/h				1354	0	297	1682	3197	0	0	3516	0
Grp Volume(v), veh/h				239	0	0	152	793	0	0	217	0
Grp Sat Flow(s),veh/h/ln				1651	0	0	1682	1431	0	0	1670	0
Q Serve(g_s), s				14.0	0.0	0.0	9.0	23.1	0.0	0.0	2.9	0.0
Cycle Q Clear(g_c), s				14.0	0.0	0.0	9.0	23.1	0.0	0.0	2.9	0.0
Prop In Lane				0.82		0.18	1.00		0.00	0.00		0.00
Lane Grp Cap(c), veh/h				284	0	0	187	2111	0	0	1943	
V/C Ratio(X)				0.84	0.00	0.00	0.81	0.38	0.00	0.00	0.11	
Avail Cap(c_a), veh/h				537	0	0	429	2111	0	0	1943	
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.76	0.76	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				40.1	0.0	0.0	47.1	18.7	0.0	0.0	9.4	0.0
Incr Delay (d2), s/veh				6.6	0.0	0.0	6.4	0.4	0.0	0.0	0.1	0.0
Initial Q Delay(d3), s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				6.1	0.0	0.0	4.2	8.8	0.0	0.0	1.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh				46.7	0.0	0.0	53.5	19.0	0.0	0.0	9.5	0.0
LnGrp LOS				D			D	B			A	
Approach Vol, veh/h					239			945			217	
Approach Delay, s/veh					46.7			24.6			9.5	
Approach LOS					D			C			A	

Timer - Assigned Phs	2		5	6		8						
Phs Duration (G+Y+Rc), s	78.3		15.6	62.7		21.7						
Change Period (Y+Rc), s	4.5		4.5	4.5		4.5						
Max Green Setting (Gmax), s	58.5		25.5	28.5		32.5						
Max Q Clear Time (g_c+I1), s	25.1		11.0	4.9		16.0						
Green Ext Time (p_c), s	5.6		0.3	1.3		1.2						

Intersection Summary		
HCM 6th Ctrl Delay, s/veh	26.0	
HCM 6th LOS	C	

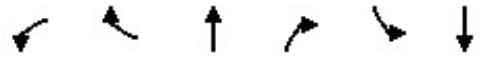
Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	239	152	793	402
v/c Ratio	0.74	0.63	0.37	0.22
Control Delay (s/veh)	41.8	43.1	4.3	6.4
Queue Delay	0.0	0.0	0.4	0.0
Total Delay (s/veh)	41.8	43.1	4.7	6.4
Queue Length 50th (ft)	107	78	42	15
Queue Length 95th (ft)	175	m122	141	62
Internal Link Dist (ft)	616		312	363
Turn Bay Length (ft)		100		
Base Capacity (vph)	581	425	2125	1806
Starvation Cap Reductn	0	0	786	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.41	0.36	0.59	0.22

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	110	50	630	140	60	260
Future Volume (veh/h)	110	50	630	140	60	260
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1870	1870	1864	1864	1870	1870
Adj Flow Rate, veh/h	120	54	685	152	65	283
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	143	65	1414	1198	539	1418
Arrive On Green	0.12	0.12	0.76	0.76	0.76	0.76
Sat Flow, veh/h	1177	530	1864	1580	757	1870
Grp Volume(v), veh/h	175	0	685	152	65	283
Grp Sat Flow(s),veh/h/ln	1716	0	1864	1580	757	1870
Q Serve(g_s), s	10.0	0.0	14.0	2.6	3.6	4.3
Cycle Q Clear(g_c), s	10.0	0.0	14.0	2.6	17.6	4.3
Prop In Lane	0.69	0.31		1.00	1.00	
Lane Grp Cap(c), veh/h	209	0	1414	1198	539	1418
V/C Ratio(X)	0.84	0.00	0.48	0.13	0.12	0.20
Avail Cap(c_a), veh/h	360	0	1414	1198	539	1418
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.9	0.0	4.6	3.2	8.0	3.4
Incr Delay (d2), s/veh	8.6	0.0	1.2	0.2	0.5	0.3
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	0.0	4.6	0.7	0.6	1.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	51.5	0.0	5.8	3.5	8.4	3.8
LnGrp LOS	D		A	A	A	A
Approach Vol, veh/h	175		837			348
Approach Delay, s/veh	51.5		5.4			4.6
Approach LOS	D		A			A

Timer - Assigned Phs		2			6	8
Phs Duration (G+Y+Rc), s		81.8			81.8	18.2
Change Period (Y+Rc), s		6.0			6.0	6.0
Max Green Setting (Gmax), s		67.0			67.0	21.0
Max Q Clear Time (g_c+I1), s		16.0			19.6	12.0
Green Ext Time (p_c), s		6.4			2.4	0.3

Intersection Summary	
HCM 6th Ctrl Delay, s/veh	11.1
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Lane Group	WBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	174	685	152	65	283
v/c Ratio	0.66	0.50	0.13	0.14	0.21
Control Delay (s/veh)	47.2	5.6	0.8	5.5	5.0
Queue Delay	0.0	0.1	0.0	0.0	0.0
Total Delay (s/veh)	47.2	5.7	0.8	5.5	5.0
Queue Length 50th (ft)	93	33	0	10	47
Queue Length 95th (ft)	154	386	21	30	93
Internal Link Dist (ft)	889	85			775
Turn Bay Length (ft)				75	
Base Capacity (vph)	379	1367	1202	479	1375
Starvation Cap Reductn	0	79	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.46	0.53	0.13	0.14	0.21

Intersection Summary

Intersection	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	174	837	348
Demand Flow Rate, veh/h	177	854	355
Vehicles Circulating, veh/h	699	66	122
Vehicles Exiting, veh/h	66	411	754
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.6	8.0	5.7
Approach LOS	A	A	A

Lane	Left	Left	Bypass	Left
Designated Moves	LR	T	R	LT
Assumed Moves	LR	T		LT
RT Channelized			Yield	
Lane Util	1.000	1.000		1.000
Follow-Up Headway, s	2.609	2.609		2.609
Critical Headway, s	4.976	4.976		4.976
Entry Flow, veh/h	177	699	155	355
Cap Entry Lane, veh/h	676	1290	1290	1218
Entry HV Adj Factor	0.983	0.980	0.980	0.981
Flow Entry, veh/h	174	685	152	348
Cap Entry, veh/h	665	1265	1265	1196
V/C Ratio	0.262	0.542	0.120	0.291
Control Delay, s/veh	8.6	8.9	3.8	5.7
LOS	A	A	A	A
95th %tile Queue, veh	1	3	0	1

Intersection: 100: Earlystown Rd (S.R. 0045) & Old 322 Connector

Movement	WB	NB	NB	B151	SB
Directions Served	LR	T	R	T	LT
Maximum Queue (ft)	84	139	42	82	84
Average Queue (ft)	30	47	2	5	22
95th Queue (ft)	63	119	18	47	62
Link Distance (ft)	868	74	74	381	
Upstream Blk Time (%)		7			
Queuing Penalty (veh)		26			
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 101: Boal Ave (S.R. 0322) & Old 322 Connector

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	86	53
Average Queue (ft)	38	14
95th Queue (ft)	62	43
Link Distance (ft)	1050	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 117: Estate Drive & Earlystown Road (S.R. 0045)

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

ROUNDABOUT INTERCHANGE ALTERNATIVE

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	250	110	20	0	140	10	10	10	0	10	10	770
Future Volume (veh/h)	250	110	20	0	140	10	10	10	0	10	10	770
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1822	1795	1795	1866	1786	1786	1786	1959	1959	1959
Adj Flow Rate, veh/h	272	120	22	0	152	0	11	11	0	11	11	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	1	1	1	2	2	2
Cap, veh/h	839	1122	989	224	613		218	50	0	223	55	
Arrive On Green	0.17	0.64	0.64	0.00	0.34	0.00	0.03	0.06	0.00	0.03	0.06	0.00
Sat Flow, veh/h	1669	1752	1544	1196	1795	0	820	820	0	899	899	1660
Grp Volume(v), veh/h	272	120	22	0	152	0	22	0	0	22	0	0
Grp Sat Flow(s),veh/h/ln	1669	1752	1544	1196	1795	0	1639	0	0	1798	0	1660
Q Serve(g_s), s	2.5	0.9	0.2	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.5	0.9	0.2	0.0	2.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.50		0.00	0.50		1.00
Lane Grp Cap(c), veh/h	839	1122	989	224	613		218	0	0	222	0	
V/C Ratio(X)	0.32	0.11	0.02	0.00	0.25		0.10	0.00	0.00	0.10	0.00	
Avail Cap(c_a), veh/h	860	1764	1555	647	1249		1218	0	0	1320	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	3.6	2.2	2.1	0.0	7.6	0.0	14.6	0.0	0.0	14.6	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.1	0.0	0.0	0.6	0.0	0.2	0.0	0.0	0.2	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.1	0.0	0.0	0.6	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	3.7	2.4	2.1	0.0	8.2	0.0	14.8	0.0	0.0	14.8	0.0	0.0
LnGrp LOS	A	A	A		A		B			B		
Approach Vol, veh/h		414			152			22			22	
Approach Delay, s/veh		3.2			8.2			14.8			14.8	
Approach LOS		A			A			B			B	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	9.6	15.3		7.3		24.9		7.3				
Change Period (Y+Rc), s	5.0	5.3		6.3		5.3		6.3				
Max Green Setting (Gmax), s	5.0	21.4		22.0		31.4		22.0				
Max Q Clear Time (g_c+I1), s	5.0	4.5		2.5		3.4		2.5				
Green Ext Time (p_c), s	0.0	2.5		0.0		3.1		0.0				

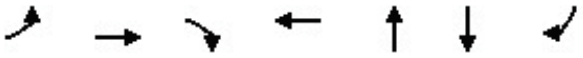
Intersection Summary		
HCM 6th Ctrl Delay, s/veh		5.3
HCM 6th LOS		A

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

4: Main St/Earlystown Rd (S.R. 0045) & Boal Ave (S.R. 0045)/Boal Ave (S.R. 3014)



Lane Group	EBL	EBT	EBR	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	272	120	22	163	22	22	837
v/c Ratio	0.32	0.08	0.02	0.21	0.05	0.05	0.49
Control Delay (s/veh)	2.9	1.8	0.6	7.2	11.4	11.4	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	2.9	1.8	0.6	7.2	11.4	11.4	1.0
Queue Length 50th (ft)	0	0	0	9	2	2	0
Queue Length 95th (ft)	53	25	2	58	18	18	0
Internal Link Dist (ft)		718		873	369	770	
Turn Bay Length (ft)	250						120
Base Capacity (vph)	864	1646	1496	1323	1438	1543	1725
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.07	0.01	0.12	0.02	0.01	0.49

Intersection Summary

Intersection	
Intersection Delay, s/veh	8.6
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	0	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	206	0	326	836
Demand Flow Rate, veh/h	219	0	332	844
Vehicles Circulating, veh/h	844	359	181	0
Vehicles Exiting, veh/h	0	43	882	359
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	12.3	0.0	3.3	9.7
Approach LOS	B	-	A	A

Lane	Left	Left	Bypass	Left
Designated Moves	LTR	T	R	LT
Assumed Moves	LTR	T		LT
RT Channelized			Free	
Lane Util	1.000	1.000		1.000
Follow-Up Headway, s	2.609	2.609		2.609
Critical Headway, s	4.976	4.976		4.976
Entry Flow, veh/h	219	221	111	844
Cap Entry Lane, veh/h	583	1147	1938	1380
Entry HV Adj Factor	0.941	0.980	0.980	0.991
Flow Entry, veh/h	206	217	109	836
Cap Entry, veh/h	549	1125	1900	1367
V/C Ratio	0.375	0.193	0.057	0.612
Control Delay, s/veh	12.3	4.9	0.0	9.7
LOS	B	A	A	A
95th %tile Queue, veh	2	1	0	4

Intersection	
Intersection Delay, s/veh	6.3
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	0	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	0	337	348	1044
Demand Flow Rate, veh/h	0	344	361	1054
Vehicles Circulating, veh/h	848	361	0	400
Vehicles Exiting, veh/h	90	0	848	305
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	0.0	7.8	5.0	6.3
Approach LOS	-	A	A	A

Lane	Left	Left	Left	Bypass
Designated Moves	LTR	LT	T	R
Assumed Moves	LTR	LT	T	
RT Channelized				Free
Lane Util	1.000	1.000	1.000	
Follow-Up Headway, s	2.609	2.609	2.609	
Critical Headway, s	4.976	4.976	4.976	
Entry Flow, veh/h	344	361	538	516
Cap Entry Lane, veh/h	955	1380	918	1919
Entry HV Adj Factor	0.980	0.963	0.990	0.990
Flow Entry, veh/h	337	348	533	511
Cap Entry, veh/h	935	1329	909	1900
V/C Ratio	0.360	0.262	0.586	0.269
Control Delay, s/veh	7.8	5.0	12.3	0.0
LOS	A	A	B	A
95th %tile Queue, veh	2	1	4	1

Intersection	
Intersection Delay, s/veh	13.1
Intersection LOS	B

Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	174	293	957
Demand Flow Rate, veh/h	177	299	976
Vehicles Circulating, veh/h	244	22	111
Vehicles Exiting, veh/h	77	1065	310
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	4.9	4.6	17.2
Approach LOS	A	A	C

Lane	Left	Left	Left
Designated Moves	LR	TR	LT
Assumed Moves	LR	TR	LT
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	177	299	976
Cap Entry Lane, veh/h	1076	1349	1232
Entry HV Adj Factor	0.983	0.981	0.981
Flow Entry, veh/h	174	293	957
Cap Entry, veh/h	1058	1323	1209
V/C Ratio	0.165	0.222	0.792
Control Delay, s/veh	4.9	4.6	17.2
LOS	A	A	C
95th %tile Queue, veh	1	1	9

Intersection: 4: Main St/Earlystown Rd (S.R. 0045) & Boal Ave (S.R. 0045)/Boal Ave (S.R. 3014)

Movement	EB	EB	EB	WB	NB	SB
Directions Served	L	T	R	TR	LTR	LT
Maximum Queue (ft)	92	49	41	95	36	37
Average Queue (ft)	28	6	3	29	8	7
95th Queue (ft)	67	26	19	69	23	23
Link Distance (ft)		742	742		382	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	250					
Storage Blk Time (%)				0		
Queuing Penalty (veh)				0		

Intersection: 5: Earlystown Rd (S.R. 0045) & S.R. 0322 EB Off-Ramp

Movement	EB	NB	SB
Directions Served	LTR	T	LT
Maximum Queue (ft)	114	51	78
Average Queue (ft)	51	11	10
95th Queue (ft)	94	36	50
Link Distance (ft)	462		284
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Earlystown Rd (S.R. 0045) & S.R. 0322 WB On-Ramp

Movement	WB	NB	SB
Directions Served	LTR	LT	T
Maximum Queue (ft)	155	73	149
Average Queue (ft)	51	11	53
95th Queue (ft)	102	42	112
Link Distance (ft)		284	352
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 100: Earlystown Rd (S.R. 0045) & Old 322 Connector

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	61	30	434
Average Queue (ft)	23	2	215
95th Queue (ft)	52	16	489
Link Distance (ft)	879	82	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 101: Boal Ave (S.R. 0322) & Old 322 Connector

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	77	52
Average Queue (ft)	38	7
95th Queue (ft)	61	32
Link Distance (ft)	1050	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 117: Estate Drive & Earlystown Road (S.R. 0045)

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	750	190	60	0	100	10	30	30	0	10	20	410
Future Volume (veh/h)	750	190	60	0	100	10	30	30	0	10	20	410
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1780	1780	1852	1823	1823	1896	1772	1772	1772	1959	1959	1959
Adj Flow Rate, veh/h	815	207	65	0	109	0	33	33	0	11	22	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	2	2	2
Cap, veh/h	1057	1277	1125	150	417		177	65	0	144	111	
Arrive On Green	0.41	0.72	0.72	0.00	0.23	0.00	0.06	0.08	0.00	0.06	0.08	0.00
Sat Flow, veh/h	1696	1780	1569	1079	1823	0	783	783	0	535	1333	1660
Grp Volume(v), veh/h	815	207	65	0	109	0	66	0	0	33	0	0
Grp Sat Flow(s),veh/h/ln	1696	1780	1569	1079	1823	0	1567	0	0	1868	0	1660
Q Serve(g_s), s	14.0	1.8	0.6	0.0	2.4	0.0	1.2	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	14.0	1.8	0.6	0.0	2.4	0.0	1.9	0.0	0.0	0.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	0.50		0.00	0.33		1.00
Lane Grp Cap(c), veh/h	1057	1277	1125	150	417		210	0	0	216	0	
V/C Ratio(X)	0.77	0.16	0.06	0.00	0.26		0.31	0.00	0.00	0.15	0.00	
Avail Cap(c_a), veh/h	1462	2124	1872	405	849		807	0	0	907	0	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	5.3	2.2	2.0	0.0	15.2	0.0	21.3	0.0	0.0	20.7	0.0	0.0
Incr Delay (d2), s/veh	1.1	0.2	0.1	0.0	1.0	0.0	0.8	0.0	0.0	0.3	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.2	0.1	0.0	0.9	0.0	0.7	0.0	0.0	0.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.4	2.3	2.1	0.0	16.2	0.0	22.2	0.0	0.0	21.0	0.0	0.0
LnGrp LOS	A	A	A		B		C			C		
Approach Vol, veh/h		1087			109			66			33	
Approach Delay, s/veh		5.3			16.2			22.2			21.0	
Approach LOS		A			B			C			C	

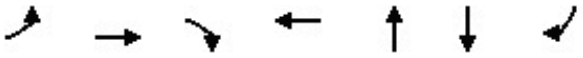
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	23.5	15.3		9.3		38.8		9.3				
Change Period (Y+Rc), s	5.0	5.3		6.3		5.3		6.3				
Max Green Setting (Gmax), s	30.0	21.4		22.0		56.4		22.0				
Max Q Clear Time (g_c+I1), s	16.5	4.9		2.8		4.3		3.9				
Green Ext Time (p_c), s	2.0	1.6		0.1		8.2		0.2				

Intersection Summary			
HCM 6th Ctrl Delay, s/veh		7.5	
HCM 6th LOS		A	

Notes

User approved pedestrian interval to be less than phase max green.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBT	NBT	SBT	SBR
Lane Group Flow (vph)	815	207	65	120	66	33	446
v/c Ratio	0.76	0.14	0.05	0.28	0.27	0.12	0.26
Control Delay (s/veh)	11.1	3.2	1.1	23.6	29.0	26.9	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	11.1	3.2	1.1	23.6	29.0	26.9	0.4
Queue Length 50th (ft)	138	21	0	40	25	12	0
Queue Length 95th (ft)	#389	47	9	88	62	37	0
Internal Link Dist (ft)		718		873	369	770	
Turn Bay Length (ft)	250						120
Base Capacity (vph)	1212	1579	1439	747	652	739	1725
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.67	0.13	0.05	0.16	0.10	0.04	0.26

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Intersection	
Intersection Delay, s/veh	8.9
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	0	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	510	0	913	413
Demand Flow Rate, veh/h	521	0	922	417
Vehicles Circulating, veh/h	417	959	421	0
Vehicles Exiting, veh/h	0	33	517	959
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	12.4	0.0	8.7	5.3
Approach LOS	B	-	A	A

Lane	Left	Left	Bypass	Left
Designated Moves	LTR	T	R	LT
Assumed Moves	LTR	T		LT
RT Channelized			Free	
Lane Util	1.000	1.000		1.000
Follow-Up Headway, s	2.609	2.609		2.609
Critical Headway, s	4.976	4.976		4.976
Entry Flow, veh/h	521	571	351	417
Cap Entry Lane, veh/h	902	898	1919	1380
Entry HV Adj Factor	0.979	0.990	0.990	0.991
Flow Entry, veh/h	510	565	348	413
Cap Entry, veh/h	883	889	1900	1367
V/C Ratio	0.578	0.636	0.183	0.302
Control Delay, s/veh	12.4	14.0	0.0	5.3
LOS	B	B	A	A
95th %tile Queue, veh	4	5	1	1

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	0	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	0	239	945	402
Demand Flow Rate, veh/h	0	244	964	415
Vehicles Circulating, veh/h	424	964	0	355
Vehicles Exiting, veh/h	155	0	424	853
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	0.0	15.7	12.1	3.3
Approach LOS	-	C	B	A

Lane	Left	Left	Left	Bypass
Designated Moves	LTR	LT	T	R
Assumed Moves	LTR	LT	T	
RT Channelized				Free
Lane Util	1.000	1.000	1.000	
Follow-Up Headway, s	2.609	2.609	2.609	
Critical Headway, s	4.976	4.976	4.976	
Entry Flow, veh/h	244	964	224	191
Cap Entry Lane, veh/h	516	1380	961	1957
Entry HV Adj Factor	0.980	0.980	0.971	0.971
Flow Entry, veh/h	239	945	217	185
Cap Entry, veh/h	506	1353	933	1900
V/C Ratio	0.473	0.699	0.233	0.097
Control Delay, s/veh	15.7	12.1	6.2	0.0
LOS	C	B	A	A
95th %tile Queue, veh	3	6	1	0

Intersection	
Intersection Delay, s/veh	9.7
Intersection LOS	A

Approach	WB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	174	837	348
Demand Flow Rate, veh/h	177	854	355
Vehicles Circulating, veh/h	699	66	122
Vehicles Exiting, veh/h	221	411	754
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.6	11.5	5.7
Approach LOS	A	B	A

Lane	Left	Left	Left
Designated Moves	LR	TR	LT
Assumed Moves	LR	TR	LT
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	177	854	355
Cap Entry Lane, veh/h	676	1290	1218
Entry HV Adj Factor	0.983	0.980	0.981
Flow Entry, veh/h	174	837	348
Cap Entry, veh/h	665	1265	1196
V/C Ratio	0.262	0.662	0.291
Control Delay, s/veh	8.6	11.5	5.7
LOS	A	B	A
95th %tile Queue, veh	1	5	1

Intersection: 4: Main St/Earlystown Rd (S.R. 0045) & Boal Ave (S.R. 0045)/Boal Ave (S.R. 3014)

Movement	EB	EB	EB	WB	NB	SB
Directions Served	L	T	R	TR	LTR	LT
Maximum Queue (ft)	269	335	187	116	79	40
Average Queue (ft)	125	34	17	47	28	11
95th Queue (ft)	237	184	159	91	61	30
Link Distance (ft)		742	742		382	
Upstream Blk Time (%)		0	0			
Queuing Penalty (veh)		0	0			
Storage Bay Dist (ft)	250					
Storage Blk Time (%)	1			3		
Queuing Penalty (veh)	2			0		

Intersection: 5: Earlystown Rd (S.R. 0045) & S.R. 0322 EB Off-Ramp

Movement	EB	NB	NB	SB
Directions Served	LTR	T	R	LT
Maximum Queue (ft)	249	335	123	33
Average Queue (ft)	93	131	33	2
95th Queue (ft)	210	394	123	16
Link Distance (ft)	462			284
Upstream Blk Time (%)	0			
Queuing Penalty (veh)	0			
Storage Bay Dist (ft)			100	
Storage Blk Time (%)		14	0	
Queuing Penalty (veh)		44	1	

Intersection: 6: Earlystown Rd (S.R. 0045) & S.R. 0322 WB On-Ramp

Movement	WB	NB	SB
Directions Served	LTR	LT	T
Maximum Queue (ft)	124	292	84
Average Queue (ft)	50	102	21
95th Queue (ft)	97	306	57
Link Distance (ft)		284	352
Upstream Blk Time (%)		10	
Queuing Penalty (veh)		89	
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 100: Earlystown Rd (S.R. 0045) & Old 322 Connector

Movement	WB	NB	B151	SB
Directions Served	LR	TR	T	LT
Maximum Queue (ft)	78	127	17	85
Average Queue (ft)	28	32	1	17
95th Queue (ft)	60	86	10	54
Link Distance (ft)	879	82	352	
Upstream Blk Time (%)		2		
Queuing Penalty (veh)		16		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 101: Boal Ave (S.R. 0322) & Old 322 Connector

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	73	44
Average Queue (ft)	38	12
95th Queue (ft)	59	38
Link Distance (ft)	1050	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 117: Estate Drive & Earlystown Road (S.R. 0045)

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

OLD ROUTE 322 INTERSECTIONS

ROADWAY SEGMENTS

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	85	157	3	11	9
Future Vol, veh/h	10	85	157	3	11	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	2	2
Mvmt Flow	11	92	171	3	12	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	174	0	-	0	287	173
Stage 1	-	-	-	-	173	-
Stage 2	-	-	-	-	114	-
Critical Hdwy	4.3	-	-	-	7.1	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	3	-	-	-	3	3.1
Pot Cap-1 Maneuver	1047	-	-	-	766	927
Stage 1	-	-	-	-	993	-
Stage 2	-	-	-	-	1060	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1047	-	-	-	758	927
Mov Cap-2 Maneuver	-	-	-	-	758	-
Stage 1	-	-	-	-	982	-
Stage 2	-	-	-	-	1060	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.9	0	9.5
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1047	-	-	-	826
HCM Lane V/C Ratio	0.01	-	-	-	0.026
HCM Ctrl Dly (s/v)	8.5	0	-	-	9.5
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q (veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	76	20	20	122	38	2
Future Vol, veh/h	76	20	20	122	38	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	2	2
Mvmt Flow	83	22	22	133	41	2

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	105	0	271	94
Stage 1	-	-	-	-	94	-
Stage 2	-	-	-	-	177	-
Critical Hdwy	-	-	4.3	-	7.1	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	3	-	3	3.1
Pot Cap-1 Maneuver	-	-	1106	-	786	1028
Stage 1	-	-	-	-	1083	-
Stage 2	-	-	-	-	989	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1106	-	769	1028
Mov Cap-2 Maneuver	-	-	-	-	769	-
Stage 1	-	-	-	-	1083	-
Stage 2	-	-	-	-	968	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	1.2	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	779	-	-	1106	-
HCM Lane V/C Ratio	0.056	-	-	0.02	-
HCM Ctrl Dly (s/v)	9.9	-	-	8.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q (veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	100	75	7	14	11
Future Vol, veh/h	9	100	75	7	14	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	109	82	8	15	12

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	90	0	-	0	215	86
Stage 1	-	-	-	-	86	-
Stage 2	-	-	-	-	129	-
Critical Hdwy	4.3	-	-	-	7.1	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	3	-	-	-	3	3.1
Pot Cap-1 Maneuver	1119	-	-	-	858	1038
Stage 1	-	-	-	-	1092	-
Stage 2	-	-	-	-	1042	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1119	-	-	-	849	1038
Mov Cap-2 Maneuver	-	-	-	-	849	-
Stage 1	-	-	-	-	1081	-
Stage 2	-	-	-	-	1042	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.7	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1119	-	-	-	923
HCM Lane V/C Ratio	0.009	-	-	-	0.029
HCM Ctrl Dly (s/v)	8.2	0	-	-	9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q (veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	5	30	1	2	55	1	1	7	1	1	7	10
Future Vol, veh/h	5	30	1	2	55	1	1	7	1	1	7	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	5	33	1	2	60	1	1	8	1	1	8	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	61	0	0	34	0	0	118	109	34	113	109	61
Stage 1	-	-	-	-	-	-	44	44	-	65	65	-
Stage 2	-	-	-	-	-	-	74	65	-	48	44	-
Critical Hdwy	4.3	-	-	4.3	-	-	7.1	6.5	6.23	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	3	-	-	3	-	-	3	4.027	3.1	3	4.027	3.1
Pot Cap-1 Maneuver	1144	-	-	1169	-	-	998	780	1111	1005	779	1073
Stage 1	-	-	-	-	-	-	1134	856	-	1104	839	-
Stage 2	-	-	-	-	-	-	1091	839	-	1128	856	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1144	-	-	1169	-	-	976	775	1111	992	774	1073
Mov Cap-2 Maneuver	-	-	-	-	-	-	976	775	-	992	774	-
Stage 1	-	-	-	-	-	-	1129	853	-	1100	837	-
Stage 2	-	-	-	-	-	-	1068	837	-	1112	853	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	1.1	0.3	9.4	9
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	821	1144	-	-	1169	-	-	929
HCM Lane V/C Ratio	0.012	0.005	-	-	0.002	-	-	0.021
HCM Ctrl Dly (s/v)	9.4	8.2	0	-	8.1	0	-	9
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q (veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	8.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	60	0	0	0	0	0	0	5	0	70	5	0
Future Vol, veh/h	60	0	0	0	0	0	0	5	0	70	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	2	2	2	2	2	2	2	2	2
Mvmt Flow	65	0	0	0	0	0	0	5	0	76	5	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	162	162	5	-	0	0	5	0	0
Stage 1	157	157	-	-	-	-	-	-	-
Stage 2	5	5	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.23	-	-	-	4.3	-	-
Critical Hdwy Stg 1	5.43	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3	4.027	3.1	-	-	-	3	-	-
Pot Cap-1 Maneuver	932	730	1154	0	-	-	1195	-	0
Stage 1	1010	766	-	0	-	-	-	-	0
Stage 2	1193	890	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	872	0	1154	-	-	-	1195	-	-
Mov Cap-2 Maneuver	872	0	-	-	-	-	-	-	-
Stage 1	1010	0	-	-	-	-	-	-	-
Stage 2	1117	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	9.5	0	7.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	872	1195	-
HCM Lane V/C Ratio	-	-	0.075	0.064	-
HCM Ctrl Dly (s/v)	-	-	9.5	8.2	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q (veh)	-	-	0.2	0.2	-

Intersection	
Intersection Delay, s/veh	3.8
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	44	54	71	239
Demand Flow Rate, veh/h	45	55	72	244
Vehicles Circulating, veh/h	49	83	11	27
Vehicles Exiting, veh/h	222	0	83	111
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.1	3.3	3.1	4.3
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LR	LTR	LT	LTR
Assumed Moves	LR	LTR	LT	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	45	55	72	244
Cap Entry Lane, veh/h	1313	1268	1364	1342
Entry HV Adj Factor	0.978	0.978	0.983	0.980
Flow Entry, veh/h	44	54	71	239
Cap Entry, veh/h	1283	1240	1342	1316
V/C Ratio	0.034	0.043	0.053	0.182
Control Delay, s/veh	3.1	3.3	3.1	4.3
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	1

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	75	36	5	60	19	7
Future Vol, veh/h	75	36	5	60	19	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	39	5	65	21	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	121	0	177	102
Stage 1	-	-	-	-	102	-
Stage 2	-	-	-	-	75	-
Critical Hdwy	-	-	4.3	-	7.1	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	3	-	3	3.1
Pot Cap-1 Maneuver	-	-	1092	-	910	1017
Stage 1	-	-	-	-	1074	-
Stage 2	-	-	-	-	1106	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1092	-	905	1017
Mov Cap-2 Maneuver	-	-	-	-	905	-
Stage 1	-	-	-	-	1074	-
Stage 2	-	-	-	-	1100	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0.6	9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	933	-	-	1092	-
HCM Lane V/C Ratio	0.03	-	-	0.005	-
HCM Ctrl Dly (s/v)	9	-	-	8.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q (veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	2	30	55	1	1	9
Future Vol, veh/h	2	30	55	1	1	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	200	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	33	60	1	1	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	61	0	-	0	98	61
Stage 1	-	-	-	-	61	-
Stage 2	-	-	-	-	37	-
Critical Hdwy	4.3	-	-	-	7.1	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	3	-	-	-	3	3.1
Pot Cap-1 Maneuver	1144	-	-	-	1030	1073
Stage 1	-	-	-	-	1123	-
Stage 2	-	-	-	-	1153	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1144	-	-	-	1028	1073
Mov Cap-2 Maneuver	-	-	-	-	1028	-
Stage 1	-	-	-	-	1121	-
Stage 2	-	-	-	-	1153	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.5	0	8.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1144	-	-	-	1068
HCM Lane V/C Ratio	0.002	-	-	-	0.01
HCM Ctrl Dly (s/v)	8.2	-	-	-	8.4
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q (veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	30	4	1	50	6	1
Future Vol, veh/h	30	4	1	50	6	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	4	1	54	7	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	37	0	91	35
Stage 1	-	-	-	-	35	-
Stage 2	-	-	-	-	56	-
Critical Hdwy	-	-	4.3	-	7.1	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	3	-	3	3.1
Pot Cap-1 Maneuver	-	-	1166	-	1041	1110
Stage 1	-	-	-	-	1155	-
Stage 2	-	-	-	-	1129	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1166	-	1040	1110
Mov Cap-2 Maneuver	-	-	-	-	1040	-
Stage 1	-	-	-	-	1155	-
Stage 2	-	-	-	-	1128	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0.2	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1049	-	-	1166	-
HCM Lane V/C Ratio	0.007	-	-	0.001	-
HCM Ctrl Dly (s/v)	8.5	-	-	8.1	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q (veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	170	30	40	10
Future Vol, veh/h	0	0	170	30	40	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	10	3	3	3
Mvmt Flow	0	0	185	33	43	11

Major/Minor	Major2		Minor2	
Conflicting Flow All	-	0	202	202
Stage 1	-	-	202	-
Stage 2	-	-	0	-
Critical Hdwy	-	-	7.1	6.23
Critical Hdwy Stg 1	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	3	3.1
Pot Cap-1 Maneuver	-	-	875	892
Stage 1	-	-	961	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-		
Mov Cap-1 Maneuver	-	-	875	892
Mov Cap-2 Maneuver	-	-	875	-
Stage 1	-	-	961	-
Stage 2	-	-	-	-

Approach	WB	SB
HCM Ctrl Dly, s/v	0	9.4
HCM LOS		A

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	878
HCM Lane V/C Ratio	-	-	0.062
HCM Ctrl Dly (s/v)	-	-	9.4
HCM Lane LOS	-	-	A
HCM 95th %tile Q (veh)	-	-	0.2

Intersection	
Int Delay, s/veh	6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	50	30	100	70	90	30
Future Vol, veh/h	50	30	100	70	90	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	54	33	109	76	98	33

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	87	0	365	71
Stage 1	-	-	-	-	71	-
Stage 2	-	-	-	-	294	-
Critical Hdwy	-	-	4.3	-	7.1	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	3	-	3	3.1
Pot Cap-1 Maneuver	-	-	1121	-	678	1059
Stage 1	-	-	-	-	1110	-
Stage 2	-	-	-	-	868	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1121	-	609	1059
Mov Cap-2 Maneuver	-	-	-	-	609	-
Stage 1	-	-	-	-	1110	-
Stage 2	-	-	-	-	779	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	5	11.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	681	-	-	1121	-
HCM Lane V/C Ratio	0.192	-	-	0.097	-
HCM Ctrl Dly (s/v)	11.5	-	-	8.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q (veh)	0.7	-	-	0.3	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	192	146	20	19	10
Future Vol, veh/h	25	192	146	20	19	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	2	2
Mvmt Flow	27	209	159	22	21	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	181	0	-	0	433	170
Stage 1	-	-	-	-	170	-
Stage 2	-	-	-	-	263	-
Critical Hdwy	4.3	-	-	-	7.1	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	3	-	-	-	3	3.1
Pot Cap-1 Maneuver	1041	-	-	-	609	931
Stage 1	-	-	-	-	996	-
Stage 2	-	-	-	-	899	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1041	-	-	-	591	931
Mov Cap-2 Maneuver	-	-	-	-	591	-
Stage 1	-	-	-	-	967	-
Stage 2	-	-	-	-	899	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	1	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1041	-	-	-	676
HCM Lane V/C Ratio	0.026	-	-	-	0.047
HCM Ctrl Dly (s/v)	8.6	0	-	-	10.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q (veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	3.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	125	77	60	101	65	7
Future Vol, veh/h	125	77	60	101	65	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	2	2
Mvmt Flow	136	84	65	110	71	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	220	0	418	178
Stage 1	-	-	-	-	178	-
Stage 2	-	-	-	-	240	-
Critical Hdwy	-	-	4.3	-	7.1	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	3	-	3	3.1
Pot Cap-1 Maneuver	-	-	1010	-	623	921
Stage 1	-	-	-	-	988	-
Stage 2	-	-	-	-	922	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1010	-	580	921
Mov Cap-2 Maneuver	-	-	-	-	580	-
Stage 1	-	-	-	-	988	-
Stage 2	-	-	-	-	858	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	3.3	11.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	602	-	-	1010	-
HCM Lane V/C Ratio	0.13	-	-	0.065	-
HCM Ctrl Dly (s/v)	11.9	-	-	8.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q (veh)	0.4	-	-	0.2	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	100	75	7	14	11
Future Vol, veh/h	9	100	75	7	14	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	109	82	8	15	12

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	90	0	-	0	215	86
Stage 1	-	-	-	-	86	-
Stage 2	-	-	-	-	129	-
Critical Hdwy	4.3	-	-	-	7.1	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	3	-	-	-	3	3.1
Pot Cap-1 Maneuver	1119	-	-	-	858	1038
Stage 1	-	-	-	-	1092	-
Stage 2	-	-	-	-	1042	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1119	-	-	-	849	1038
Mov Cap-2 Maneuver	-	-	-	-	849	-
Stage 1	-	-	-	-	1081	-
Stage 2	-	-	-	-	1042	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.7	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1119	-	-	-	923
HCM Lane V/C Ratio	0.009	-	-	-	0.029
HCM Ctrl Dly (s/v)	8.2	0	-	-	9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q (veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	55	1	2	45	1	4	9	4	0	12	2
Future Vol, veh/h	5	55	1	2	45	1	4	9	4	0	12	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	2	2	2	2	2	2
Mvmt Flow	5	60	1	2	49	1	4	10	4	0	13	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	50	0	0	61	0	0	132	125	61	132	125	50
Stage 1	-	-	-	-	-	-	71	71	-	54	54	-
Stage 2	-	-	-	-	-	-	61	54	-	78	71	-
Critical Hdwy	4.3	-	-	4.3	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	3	-	-	3	-	-	3	4.018	3.1	3	4.018	3.1
Pot Cap-1 Maneuver	1154	-	-	1144	-	-	976	765	1073	976	765	1088
Stage 1	-	-	-	-	-	-	1095	836	-	1120	850	-
Stage 2	-	-	-	-	-	-	1110	850	-	1086	836	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1154	-	-	1144	-	-	956	760	1073	958	760	1088
Mov Cap-2 Maneuver	-	-	-	-	-	-	956	760	-	958	760	-
Stage 1	-	-	-	-	-	-	1091	833	-	1116	848	-
Stage 2	-	-	-	-	-	-	1089	848	-	1065	833	-

Approach	EB	WB	NB	SB
HCM Ctrl Dly, s/v	0.7	0.3	9.3	9.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	861	1154	-	-	1144	-	-	794
HCM Lane V/C Ratio	0.021	0.005	-	-	0.002	-	-	0.019
HCM Ctrl Dly (s/v)	9.3	8.1	0	-	8.2	0	-	9.6
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q (veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	9.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	185	0	0	0	0	0	0	5	0	90	5	0
Future Vol, veh/h	185	0	0	0	0	0	0	5	0	90	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	2	2	2	2	2	2	2	2	2
Mvmt Flow	201	0	0	0	0	0	0	5	0	98	5	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	206	206	5	-	0	0	5	0	0
Stage 1	201	201	-	-	-	-	-	-	-
Stage 2	5	5	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.53	6.23	-	-	-	4.3	-	-
Critical Hdwy Stg 1	5.43	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.43	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3	4.027	3.1	-	-	-	3	-	-
Pot Cap-1 Maneuver	870	689	1154	0	-	-	1195	-	0
Stage 1	962	733	-	0	-	-	-	-	0
Stage 2	1193	890	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	799	0	1154	-	-	-	1195	-	-
Mov Cap-2 Maneuver	799	0	-	-	-	-	-	-	-
Stage 1	962	0	-	-	-	-	-	-	-
Stage 2	1095	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	11	0	7.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	799	1195	-
HCM Lane V/C Ratio	-	-	0.252	0.082	-
HCM Ctrl Dly (s/v)	-	-	11	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q (veh)	-	-	1	0.3	-

Intersection	
Intersection Delay, s/veh	3.8
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	44	65	207	141
Demand Flow Rate, veh/h	45	66	211	144
Vehicles Circulating, veh/h	71	222	11	27
Vehicles Exiting, veh/h	100	0	105	261
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.1	3.8	4.0	3.6
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LR	LTR	LT	LTR
Assumed Moves	LR	LTR	LT	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	45	66	211	144
Cap Entry Lane, veh/h	1283	1100	1364	1342
Entry HV Adj Factor	0.978	0.982	0.981	0.977
Flow Entry, veh/h	44	65	207	141
Cap Entry, veh/h	1255	1080	1339	1312
V/C Ratio	0.035	0.060	0.155	0.107
Control Delay, s/veh	3.1	3.8	4.0	3.6
LOS	A	A	A	A
95th %tile Queue, veh	0	0	1	0

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	75	36	5	60	19	7
Future Vol, veh/h	75	36	5	60	19	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	39	5	65	21	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	121	0	177	102
Stage 1	-	-	-	-	102	-
Stage 2	-	-	-	-	75	-
Critical Hdwy	-	-	4.3	-	7.1	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	3	-	3	3.1
Pot Cap-1 Maneuver	-	-	1092	-	910	1018
Stage 1	-	-	-	-	1074	-
Stage 2	-	-	-	-	1106	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1092	-	905	1018
Mov Cap-2 Maneuver	-	-	-	-	905	-
Stage 1	-	-	-	-	1074	-
Stage 2	-	-	-	-	1100	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0.6	9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	933	-	-	1092	-
HCM Lane V/C Ratio	0.03	-	-	0.005	-
HCM Ctrl Dly (s/v)	9	-	-	8.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q (veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	19	55	45	10	2	11
Future Vol, veh/h	19	55	45	10	2	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	21	60	49	11	2	12

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	60	0	-	0	157	55
Stage 1	-	-	-	-	55	-
Stage 2	-	-	-	-	102	-
Critical Hdwy	4.3	-	-	-	7.1	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	3	-	-	-	3	3.1
Pot Cap-1 Maneuver	1145	-	-	-	939	1081
Stage 1	-	-	-	-	1130	-
Stage 2	-	-	-	-	1073	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1145	-	-	-	921	1081
Mov Cap-2 Maneuver	-	-	-	-	921	-
Stage 1	-	-	-	-	1109	-
Stage 2	-	-	-	-	1073	-

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	2.1	0	8.5
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1145	-	-	-	1053
HCM Lane V/C Ratio	0.018	-	-	-	0.013
HCM Ctrl Dly (s/v)	8.2	0	-	-	8.5
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q (veh)	0.1	-	-	-	0

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	55	10	2	40	4	1
Future Vol, veh/h	55	10	2	40	4	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	60	11	2	43	4	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	71	0	113	66
Stage 1	-	-	-	-	66	-
Stage 2	-	-	-	-	47	-
Critical Hdwy	-	-	4.3	-	7.1	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	3	-	3	3.1
Pot Cap-1 Maneuver	-	-	1135	-	1006	1066
Stage 1	-	-	-	-	1117	-
Stage 2	-	-	-	-	1140	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1135	-	1004	1066
Mov Cap-2 Maneuver	-	-	-	-	1004	-
Stage 1	-	-	-	-	1117	-
Stage 2	-	-	-	-	1138	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	0.4	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1016	-	-	1135	-
HCM Lane V/C Ratio	0.005	-	-	0.002	-
HCM Ctrl Dly (s/v)	8.6	-	-	8.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q (veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	170	30	40	10
Future Vol, veh/h	0	0	170	30	40	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	10	3	3	3
Mvmt Flow	0	0	185	33	43	11

Major/Minor	Major2		Minor2	
Conflicting Flow All	-	0	202	202
Stage 1	-	-	202	-
Stage 2	-	-	0	-
Critical Hdwy	-	-	7.1	6.23
Critical Hdwy Stg 1	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	3	3.1
Pot Cap-1 Maneuver	-	-	875	892
Stage 1	-	-	961	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-		
Mov Cap-1 Maneuver	-	-	875	892
Mov Cap-2 Maneuver	-	-	875	-
Stage 1	-	-	961	-
Stage 2	-	-	-	-

Approach	WB	SB
HCM Ctrl Dly, s/v	0	9.4
HCM LOS		A

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	878
HCM Lane V/C Ratio	-	-	0.062
HCM Ctrl Dly (s/v)	-	-	9.4
HCM Lane LOS	-	-	A
HCM 95th %tile Q (veh)	-	-	0.2

Intersection	
Int Delay, s/veh	4.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	140	80	70	90	70	90
Future Vol, veh/h	140	80	70	90	70	90
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	152	87	76	98	76	98

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	239	0	446	196
Stage 1	-	-	-	-	196	-
Stage 2	-	-	-	-	250	-
Critical Hdwy	-	-	4.3	-	7.1	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	3	-	3	3.1
Pot Cap-1 Maneuver	-	-	995	-	596	899
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	912	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	995	-	548	899
Mov Cap-2 Maneuver	-	-	-	-	548	-
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	838	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	3.9	11.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	702	-	-	995	-
HCM Lane V/C Ratio	0.248	-	-	0.076	-
HCM Ctrl Dly (s/v)	11.8	-	-	8.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q (veh)	1	-	-	0.2	-

BASIC FREEWAY SEGMENTS

HCS Basic Freeway Report

Project Information

Analyst	Drive Engineering	Date	3/28/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Harris Township	Time Analyzed	AM
Project Description	322 West of Earlystown Rd - EB	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	60.0	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	57.2
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	745	Heavy Vehicle Adjustment Factor (f_{HV})	0.893
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	444
Total Trucks, %	12.00	Capacity (c), pc/h/ln	2272
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2272
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2272
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.20

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	57.2
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	7.8
Total Ramp Density Adjustment	2.8	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	57.2		

HCS Basic Freeway Report

Project Information

Analyst	Drive Engineering	Date	3/28/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Harris Township	Time Analyzed	AM
Project Description	322 West of Earlystown Rd - WB	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	60.0	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	57.2
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	1335	Heavy Vehicle Adjustment Factor (f_{HV})	0.901
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	788
Total Trucks, %	11.00	Capacity (c), pc/h/ln	2272
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2272
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2272
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.35

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	57.2
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	13.8
Total Ramp Density Adjustment	2.8	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	57.2		

HCS Basic Freeway Report

Project Information

Analyst	Drive Engineering	Date	3/28/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Harris Township	Time Analyzed	PM
Project Description	322 West of Earlystown Rd - EB	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	60.0	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	57.2
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	1360	Heavy Vehicle Adjustment Factor (f_{HV})	0.909
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	796
Total Trucks, %	10.00	Capacity (c), pc/h/ln	2272
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2272
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2272
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.35

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	57.2
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	13.9
Total Ramp Density Adjustment	2.8	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	57.2		

HCS Basic Freeway Report

Project Information

Analyst	Drive Engineering	Date	3/28/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Harris Township	Time Analyzed	PM
Project Description	322 West of Earlystown Rd - WB	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	60.0	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	57.2
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Final Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	995	Heavy Vehicle Adjustment Factor (f_{HV})	0.870
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	608
Total Trucks, %	15.00	Capacity (c), pc/h/ln	2272
Single-Unit Trucks (SUT), %	-	Initial Adjusted Capacity (c_{adj}), pc/h/ln	2272
Tractor-Trailers (TT), %	-	Final Adjusted Capacity (c_{adj}), pc/h/ln	2272
Passenger Car Equivalent (E_T)	2.00	Volume-to-Capacity Ratio (v/c)	0.27

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	57.2
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	10.6
Total Ramp Density Adjustment	2.8	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	57.2		

HCS Basic Freeway Report

Project Information

Analyst	Drive Engineering	Date	3/7/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	AM
Project Description	West of Potters Mills Gap - EB	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	60.0	Total Ramp Density (TRD), ramps/mi	0.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	60.0
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	685	Heavy Vehicle Adjustment Factor (f_{HV})	0.685
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	532
Total Trucks, %	23.00	Capacity (c), pc/h/ln	2300
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2300
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.23
Passenger Car Equivalent (E_T)	3.00		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	60.0
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	8.9
Total Ramp Density Adjustment	0.0	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	60.0		

HCS Basic Freeway Report

Project Information

Analyst	Drive Engineering	Date	3/7/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	AM
Project Description	322 West of Potters Mills Gap - WB	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	60.0	Total Ramp Density (TRD), ramps/mi	0.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	60.0
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	1105	Heavy Vehicle Adjustment Factor (f_{HV})	0.758
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	776
Total Trucks, %	16.00	Capacity (c), pc/h/ln	2300
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2300
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.34
Passenger Car Equivalent (E_T)	3.00		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	60.0
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	12.9
Total Ramp Density Adjustment	0.0	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	60.0		

HCS Basic Freeway Report

Project Information

Analyst	Drive Engineering	Date	3/7/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	PM
Project Description	322 West of Potters Mills Gap - EB	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	60.0	Total Ramp Density (TRD), ramps/mi	0.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	60.0
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	1250	Heavy Vehicle Adjustment Factor (f_{HV})	0.806
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	825
Total Trucks, %	12.00	Capacity (c), pc/h/ln	2300
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2300
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.36
Passenger Car Equivalent (E_T)	3.00		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	60.0
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	13.8
Total Ramp Density Adjustment	0.0	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	60.0		

HCS Basic Freeway Report

Project Information

Analyst	Drive Engineering	Date	3/7/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	PM
Project Description	West of Potters Mills Gap - WB	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	60.0	Total Ramp Density (TRD), ramps/mi	0.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	60.0
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	905	Heavy Vehicle Adjustment Factor (f_{HV})	0.704
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	684
Total Trucks, %	21.00	Capacity (c), pc/h/ln	2300
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2300
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.30
Passenger Car Equivalent (E_T)	3.00		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	60.0
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	11.4
Total Ramp Density Adjustment	0.0	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	60.0		

HCS Basic Freeway Report

Project Information

Analyst	Drive Engineering	Date	1/22/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	AM
Project Description	East of Potters Mills Gap - EB	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	60.0	Total Ramp Density (TRD), ramps/mi	0.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	60.0
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	695	Heavy Vehicle Adjustment Factor (f_{HV})	0.685
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	540
Total Trucks, %	23.00	Capacity (c), pc/h/ln	2300
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2300
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.23
Passenger Car Equivalent (E_T)	3.00		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	60.0
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	9.0
Total Ramp Density Adjustment	0.0	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	60.0		

HCS Basic Freeway Report

Project Information

Analyst	Drive Engineering	Date	1/22/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	AM
Project Description	322 East of Potters Mills Gap - WB	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	60.0	Total Ramp Density (TRD), ramps/mi	0.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	60.0
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	975	Heavy Vehicle Adjustment Factor (f_{HV})	0.758
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	684
Total Trucks, %	16.00	Capacity (c), pc/h/ln	2300
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2300
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.30
Passenger Car Equivalent (E_T)	3.00		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	60.0
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	11.4
Total Ramp Density Adjustment	0.0	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	60.0		

HCS Basic Freeway Report

Project Information

Analyst	Drive Engineering	Date	1/22/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	PM
Project Description	322 East of Potters Mills Gap - EB	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	60.0	Total Ramp Density (TRD), ramps/mi	0.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	60.0
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	1155	Heavy Vehicle Adjustment Factor (f_{HV})	0.806
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	762
Total Trucks, %	12.00	Capacity (c), pc/h/ln	2300
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2300
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.33
Passenger Car Equivalent (E_T)	3.00		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	60.0
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	12.7
Total Ramp Density Adjustment	0.0	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	60.0		

HCS Basic Freeway Report

Project Information

Analyst	Drive Engineering	Date	1/22/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	PM
Project Description	East of Potters Mills Gap - WB	Units	U.S. Customary

Geometric Data

Number of Lanes (N), ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	60.0	Total Ramp Density (TRD), ramps/mi	0.00
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	60.0
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Demand Adjustment Factor (DAF)	1.000
Incident Type	No Incident	Capacity Adjustment Factor (CAF)	1.000
Proportion of CAVs in Traffic Stream	0	Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000

Demand and Capacity

Demand Volume (V), veh/h	905	Heavy Vehicle Adjustment Factor (f_{HV})	0.704
Peak Hour Factor (PHF)	0.94	Flow Rate (v_p), pc/h/ln	684
Total Trucks, %	21.00	Capacity (c), pc/h/ln	2300
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2300
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.30
Passenger Car Equivalent (E_T)	3.00		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	60.0
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	11.4
Total Ramp Density Adjustment	0.0	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	60.0		

FREEWAY RAMP JUNCTIONS

HCS Freeway Diverge Report

Project Information			
Analyst	Drive Engineering	Date	3/5/2024
Agency	PennDOT District 2-0	Analysis Year	2050
Jurisdiction	Boalsburg	Time Analyzed	
Project Description	Boalsburg Interchange EB Diverge Alt 4 Connector and T AM	Units	U.S. Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Deceleration Length (LD), ft	1500	800
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor (CAF)	1.000	1.000
Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000	-

Demand and Capacity		
Demand Volume (V_i), veh/h	635	80
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	23.00	6.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.813	0.943
Flow Rate (v_i), pc/h	849	92
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.18	0.05

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.436
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	52.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	65.8

Flow in Lanes 1 and 2 (v_{12}), pc/h	849	Ramp Junction Speed (S), mi/h	52.2
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	8.1
Level of Service (LOS)	A	Density in Ramp Influence Area (D_R), pc/mi/ln	4.4

HCS Freeway Diverge Report

Project Information			
Analyst	Drive Engineering	Date	3/5/2024
Agency	PennDOT District 2-0	Analysis Year	2050
Jurisdiction	Boalsburg	Time Analyzed	
Project Description	Boalsburg Interchange EB Diverge Alt 4 Connector and T PM	Units	U.S. Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Deceleration Length (LD), ft	1500	800
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor (CAF)	1.000	1.000
Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000	-

Demand and Capacity		
Demand Volume (V_i), veh/h	1260	370
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	13.00	2.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.980
Flow Rate (v_i), pc/h	1548	410
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.34	0.21

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.465
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	51.6
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	65.8

Flow in Lanes 1 and 2 (v_{12}), pc/h	1548	Ramp Junction Speed (S), mi/h	51.6
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	15.0
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	10.4

Design Analysis Table

Freeway Lanes, ln	2	2	3	3	4	4	5	5
Ramp Lanes, ln	1	2	1	2	1	2	1	2
Density, pc/mi/ln	15.0	15.0	9.5	9.1	6.8	6.6	5.5	5.3
LOS	B	A	A	A	A	A	A	A

HCS Freeway Merge Report

Project Information

Analyst	Drive Engineering	Date	3/5/2024
Agency	PennDOT District 2-0	Analysis Year	2050
Jurisdiction	Boalsburg	Time Analyzed	
Project Description	Boalsburg Interchange EB Merge Alt 4 Connector and T AM	Units	U.S. Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	1000
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	555	130
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	23.00	23.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.813	0.813
Flow Rate (v_i), pc/h	742	174
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.20	0.09

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.261
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	55.3
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	60.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	742	Ramp Junction Speed (S), mi/h	55.3

Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	916	Average Density (D), pc/mi/ln	8.3
Level of Service (LOS)	A	Density in Ramp Influence Area (D_R), pc/mi/ln	6.3

HCS Freeway Merge Report

Project Information

Analyst	Drive Engineering	Date	3/5/2024
Agency	PennDOT District 2-0	Analysis Year	2050
Jurisdiction	Boalsburg	Time Analyzed	
Project Description	Boalsburg Interchange EB Merge Alt 4 Connector and T PM	Units	U.S. Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	1000
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	890	360
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	13.00	13.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.885
Flow Rate (v_i), pc/h	1093	442
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.33	0.22

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.269
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	55.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	60.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	1093	Ramp Junction Speed (S), mi/h	55.2

Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1535	Average Density (D), pc/mi/ln	13.9
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	11.0

HCS Freeway Diverge Report

Project Information			
Analyst	Drive Engineering	Date	3/5/2024
Agency	PennDOT District 2-0	Analysis Year	2050
Jurisdiction	Boalsburg	Time Analyzed	
Project Description	Boalsburg Interchange WB Diverge Alt 4 Connector and T AM	Units	U.S. Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Deceleration Length (LD), ft	1500	1400
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor (CAF)	1.000	1.000
Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000	-

Demand and Capacity		
Demand Volume (V_i), veh/h	1105	320
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	13.00	13.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.885
Flow Rate (v_i), pc/h	1357	393
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.30	0.20

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.463
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	51.7
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	65.8

Flow in Lanes 1 and 2 (v_{12}), pc/h	1357	Ramp Junction Speed (S), mi/h	51.7
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	13.1
Level of Service (LOS)	A	Density in Ramp Influence Area (D_R), pc/mi/ln	3.3

HCS Freeway Diverge Report

Project Information			
Analyst	Drive Engineering	Date	3/5/2024
Agency	PennDOT District 2-0	Analysis Year	2050
Jurisdiction	Boalsburg	Time Analyzed	
Project Description	Boalsburg Interchange WB Diverge Alt 4 Connector and T PM	Units	U.S. Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Deceleration Length (LD), ft	1500	1400
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor (CAF)	1.000	1.000
Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000	-

Demand and Capacity		
Demand Volume (V_i), veh/h	905	220
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	18.00	18.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.847	0.847
Flow Rate (v_i), pc/h	1161	282
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.25	0.14

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.453
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	51.8
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	65.8

Flow in Lanes 1 and 2 (v_{12}), pc/h	1161	Ramp Junction Speed (S), mi/h	51.8
Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	11.2
Level of Service (LOS)	A	Density in Ramp Influence Area (D_R), pc/mi/ln	1.6

HCS Freeway Merge Report

Project Information

Analyst	Drive Engineering	Date	3/5/2024
Agency	PennDOT District 2-0	Analysis Year	2050
Jurisdiction	Boalsburg	Time Analyzed	
Project Description	Boalsburg Interchange WB Merge Alt 4 Connector and T AM	Units	U.S. Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	1200
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	785	470
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	13.00	2.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.885	0.980
Flow Rate (v_i), pc/h	964	521
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.32	0.26

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.254
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	55.4
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	60.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	964	Ramp Junction Speed (S), mi/h	55.4

Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1485	Average Density (D), pc/mi/ln	13.4
Level of Service (LOS)	A	Density in Ramp Influence Area (D_R), pc/mi/ln	9.4

HCS Freeway Merge Report

Project Information

Analyst	Drive Engineering	Date	3/5/2024
Agency	PennDOT District 2-0	Analysis Year	2050
Jurisdiction	Boalsburg	Time Analyzed	
Project Description	Boalsburg Interchange WB Merge Alt 4 Connector and T PM	Units	U.S. Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Acceleration Length (L_A), ft	1500	1200
Terrain Type	Level	Level
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity

Demand Volume (V_i), veh/h	685	90
Peak Hour Factor (PHF)	0.92	0.92
Total Trucks, %	18.00	2.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.847	0.980
Flow Rate (v_i), pc/h	879	100
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.21	0.05

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.247
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	55.6
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	60.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	879	Ramp Junction Speed (S), mi/h	55.6

Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	979	Average Density (D), pc/mi/ln	8.8
Level of Service (LOS)	A	Density in Ramp Influence Area (D_R), pc/mi/ln	5.6

HCS Freeway Diverge Report

Project Information			
Analyst	Drive Engineering	Date	1/22/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	AM
Project Description	322 Potters Mills Gap EB Diverge	Units	U.S. Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Deceleration Length (LD), ft	1500	400
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor (CAF)	1.000	1.000
Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000	-

Demand and Capacity		
Demand Volume (V_i), veh/h	565	60
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	23.00	6.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.685	0.893
Flow Rate (v_i), pc/h	877	71
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.19	0.04

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.434
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	52.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	65.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	877	Ramp Junction Speed (S), mi/h	52.2

Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	8.4
Level of Service (LOS)	A	Density in Ramp Influence Area (D_R), pc/mi/ln	8.2

HCS Freeway Diverge Report

Project Information

Analyst	Drive Engineering	Date	1/22/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	PM
Project Description	322 Potters Mills Gap EB Diverge	Units	U.S. Customary

Geometric Data

	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Deceleration Length (LD), ft	1500	400
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors

Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor (CAF)	1.000	1.000
Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000	-

Demand and Capacity

Demand Volume (V_i), veh/h	880	185
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	12.00	1.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.806	0.980
Flow Rate (v_i), pc/h	1162	201
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.25	0.10

Speed and Density

Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.446
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	52.0
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	65.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	1162	Ramp Junction Speed (S), mi/h	52.0

Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	11.2
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	10.6

HCS Freeway Merge Report

Project Information			
Analyst	Drive Engineering	Date	1/22/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	AM
Project Description	322 Potters Mills Gap EB Merge	Units	U.S. Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Acceleration Length (LA), ft	1500	950
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity		
Demand Volume (V_i), veh/h	625	70
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	23.00	6.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.685	0.893
Flow Rate (v_i), pc/h	971	83
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.23	0.04

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.266
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	55.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	60.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	971	Ramp Junction Speed (S), mi/h	55.2

Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1054	Average Density (D), pc/mi/ln	9.5
Level of Service (LOS)	A	Density in Ramp Influence Area (D_R), pc/mi/ln	7.8

HCS Freeway Merge Report

Project Information			
Analyst	Drive Engineering	Date	1/22/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	PM
Project Description	322 Potters Mills Gap EB Merge	Units	U.S. Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Acceleration Length (LA), ft	1500	950
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity		
Demand Volume (V_i), veh/h	1065	90
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	12.00	1.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.806	0.980
Flow Rate (v_i), pc/h	1406	98
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.33	0.05

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO), ln	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.272
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	55.1
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	1.000	Outer Lanes Freeway Speed (SO), mi/h	60.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	1406	Ramp Junction Speed (S), mi/h	55.1

Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1504	Average Density (D), pc/mi/ln	13.6
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	11.3

HCS Freeway Diverge Report

Project Information			
Analyst	Drive Engineering	Date	1/22/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	AM
Project Description	322 Potters Mills Gap WB Diverge	Units	U.S. Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Deceleration Length (LD), ft	1500	600
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor (CAF)	1.000	1.000
Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000	-

Demand and Capacity		
Demand Volume (V_i), veh/h	875	50
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	16.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.758	0.877
Flow Rate (v_i), pc/h	1228	61
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.27	0.03

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.433
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	52.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	65.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	1228	Ramp Junction Speed (S), mi/h	52.2

Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	11.8
Level of Service (LOS)	A	Density in Ramp Influence Area (D_R), pc/mi/ln	9.4

HCS Freeway Diverge Report

Project Information			
Analyst	Drive Engineering	Date	1/22/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	PM
Project Description	322 Potters Mills Gap WB Diverge	Units	U.S. Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Deceleration Length (LD), ft	1500	600
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor (CAF)	1.000	1.000
Capacity Adj. Factor for CAVs, CAF_{CAV}	1.000	-

Demand and Capacity		
Demand Volume (V_i), veh/h	765	70
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	21.00	2.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.704	0.962
Flow Rate (v_i), pc/h	1156	77
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.25	0.04

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (D_S)	0.435
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	Off-Ramp Influence Area Speed (S_R), mi/h	52.2
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FD})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	65.8
Flow in Lanes 1 and 2 (v_{12}), pc/h	1156	Ramp Junction Speed (S), mi/h	52.2

Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	-	Average Density (D), pc/mi/ln	11.1
Level of Service (LOS)	A	Density in Ramp Influence Area (D_R), pc/mi/ln	8.8

HCS Freeway Merge Report

Project Information			
Analyst	Drive Engineering	Date	1/22/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	AM
Project Description	322 Potters Mills Gap WB Merge	Units	U.S. Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Acceleration Length (LA), ft	1500	700
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity		
Demand Volume (V_i), veh/h	925	180
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	16.00	7.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.758	0.877
Flow Rate (v_i), pc/h	1298	218
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.33	0.11

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO), ln	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.290
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	54.8
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	1.000	Outer Lanes Freeway Speed (SO), mi/h	60.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	1298	Ramp Junction Speed (S), mi/h	54.8

Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1516	Average Density (D), pc/mi/ln	13.8
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	12.9

HCS Freeway Merge Report

Project Information			
Analyst	Drive Engineering	Date	1/22/2024
Agency	PennDOT District 2-0	Analysis Year	2050 Build
Jurisdiction	Potter Township	Time Analyzed	PM
Project Description	322 Potters Mills Gap WB Merge	Units	U.S. Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	60.0	35.0
Segment Length (L) / Acceleration Length (LA), ft	1500	700
Terrain Type	Rolling	Rolling
Percent Grade, %	-	-
Segment Type / Ramp Type	Freeway	Right-Sided One-Lane

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Proportion of CAVs in Traffic Stream	0	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Demand Adjustment Factor (DAF)	1.000	1.000
Capacity Adjustment Factor for CAVs, CAF_{CAV}	1.000	-
Final Capacity Adjustment Factor (CAF)	1.000	1.000

Demand and Capacity		
Demand Volume (V_i), veh/h	835	70
Peak Hour Factor (PHF)	0.94	0.94
Total Trucks, %	21.00	2.00
Single-Unit Trucks (SUT), %	-	-
Tractor-Trailers (TT), %	-	-
Heavy Vehicle Adjustment Factor (f_{HV})	0.704	0.962
Flow Rate (v_i), pc/h	1262	77
Capacity (c_{md}), pc/h	4600	2000
Adjusted Capacity (c_{md}), pc/h	4600	2000
Volume-to-Capacity Ratio (v/c)	0.29	0.04

Speed and Density			
Upstream Equilibrium Distance (L_{EQ}), ft	-	Number of Outer Lanes on Freeway (N_O), ln	0
Distance to Upstream Ramp (L_{UP}), ft	-	Speed Index (M_S)	0.287
Downstream Equilibrium Distance (L_{EQ}), ft	-	Flow Outer Lanes (v_{OA}), pc/h/ln	-
Distance to Downstream Ramp (L_{DOWN}), ft	-	On-Ramp Influence Area Speed (S_R), mi/h	54.8
Prop. Freeway Vehicles in Lane 1 and 2 (P_{FM})	1.000	Outer Lanes Freeway Speed (S_O), mi/h	60.0
Flow in Lanes 1 and 2 (v_{12}), pc/h	1262	Ramp Junction Speed (S), mi/h	54.8

Flow Entering Ramp-Infl. Area (v_{R12}), pc/h	1339	Average Density (D), pc/mi/ln	12.2
Level of Service (LOS)	B	Density in Ramp Influence Area (D_R), pc/mi/ln	11.6

APPENDIX D

Build Alternatives HSM Analyses

- **CMF CLEARINGHOUSE DATA**
- **SPUI FUNCTION/ANALYSIS**
- **EIS ALTERNATIVES**

CMF CLEARINGHOUSE DATA

CRASH MODIFICATION FACTORS CLEARINGHOUSE

CMF / CRF Details

CMF ID: 227

CMF Name: Convert intersection with minor-road stop control to modern round

Description:

Prior Condition: No Prior Condition(s)

Category: Intersection geometry

Study ID: *NCHRP Report 572: Applying Roundabouts in the United States*, Rodegerdts et al. 2007

Star Quality Rating	
Star Quality Rating:	3 Stars

Crash Modification Factor (CMF)	
Value:	0.56
Adjusted Standard Error:	0.05
Unadjusted Standard Error:	0.04

Crash Reduction Factor	
Value:	44
Adjusted Standard Error:	5
Unadjusted Standard Error:	4

Applicability	
Crash Type:	All
Crash Severity:	All
Roadway Types:	Not Specified
Minimum Number of Lanes:	1
Maximum Number of Lanes:	2
Number of Lanes Direction:	
Number of Lanes Comment:	
Road Division Type:	
Minimum Speed Limit:	
Maximum Speed Limit:	
Speed Unit:	
Speed Limit Comment:	
Area Type:	All
Traffic Volume:	
Average Traffic Volume:	
Time of Day:	
If countermeasure is intersection-based.	
Intersection Type:	Roadway/roadway (not interchange related)
Intersection Geometry:	4-leg
Traffic Control:	Stop-controlled
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Average Major Road Volume:	
Average Minor Road Volume:	

Development Details

Date Range of Data Used:	
Municipality:	
State:	
Country:	
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes

Other Details

Included in HSM:	Yes. HSM lists this CMF in bold font to indicate that it has the highest
Date Added to Clearinghouse:	Dec 01, 2009
Comments:	Countermeasure name changed from

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CMF COMPARISON

Below you will find comparisons for the CMFs you chose.
Please note that the rows ***highlighted and bold/italic*** contain the differences in the selected CMFs.

Selected CMF

Countermeasure Name	Convert to roundabout interchanges	Convert to roundabout interchanges	Convert to roundabout interchanges	Convert to roundabout interchanges
CMF ID	9445	11132	11148	11166
CMF	0.756	0.604	0.822	0.954
Study Reference	CLAROS ET AL., 2018	BORIS CLAROS, BEAU BURDETT, MADHAV CHITTURI, ANDREA BILL, AND DAVID A. NOYCE, 2021	BORIS CLAROS, BEAU BURDETT, MADHAV CHITTURI, ANDREA BILL, AND DAVID A. NOYCE, 2021	BORIS CLAROS, B BURDETT, MADH CHITTURI, ANDR AND DAVID A. NC 2021
Unadjusted Standard Error AMF				
CMFunction				
Star Rating	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆
Rating Score Total	***90***	***95***	***95***	***75***
Crash Type	All	All	All	All
Crash Severity				
Crash Time of Day	***All***	***Not specified***	***Not specified***	***Not specified***
Area Type	***All***			
Road Division Type				
Road Type	***All***	***Principal Arterial Other Freeways and Expressways***	***Principal Arterial Other Freeways and Expressways***	***Principal Arterial Freeways and Ex***
Min Number of Lanes	***1***			
Max Number of Lanes	***1***			
Number of Lanes Direction		***Not Specified***	***Not Specified***	***Not Specified***
Number of Lanes Comment				
Intersection Type	Roadway/roadway (interchange ramp terminal)	Roadway/roadway (interchange ramp terminal)	Roadway/roadway (interchange ramp terminal)	Roadway/roadway (interchange ramp
Intersection Geometry	No values chosen.	No values chosen.	No values chosen.	No values chosen.
Traffic Control	Roundabout	Roundabout	Roundabout	Roundabout
Minimum Speed Limit	***25***			
Maximum Speed Limit	***45***			
Speed Unit	mph	mph	mph	mph
Speed Limit Comment		***Posted speed limits for freeways were between 55 mph and 70 mph. Posted speed limits for crossroads were between 25 mph and 55 mph.***	***Posted speed limits for freeways were between 55 mph and 70 mph. Posted speed limits for crossroads were between 25 mph and 45 mph.***	***Posted speed limit freeways were bet mph and 70 mph. speed limits for cr were between 35 45 mph.***
Study Type	2	2	2	2
Years From	***2003***			
Years To	***2016***			

Traffic Volume Unit	Annual Average Daily Traffic (AADT)	Annual Average Daily Traffic (AADT)	Annual Average Daily Traffic (AADT)	Annual Average D Traffic (AADT)
Min Traffic Volume				
Max Traffic Volume				
Min Major Rd Volume	***2060***	***2060***	***2060***	***7493***
Max Major Rd Volume	***16715***	***17150***	***30700***	***30700***
Min Minor Rd Volume	***647***	***1300***	***1300***	***1900***
Max Minor Rd Volume	***5630***	***10900***	***10900***	***9400***
Avg Traffic Volume				
Avg Major Rd Volume	***8186***			
Avg Minor Rd Volume	***2721***			
State of Origin	***MO***	***MO,WI***	***MO,WI***	***MO,WI***
Municipality				
Country		***USA***	***USA***	***USA***
Comments	***This CMF is for all crashes at single-lane roundabout ramp terminals. Number of lanes and speed limits entered here are for ramps.***	***AADT on exit ramps were between 1,300 and 10,900 vpd. AADT on entrance ramps were between 647 and 11,450 vpd. AADT on crossroad approaches were between 2,060 and 17,150 vpd.***	***AADT on exit ramps were between 1,300 and 10,900 vpd. AADT on entrance ramps were between 647 and 11,450 vpd. AADT on crossroad approaches were between 2,060 and 30,700 vpd.***	***AADT on exit ran between 1,900 an vpd. AADT on ent ramps were betwe and 9,267 vpd. AA crossroad approac between 7,493 an vpd.***

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For more information, contact Sarah Weissman Pascual at **sara**

CMF / CRF Details

CMF ID: 11132

CMF Name: Convert to roundabout interchanges

Description: Convert to interchange roundabouts with either a single roundabo

Prior Condition: Stop-controlled ramp terminal on diamond interchange

Category: Interchange design

Study ID: *Are Roundabouts Safe and Economically Viable Replacing Conventional Diamond Interchange Ramp Terminals?*, Boris Claros, Beau Burdett, Madhav Chitturi, Andrea Bill, and David A. Noyce 2021

Star Quality Rating	
Star Quality Rating:	3 Stars

Crash Modification Factor (CMF)	
Value:	0.604
Adjusted Standard Error:	
Unadjusted Standard Error:	

Crash Reduction Factor	
Value:	39.6
Adjusted Standard Error:	
Unadjusted Standard Error:	

Applicability	
Crash Type:	All
Crash Severity:	All
Roadway Types:	Principal Arterial Other Freeways and Expressways
Minimum Number of Lanes:	
Maximum Number of Lanes:	
Number of Lanes Direction:	Not Specified
Number of Lanes Comment:	
Road Division Type:	
Minimum Speed Limit:	
Maximum Speed Limit:	
Speed Unit:	mph
Speed Limit Comment:	Posted speed limits for freeways were between 55 mph and 70 mph. Posted speed limi
Area Type:	
Traffic Volume:	
Average Traffic Volume:	
Time of Day:	Not specified
If countermeasure is intersection-based.	
Intersection Type:	Roadway/roadway (interchange ramp terminal)
Intersection Geometry:	No values chosen.
Traffic Control:	Roundabout
Major Road Traffic Volume:	Minimum of 2060 to Maximum of 17150 Annual Average Daily Traffic (AADT)
Minor Road Traffic Volume:	Minimum of 1300 to Maximum of 10900 Annual Average Daily Traffic (AADT)

Average Major Road Volume:	
Average Minor Road Volume:	

Development Details

Date Range of Data Used:	
Municipality:	
State:	MO,WI
Country:	USA
Type of Methodology Used:	

Other Details

Included in HSM:	No
Date Added to Clearinghouse:	Aug 25, 2022
Comments:	AADT on exit ramps were between 1,300 and 10,900 vpd. AADT on entrance ramps were between 647 and 11,450 vpd. AADT on crossroad approaches were between 2,060 and 17,150 vpd.

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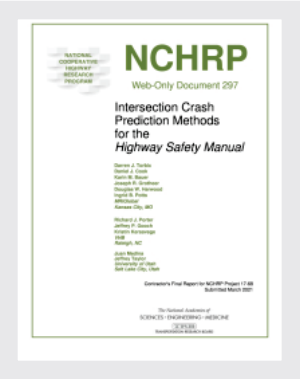

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Contractor's Final Report for NCHRP Project 17-68
Submitted March 2021

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Chapter 8. Development of Models for Use in HSM Crash Prediction Methods: Crossroad Ramp Terminals at Single-Point Diamond Interchanges

This section describes the development of crash prediction models for crossroad ramp terminals at single-point diamond interchanges (SPs). Single-point diamond interchanges are implemented in urban areas. Their crossroad ramp terminals are characterized by one intersection through which all at-grade traffic movements are made (Leisch, 2005). Section 8.1 describes the site selection and data collection processes for developing crash prediction models for crossroad ramp terminals at single-point diamond interchanges. Section 8.2 provides descriptive statistics of the databases used for model development. Section 8.3 presents the statistical analysis and resulting SPFs for crossroad ramp terminals at single-point diamond interchanges. Section 8.4 discusses the CMFs recommended for use with the SPFs. Section 8.5 addresses the outcomes of the analysis to develop SDFs for crossroad ramp terminals of single-point diamond interchanges. Section 8.6 provides recommendations for incorporating the new crash prediction models for crossroad ramp terminals at single-point diamond interchanges in the second edition of the HSM.

8.1 Site Selection and Data Collection

A list of potential single-point diamond interchanges was developed by searching databases and satellite imagery in five states:

- Arizona (AZ)
- Missouri (MO)
- Nevada (NV)
- Tennessee (TN)
- Utah (UT)

Data collection activities for these sites included gathering geometric design attributes of the interchanges as well as traffic and crash data. Geometric attributes were collected from aerial imagery in Google Earth®, as well as Google Street View®. Table 91 lists the geometric attributes collected (and respective definitions and permitted values) for each single-point diamond interchange.

Table 91. Site characteristic variables collected for crossroad ramp terminals at single-point diamond interchanges

Variable	Definition	Range or Permitted Values
General Intersection Attributes		
Intersection configuration (i.e., number of legs and type of traffic control)	Indicates the number of legs and type of traffic control	4SG
Area type	Indicates whether the intersection is in a rural or urban area	Urban
Presence of intersection lighting	Indicates if overhead lighting is present at the intersection proper	Yes, no
Crossroad over or under freeway	Indicates whether the crossroad passes over or under the freeway	Over or under
Construction year	Estimated year when the interchange was constructed	Range: 1992 to 2014

Table 91. Site characteristic variables collected for crossroad ramp terminals at single-point diamond interchanges (Continued)

Approach Specific Attributes		
Route name or number	Specifies the route name or number of the approach	
Location at intersection	Side of the intersection the approach is located	Primary, secondary
Presence of left-turn lanes	The number of approaches with one or more left-turn lanes	4
Number of left-turn lanes	Number of left-turn lanes provided for turning movements to/from each freeway ramp	0, 1, 2, 3
Left-turn protected only	Number of approaches with protected only left-turn options	4
Presence of right-turn lane	Number of approaches with one or more right-turn lanes	0,1,2,3,4
Number of right-turn lanes	Number of right-turn lanes provided for turning movements to/from each freeway ramp	0, 1, 2, 3
Number of through lanes	Number of through lanes present on each crossroad approach to the crossroad ramp terminal	1, 2, 3, 4
Presence of frontage roads	Indicates the presence of frontage roads at the interchange, where a through movement is added between the exit and entrance ramps	Yes, no
Presence of crosswalk	Indicates the presence of crosswalks at the crossroad ramp terminal	Yes, no
Presence of bike lane	Indicates the presence of a bike lane on the crossroad at the crossroad ramp terminal	Yes, no
Median width	Width of median (in feet) on each crossroad approach to the crossroad ramp terminal	Range: 0 to 47 ft
Median type	Type of median present on each crossroad approach to the crossroad ramp terminal	Raised, flush, depressed, none
Skew angle	The intersection skew angle of the freeway mainline and crossroad	Range: 0 to 90 degrees
Number of driveways	Number of driveways located within 250 ft of the crossroad stop bars/lines	Range: 0 to 10
Presence of public street approach	Indicates if an unsignalized public street approach is present within 250 ft of a crossroad stop bar/line	Yes, no
Presence of railroad crossing	Indicates the presence of a railroad crossing on the crossroad	Yes, no
Freeway posted speed limit	The posted speed limit on the freeway mainline	Range: 45 to 75 mph
Crossroad posted speed limit	The posted speed limit on the crossroad	Range: 30 to 55 mph
Terminal length	The distance measured along the crossroad between the outermost ramp terminal boundaries	Range: 468 to 2274 ft
Traffic control type for right turns	Type of traffic control for right-turn movements	Signal, stop, yield, none
U-turns allowed	Indicates if a U-turn is allowed between exit ramps and entrance ramps	Yes, no
Distance to right-turn approach	Distance from the center of the crossroad ramp terminal to the center of the right turn approach	Range: 100 to 1654 ft

The "construction year" was estimated using the "Clock" feature in Google Earth® as the earliest year with the interchange present in aerial imagery. Some single-point diamond interchanges in the database were built during the study period and therefore had fewer years of data available for analysis. Additional information about the interchange configuration was used to exclude sites with uncommon or inconsistent geometric conditions, such as the lack of a crossroad approach or ramp approach.

Traffic data collection activities primarily involved accessing publicly available traffic volumes and statistics.

Crash data were obtained from state DOTs. The crash data generally included details about the crash location (geographic coordinates), as well as attributes describing the crash, people involved in the crash, and the road and environmental conditions at the location and time of the crash.

Identifying crashes associated with the ramp terminal required a clear definition of a ramp terminal-related crash based on geographic location and crash attributes. To maintain a level of consistency with the ramp terminal models in NCHRP Project 17-45, these crashes were selected using the following criteria:

- Crashes occurring on the crossroad within the ramp terminal boundary, defined as a point 100 ft from the gore or curb return of the outermost ramp connection, and having one of the following attributes:
  - at intersection
  - intersection-related
  - at driveway
  - driveway-related
  - involving a pedestrian or bicyclist
- Crashes occurring on a ramp with at least one of the following attributes:
  - at intersection;
  - intersection-related;
  - involving a pedestrian or bicyclist, or
  - located on an exit ramp and manner of collision is rear-end.

This definition departs from the NCHRP Project 17-45 ramp terminal definition, using a different distance reference to define the crossroad ramp terminal boundary. The NCHRP Project 17-45 definition used 250 ft from the crossroad ramp terminal, measured from the center of the intersection. The definition implemented for the crossroad ramp terminals of single-point diamond interchanges is based on the American National Standards Institute (ANSI) D16.1-2007 (Manual on Classification of Motor Vehicle Traffic Accidents) definition of an interchange crash. According to the ANSI definition, an interchange crash is a crash in which the first harmful event occurs within a boundary defined by a point 100 ft from the gore or curb return of the outermost ramp connection. Figure 69 illustrates the boundaries for defining ramp terminal crashes at a single-point diamond interchange.

This ramp terminal boundary adjustment was necessary for this application due to the size of a typical crossroad ramp terminal at a single-point diamond interchange and its main characteristic of operating as one intersection. Figure 70 shows an example of a single-point diamond interchange with a crossroad terminal size/length approximately equal to the average of terminal sizes/lengths at sites in Arizona and Utah. At this location, the maximum distance between the center of the interchange and the outermost ramp connection is approximately 330 ft, more than the 250 ft used in the NCHRP Project 17-45 definition. As a result, using the 250 ft boundary would have resulted in missing crashes associated with right turn movements at the entrance and exit ramps. It would have also resulted in missing part of the longer left-turn lanes on the cross street that are common to crossroad ramp terminals at single-point diamond interchanges. The ramp terminal boundary that is based on the ANSI definition and implemented in this research

extends 100 ft beyond the outermost ramp connections, capturing crashes associated with the right-turn movements and the left-turn lanes.

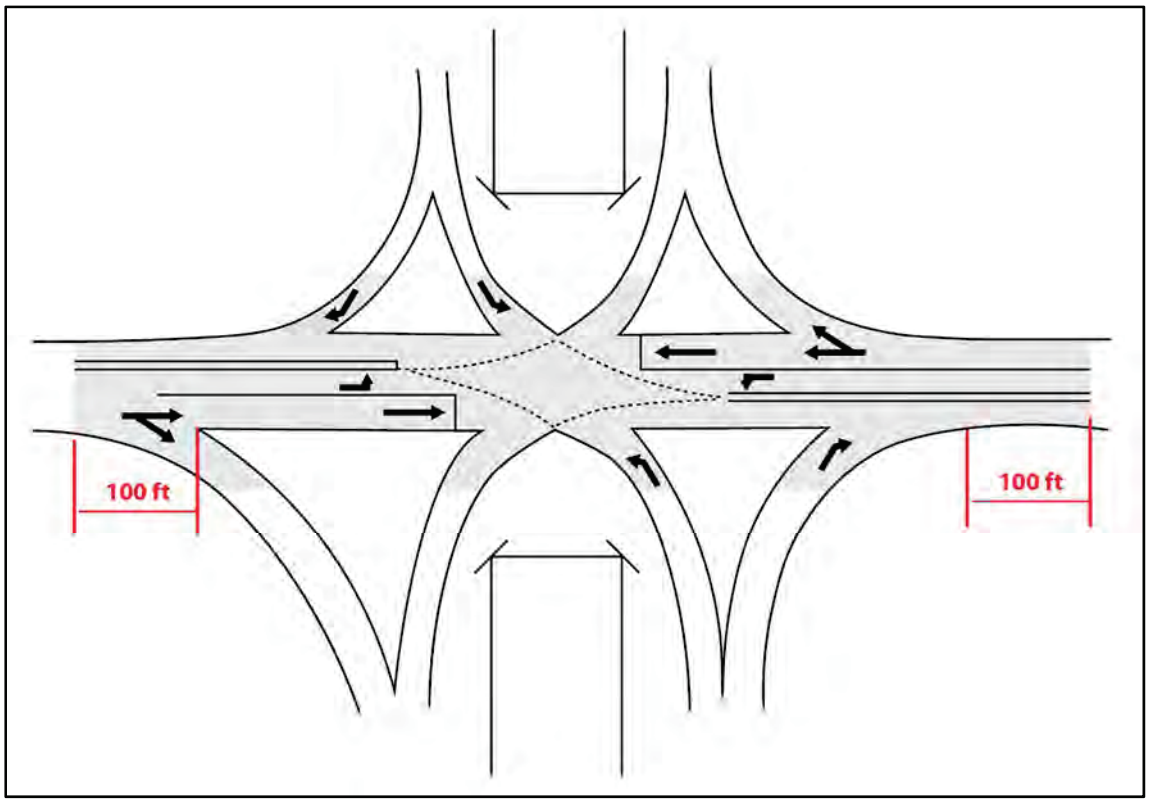

Figure 69. Single-point diamond interchange ramp terminal boundaries for defining ramp terminal crashes (adapted from Bonneson et al., 2012)

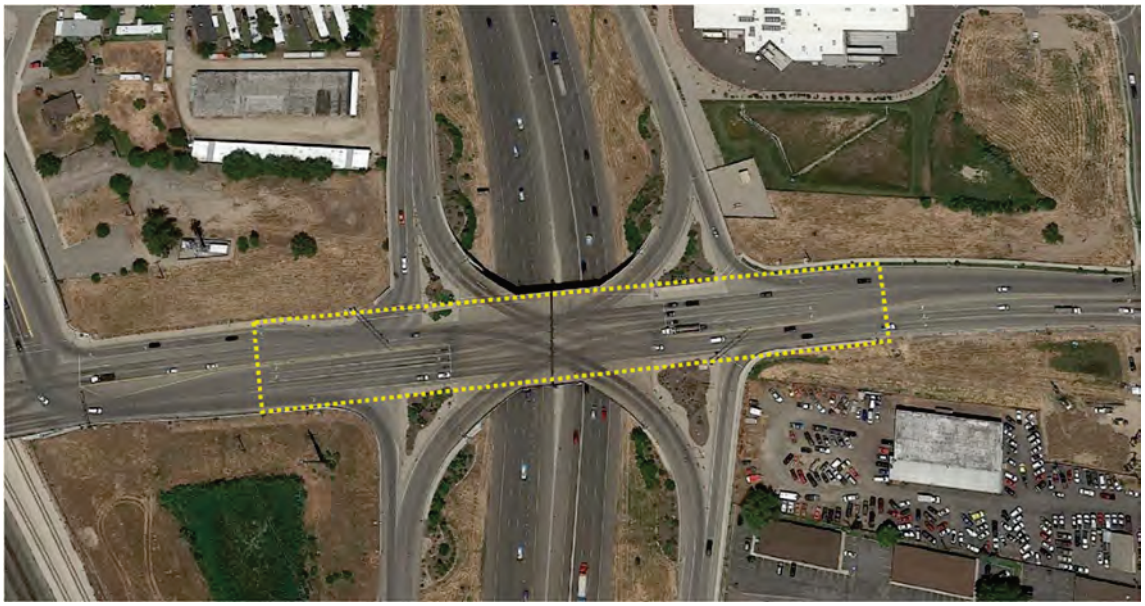

Figure 70. Example of a single-point diamond interchange with the implemented ramp terminal boundary identified along the crossroad (Source: ArcMap)

All of the collected data (i.e., site characteristics, crashes, and traffic volumes) were assembled into one database for the purposes of model development. After initial database development and quality assessments, interchanges in Arizona and Utah were selected for model development due to a higher level of confidence in accurately and reliably locating and identifying terminal-related crashes in those states. This decision resulted in 70 potential crossroad ramp terminals for model development. This list of interchanges was further reduced due to unusual geometric attributes and missing traffic data. Specifically, 12 sites were excluded due to missing ramp volumes on at least one ramp approach, four were excluded for unusual ramp terminal configurations (e.g., exit ramp integration with nearby intersections or streets), and two were excluded for unusual crossroad configurations (e.g., missing crossroad approach, resulting in a three-leg variation of a single-point diamond interchange).

With 52 potential sites remaining for model development, cumulative residual (CURE) plots for preliminary models indicated three potential outliers were present in the database. These locations generally had an excessive number of PDO crashes relative to their reported traffic volumes on the crossroads and ramps, resulting in unusually large residuals. The final database excluded these three sites, resulting in 49 crossroad ramp terminals at single-point diamond interchanges for model development.

8.2 Descriptive Statistics of Database

A total of 49 crossroad ramp terminals at single-point diamond interchanges were used for crash prediction model development. The selected sites were from two states: Arizona and Utah. To remain consistent with the standards for development of the intersection predictive models in the first edition of the HSM, the goal of this research was to develop crash prediction models with a minimum of 200 site-years of data, and preferably 450 site-years of data or more.

8.2.1 Traffic Volumes and Site Characteristics

Traffic volumes and crash data from years 2011 through 2015 were used for analysis. Table 92 provides summary statistics for traffic volume at the study sites used for model development. Study period (date range), number of sites and site-years, and traffic volume descriptive statistics are shown by state.

Table 92. Crossroad and ramp AADT statistics at single-point diamond interchange crossroad ramp terminals

State	Date Range	Number of Sites	Number of Site-Years	Crossroad AADT (veh/day)				Ramp AADT (sum of all four ramps) (veh/day)			
				Min	Max	Mean	Median	Min	Max	Mean	Median
AZ	2011-2015	28	140	14,934	70,790	36,169	36,302	16,556	64,648	40,113	39,308
UT	2011-2015	21	99	13,445	47,295	29,255	29,315	14,069	80,030	42,326	38,075
All states	**2011-2015**	**49**	**239**	**13,445**	**70,790**	**33,305**	**33,800**	**14,069**	**80,030**	**41,030**	**39,169**

Interchange geometric characteristics were collected using Google Earth® and Google Street View® (Table 91). The key variables of interest for modeling were:

- Terminal length (measured along crossroad)
  - Min = 605 ft, Max = 1236 ft, Mean = 829 ft
- Number of through lanes on crossroad approaches
  - Min = 1, Max = 4, Mean = 2.53
- Number of left-turn lanes
  - Exit (from freeway) and entrance (to freeway) movements: Min = 1, Max = 3, Mean = 1.94
- Number of right-turn lanes
  - Entrance (to freeway) movements: Min = 1, Max = 2, Mean = 1.05
  - Exit (from freeway) movements: Min = 1, Max = 2, Mean = 1.43
  - All movements: Min = 1, Max = 2, Mean = 1.24
- Traffic control type for right turns
  - To entrance ramp:
    - Both signalized (frontage roads): 7 sites
    - Both no control: 42 sites
  - From exit ramp
    - Both signalized: 19 sites
    - Both yield control: 19 sites
    - Both no control (free right): 2 sites
    - 1 signalized, 1 stop control: 3 sites
    - 1 signalized, 1 yield control: 1 site
    - 1 stop control, 1 yield control: 1 site
    - 1 signalized, 1 no control: 1 site
    - 1 stop control, 1 no control: 1 site
    - 1 yield control, 1 no control: 1 site

The findings with respect to some of these site characteristics are discussed in Section 8.3 on SPF development.

8.2.2 Crash Counts

All 49 interchanges included in the study experienced crashes. The average number of single- and MV crashes per terminal was 124.6 crashes (approximately 25.0 crashes per terminal per year), and the average number of vehicle-pedestrian plus vehicle-bicycle crashes per intersection was 2.1 over the entire study period (approximately 0.4 pedestrian and bicycle crashes per terminal per year). Table 93 shows all, SV, and MV crash counts by crash severity and time of day for each state over the entire study period. Crash counts are tallied by collision type and manner of collision across all states in Table 94.

Table 93. All crashes combined, single- and MV, and pedestrian and bicycle crash counts by crash severity—single-point diamond interchange crossroad ramp terminals

State	Date Range	Number of Sites	Number of Site-Years	Time of Day	All Crashes Combined			SV Crashes			Multiple-Vehicle Crashes			Pedestrian Crashes	Bicycle Crashes
					Total	FI	PDO	Total	FI	PDO	Total	FI	PDO	FI	FI
AZ	2011-2015	28	140	All	4071	1079	2992	287	83	204	3723	941	2782	18	43
UT	2011-2015	21	99	All	2133	504	1629	53	15	38	2040	454	1586	16	24
All states	**2011-2015**	**49**	**239**	**All**	**6,204**	**1,583**	**4,621**	**340**	**98**	**242**	**5,763**	**1,395**	**4,368**	**34**	**67**

Table 94. Crash counts by collision type and manner of collision and crash severity at single-point diamond interchange crossroad ramp terminals

Collision Type	Total	FI	PDO
Single-Vehicle Crashes			
Collision with animal	0	0	0
Collision with fixed object	288	74	214
Collision with other object	8	3	5
Collision with parked vehicle	0	0	0
Other SV collision	44	21	23
Total SV crashes	**340**	**98**	**242**
Multiple-Vehicle Crashes			
Head-on collision	83	54	29
Angle collision	573	205	368
Rear-end collision	4485	1056	3429
Sideswipe collision	579	63	516
Other MV collision	43	17	26
Total MV crashes	**5763**	**1395**	**4368**
Nonmotorized Crashes			
Pedestrian	34	34	0
Bicycle	67	67	0
Total nonmotorized crashes	**101**	**101**	**0**
Total Crashes	**6204**	**1594**	**4610**

8.3 Safety Performance Functions—Model Development

SPFs for the crossroad ramp terminal of a single-point diamond interchange were initially developed using Equation 56:

$$N_{spf\ int} = exp\left[a + b \times \ln(AADT_{xrd}) + c \times \ln\left(AADT_{ramp}\right) + d \times exit\_free\_right\right] \quad \text{(Eq. 56)}$$

Where:

$N_{spf\ int}$ = predicted average crash frequency of a crossroad ramp terminal at a single-point diamond interchange with base conditions (crashes/year)
$AADT_{xrd}$ = AADT on the crossroad (veh/day)
$AADT_{ramp}$ = um of ramp AADTs (veh/day)
$exit\_free\_right$ = number of exit ramps with free-flow right turns (0, 1, or 2)
a, b, c, and d = estimated regression coefficients

All SPFs were developed using a NB regression model based on all sites combined. Based on a review of the number of states, sites, site-years, and crashes for the database assembled, data for all sites were used for model development to maximize the sample size rather than using a portion of the data for model development and a portion for model validation. Separate models using data from Arizona and Utah were initially explored and showed relatively consistent model coefficients. This increased confidence in the approach to pool all data for model development. STATA 12.1 was used for modeling. The final SPFs based on Equation 57 for crossroad ramp terminals at single-point diamond interchanges are shown in Table 95. Table 95 shows the estimated model coefficients and overdispersion parameter (estimate), their standard error, and associated p-values (or significance level) for each severity level. Figures 71-73 graphically present the SPFs shown in Table 95 for various crossroad and ramp AADTs.

SPFs for vehicle-pedestrian and vehicle-bicycle crashes at crossroad ramp terminals of single-point diamond interchanges could not be developed as pedestrian and bicycle volumes were not available. The SPFs in Table 95 predict the average crash frequency at the crossroad ramp terminal for all crash types (i.e., multi-vehicle, SV, pedestrian, and bicyclist) for total, FI, and PDO severity levels.

The estimated SPFs use both the crossroad AADT and sum of AADTs on all ramps connected to the interchange. The coefficients for these terms are positive and statistically significant (at greater than 99% confidence level) in each SPF, although their magnitudes fluctuate between the FI and PDO models. The estimated coefficient for crossroad AADT was lower for PDO crashes than for FI crashes. The estimated coefficient for ramp AADT was higher for PDO crashes than for FI crashes and greater than unity. This is associated with the larger number of rear-end PDO crashes occurring on the ramps at the study sites with larger ramp volumes.

Multiple models were tested considering the effects of different geometric attributes, including the interchange length, number of turn lanes (right and left), number of through lanes, and number of approaches with a particular right turn control type. Only the right turn control type was found to have a statistically significant effect. However, the type of right turn control also coincides with a particular state (i.e., Arizona uses more yield control, Utah uses more signal control and free-flow right turns), limiting the ability to estimate the effect of the right turn control variable without confounding effects. The free-right turn on exit ramps variable was included in the model because it was statistically significant, and its coefficient was relatively consistent between models. This variable is capturing not only the differences in right turn capacity and its effect on rear-end exit ramp crashes, but also the removal of conflict points within the defined ramp terminal area. The free-flow right turns at the study locations are accommodated by an auxiliary lane along the crossroad (thereby removing the need for right-turning vehicles to merge within the terminal area). Rather than presenting the free-flow right-turn effects as CMFs, separate SPFs were developed in the form of Equation 57 based on number of exit ramps with free-flow right turns to the crossroad – 0, 1, or 2. The final adjusted values for the estimated parameters are presented in Table 96. There are no additional base conditions for the SPFs.

$$N_{spf} = exp\left[a + b \times \ln(AADT_{xrd}) + c \times \ln\left(AADT_{ramp}\right)\right] \quad \text{(Eq. 57)}$$

Table 95. SPF coefficients for crossroad ramp terminals at single-point diamond interchanges (based on Equation 56)

Crash Severity	Parameter	Estimate	Standard Error	Pr > F	Significance Level
Total Crashes	Intercept	-15.31	1.70	--	--
	ln($AADT_{xrd}$)	0.69	0.17	0.000	Significant at 99% level
	ln($AADT_{ramp}$)	1.08	0.18	0.000	Significant at 99% level
	exit_free_right	-0.60	0.11	0.000	Significant at 99% level
	Overdispersion	0.10	0.02	--	--
FI Crashes	Intercept	-16.71	2.06	--	--
	ln($AADT_{xrd}$)	0.88	0.20	0.000	Significant at 99% level
	ln($AADT_{ramp}$)	0.88	0.21	0.000	Significant at 99% level
	exit_free_right	-0.58	0.13	0.000	Significant at 99% level
	Overdispersion	0.11	0.03	--	--
PDO Crashes	Intercept	-15.60	1.72	--	--
	ln($AADT_{xrd}$)	0.61	0.17	0.000	Significant at 99% level
	ln($AADT_{ramp}$)	1.15	0.18	0.000	Significant at 99% level
	exit_free_right	-0.60	0.11	0.000	Significant at 99% level
	Overdispersion	0.10	0.02	--	--

Base Conditions: 0, 1, and 2 are valid values for the number of exit ramps with free-flow right turns to the crossroad. There are no additional base conditions.

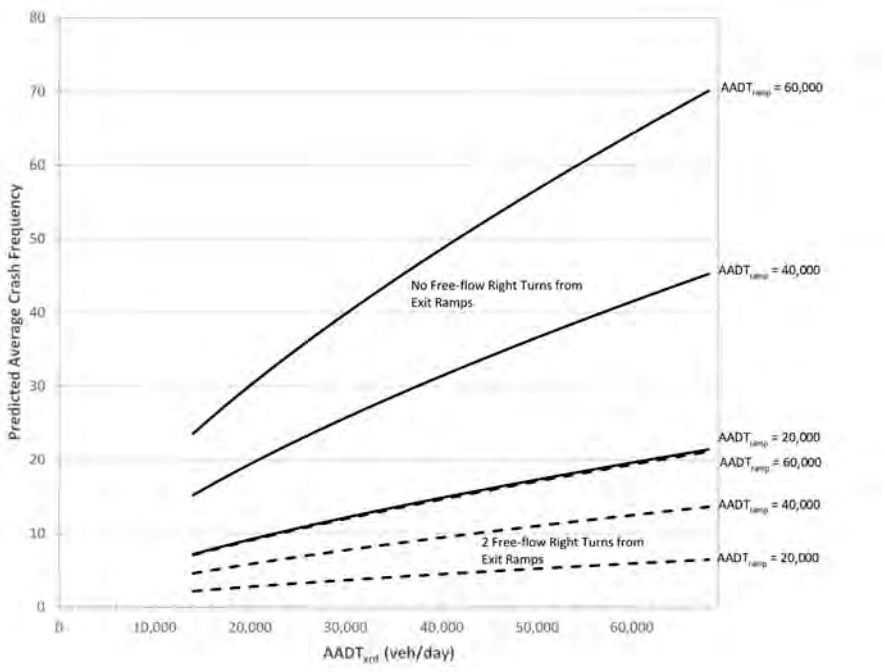

Figure 71. Graphical representation of the SPF for total crashes at crossroad ramp terminals at single-point diamond interchanges

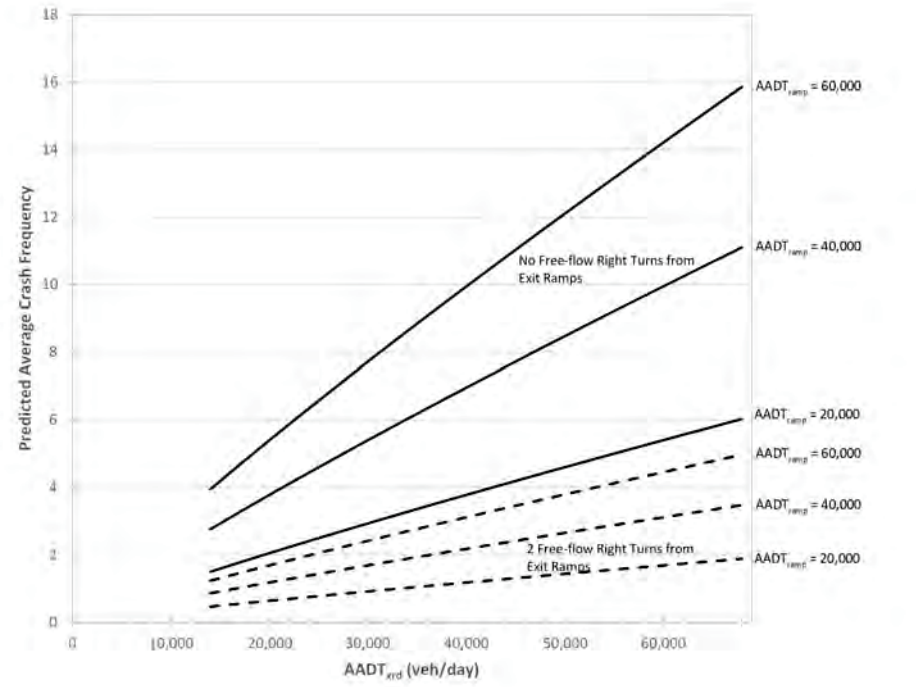

Figure 72. Graphical representation of the SPF for FI crashes at crossroad ramp terminals at single-point diamond interchanges

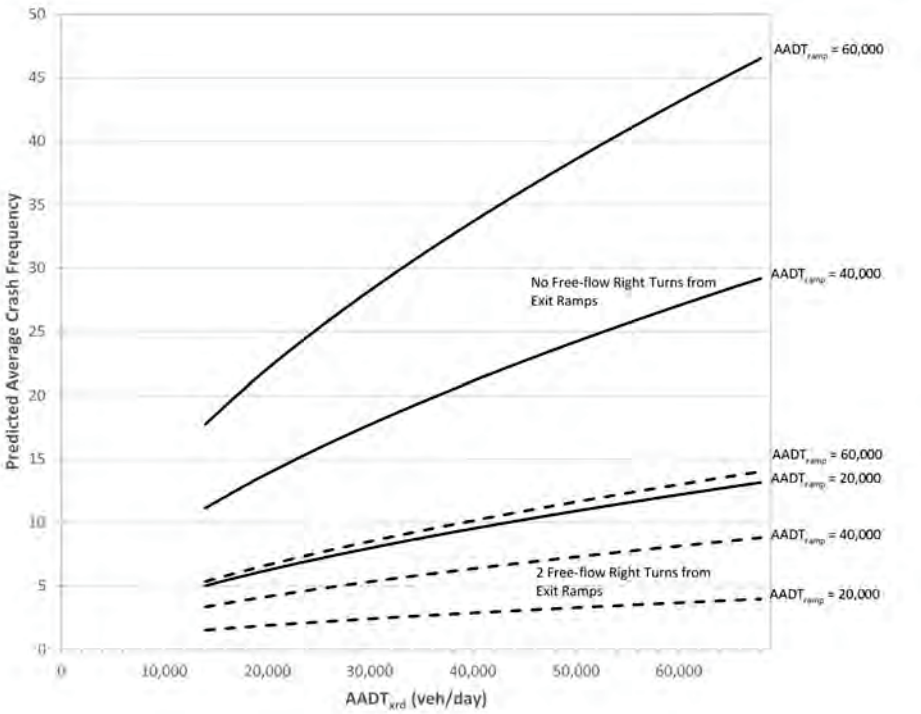

Figure 73. Graphical representation of the SPF for PDO crashes at crossroad ramp terminals at single-point diamond interchanges

Table 96. SPF coefficients for crossroad ramp terminals at single-point diamond interchanges (based on Equation 57)

Crash Severity	Number of Free-Flow Right Turns from Exit Ramp to Crossroad	SPF Coefficient			Dispersion Parameter
		a	*b*	*c*	
Total crashes	0	-15.31	0.69	1.08	0.10
	1	-15.91	0.69	1.08	0.10
	2	-16.51	0.69	1.08	0.10
Fatal-and-injury crashes	0	-16.71	0.88	0.88	0.11
	1	-17.29	0.88	0.88	0.11
	2	-17.87	0.88	0.88	0.11
Property-damage-only crashes	0	-15.60	0.61	1.15	0.10
	1	-16.20	0.61	1.15	0.10
	2	-16.80	0.61	1.15	0.10

There are no additional base conditions.

Tables 97 and 98 provide proportions for crash severity levels and collision types and manner of collision, respectively, for crashes at crossroad ramp terminals of single-point diamond interchanges. These proportions were calculated based on the observed data from both states combined.

Table 97. Distributions for crash severity level at crossroad ramp terminals at single-point diamond interchanges

Crash Severity Level	Percentage of Total Crashes	Percentage of FI Crashes
Fatal	0.16	0.6
Incapacitating injury	1.19	4.7
Non-incapacitating injury	7.09	27.8
Possible injury	17.07	66.9
Total fatal plus injury	25.52	
Property-damage-only	74.48	
Total	**100.0**	**100.0**

Table 98. Distributions for collision type and manner of collision at crossroad ramp terminals at single-point diamond interchanges

Collision Type	Percentage of Total Crashes	
	FI	PDO
Single-Vehicle Crashes		
Collision with animal	0.0	0.0
Collision with fixed object	4.6	4.6
Collision with other object	0.2	0.1
Collision with parked vehicle	0.0	0.0
Other SV collision	1.3	0.5
Multiple-Vehicle Crashes		
Head-on collision	3.4	0.6
Angle collision	12.9	8.0
Rear-end collision	66.2	74.4
Sideswipe collision	4.0	11.2
Other MV collision	1.1	0.6
Nonmotorized Crashes		
Pedestrian	2.1	0.0
Bicycle	4.2	0.0
Total Crashes	**100.0**	**100.0**

Following the development of the crash prediction models for crossroad ramp terminals at single-point diamond interchanges, compatibility testing of the new models to confirm that the

new models provide reasonable results over a broad range of input conditions and that the new models integrate seamlessly with existing intersection crash prediction models in the first edition of the HSM was conducted. The graphical representations of the crash prediction models in Figures 71-73 provide some sense of the reasonableness of the new models for crossroad ramp terminals at single-point diamond interchanges. Nothing from these figures suggests that the models provide unreasonable results. Comparison of the crash prediction models for crossroad ramp terminals at single-point diamond interchanges to the crash prediction models for tight diamond interchanges is presented in Section 9.3.

Regarding seamlessly integrating the new crash prediction models for crossroad ramp terminals at single-point diamond interchanges with existing crash prediction models in Chapter 19 of the HSM, the primary issue that needs to be clearly addressed is the approach for defining crashes associated with the crossroad ramp terminals at single-point diamond interchanges. As stated in Section 8.1, crashes associated with the crossroad ramp terminals at single-point diamond interchanges are defined as follows:

- Crashes occurring on the crossroad within the ramp terminal boundary, defined as a point 100 ft from the gore or curb return of the outermost ramp connection, and having one of the following attributes:
  - at intersection
  - intersection-related
  - at driveway
  - driveway-related
  - involving a pedestrian or bicyclist
- Crashes occurring on a ramp with at least one of the following attributes:
  - at intersection
  - intersection-related
  - involving a pedestrian or bicyclist
  - located on an exit ramp and manner of collision is rear-end

This definition departs from the NCHRP Project 17-45 and HSM approach for defining ramp terminal crashes, using a different distance reference to define the crossroad ramp terminal boundary, so this needs to be clearly stated in the second edition of the HSM. No other issues were identified concerning integrating the new crash prediction models for crossroad ramp terminals at single-point diamond interchanges with existing crash prediction models in Chapter 19 of the HSM.

8.4 Crash Modification Factors

During the development of the crash prediction models for crossroad ramp terminals at single-point diamond interchanges, three potential sources of CMFs for use with the SPFs were considered:

- CMFs developed as part of this research based on a cross-sectional study design and regression modeling
- CMFs already incorporated into the first edition of the HSM and applicable to crossroad ramp terminals at single-point diamond interchanges
- High-quality CMFs applicable to crossroad ramp terminals at single-point diamond interchanges developed using defensible study designs (e.g., observational before-after evaluation studies using SPFs—the EB method), as referenced in FHWA's CMF Clearinghouse with four or five-star quality ratings or based on a review of relevant intersection safety literature

Based on a review of the CMFs already incorporated in the first edition of the HSM and other potential high-quality CMFs developed using defensible study designs, no CMFs were identified that were adaptable to the predictive models for crossroad ramp terminals at single-point diamond interchanges. New potential CMFs were explored during regression modeling, but only the right turn configuration from the exit ramps to the crossroad (i.e., free-flow versus yield/stop/signal control) showed consistent and statistically significant safety effects. As noted in Section 8.3, instead of presenting the free-flow right-turn effects as CMFs, separate SPFs are recommended for three exit ramp to crossroad right turn configurations (defined by the number of exit ramps with free-flow right turns to the crossroad—0, 1, or 2). No additional base conditions or CMFs are recommended for use with the SPFs for crossroad ramp terminals as single-point diamond interchanges. The lack of other effects is not necessarily surprising. Crossroad ramp terminals at single-point diamond interchanges are relatively similar in some of their major features (e.g., one intersection through which all at-grade traffic movements are made, signal timing, presence of exclusive left-turn lanes). Sample sizes did not allow any differences in safety performance to be detected at finer levels of detail (e.g., number of exclusive left-turn lanes, number of cross street through lanes).

8.5 Severity Distribution Functions

Development of SDFs was explored for crossroad ramp terminals at single-point diamond interchanges using methods outlined in Section 2.2.3 of this report. SDFs were not used in the development of crash prediction methods in the first edition of the HSM but were subsequently used in the Supplement to the HSM for freeways and ramps (AASHTO, 2014). The database used to explore SDFs for crossroad ramp terminals at single-point diamond interchanges consisted of the same crashes and crossroad ramp terminals as the database used to estimate the SPFs, but restructured so that the basic observation unit (i.e., database row) was a crash instead of a ramp terminal. No traffic or geometric variables showed consistent and statistically significant effects in the SDFs for crossroad ramp terminals at single-point diamond interchanges.

8.6 Summary of Recommended Models for Incorporation in the HSM

In summary, several crash prediction models were developed for crossroad ramp terminals at single-point diamond interchanges for consideration in the second edition of the HSM. The final models for FI and PDO severity levels presented in Table 96 are recommended for inclusion in the second edition of the HSM, consistent with existing methods in HSM Chapter 19. Separate SPFs are presented in the form of Equation 57 based on number of exit ramps with free-flow right turns to the crossroad (– 0, 1, or 2).

Attempts to develop SDFs for crossroad ramp terminals at single-point diamond interchanges proved unsuccessful for the reasons explained in Section 4.6. The SPFs by severity for crossroad ramp terminals at single-point diamond interchanges provided in Table 96, combined with the severity distributions provided in Table 97, are recommended for addressing crash severity at these intersection types, without use of SDFs. The SPFs predict FI and PDO crashes separately. Additional disaggregation of FI crashes into fatal, incapacitating injury, non-incapacitating injury, and possible injury crashes can be accomplished using the severity distributions provided in Table 97.

Appendix A presents recommended text for incorporating the final recommended models for crossroad ramp terminals at single-point diamond interchanges into Chapter 19 of the HSM.

SPF coefficients for crossroad ramp terminals at single-point diamond interchanges
(based on Equation 57 from Intersection Crash Prediction Methods for the Highway Safety Manual (2021)

Crash Severity	Number of Free-Flow Right Turns from Exit Ramp to Crossroad	SPF Coefficient			Dispersion Parameter
		a	*b*	*c*	
Total Crashes	0	-15.31	0.69	1.08	0.10
	1	-15.91	0.69	1.08	0.10
	2	-16.51	0.69	1.08	0.10
Fatal and Injury Crashes	0	-16.71	0.88	0.88	0.11
	1	-17.29	0.88	0.88	0.11
	2	-17.87	0.88	0.88	0.11
Property Damage Only Crashes	0	-15.60	0.61	1.15	0.10
	1	-16.20	0.61	1.15	0.10
	2	-16.80	0.61	1.15	0.10

$AADT_{crossroad}$ = 12400
$AADT_{ramps}$ = 6700
Number of exit ramps with free-flow right turns = 0

Eq. 57: $N_{spf} = \exp [a + b \times \ln (AADT_{crossroad}) + c \times \ln (AADT_{ramps})]$

Predictive Crash Frequency		
Total	FI	PDO
2.030	0.515	1.324

EIS ALTERNATIVES

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Alternative	Roadway	Classification	Segment/ Offset or Station	Intersecting Road	Segment/ Offset	Intersecting Road	Design Year (2050)					
							[1]AADT (vpd)	[2]Predicted Crash Frequency	Predicted Crash Frequency			
									FI	PDO	Total	
North Alternative (Diamond Interchange)	SR 0322	Freeway	100+00	N/A	535+00	N/A	26,400	29.4	12.6	16.8	29.4	
	SR 0322/SR 0045	Ramp	10+00	SR 0045/SR 0322 EB On-Ramp	32+00	SR 0322 EB On-Ramp/SR 0322 EB	3,100	0.3	13.1	17.3	30.4	New Rdwy
			0+00	SR 0322 EB/SR 0322 EB Off-Ramp	13+00	SR 0322 EB Off-Ramp/SR 0045	3,700	0.2	0.5	0.5	1.0	
			0+00	SR 0045/SR 0322 WB On-Ramp	10+00	SR 0322 WB On-Ramp/SR 0322 WB	5,000	0.3				
			20+00	SR 00322 WB/SR 0322 WB Off-Ramp	44+00	SR 0322 WB Off-Ramp/SR 0322 WB	3,000	0.2				
		Ramp Terminal (Diamond)	0+00	SR 0045/SR 0322 EB On-Ramp	11+50	SR 0322 EB On-Ramp/SR 0322 EB	11,200	2.3	2.4	2.3	4.7	
			0+00	SR 0045/SR 0322 WB Off-Ramp	10+50	SR 0322 WB Off-Ramp/SR 0322 WB	11,200	2.4				
	Old Route SR 0322	Rural Two-Lane	0610/0427	Elks Club Road	0630/0116	Tait Road	3,200	2.4	6.1	4.9	11.0	Old 322
			0630/0116	Tait Road	0660/0979	Tussey View Lane	2,400	2.6	5.0	3.8	8.8	
			0660/0979	Tussey View Lane	0680/0426	Taylor Hill Road	2,400	1.2				
			0680/0426	Taylor Hill Road	0690/2133	Neff Road	1,000	0.8				
			0690/2133	Neff Road	740/2600	Skyview Drive	1,000	1.8				
	SR 0045	Urban/Suburban Arterial	0272/0000	SR 3014 Boal Avenue	0282/0590	SR 0322 EB Off-Ramp	11,200	6.8	6.1	4.3	10.4	PA 45
			0282/0590	SR 0322 EB Off-Ramp	0282/1180	SR 0322 WB On-Ramp	12,400	2.3	8.9	6.8	15.7	
			0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	1.3				
		[3]New Interchange	0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	0.6	0.4	0.2	0.6	
	SR 0045 Connector Road	Urban/Suburban Arterial	10+00	SR 0045	54+00	Elks Club Road	3,400	1.5	0.8	0.7	1.5	
	SR 3014 Boal Ave	Urban/Suburban Arterial	0200/0000	Earlystown Road (SR 0045)	20+75	SR 0045 Connector Road	3,400	0.7	0.3	0.4	0.7	
Total								57.1	28.1	29.0	57.1	

Notes:
(1) Includes traffic volumes at intersections along indicated segments (if applicable)
(2) Includes crashes contributed by intersections along indicated segments (if applicable).
(3) New intersection at SR 0045 and SR 0045 (Connector Road). Intersection analyzed as a roundabout.

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Alternative	Roadway	Classification	Segment/ Offset or Station	Intersecting Road	Segment/ Offset	Intersecting Road	Design Year (2050)				
							(1)AADT (vpd)	(2)Predicted Crash Frequency	Predicted Crash Frequency		
									FI	PDO	Total
Central Alternative (Diamond Interchange)	SR 0322	Freeway	100+00	N/A	535+00	N/A	26,400	28.5	12.3	16.2	28.5
	SR 0322/SR 0045	Ramp	10+00	SR 0045/SR 0322 EB On-Ramp	32+00	SR 0322 EB On-Ramp/SR 0322 EB	3,100	0.3	12.8	16.7	29.5
			0+00	SR 0322 EB/SR 0322 EB Off-Ramp	13+00	SR 0322 EB Off-Ramp/SR 0045	3,700	0.2	0.5	0.5	1.0
			0+00	SR 0045/SR 0322 WB On-Ramp	10+00	SR 0322 WB On-Ramp/SR 0322 WB	5,000	0.3			
			20+00	SR 00322 WB/SR 0322 WB Off-Ramp	44+00	SR 0322 WB Off-Ramp/SR 0322 WB	3,000	0.2			
		Ramp Terminal (Diamond)	0+00	SR 0045/SR 0322 EB On-Ramp	11+50	SR 0322 EB On-Ramp/SR 0322 EB	11,200	2.3	2.4	2.3	4.7
			0+00	SR 0045/SR 0322 WB Off-Ramp	10+50	SR 0322 WB Off-Ramp/SR 0322 WB	11,200	2.4			
	Old Route SR 0322	Rural Two-Lane	0610/0427	Elks Club Road	0630/0116	Tait Road	3,200	2.5	5.9	4.8	10.7
			0630/0116	Tait Road	0660/0979	Tussey View Lane	2,400	2.6			
			0660/0979	Tussey View Lane	0680/0426	Taylor Hill Road	2,400	1.2	4.8	3.7	8.5
			0680/0426	Taylor Hill Road	0690/2133	Neff Road	1,000	0.8			
			0690/2133	Neff Road	740/2600	Skyview Drive	1,000	1.4			
	SR 0045	Urban/Suburban Arterial	0272/0000	SR 3014 Boal Avenue	0282/0590	SR 0322 EB Off-Ramp	11,200	6.8	6.1	4.3	10.4
			0282/0590	SR 0322 EB Off-Ramp	0282/1180	SR 0322 WB On-Ramp	12,400	2.3	8.9	6.8	15.7
			0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	1.3			
		(3)New Interchange	0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	0.6	0.4	0.2	0.6
	SR 0045 Connector Road	Urban/Suburban Arterial	10+00	SR 0045	54+00	Elks Club Road	3,400	1.5	0.8	0.7	1.5
	SR 3014 Boal Ave	Urban/Suburban Arterial	0200/0000	Earlystown Road (SR 0045)	20+75	SR 0045 Connector Road	3,400	0.7	0.3	0.4	0.7
Total								55.9	27.6	28.3	55.9

New Rdwy

Old 322

PA 45

Notes:
(1) Includes traffic volumes at intersections along indicated segments (if applicable)
(2) Includes crashes contributed by intersections along indicated segments (if applicable).
(3) New intersection at SR 0045 and SR 0045 (Connector Road). Intersection analyzed as a roundabout.

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							[1]AADT (vpd)	[2]Predicted Crash Frequency	Predicted Crash Frequency			
									FI	PDO	Total	
South Alternative (Diamond Interchange)	SR 0322	Freeway	100+00	N/A	535+00	N/A	26,400	28.1	12.1	16.0	28.1	
	SR 0322/SR 0045	Ramp	10+00	SR 0045/SR 0322 EB On-Ramp	32+00	SR 0322 EB On-Ramp/SR 0322 EB	3,100	0.3	12.6	16.5	29.1	New Rdwy
			0+00	SR 0322 EB/SR 0322 EB Off-Ramp	13+00	SR 0322 EB Off-Ramp/SR 0045	3,700	0.2	0.5	0.5	1.0	
			0+00	SR 0045/SR 0322 WB On-Ramp	10+00	SR 0322 WB On-Ramp/SR 0322 WB	5,000	0.3				
			20+00	SR 00322 WB/SR 0322 WB Off-Ramp	44+00	SR 0322 WB Off-Ramp/SR 0322 WB	3,000	0.2				
		Ramp Terminal (Diamond)	0+00	SR 0045/SR 0322 EB On-Ramp	11+50	SR 0322 EB On-Ramp/SR 0322 EB	11,200	2.3	2.4	2.3	4.7	
			0+00	SR 0045/SR 0322 WB Off-Ramp	10+50	SR 0322 WB Off-Ramp/SR 0322 WB	11,200	2.4				
	Old Route SR 0322	Rural Two-Lane	0610/0427	Elks Club Road	0630/0116	Tait Road	3,200	2.5	5.9	4.8	10.7	Old 322
			0630/0116	Tait Road	0660/0979	Tussey View Lane	2,400	2.6	4.8	3.7	8.5	
			0660/0979	Tussey View Lane	0680/0426	Taylor Hill Road	2,400	1.2				
			0680/0426	Taylor Hill Road	0690/2133	Neff Road	1,000	0.8				
			0690/2133	Neff Road	740/2600	Skyview Drive	1,000	1.4				
	SR 0045	Urban/Suburban Arterial	0272/0000	SR 3014 Boal Avenue	0282/0590	SR 0322 EB Off-Ramp	11,200	6.8	6.1	4.3	10.4	PA 45
			0282/0590	SR 0322 EB Off-Ramp	0282/1180	SR 0322 WB On-Ramp	12,400	2.3	8.9	6.8	15.7	
			0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	1.3				
		[3]New Interchange	0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	0.6	0.4	0.2	0.6	
	SR 0045 Connector Road	Urban/Suburban Arterial	10+00	SR 0045	54+00	Elks Club Road	3,400	1.5	0.8	0.7	1.5	
	SR 3014 Boal Ave	Urban/Suburban Arterial	0200/0000	Earlystown Road (SR 0045)	20+75	SR 0045 Connector Road	3,400	0.7	0.3	0.4	0.7	
Total								55.5	27.4	28.1	55.5	

Notes:
(1) Includes traffic volumes at intersections along indicated segments (if applicable)
(2) Includes crashes contributed by intersections along indicated segments (if applicable).
(3) New intersection at SR 0045 and SR 0045 (Connector Road). Intersection analyzed as a roundabout.

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							[1]AADT (vpd)	[2]Predicted Crash Frequency	Predicted Crash Frequency			
									FI	PDO	Total	
North Alternative (SPUI Interchange)	SR 0322	Freeway	100+00	N/A	535+00	N/A	26,400	29.4	12.6	16.8	29.4	
	SR 0322/SR 0045	Ramp	10+00	SR 0045/SR 0322 EB On-Ramp	32+00	SR 0322 EB On-Ramp/SR 0322 EB	3,100	0.3	13.1	17.3	30.4	New Rdwy
			0+00	SR 0322 EB/SR 0322 EB Off-Ramp	13+00	SR 0322 EB Off-Ramp/SR 0045	3,700	0.2	0.5	0.5	1.0	
			0+00	SR 0045/SR 0322 WB On-Ramp	10+00	SR 0322 WB On-Ramp/SR 0322 WB	5,000	0.3				
			20+00	SR 00322 WB/SR 0322 WB Off-Ramp	44+00	SR 0322 WB Off-Ramp/SR 0322 WB	3,000	0.2				
		Ramp Terminal (SPUI)	0+00	SR 0045/SR 0322 EB On-Ramp	11+50	SR 0322 EB On-Ramp/SR 0322 EB	11,200	1.0	0.6	1.4	2.0	
			0+00	SR 0045/SR 0322 WB Off-Ramp	10+50	SR 0322 WB Off-Ramp/SR 0322 WB	11,200	1.0				
	Old Route SR 0322	Rural Two-Lane	0610/0427	Elks Club Road	0630/0116	Tait Road	3,200	2.4	6.1	4.9	11.0	Old 322
			0630/0116	Tait Road	0660/0979	Tussey View Lane	2,400	2.6	5.0	3.8	8.8	
			0660/0979	Tussey View Lane	0680/0426	Taylor Hill Road	2,400	1.2				
			0680/0426	Taylor Hill Road	0690/2133	Neff Road	1,000	0.8				
			0690/2133	Neff Road	740/2600	Skyview Drive	1,000	1.8				
	SR 0045	Urban/Suburban Arterial	0272/0000	SR 3014 Boal Avenue	0282/0590	SR 0322 EB Off-Ramp	11,200	6.8	6.1	4.3	10.4	PA 45
			0282/0590	SR 0322 EB Off-Ramp	0282/1180	SR 0322 WB On-Ramp	12,400	2.3	7.1	5.9	13.0	
			0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	1.3				
		[3]New Interchange	0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	0.6	0.4	0.2	0.6	
	SR 0045 Connector Road	Urban/Suburban Arterial	10+00	SR 0045	54+00	Elks Club Road	3,400	1.5	0.8	0.7	1.5	
	SR 3014 Boal Ave	Urban/Suburban Arterial	0200/0000	Earlystown Road (SR 0045)	20+75	SR 0045 Connector Road	3,400	0.7	0.3	0.4	0.7	
Total								54.4	26.3	28.1	54.4	

Notes:
(1) Includes traffic volumes at intersections along indicated segments (if applicable)
(2) Includes crashes contributed by intersections along indicated segments (if applicable).
(3) New intersection at SR 0045 and SR 0045 (Connector Road). Intersection analyzed as a roundabout.

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							(1)AADT (vpd)	(2)Predicted Crash Frequency	Predicted Crash Frequency			
									FI	PDO	Total	
Central Alternative (SPUI Interchange)	SR 0322	Freeway	100+00	N/A	535+00	N/A	26,400	28.5	12.3	16.2	28.5	
	SR 0322/SR 0045	Ramp	10+00	SR 0045/SR 0322 EB On-Ramp	32+00	SR 0322 EB On-Ramp/SR 0322 EB	3,100	0.3	12.8	16.7	29.5	New Rdwy
			0+00	SR 0322 EB/SR 0322 EB Off-Ramp	13+00	SR 0322 EB Off-Ramp/SR 0045	3,700	0.2	0.5	0.5	1.0	
			0+00	SR 0045/SR 0322 WB On-Ramp	10+00	SR 0322 WB On-Ramp/SR 0322 WB	5,000	0.3				
			20+00	SR 00322 WB/SR 0322 WB Off-Ramp	44+00	SR 0322 WB Off-Ramp/SR 0322 WB	3,000	0.2				
		Ramp Terminal (SPUI)	0+00	SR 0045/SR 0322 EB On-Ramp	11+50	SR 0322 EB On-Ramp/SR 0322 EB	11,200	1.0	0.6	1.4	2.0	
			0+00	SR 0045/SR 0322 WB Off-Ramp	10+50	SR 0322 WB Off-Ramp/SR 0322 WB	11,200	1.0				
	Old Route SR 0322	Rural Two-Lane	0610/0427	Elks Club Road	0630/0116	Tait Road	3,200	2.5	5.9	4.8	10.7	Old 322
			0630/0116	Tait Road	0660/0979	Tussey View Lane	2,400	2.6	4.8	3.7	8.5	
			0660/0979	Tussey View Lane	0680/0426	Taylor Hill Road	2,400	1.2				
			0680/0426	Taylor Hill Road	0690/2133	Neff Road	1,000	0.8				
			0690/2133	Neff Road	740/2600	Skyview Drive	1,000	1.4				
	SR 0045	Urban/Suburban Arterial	0272/0000	SR 3014 Boal Avenue	0282/0590	SR 0322 EB Off-Ramp	11,200	6.8	6.1	4.3	10.4	PA 45
			0282/0590	SR 0322 EB Off-Ramp	0282/1180	SR 0322 WB On-Ramp	12,400	2.3	7.1	5.9	13.0	
			0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	1.3				
		(3)New Interchange	0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	0.6	0.4	0.2	0.6	
	SR 0045 Connector Road	Urban/Suburban Arterial	10+00	SR 0045	54+00	Elks Club Road	3,400	1.5	0.8	0.7	1.5	
	SR 3014 Boal Ave	Urban/Suburban Arterial	0200/0000	Earlystown Road (SR 0045)	20+75	SR 0045 Connector Road	3,400	0.7	0.3	0.4	0.7	
Total								53.2	25.8	27.4	53.2	

Notes:
(1) Includes traffic volumes at intersections along indicated segments (if applicable)
(2) Includes crashes contributed by intersections along indicated segments (if applicable).
(3) New intersection at SR 0045 and SR 0045 (Connector Road). Intersection analyzed as a roundabout.

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Alternative	Roadway	Classification	Segment/ Offset or Station	Intersecting Road	Segment/ Offset	Intersecting Road	Design Year (2050)				
							(1)AADT (vpd)	(2)Predicted Crash Frequency	Predicted Crash Frequency		
									FI	PDO	Total
South Alternative (SPUI Interchange)	SR 0322	Freeway	100+00	N/A	535+00	N/A	26,400	28.1	12.1	16.0	28.1
	SR 0322/SR 0045	Ramp	10+00	SR 0045/SR 0322 EB On-Ramp	32+00	SR 0322 EB On-Ramp/SR 0322 EB	3,100	0.3	**12.6**	**16.5**	**29.1**
			0+00	SR 0322 EB/SR 0322 EB Off-Ramp	13+00	SR 0322 EB Off-Ramp/SR 0045	3,700	0.2	0.5	0.5	1.0
			0+00	SR 0045/SR 0322 WB On-Ramp	10+00	SR 0322 WB On-Ramp/SR 0322 WB	5,000	0.3			
			20+00	SR 00322 WB/SR 0322 WB Off-Ramp	44+00	SR 0322 WB Off-Ramp/SR 0322 WB	3,000	0.2			
		Ramp Terminal (SPUI)	0+00	SR 0045/SR 0322 EB On-Ramp	11+50	SR 0322 EB On-Ramp/SR 0322 EB	11,200	1.0	0.6	1.4	2.0
			0+00	SR 0045/SR 0322 WB Off-Ramp	10+50	SR 0322 WB Off-Ramp/SR 0322 WB	11,200	1.0			
	Old Route SR 0322	Rural Two-Lane	0610/0427	Elks Club Road	0630/0116	Tait Road	3,200	2.5	**5.9**	**4.8**	**10.7**
			0630/0116	Tait Road	0660/0979	Tussey View Lane	2,400	2.6			
			0660/0979	Tussey View Lane	0680/0426	Taylor Hill Road	2,400	1.2	4.8	3.7	8.5
			0680/0426	Taylor Hill Road	0690/2133	Neff Road	1,000	0.8			
			0690/2133	Neff Road	740/2600	Skyview Drive	1,000	1.4			
	SR 0045	Urban/Suburban Arterial	0272/0000	SR 3014 Boal Avenue	0282/0590	SR 0322 EB Off-Ramp	11,200	6.8			
			0282/0590	SR 0322 EB Off-Ramp	0282/1180	SR 0322 WB On-Ramp	12,400	2.3	6.1	4.3	10.4
			0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	1.3	**7.1**	**5.9**	**13.0**
		(3)New Interchange	0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	0.6	0.4	0.2	0.6
	SR 0045 Connector Road	Urban/Suburban Arterial	10+00	SR 0045	54+00	Elks Club Road	3,400	1.5	0.8	0.7	1.5
	SR 3014 Boal Ave	Urban/Suburban Arterial	0200/0000	Earlystown Road (SR 0045)	20+75	SR 0045 Connector Road	3,400	0.7	0.3	0.4	0.7
Total								**52.8**	**25.6**	**27.2**	**52.8**

New Rdwy

Old 322

PA 45

Notes:
(1) Includes traffic volumes at intersections along indicated segments (if applicable)
(2) Includes crashes contributed by intersections along indicated segments (if applicable).
(3) New intersection at SR 0045 and SR 0045 (Connector Road). Intersection analyzed as a roundabout.

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Checked By HAK Date 1/21/2025

Alternative	Roadway	Classification	Segment/ Offset or Station	Intersecting Road	Segment/ Offset	Intersecting Road	Design Year (2050)				
							[1]AADT (vpd)	[2]Predicted Crash Frequency	Predicted Crash Frequency		
									FI	PDO	Total
North Alternative (Roundabout Interchange)	SR 0322	Freeway	100+00	N/A	535+00	N/A	26,400	29.4	12.6	16.8	29.4
	SR 0322/SR 0045	Ramp	10+00	SR 0045/SR 0322 EB On-Ramp	32+00	SR 0322 EB On-Ramp/SR 0322 EB	3,100	0.3	13.1	17.3	30.4
			0+00	SR 0322 EB/SR 0322 EB Off-Ramp	13+00	SR 0322 EB Off-Ramp/SR 0045	3,700	0.2	0.5	0.5	1.0
			0+00	SR 0045/SR 0322 WB On-Ramp	10+00	SR 0322 WB On-Ramp/SR 0322 WB	5,000	0.3			
			20+00	SR 00322 WB/SR 0322 WB Off-Ramp	44+00	SR 0322 WB Off-Ramp/SR 0322 WB	3,000	0.2			
		Ramp Terminal [4](Roundabout)	0+00	SR 0045/SR 0322 EB On-Ramp	11+50	SR 0322 EB On-Ramp/SR 0322 EB	11,200	1.4	1.4	1.4	2.8
			0+00	SR 0045/SR 0322 WB Off-Ramp	10+50	SR 0322 WB Off-Ramp/SR 0322 WB	11,200	1.4			
	Old Route SR 0322	Rural Two-Lane	0610/0427	Elks Club Road	0630/0116	Tait Road	3,200	2.4	6.1	4.9	11.0
			0630/0116	Tait Road	0660/0979	Tussey View Lane	2,400	2.6	5.0	3.8	8.8
			0660/0979	Tussey View Lane	0680/0426	Taylor Hill Road	2,400	1.2			
			0680/0426	Taylor Hill Road	0690/2133	Neff Road	1,000	0.8			
			0690/2133	Neff Road	740/2600	Skyview Drive	1,000	1.8			
	SR 0045	Urban/Suburban Arterial	0272/0000	SR 3014 Boal Avenue	0282/0590	SR 0322 EB Off-Ramp	11,200	6.8	6.1	4.3	10.4
			0282/0590	SR 0322 EB Off-Ramp	0282/1180	SR 0322 WB On-Ramp	12,400	2.3	7.9	5.9	13.8
			0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	1.3			
		[3]New Interchange	0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	0.6	0.4	0.2	0.6
	SR 0045 Connector Road	Urban/Suburban Arterial	10+00	SR 0045	54+00	Elks Club Road	3,400	1.5	0.8	0.7	1.5
	SR 3014 Boal Ave	Urban/Suburban Arterial	0200/0000	Earlystown Road (SR 0045)	20+75	SR 0045 Connector Road	3,400	0.7	0.3	0.4	0.7
Total								55.2	27.1	28.1	55.2

New Rdwy

Old 322

PA 45

Notes:
(1) Includes traffic volumes at intersections along indicated segments (if applicable)
(2) Includes crashes contributed by intersections along indicated segments (if applicable).
(3) New intersection at SR 0045 and SR 0045 (Connector Road). Intersection analyzed as a roundabout.
(4) New roundabouts at SR 0045/SR 0322 EB and SR 0045/SR 0322 WB intersections.
CMF = 0.604

Project State College Connector
Subject HSM Summary
Computed By NTS Date 1/20/2025

Job No. 18-01796-001
Sheet No. 2 of 3
Checked By HAK Date 1/21/2025

Alternative	Roadway	Classification	Segment/ Offset or Station	Intersecting Road	Segment/ Offset	Intersecting Road	Design Year (2050)				
							(1)AADT (vpd)	(2)Predicted Crash Frequency	Predicted Crash Frequency		
									FI	PDO	Total
Central Alternative (Roundabout Interchange)	SR 0322	Freeway	100+00	N/A	535+00	N/A	26,400	28.5	12.3	16.2	28.5
	SR 0322/SR 0045	Ramp	10+00	SR 0045/SR 0322 EB On-Ramp	32+00	SR 0322 EB On-Ramp/SR 0322 EB	3,100	0.3	12.8	16.7	29.5
			0+00	SR 0322 EB/SR 0322 EB Off-Ramp	13+00	SR 0322 EB Off-Ramp/SR 0045	3,700	0.2	0.5	0.5	1.0
			0+00	SR 0045/SR 0322 WB On-Ramp	10+00	SR 0322 WB On-Ramp/SR 0322 WB	5,000	0.3			
			20+00	SR 00322 WB/SR 0322 WB Off-Ramp	44+00	SR 0322 WB Off-Ramp/SR 0322 WB	3,000	0.2			
		Ramp Terminal (4)(Roundabout)	0+00	SR 0045/SR 0322 EB On-Ramp	11+50	SR 0322 EB On-Ramp/SR 0322 EB	11,200	1.4	1.4	1.4	2.8
			0+00	SR 0045/SR 0322 WB Off-Ramp	10+50	SR 0322 WB Off-Ramp/SR 0322 WB	11,200	1.4			
	Old Route SR 0322	Rural Two-Lane	0610/0427	Elks Club Road	0630/0116	Tait Road	3,200	2.5	5.9	4.8	10.7
			0630/0116	Tait Road	0660/0979	Tussey View Lane	2,400	2.6			
			0660/0979	Tussey View Lane	0680/0426	Taylor Hill Road	2,400	1.2	4.8	3.7	8.5
			0680/0426	Taylor Hill Road	0690/2133	Neff Road	1,000	0.8			
			0690/2133	Neff Road	740/2600	Skyview Drive	1,000	1.4			
	SR 0045	Urban/Suburban Arterial	0272/0000	SR 3014 Boal Avenue	0282/0590	SR 0322 EB Off-Ramp	11,200	6.8			
			0282/0590	SR 0322 EB Off-Ramp	0282/1180	SR 0322 WB On-Ramp	12,400	2.3	6.1	4.3	10.4
			0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	1.3	7.9	5.9	13.8
		(3)New Interchange	0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	0.6	0.4	0.2	0.6
	SR 0045 Connector Road	Urban/Suburban Arterial	10+00	SR 0045	54+00	Elks Club Road	3,400	1.5	0.8	0.7	1.5
	SR 3014 Boal Ave	Urban/Suburban Arterial	0200/0000	Earlystown Road (SR 0045)	20+75	SR 0045 Connector Road	3,400	0.7	0.3	0.4	0.7
Total								54.0	26.6	27.4	54.0

New Rdwy

Old 322

PA 45

Notes:
(1) Includes traffic volumes at intersections along indicated segments (if applicable)
(2) Includes crashes contributed by intersections along indicated segments (if applicable).
(3) New intersection at SR 0045 and SR 0045 (Connector Road). Intersection analyzed as a roundabout.
(4) New roundabouts at SR 0045/SR 0322 EB and SR 0045/SR 0322 WB intersections.
CMF = 0.604

Project State College Connector
Subject HSM Summary
Computed By NTS Date 1/20/2025

Job No. 18-01796-001
Sheet No. 3 of 3
Checked By HAK Date 1/21/2025

Alternative	Roadway	Classification	Segment/ Offset or Station	Intersecting Road	Segment/ Offset	Intersecting Road	Design Year (2050)					
							[1]AADT (vpd)	[2]Predicted Crash Frequency	Predicted Crash Frequency			
									FI	PDO	Total	
South Alternative (Roundabout Interchange)	SR 0322	Freeway	100+00	N/A	535+00	N/A	26,400	28.1	12.1	16.0	28.1	
	SR 0322/SR 0045	Ramp	10+00	SR 0045/SR 0322 EB On-Ramp	32+00	SR 0322 EB On-Ramp/SR 0322 EB	3,100	0.3	12.6	16.5	29.1	New Rdwy
			0+00	SR 0322 EB/SR 0322 EB Off-Ramp	13+00	SR 0322 EB Off-Ramp/SR 0045	3,700	0.2	0.5	0.5	1.0	
			0+00	SR 0045/SR 0322 WB On-Ramp	10+00	SR 0322 WB On-Ramp/SR 0322 WB	5,000	0.3				
			20+00	SR 00322 WB/SR 0322 WB Off-Ramp	44+00	SR 0322 WB Off-Ramp/SR 0322 WB	3,000	0.2				
		Ramp Terminal [4](Roundabout)	0+00	SR 0045/SR 0322 EB On-Ramp	11+50	SR 0322 EB On-Ramp/SR 0322 EB	11,200	1.4	1.4	1.4	2.8	
			0+00	SR 0045/SR 0322 WB Off-Ramp	10+50	SR 0322 WB Off-Ramp/SR 0322 WB	11,200	1.4				
	Old Route SR 0322	Rural Two-Lane	0610/0427	Elks Club Road	0630/0116	Tait Road	3,200	2.5	5.9	4.8	10.7	Old 322
			0630/0116	Tait Road	0660/0979	Tussey View Lane	2,400	2.6	4.8	3.7	8.5	
			0660/0979	Tussey View Lane	0680/0426	Taylor Hill Road	2,400	1.2				
			0680/0426	Taylor Hill Road	0690/2133	Neff Road	1,000	0.8				
			0690/2133	Neff Road	740/2600	Skyview Drive	1,000	1.4				
	SR 0045	Urban/Suburban Arterial	0272/0000	SR 3014 Boal Avenue	0282/0590	SR 0322 EB Off-Ramp	11,200	6.8	6.1	4.3	10.4	PA 45
			0282/0590	SR 0322 EB Off-Ramp	0282/1180	SR 0322 WB On-Ramp	12,400	2.3	7.9	5.9	13.8	
			0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	1.3				
		[3]New Interchange	0282/1180	SR 0322 WB On-Ramp	0292/0770	Indian Hill Road	9,800	0.6	0.4	0.2	0.6	
	SR 0045 Connector Road	Urban/Suburban Arterial	10+00	SR 0045	54+00	Elks Club Road	3,400	1.5	0.8	0.7	1.5	
	SR 3014 Boal Ave	Urban/Suburban Arterial	0200/0000	Earlystown Road (SR 0045)	20+75	SR 0045 Connector Road	3,400	0.7	0.3	0.4	0.7	
Total								53.6	26.4	27.2	53.6	

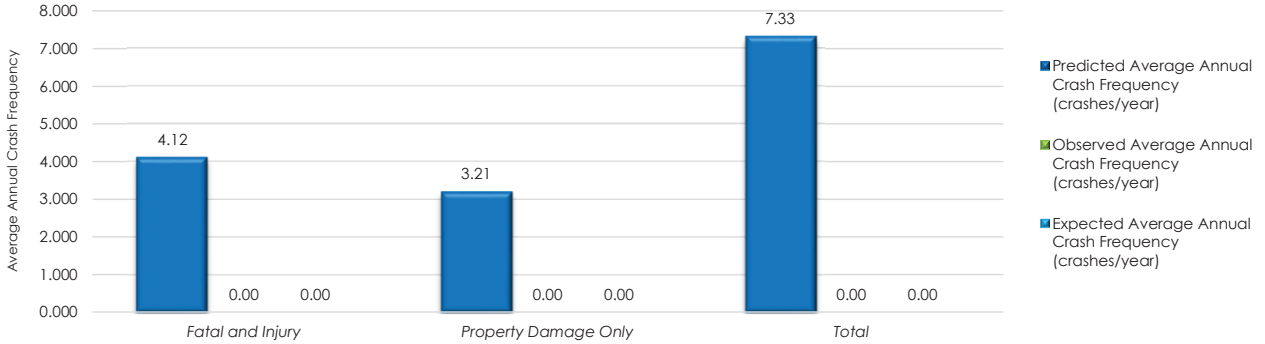
Notes:
(1) Includes traffic volumes at intersections along indicated segments (if applicable)
(2) Includes crashes contributed by intersections along indicated segments (if applicable).
(3) New intersection at SR 0045 and SR 0045 (Connector Road). Intersection analyzed as a roundabout.
(4) New roundabouts at SR 0045/SR 0322 EB and SR 0045/SR 0322 WB intersections.
CMF = 0.604

2050 NO-BUILD

Project Safety Performance Summary Report

Project Description	SCAC
Date	2/7/2024
Analysis Year	2050
Analysis Type	Site Level Analysis
Facility Type(s)	Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Project Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	4.12	3.21	7.33
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

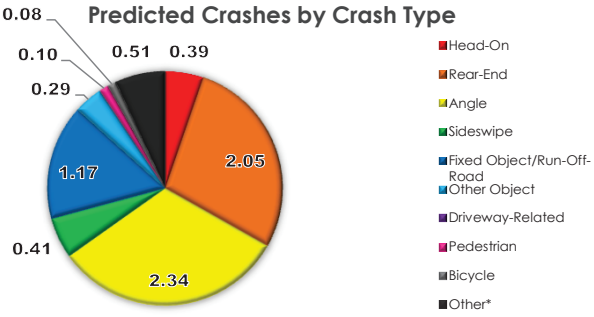
Total Project Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	1.93	1.73	3.66
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	2.20	1.48	3.67
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	4.12	3.21	7.33
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Project Total: Predicted Crashes by Crash Type



No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Project Safety Performance Detailed Report

Urban and Suburban Arterials

Project Description SCAC
Date 2/7/2024
Analysis Year 2050
Analysis Type Site Level Analysis
Facility Type(s) Urban/Suburban Arterials

Urban and Suburban Arterials: Segments

Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	272	0	2.01	0.00	--	--
Segment 2	282	531	0.58	0.00	--	--
Segment 3	282	1128	1.07	0.00	--	--

Project Safety Performance Detailed Report

Urban and Suburban Arterials

Project Description SCAC
Date 2/7/2024
Analysis Year 2050
Analysis Type Site Level Analysis
Facility Type(s) Urban/Suburban Arterials

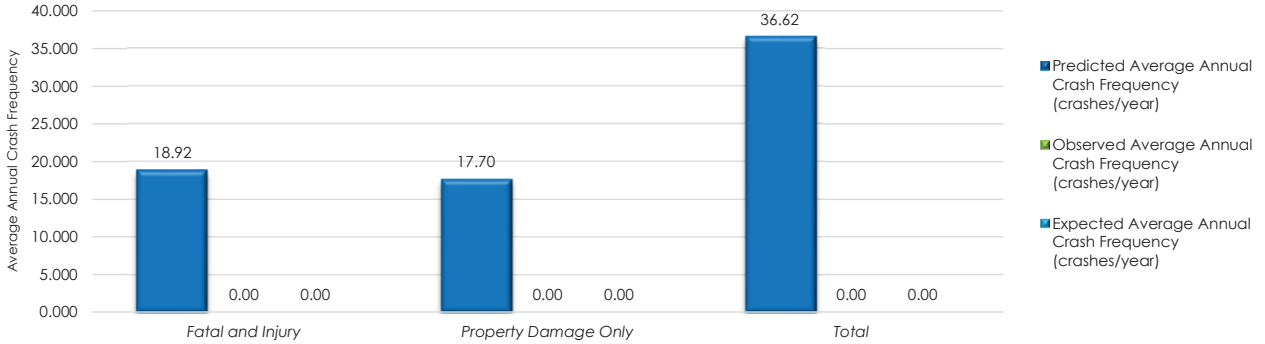
Urban and Suburban Arterials: Intersections

Intersection Name	*Major Road*	*Minor Road*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Intersection 1	SR 0045 (Earlystown Rd)	SR 3014 (Boal Ave)	2.98	0.00	--	--
Intersection 2	SR 0045 (Earlystown Rd)	Indian Hill Rd	0.69	0.00	--	--

Project Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Predicted Only (No Crash Data Analysis)
Facility Type(s)	Rural Two-Lane Roads, and Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Project Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	18.92	17.70	36.62
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

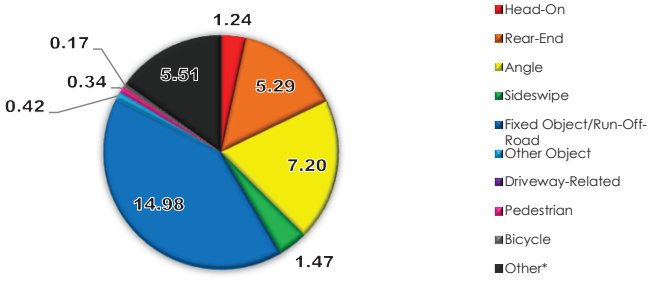
Total Project Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	14.89	14.25	29.15
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	4.02	3.45	7.47
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	18.92	17.70	36.62
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Project Total: Predicted Crashes by Crash Type



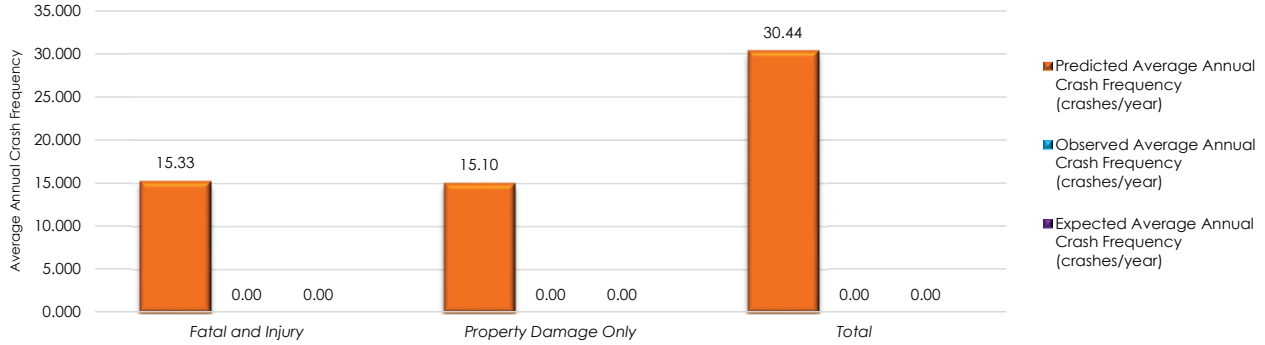
No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Rural Two-Lane Roads Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Predicted Only (No Crash Data Analysis)
Facility Type(s)	Rural Two-Lane Roads, and Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Rural Two-Lane Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	15.33	15.10	30.44
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

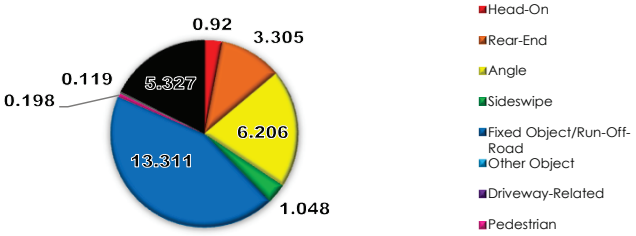
Rural Two-Lane Roads Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	11.31	11.66	22.97
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	4.02	3.45	7.47
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	15.33	15.10	30.44
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Rural Two-Lane Roads: Predicted Crashes by Crash Type



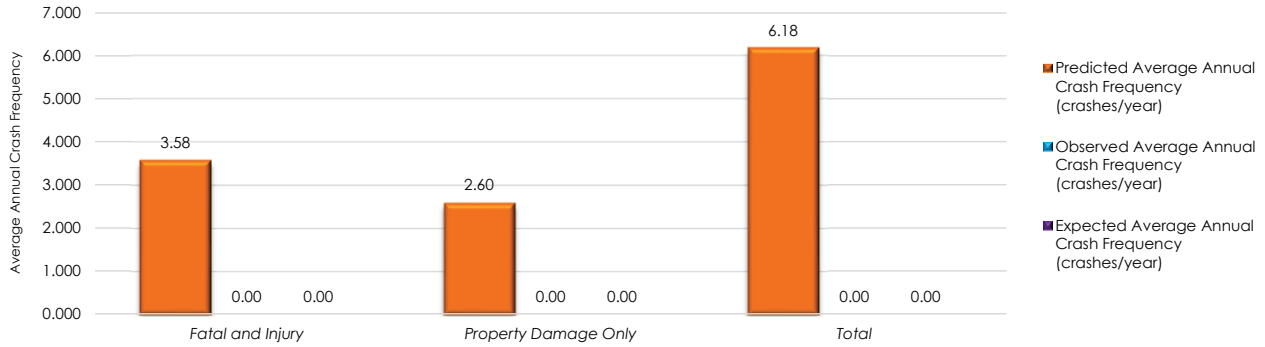
No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Urban/Suburban Arterials Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Predicted Only (No Crash Data Analysis)
Facility Type(s)	Rural Two-Lane Roads, and Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Urban/Suburban Arterial Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	3.58	2.60	6.18
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

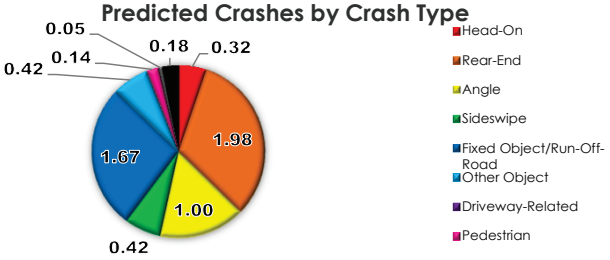
Urban/Suburban Arterials Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	3.58	2.60	6.18
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	3.58	2.60	6.18
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Urban/Suburban Arterials: Predicted Crashes by Crash Type



No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Project Safety Performance Detailed Report

Rural Two-Lane, Two-Way Roads

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Predicted Only (No Crash Data Analysis)
Facility Type(s) Rural Two-Lane Roads, and Urban/Suburban Arterials

Rural Two-Lane, Two-Way Roads: Segments

Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	610	427	2.75	N/A	--	--
Segment 2	620	2110	6.33	N/A	--	--
Segment 3	660	979	3.26	N/A	--	--
Segment 4	680	479	2.94	N/A	--	--
Segment 5	700	0	7.69	N/A	--	--

Project Safety Performance Detailed Report

Rural Two-Lane, Two-Way Roads

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Predicted Only (No Crash Data Analysis)
Facility Type(s) Rural Two-Lane Roads, and Urban/Suburban Arterials

Rural Two-Lane, Two-Way Roads: Intersections

Intersection Name	*Major Road*	*Minor Road*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Intersection 1	SR 0322	b Road/Bear Meadow	1.67	N/A	--	--
Intersection 2	SR 0322	Tati Road	1.01	N/A	--	--
Intersection 3	SR 0322	Tussey View Lane	1.01	N/A	--	--
Intersection 4	SR 0322	Taylor Hill Road	1.98	N/A	--	--
Intersection 5	SR 0322	Neff Road	1.80	N/A	--	--

Project Safety Performance Detailed Report

Urban and Suburban Arterials

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Predicted Only (No Crash Data Analysis)
Facility Type(s) Rural Two-Lane Roads, and Urban/Suburban Arterials

Urban and Suburban Arterials: Segments

Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	590	0	2.81	N/A	--	--
Segment 2	590	2895	1.12	N/A	--	--
Segment 3	600	1053	2.25	N/A	--	--

SR 0322/SR 0045 Interchange Ramps (2050 No Build)

Output Summary

General Information

Project description:	2050 No Build				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050				
Last year of analysis:	2050				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	4.9	0.0	0.1	0.5	1.7	2.6
Estimated average crash freq. during Study Period, crashes/yr:	4.9	0.0	0.1	0.5	1.7	2.6

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0
Ramp segments, crashes:	2	0.8	0.0	0.0	0.1	0.2	0.5
Crossroad ramp terminals, crashes:	2	4.0	0.0	0.1	0.3	1.5	2.1

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2050	4.9	0.0	0.1	0.5	1.7	2.6
	2051						
	2052						
	2053						
	2054						
	2055						
	2056						
	2057						
	2058						
	2059						
	2060						
	2061						
	2062						
	2063						
	2064						
	2065						
	2066						
	2067						
	2068						
	2069						
	2070						
	2071						
	2072						
	2073						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.0	0.0	0.0	0.0	0.0	0.0
	Right-angle crashes:	1.3	0.0	0.0	0.1	0.5	0.6
	Rear-end crashes:	2.0	0.0	0.0	0.2	0.8	1.0
	Sideswipe crashes:	0.3	0.0	0.0	0.0	0.1	0.3
	Other multiple-vehicle crashes:	0.1	0.0	0.0	0.0	0.0	0.0
	Total multiple-vehicle crashes:	3.8	0.0	0.1	0.3	1.4	1.9
Single vehicle	Crashes with animal:	0.0	0.0	0.0	0.0	0.0	0.0
	Crashes with fixed object:	0.8	0.0	0.0	0.1	0.2	0.5
	Crashes with other object:	0.0	0.0	0.0	0.0	0.0	0.0
	Crashes with parked vehicle:	0.0	0.0	0.0	0.0	0.0	0.0
	Other single-vehicle crashes	0.2	0.0	0.0	0.0	0.1	0.1
	Total single-vehicle crashes:	1.1	0.0	0.0	0.2	0.3	0.6
	Total crashes:	4.9	0.0	0.1	0.5	1.7	2.6

Evaluation Site Summary

General Information

Project description:	2050 No Build				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050	Total length of freeway segments for Study Period (mi):		0.000	
Last year of analysis:	2050				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	0	0.000	0
2	0	0.000	0
3	0	0.000	0
4	0	0.000	0
5	0	0.000	0
6	0	0.000	0
7	0	0.000	0
8	0	0.000	0
9	0	0.000	0
10	0	0.000	0
11	0	0.000	0
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description	Number	Study Period Description
1	WB On	21	0
2	EB Off	22	0
3	0	23	0
4	0	24	0
5	0	25	0
6	0	26	0
7	0	27	0
8	0	28	0
9	0	29	0
10	0	30	0
11	0	31	0
12	0	32	0
13	0	33	0
14	0	34	0
15	0	35	0
16	0	36	0
17	0	37	0
18	0	38	0
19	0	39	0
20	0	40	0

Crossroad Ramp Terminals

Number	Config.	Control	Study Period Description
1	D3ex	Signal	EB-Off
2	D3en	One stop	WB-On
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

SR 0322/SR 3014 Interchange Ramps (2050 No Build)

Output Summary

General Information

Project description:	2050 No Build				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050				
Last year of analysis:	2050				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	0.5	0.0	0.0	0.1	0.1	0.3
Estimated average crash freq. during Study Period, crashes/yr:	0.5	0.0	0.0	0.1	0.1	0.3

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0
Ramp segments, crashes:	2	0.46	0.01	0.02	0.08	0.10	0.26
Crossroad ramp terminals, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2050	0.5	0.0	0.0	0.1	0.1	0.3
	2051						
	2052						
	2053						
	2054						
	2055						
	2056						
	2057						
	2058						
	2059						
	2060						
	2061						
	2062						
	2063						
	2064						
	2065						
	2066						
	2067						
	2068						
	2069						
	2070						
	2071						
	2072						
	2073						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.0	0.0	0.0	0.0	0.0	0.0
	Right-angle crashes:	0.0	0.0	0.0	0.0	0.0	0.0
	Rear-end crashes:	0.0	0.0	0.0	0.0	0.0	0.0
	Sideswipe crashes:	0.0	0.0	0.0	0.0	0.0	0.0
	Other multiple-vehicle crashes:	0.0	0.0	0.0	0.0	0.0	0.0
	Total multiple-vehicle crashes:	0.0	0.0	0.0	0.0	0.0	0.0
Single vehicle	Crashes with animal:	0.0	0.0	0.0	0.0	0.0	0.0
	Crashes with fixed object:	0.3	0.0	0.0	0.1	0.1	0.2
	Crashes with other object:	0.0	0.0	0.0	0.0	0.0	0.0
	Crashes with parked vehicle:	0.0	0.0	0.0	0.0	0.0	0.0
	Other single-vehicle crashes	0.1	0.0	0.0	0.0	0.0	0.0
	Total single-vehicle crashes:	0.4	0.0	0.0	0.1	0.1	0.2
	Total crashes:	0.5	0.0	0.0	0.1	0.1	0.3

Evaluation Site Summary

General Information

Project description:	2050 No Build				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050	Total length of freeway segments for Study Period (mi):		0.000	
Last year of analysis:	2050				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	0	0.000	0
2	0	0.000	0
3	0	0.000	0
4	0	0.000	0
5	0	0.000	0
6	0	0.000	0
7	0	0.000	0
8	0	0.000	0
9	0	0.000	0
10	0	0.000	0
11	0	0.000	0
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description	Number	Study Period Description
1	EB-On	21	0
2	WB-Off	22	0
3	0	23	0
4	0	24	0
5	0	25	0
6	0	26	0
7	0	27	0
8	0	28	0
9	0	29	0
10	0	30	0
11	0	31	0
12	0	32	0
13	0	33	0
14	0	34	0
15	0	35	0
16	0	36	0
17	0	37	0
18	0	38	0
19	0	39	0
20	0	40	0

Crossroad Ramp Terminals

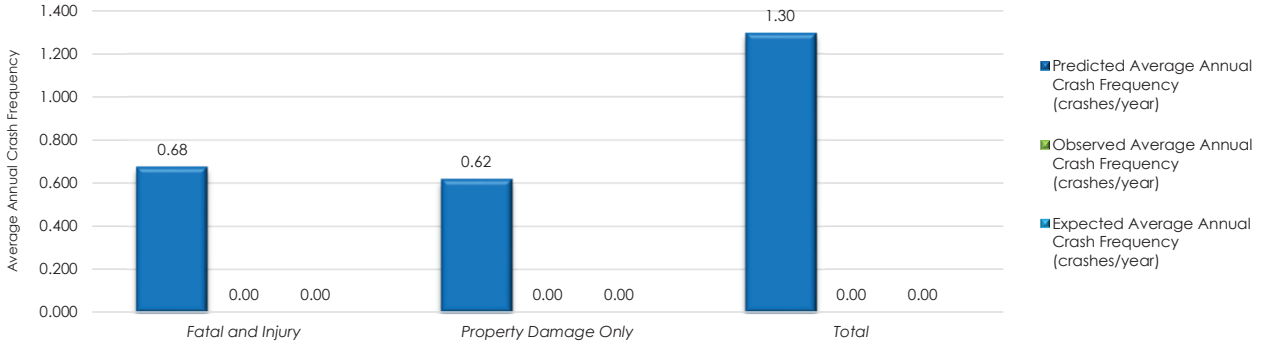
Number	Config.	Control	Study Period Description
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

SR 3014 (2050 No Build)

Project Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Site Level Analysis
Facility Type(s)	Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Project Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	0.68	0.62	1.30
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

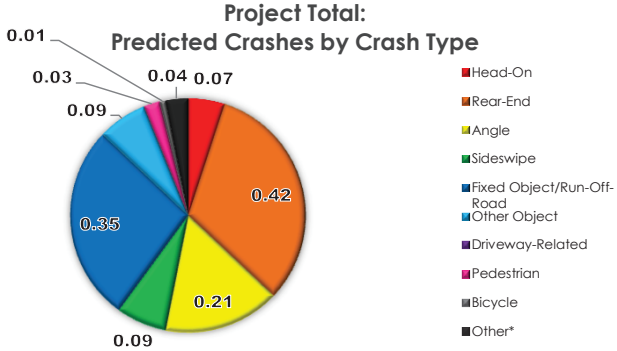
Total Project Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.68	0.62	1.30
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.68	0.62	1.30
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Project Total: Predicted Crashes by Crash Type



No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Project Safety Performance Detailed Report

Urban and Suburban Arterials

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Site Level Analysis
Facility Type(s) Urban/Suburban Arterials

Urban and Suburban Arterials: Segments

Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	200	0	1.30	0.00	--	--

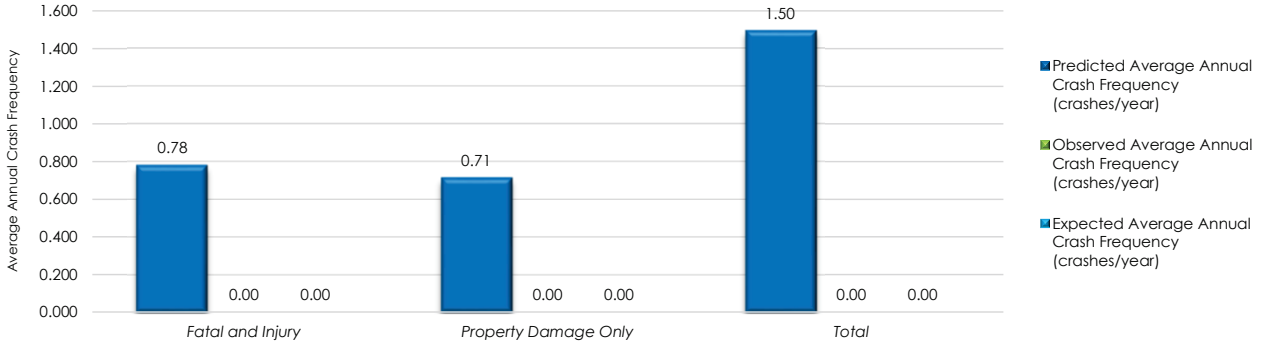
2050 BUILD

PA 45, SR 3014 & Old 322 Local Connector

Project Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Site Level Analysis
Facility Type(s)	Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Project Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	0.78	0.71	1.50
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

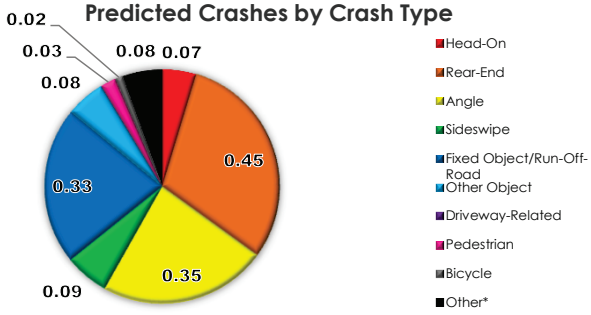
Total Project Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.44	0.51	0.95
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.34	0.21	0.54
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.78	0.71	1.50
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Project Total: Predicted Crashes by Crash Type



No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Project Safety Performance Detailed Report

Urban and Suburban Arterials

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Site Level Analysis
Facility Type(s) Urban/Suburban Arterials

Urban and Suburban Arterials: Segments

Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	0	0	0.95	0.00	--	--

Project Safety Performance Detailed Report

Urban and Suburban Arterials

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Site Level Analysis
Facility Type(s) Urban/Suburban Arterials

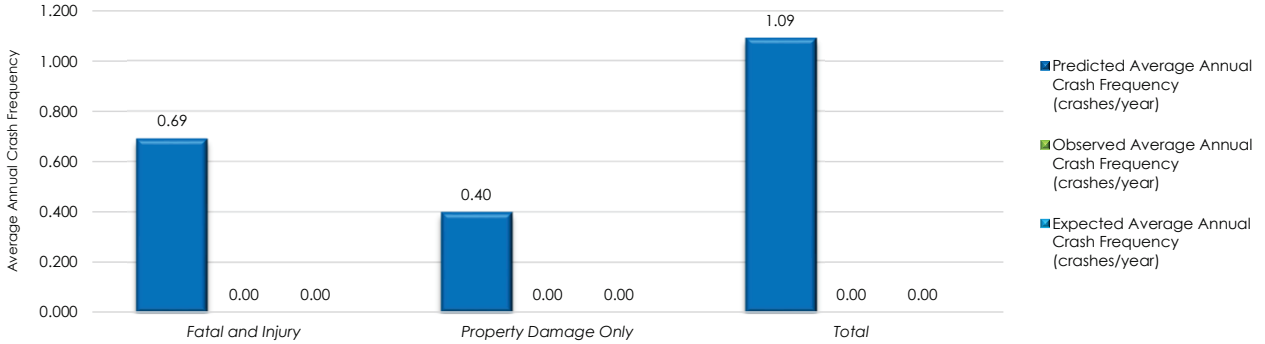
Urban and Suburban Arterials: Intersections

Intersection Name	*Major Road*	*Minor Road*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Intersection 1	R 0045 Connector Roa	SR 3014	0.54	0.00	--	--

Project Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Site Level Analysis
Facility Type(s)	Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Project Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	0.69	0.40	1.09
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

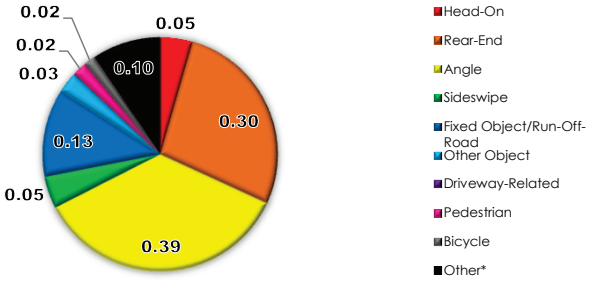
Total Project Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.69	0.40	1.09
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.69	0.40	1.09
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Project Total: Predicted Crashes by Crash Type



No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Project Safety Performance Detailed Report

Urban and Suburban Arterials

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Site Level Analysis
Facility Type(s) Urban/Suburban Arterials

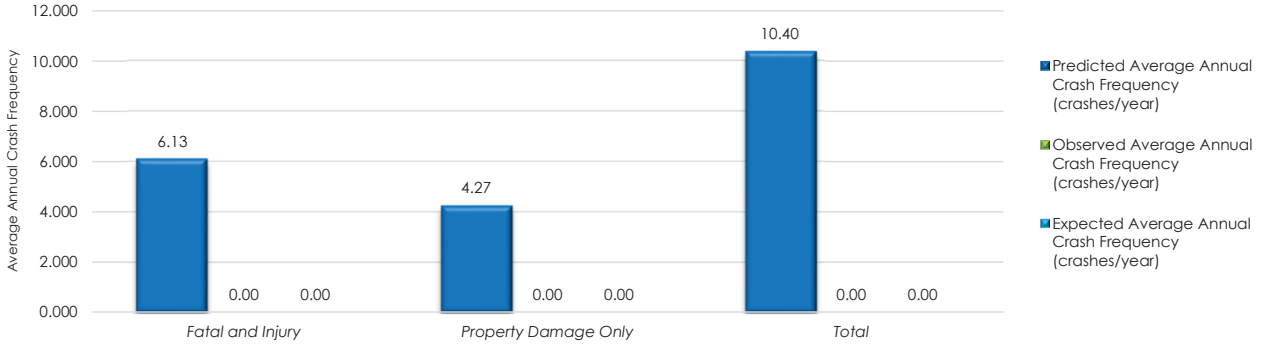
Urban and Suburban Arterials: Intersections

Intersection Name	*Major Road*	*Minor Road*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Intersection 1	SR 0045	R 0045 Connector Roa	1.09	0.00	--	--

Project Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Site Level Analysis
Facility Type(s)	Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Project Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	6.13	4.27	10.40
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

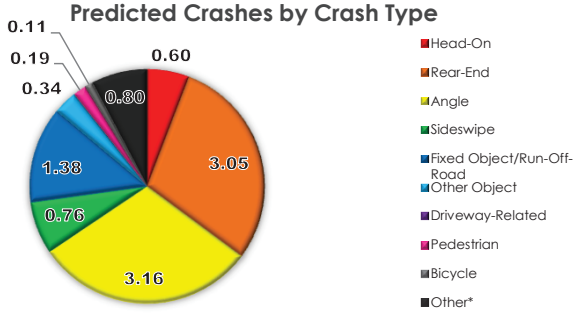
Total Project Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	3.49	2.73	6.22
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	2.64	1.53	4.17
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	6.13	4.27	10.40
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Project Total: Predicted Crashes by Crash Type



No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Project Safety Performance Detailed Report

Urban and Suburban Arterials

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Site Level Analysis
Facility Type(s) Urban/Suburban Arterials

Urban and Suburban Arterials: Segments

Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	272	0	3.43	0.00	--	--
Segment 2	283	0	2.29	0.00	--	--
Segment 3	292	0	0.51	0.00	--	--

Project Safety Performance Detailed Report

Urban and Suburban Arterials

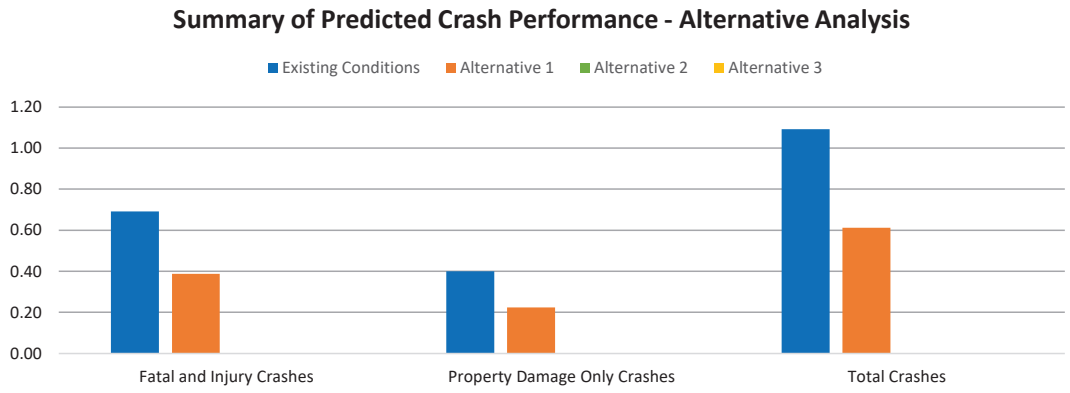
Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Site Level Analysis
Facility Type(s) Urban/Suburban Arterials

Urban and Suburban Arterials: Intersections

Intersection Name	*Major Road*	*Minor Road*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Intersection 1	SR 0045	SR 3014	3.41	0.00	--	--
Intersection 2	SR 0045	R 0045 Connector Roa	0.00	0.00	--	--
Intersection 3	SR 0045	Indian Hill Road	0.76	0.00	--	--

Alternatives Analysis - Safety Performance Summary

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	



Safety Performance Summary

Project Totals	Total Crashes			
	Existing Conditions	*Alternative 1*	*Alternative 2*	*Alternative 3*
Predicted Average Annual Crash Frequency	1.09	0.61	--	--
Expected Average Annual Crash Frequency	--	--	--	--
Change from Existing Conditions	--	--	--	--

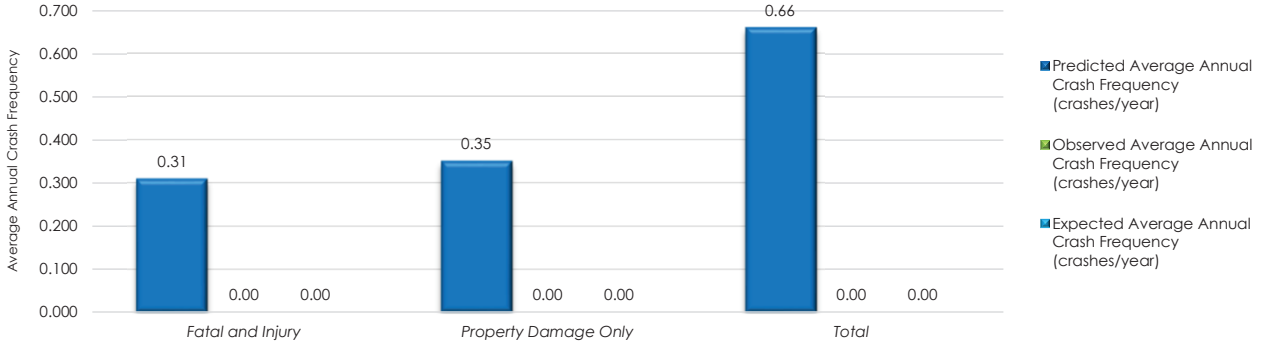
Project Totals	Fatal and Injury Crashes			
	Existing Conditions	*Alternative 1*	*Alternative 2*	*Alternative 3*
Predicted Average Annual Crash Frequency	0.69	0.39	--	--
Expected Average Annual Crash Frequency	--	--	--	--
Change from Existing Conditions	--	--	--	--

Project Totals	Property Damage Only Crashes			
	Existing Conditions	*Alternative 1*	*Alternative 2*	*Alternative 3*
Predicted Average Annual Crash Frequency	0.40	0.22	--	--
Expected Average Annual Crash Frequency	--	--	--	--
Change from Existing Conditions	--	--	--	--

Project Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Site Level Analysis
Facility Type(s)	Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



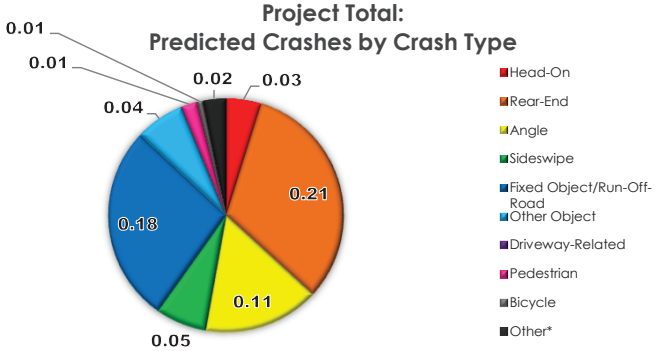
Project Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	0.31	0.35	0.66
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

Total Project Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.31	0.35	0.66
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.31	0.35	0.66
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--



No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Project Safety Performance Detailed Report

Urban and Suburban Arterials

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Site Level Analysis
Facility Type(s) Urban/Suburban Arterials

Urban and Suburban Arterials: Segments

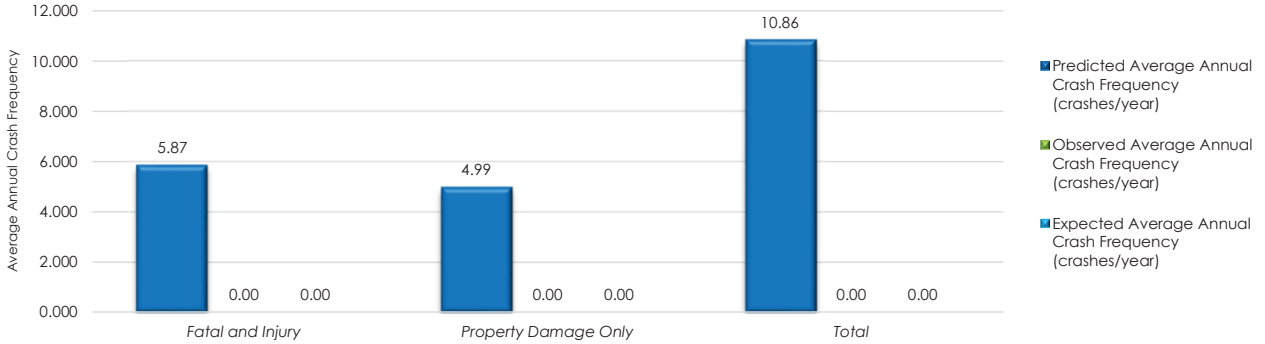
Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	210	2124	0.66	0.00	--	--

North Alternative

Project Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Predicted Only (No Crash Data Analysis)
Facility Type(s)	Rural Two-Lane Roads, and Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Project Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	5.87	4.99	10.86
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

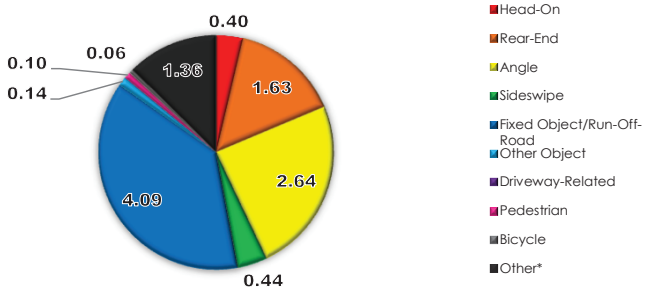
Total Project Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	3.71	3.58	7.29
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	2.16	1.41	3.56
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	5.87	4.99	10.86
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Project Total: Predicted Crashes by Crash Type



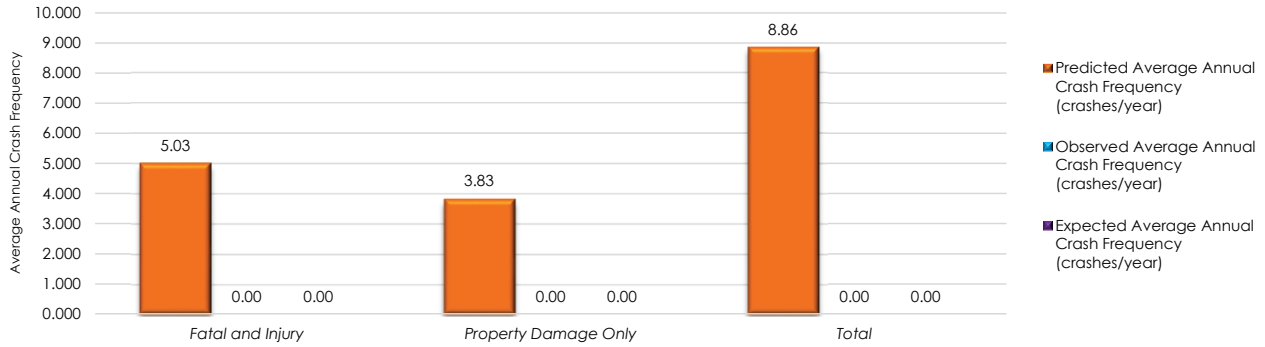
No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Rural Two-Lane Roads Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Predicted Only (No Crash Data Analysis)
Facility Type(s)	Rural Two-Lane Roads, and Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Rural Two-Lane Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	5.03	3.83	8.86
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

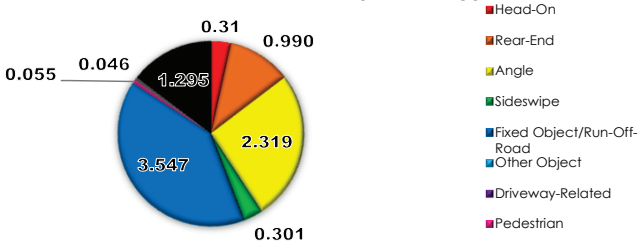
Rural Two-Lane Roads Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	2.87	2.43	5.30
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	2.16	1.41	3.56
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	5.03	3.83	8.86
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Rural Two-Lane Roads: Predicted Crashes by Crash Type



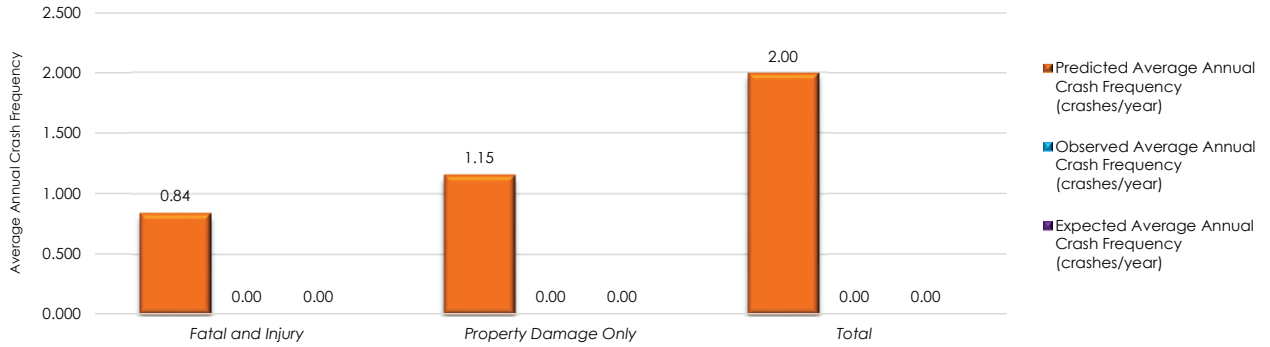
No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Urban/Suburban Arterials Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Predicted Only (No Crash Data Analysis)
Facility Type(s)	Rural Two-Lane Roads, and Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Urban/Suburban Arterial Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	0.84	1.15	2.00
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

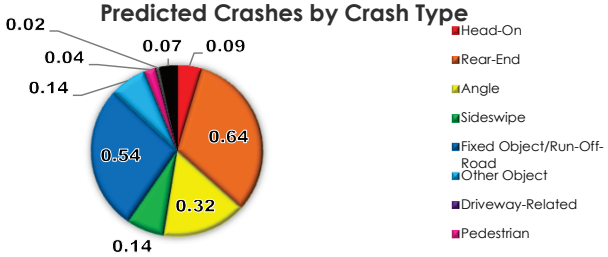
Urban/Suburban Arterials Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.84	1.15	2.00
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.84	1.15	2.00
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Urban/Suburban Arterials: Predicted Crashes by Crash Type



No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Project Safety Performance Detailed Report

Rural Two-Lane, Two-Way Roads

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Predicted Only (No Crash Data Analysis)
Facility Type(s) Rural Two-Lane Roads, and Urban/Suburban Arterials

Rural Two-Lane, Two-Way Roads: Segments

Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	610	427	1.14	N/A	--	--
Segment 2	630	116	1.47	N/A	--	--
Segment 3	660	979	0.80	N/A	--	--
Segment 4	680	426	0.45	N/A	--	--
Segment 5	690	2133	1.44	N/A	--	--

Project Safety Performance Detailed Report

Rural Two-Lane, Two-Way Roads

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Predicted Only (No Crash Data Analysis)
Facility Type(s) Rural Two-Lane Roads, and Urban/Suburban Arterials

Rural Two-Lane, Two-Way Roads: Intersections

Intersection Name	*Major Road*	*Minor Road*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Intersection 1	SR 0322	Elks Club Road	1.33	N/A	--	--
Intersection 2	SR 0322	Bear Meadows Road	1.16	N/A	--	--
Intersection 3	SR 0322	Church Hill Road	0.36	N/A	--	--
Intersection 4	SR 0322	Tusseyville Road	0.36	N/A	--	--
Intersection 5	SR 0322	Skyview Dr	0.36	N/A	--	--

Project Safety Performance Detailed Report

Urban and Suburban Arterials

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Predicted Only (No Crash Data Analysis)
Facility Type(s) Rural Two-Lane Roads, and Urban/Suburban Arterials

Urban and Suburban Arterials: Segments

Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	600	500	2.00	N/A	--	--

SR 0322 (2050 Build North Diamond Interchange Alternative)

Output Summary

General Information

Project description:	DEIS North Alternative				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050				
Last year of analysis:	2050				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	35.1	0.4	1.0	5.1	9.0	19.6
Estimated average crash freq. during Study Period, crashes/yr:	35.1	0.4	1.0	5.1	9.0	19.6

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	10	29.4	0.3	0.9	4.5	6.9	16.8
Ramp segments, crashes:	4	1.0	0.0	0.0	0.2	0.2	0.5
Crossroad ramp terminals, crashes:	2	4.7	0.0	0.1	0.4	1.9	2.3

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2050	35.1	0.4	1.0	5.1	9.0	19.6
	2051						
	2052						
	2053						
	2054						
	2055						
	2056						
	2057						
	2058						
	2059						
	2060						
	2061						
	2062						
	2063						
	2064						
	2065						
	2066						
	2067						
	2068						
	2069						
	2070						
	2071						
	2072						
	2073						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.1	0.0	0.0	0.0	0.0	0.0
	Right-angle crashes:	1.4	0.0	0.0	0.2	0.6	0.6
	Rear-end crashes:	10.7	0.1	0.4	2.0	3.8	4.4
	Sideswipe crashes:	2.8	0.0	0.1	0.4	0.7	1.5
	Other multiple-vehicle crashes:	0.4	0.0	0.0	0.1	0.1	0.2
	Total multiple-vehicle crashes:	15.4	0.2	0.5	2.7	5.3	6.7
Single vehicle	Crashes with animal:	0.3	0.0	0.0	0.0	0.0	0.3
	Crashes with fixed object:	14.2	0.1	0.3	1.7	2.7	9.3
	Crashes with other object:	2.1	0.0	0.0	0.1	0.2	1.7
	Crashes with parked vehicle:	0.3	0.0	0.0	0.0	0.1	0.2
	Other single-vehicle crashes	2.8	0.0	0.1	0.5	0.8	1.4
	Total single-vehicle crashes:	19.7	0.2	0.5	2.4	3.7	13.0
	Total crashes:	35.1	0.4	1.0	5.1	9.0	19.6

Evaluation Site Summary

General Information

Project description:	DEIS North Alternative				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050	Total length of freeway segments for Study Period (mi):		8.196	
Last year of analysis:	2050				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	4	0.260	10000
2	4	0.436	10600
3	4	0.682	12900
4	4	0.966	16500
5	4	0.985	21600
6	4	1.049	26800
7	4	0.958	32340
8	4	1.042	37400
9	4	0.871	42900
10	4	0.947	47500
11	0	0.000	52500
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description	Number	Study Period Description
1	WB Off	21	0
2	EB On	22	0
3	WB On	23	0
4	EB Off	24	0
5	0	25	0
6	0	26	0
7	0	27	0
8	0	28	0
9	0	29	0
10	0	30	0
11	0	31	0
12	0	32	0
13	0	33	0
14	0	34	0
15	0	35	0
16	0	36	0
17	0	37	0
18	0	38	0
19	0	39	0
20	0	40	0

Crossroad Ramp Terminals

Number	Config.	Control	Study Period Description
1	D4	Signal	EB-Off/On
2	D4	Signal	WB-Off/On
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

SR 0322 (2050 Build North Alternative)

Output Summary

General Information

Project description:	DEIS North Alternative				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050				
Last year of analysis:	2050				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	30.4	0.3	0.9	4.7	7.1	17.3
Estimated average crash freq. during Study Period, crashes/yr:	30.4	0.3	0.9	4.7	7.1	17.3

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	10	29.4	0.3	0.9	4.5	6.9	16.8
Ramp segments, crashes:	4	1.0	0.0	0.0	0.2	0.2	0.5
Crossroad ramp terminals, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2050	30.4	0.3	0.9	4.7	7.1	17.3
	2051						
	2052						
	2053						
	2054						
	2055						
	2056						
	2057						
	2058						
	2059						
	2060						
	2061						
	2062						
	2063						
	2064						
	2065						
	2066						
	2067						
	2068						
	2069						
	2070						
	2071						
	2072						
	2073						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.1	0.0	0.0	0.0	0.0	0.0
	Right-angle crashes:	0.3	0.0	0.0	0.1	0.1	0.1
	Rear-end crashes:	8.0	0.1	0.3	1.7	2.6	3.1
	Sideswipe crashes:	2.4	0.0	0.1	0.4	0.6	1.2
	Other multiple-vehicle crashes:	0.3	0.0	0.0	0.1	0.1	0.1
	Total multiple-vehicle crashes:	11.0	0.2	0.4	2.3	3.5	4.5
Single vehicle	Crashes with animal:	0.3	0.0	0.0	0.0	0.0	0.3
	Crashes with fixed object:	14.0	0.1	0.3	1.7	2.6	9.2
	Crashes with other object:	2.1	0.0	0.0	0.1	0.2	1.7
	Crashes with parked vehicle:	0.3	0.0	0.0	0.0	0.1	0.2
	Other single-vehicle crashes	2.8	0.0	0.1	0.5	0.8	1.4
	Total single-vehicle crashes:	19.4	0.2	0.5	2.4	3.6	12.8
	Total crashes:	30.4	0.3	0.9	4.7	7.1	17.3

Evaluation Site Summary

General Information

Project description:	DEIS North Alternative				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050	Total length of freeway segments for Study Period (mi):		8.196	
Last year of analysis:	2050				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	4	0.260	10000
2	4	0.436	10600
3	4	0.682	12900
4	4	0.966	16500
5	4	0.985	21600
6	4	1.049	26800
7	4	0.958	32340
8	4	1.042	37400
9	4	0.871	42900
10	4	0.947	47500
11	0	0.000	52500
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description	Number	Study Period Description
1	WB Off	21	0
2	EB On	22	0
3	WB On	23	0
4	EB Off	24	0
5	0	25	0
6	0	26	0
7	0	27	0
8	0	28	0
9	0	29	0
10	0	30	0
11	0	31	0
12	0	32	0
13	0	33	0
14	0	34	0
15	0	35	0
16	0	36	0
17	0	37	0
18	0	38	0
19	0	39	0
20	0	40	0

Crossroad Ramp Terminals

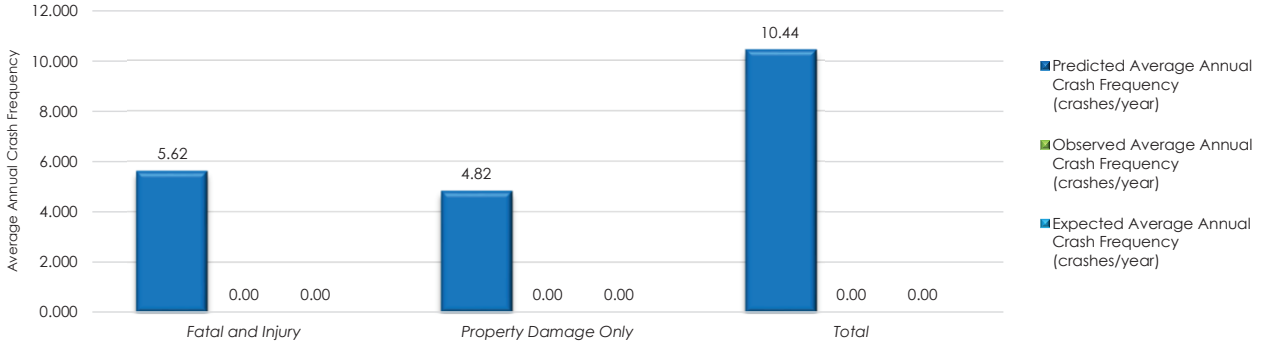
Number	Config.	Control	Study Period Description
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

Central Alternative

Project Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Predicted Only (No Crash Data Analysis)
Facility Type(s)	Rural Two-Lane Roads, and Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Project Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	5.62	4.82	10.44
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

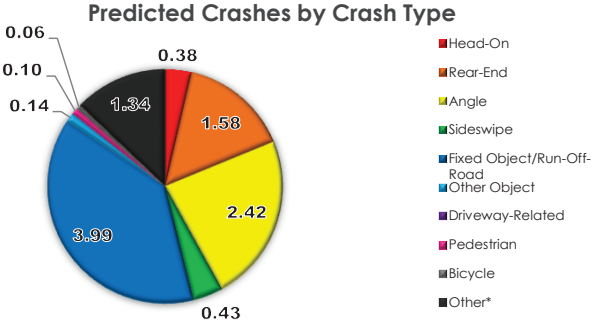
Total Project Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	3.70	3.57	7.27
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	1.92	1.25	3.17
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	5.62	4.82	10.44
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Project Total: Predicted Crashes by Crash Type



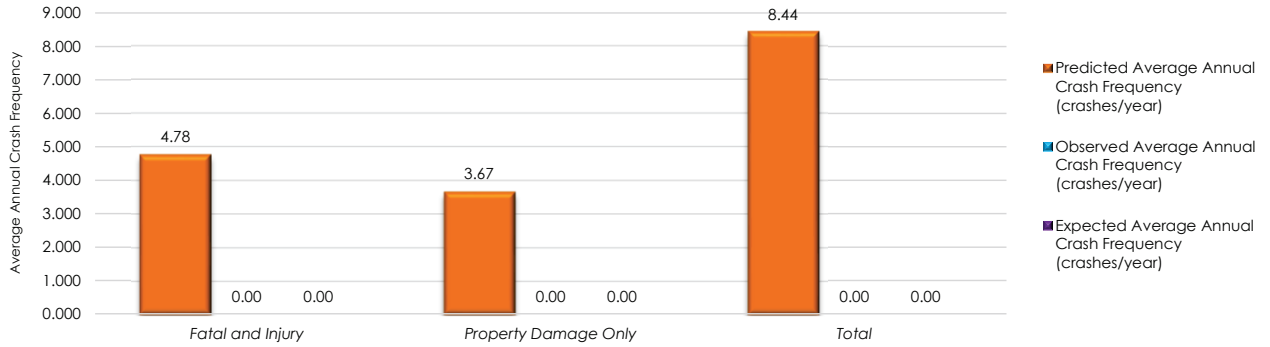
No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Rural Two-Lane Roads Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Predicted Only (No Crash Data Analysis)
Facility Type(s)	Rural Two-Lane Roads, and Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Rural Two-Lane Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	4.78	3.67	8.44
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

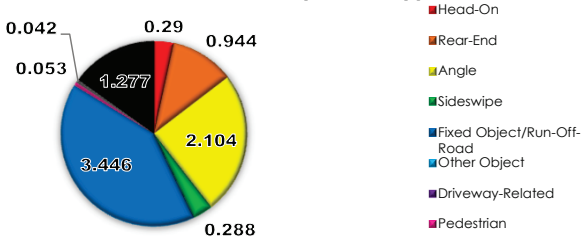
Rural Two-Lane Roads Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	2.86	2.42	5.27
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	1.92	1.25	3.17
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	4.78	3.67	8.44
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Rural Two-Lane Roads: Predicted Crashes by Crash Type



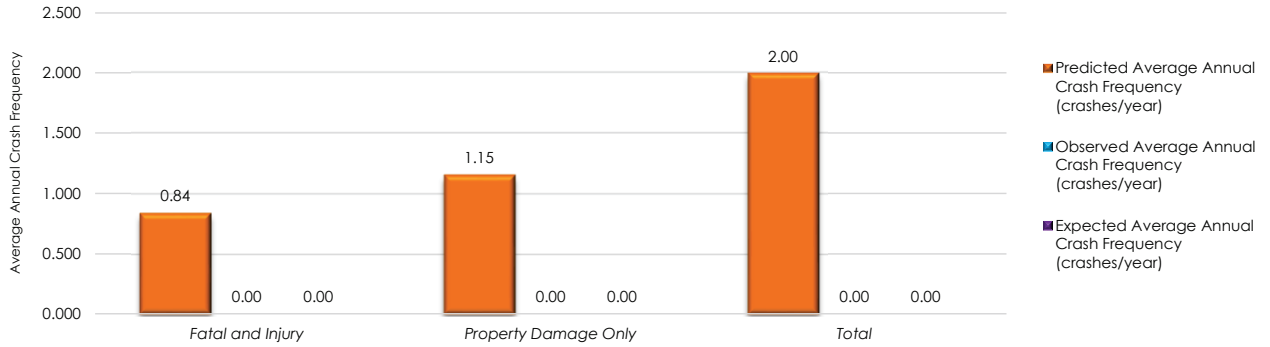
No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Urban/Suburban Arterials Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Predicted Only (No Crash Data Analysis)
Facility Type(s)	Rural Two-Lane Roads, and Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Urban/Suburban Arterial Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	0.84	1.15	2.00
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

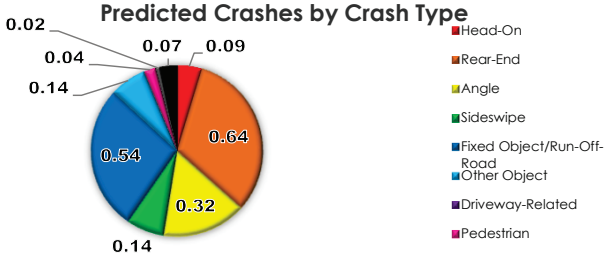
Urban/Suburban Arterials Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.84	1.15	2.00
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.84	1.15	2.00
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Urban/Suburban Arterials: Predicted Crashes by Crash Type



No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Project Safety Performance Detailed Report

Rural Two-Lane, Two-Way Roads

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Predicted Only (No Crash Data Analysis)
Facility Type(s) Rural Two-Lane Roads, and Urban/Suburban Arterials

Rural Two-Lane, Two-Way Roads: Segments

Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	610	427	1.14	N/A	--	--
Segment 2	630	116	1.44	N/A	--	--
Segment 3	660	979	0.82	N/A	--	--
Segment 4	680	426	0.45	N/A	--	--
Segment 5	690	2133	1.42	N/A	--	--

Project Safety Performance Detailed Report

Rural Two-Lane, Two-Way Roads

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Predicted Only (No Crash Data Analysis)
Facility Type(s) Rural Two-Lane Roads, and Urban/Suburban Arterials

Rural Two-Lane, Two-Way Roads: Intersections

Intersection Name	*Major Road*	*Minor Road*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Intersection 1	SR 0322	Elks Club Road	1.33	N/A	--	--
Intersection 2	SR 0322	Bear Meadows Road	1.16	N/A	--	--
Intersection 3	SR 0322	Neff Road	0.36	N/A	--	--
Intersection 4	SR 0322	Skyview Drive	0.32	N/A	--	--

Project Safety Performance Detailed Report

Urban and Suburban Arterials

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Predicted Only (No Crash Data Analysis)
Facility Type(s) Rural Two-Lane Roads, and Urban/Suburban Arterials

Urban and Suburban Arterials: Segments

Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	600	500	2.00	N/A	--	--

SR 0322 (2050 Build Central Diamond Interchange Alternative)

Output Summary

General Information

Project description:	DEIS Central Alternative				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050				
Last year of analysis:	2050				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	34.2	0.3	1.0	5.0	8.8	19.0
Estimated average crash freq. during Study Period, crashes/yr:	34.2	0.3	1.0	5.0	8.8	19.0

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	10	28.5	0.3	0.9	4.4	6.7	16.2
Ramp segments, crashes:	4	1.0	0.0	0.0	0.2	0.2	0.5
Crossroad ramp terminals, crashes:	2	4.7	0.0	0.1	0.4	1.9	2.3

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2050	34.2	0.3	1.0	5.0	8.8	19.0
	2051						
	2052						
	2053						
	2054						
	2055						
	2056						
	2057						
	2058						
	2059						
	2060						
	2061						
	2062						
	2063						
	2064						
	2065						
	2066						
	2067						
	2068						
	2069						
	2070						
	2071						
	2072						
	2073						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.1	0.0	0.0	0.0	0.0	0.0
	Right-angle crashes:	1.4	0.0	0.0	0.2	0.6	0.6
	Rear-end crashes:	10.5	0.1	0.4	2.0	3.7	4.3
	Sideswipe crashes:	2.7	0.0	0.1	0.4	0.7	1.5
	Other multiple-vehicle crashes:	0.4	0.0	0.0	0.1	0.1	0.2
	Total multiple-vehicle crashes:	15.1	0.2	0.5	2.7	5.2	6.5
Single vehicle	Crashes with animal:	0.3	0.0	0.0	0.0	0.0	0.3
	Crashes with fixed object:	13.8	0.1	0.3	1.7	2.6	9.0
	Crashes with other object:	2.0	0.0	0.0	0.1	0.2	1.7
	Crashes with parked vehicle:	0.3	0.0	0.0	0.0	0.1	0.2
	Other single-vehicle crashes	2.8	0.0	0.1	0.5	0.8	1.3
	Total single-vehicle crashes:	19.1	0.2	0.5	2.4	3.6	12.5
	Total crashes:	34.2	0.3	1.0	5.0	8.8	19.0

Evaluation Site Summary

General Information

Project description:	DEIS Central Alternative				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050	Total length of freeway segments for Study Period (mi):		8.196	
Last year of analysis:	2050				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	4	0.260	10000
2	4	0.436	10600
3	4	0.682	12900
4	4	0.966	16500
5	4	0.985	21600
6	4	1.049	26800
7	4	0.958	32340
8	4	1.042	37400
9	4	0.871	42900
10	4	0.947	47500
11	0	0.000	52500
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description	Number	Study Period Description
1	WB Off	21	0
2	EB On	22	0
3	WB On	23	0
4	EB Off	24	0
5	0	25	0
6	0	26	0
7	0	27	0
8	0	28	0
9	0	29	0
10	0	30	0
11	0	31	0
12	0	32	0
13	0	33	0
14	0	34	0
15	0	35	0
16	0	36	0
17	0	37	0
18	0	38	0
19	0	39	0
20	0	40	0

Crossroad Ramp Terminals

Number	Config.	Control	Study Period Description
1	D4	Signal	EB-Off/On
2	D4	Signal	WB-On/Off
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

SR 0322 (2050 Build Central SPUI Alternative)

Output Summary

General Information

Project description:	DEIS Central Alternative				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050				
Last year of analysis:	2050				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	29.5	0.3	0.9	4.6	6.9	16.7
Estimated average crash freq. during Study Period, crashes/yr:	29.5	0.3	0.9	4.6	6.9	16.7

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	10	28.5	0.3	0.9	4.4	6.7	16.2
Ramp segments, crashes:	4	1.0	0.0	0.0	0.2	0.2	0.5
Crossroad ramp terminals, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2050	29.5	0.3	0.9	4.6	6.9	16.7
	2051						
	2052						
	2053						
	2054						
	2055						
	2056						
	2057						
	2058						
	2059						
	2060						
	2061						
	2062						
	2063						
	2064						
	2065						
	2066						
	2067						
	2068						
	2069						
	2070						
	2071						
	2072						
	2073						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.1	0.0	0.0	0.0	0.0	0.0
	Right-angle crashes:	0.3	0.0	0.0	0.1	0.1	0.1
	Rear-end crashes:	7.7	0.1	0.3	1.7	2.6	3.0
	Sideswipe crashes:	2.3	0.0	0.1	0.4	0.6	1.2
	Other multiple-vehicle crashes:	0.3	0.0	0.0	0.1	0.1	0.1
	Total multiple-vehicle crashes:	10.6	0.2	0.4	2.3	3.4	4.4
Single vehicle	Crashes with animal:	0.3	0.0	0.0	0.0	0.0	0.3
	Crashes with fixed object:	13.6	0.1	0.3	1.7	2.5	8.9
	Crashes with other object:	2.0	0.0	0.0	0.1	0.2	1.7
	Crashes with parked vehicle:	0.3	0.0	0.0	0.0	0.1	0.2
	Other single-vehicle crashes	2.7	0.0	0.1	0.5	0.7	1.3
	Total single-vehicle crashes:	18.8	0.2	0.5	2.4	3.5	12.3
	Total crashes:	29.5	0.3	0.9	4.6	6.9	16.7

Evaluation Site Summary

General Information

Project description:	DEIS Central Alternative				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050	Total length of freeway segments for Study Period (mi):		8.196	
Last year of analysis:	2050				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	4	0.260	10000
2	4	0.436	10600
3	4	0.682	12900
4	4	0.966	16500
5	4	0.985	21600
6	4	1.049	26800
7	4	0.958	32340
8	4	1.042	37400
9	4	0.871	42900
10	4	0.947	47500
11	0	0.000	52500
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description	Number	Study Period Description
1	WB Off	21	0
2	EB On	22	0
3	WB On	23	0
4	EB Off	24	0
5	0	25	0
6	0	26	0
7	0	27	0
8	0	28	0
9	0	29	0
10	0	30	0
11	0	31	0
12	0	32	0
13	0	33	0
14	0	34	0
15	0	35	0
16	0	36	0
17	0	37	0
18	0	38	0
19	0	39	0
20	0	40	0

Crossroad Ramp Terminals

Number	Config.	Control	Study Period Description
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

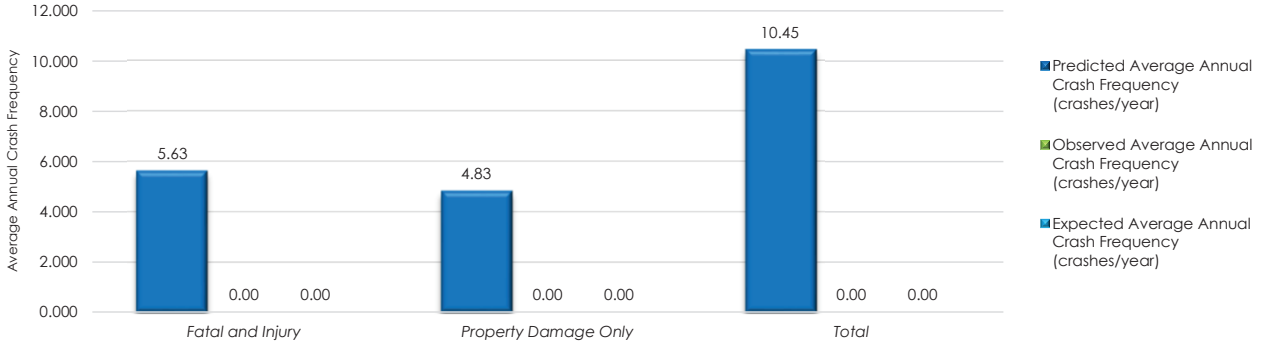
South Alternative

Old Route SR 0322 (2050 Build South Alternative)

Project Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Predicted Only (No Crash Data Analysis)
Facility Type(s)	Rural Two-Lane Roads, and Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Project Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	5.63	4.83	10.45
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

Old Route SR 0322 (2050 Build South Alternative)

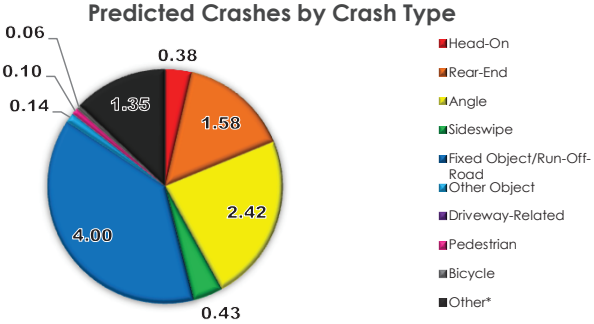
Total Project Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	3.71	3.58	7.29
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	1.92	1.25	3.17
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	5.63	4.83	10.45
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Project Total: Predicted Crashes by Crash Type



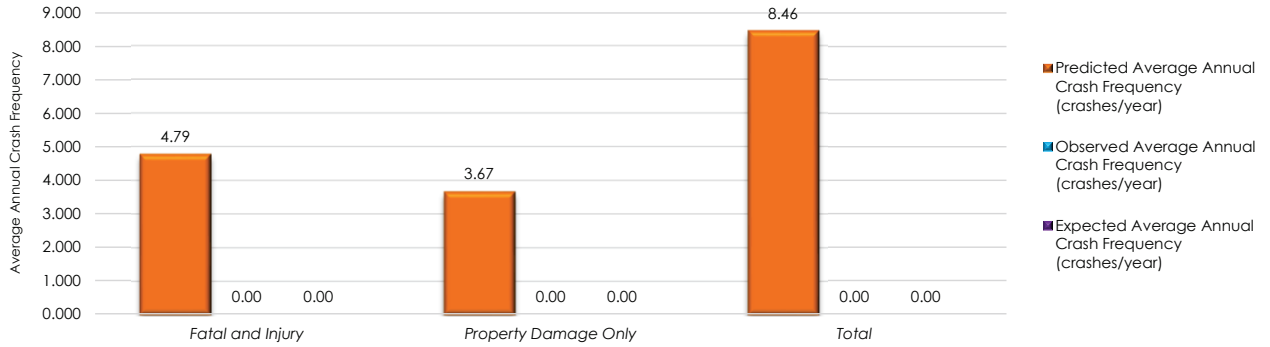
No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Rural Two-Lane Roads Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Predicted Only (No Crash Data Analysis)
Facility Type(s)	Rural Two-Lane Roads, and Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Rural Two-Lane Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	4.79	3.67	8.46
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

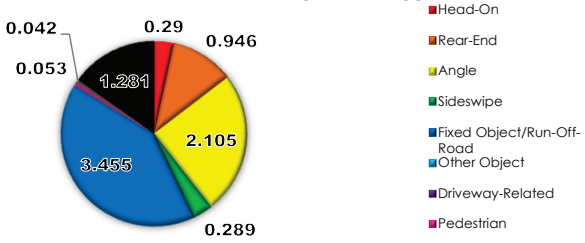
Rural Two-Lane Roads Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	2.87	2.42	5.29
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	1.92	1.25	3.17
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	4.79	3.67	8.46
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Rural Two-Lane Roads: Predicted Crashes by Crash Type



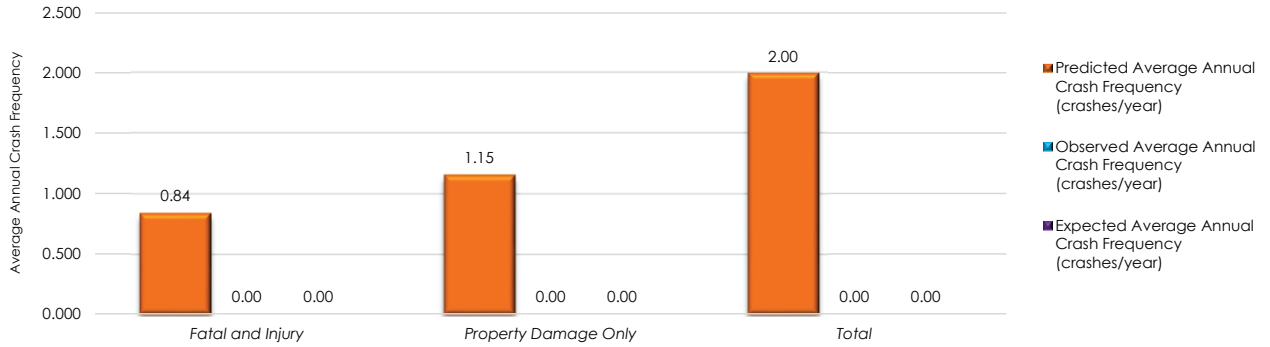
No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Urban/Suburban Arterials Safety Performance Summary Report

Project Description	SCAC
Date	2/4/2025
Analysis Year	2050
Analysis Type	Predicted Only (No Crash Data Analysis)
Facility Type(s)	Rural Two-Lane Roads, and Urban/Suburban Arterials

Summary of Average Safety Performance for the Project (crashes/year)



Urban/Suburban Arterial Totals	*Fatal and Injury Crashes*	*Property Damage Only Crashes*	*Total Crashes*
Predicted Average Annual Crash Frequency	0.84	1.15	2.00
Observed Average Annual Crash Frequency	0.00	0.00	0.00
Expected Average Annual Crash Frequency	--	--	--
Potential for Safety Improvement (PSI)	--	--	--

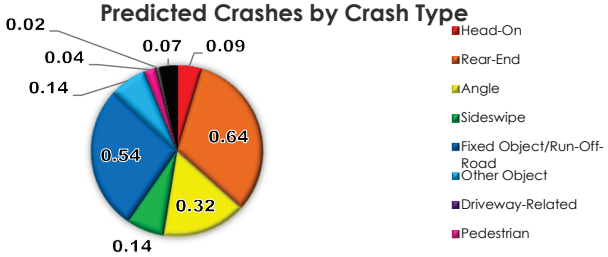
Urban/Suburban Arterials Summary

Segments	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.84	1.15	2.00
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Intersections	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Observed Average Annual Crash Frequency (crashes/yr)	N/A	N/A	N/A
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Total	*Fatal and Injury*	*Property Damage Only*	*Total*
Predicted Average Annual Crash Frequency (crashes/yr)	0.84	1.15	2.00
Observed Average Annual Crash Frequency (crashes/yr)	0.00	0.00	0.00
Expected Average Annual Crash Frequency (crashes/yr)	--	--	--

Urban/Suburban Arterials: Predicted Crashes by Crash Type



No Observed Crash Data Provided

*Note: "Other Crashes" include animal, overturn, parked vehicle, noncollisions, and other single-/multiple-vehicle crashes

Project Safety Performance Detailed Report

Rural Two-Lane, Two-Way Roads

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Predicted Only (No Crash Data Analysis)
Facility Type(s) Rural Two-Lane Roads, and Urban/Suburban Arterials

Rural Two-Lane, Two-Way Roads: Segments

Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	610	427	1.13	N/A	--	--
Segment 2	630	116	1.47	N/A	--	--
Segment 3	660	979	0.82	N/A	--	--
Segment 4	680	426	0.45	N/A	--	--
Segment 5	690	2133	1.42	N/A	--	--

Project Safety Performance Detailed Report

Rural Two-Lane, Two-Way Roads

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Predicted Only (No Crash Data Analysis)
Facility Type(s) Rural Two-Lane Roads, and Urban/Suburban Arterials

Rural Two-Lane, Two-Way Roads: Intersections

Intersection Name	*Major Road*	*Minor Road*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Intersection 1	SR 0322	Elks Club Road	1.33	N/A	--	--
Intersection 2	SR 0322	Bear Meadows Road	1.16	N/A	--	--
Intersection 3	SR 0322	Neff Road	0.36	N/A	--	--
Intersection 4	SR 0322	Skyview Drive	0.32	N/A	--	--

Project Safety Performance Detailed Report

Urban and Suburban Arterials

Project Description SCAC
Date 2/4/2025
Analysis Year 2050
Analysis Type Predicted Only (No Crash Data Analysis)
Facility Type(s) Rural Two-Lane Roads, and Urban/Suburban Arterials

Urban and Suburban Arterials: Segments

Segment Name	*PennDOT Segment*	*PennDOT Offset*	*Total Predicted Crashes*	*Total Observed Crashes*	*Total Expected Crashes*	*Potential for Safety Improvement*
Segment 1	600	500	2.00	N/A	--	--

SR 0322 (2050 Build South Diamond Interchange Alternative)

Output Summary

General Information

Project description:	DEIS South Alternative				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050				
Last year of analysis:	2050				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	33.7	0.3	0.9	4.9	8.7	18.8
Estimated average crash freq. during Study Period, crashes/yr:	33.7	0.3	0.9	4.9	8.7	18.8

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	10	28.1	0.3	0.8	4.3	6.6	16.0
Ramp segments, crashes:	4	1.0	0.0	0.0	0.2	0.2	0.5
Crossroad ramp terminals, crashes:	2	4.7	0.0	0.1	0.4	1.9	2.3

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2050	33.7	0.3	0.9	4.9	8.7	18.8
	2051						
	2052						
	2053						
	2054						
	2055						
	2056						
	2057						
	2058						
	2059						
	2060						
	2061						
	2062						
	2063						
	2064						
	2065						
	2066						
	2067						
	2068						
	2069						
	2070						
	2071						
	2072						
	2073						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.1	0.0	0.0	0.0	0.0	0.0
	Right-angle crashes:	1.4	0.0	0.0	0.2	0.6	0.6
	Rear-end crashes:	10.4	0.1	0.4	1.9	3.7	4.2
	Sideswipe crashes:	2.7	0.0	0.1	0.4	0.7	1.5
	Other multiple-vehicle crashes:	0.4	0.0	0.0	0.1	0.1	0.2
	Total multiple-vehicle crashes:	14.9	0.2	0.5	2.6	5.2	6.5
Single vehicle	Crashes with animal:	0.3	0.0	0.0	0.0	0.0	0.3
	Crashes with fixed object:	13.6	0.1	0.3	1.7	2.6	8.9
	Crashes with other object:	2.0	0.0	0.0	0.1	0.2	1.6
	Crashes with parked vehicle:	0.3	0.0	0.0	0.0	0.1	0.2
	Other single-vehicle crashes	2.7	0.0	0.1	0.5	0.8	1.3
	Total single-vehicle crashes:	18.8	0.2	0.4	2.3	3.6	12.3
	Total crashes:	33.7	0.3	0.9	4.9	8.7	18.8

Evaluation Site Summary

General Information

Project description:	DEIS South Alternative				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050	Total length of freeway segments for Study Period (mi):		8.196	
Last year of analysis:	2050				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	4	0.260	10000
2	4	0.436	10600
3	4	0.682	12900
4	4	0.966	16500
5	4	0.985	21600
6	4	1.049	26800
7	4	0.958	32340
8	4	1.042	37400
9	4	0.871	42900
10	4	0.947	47500
11	0	0.000	52500
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description	Number	Study Period Description
1	WB Off	21	0
2	EB On	22	0
3	WB On	23	0
4	EB Off	24	0
5	0	25	0
6	0	26	0
7	0	27	0
8	0	28	0
9	0	29	0
10	0	30	0
11	0	31	0
12	0	32	0
13	0	33	0
14	0	34	0
15	0	35	0
16	0	36	0
17	0	37	0
18	0	38	0
19	0	39	0
20	0	40	0

Crossroad Ramp Terminals

Number	Config.	Control	Study Period Description
1	D4	Signal	EB-Off/On
2	D4	Signal	WB-Off/On
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0

SR 0322 (2050 Build South SPUI Alternative)

Output Summary

General Information

Project description:	DEIS South Alternative				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050				
Last year of analysis:	2050				

Crash Data Description

Freeway segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp segments	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	
Ramp terminals	Segment crash data available?	No	First year of crash data:	
	Project-level crash data available?	No	Last year of crash data:	

Estimated Crash Statistics

Crashes for Entire Facility	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during Study Period, crashes:	29.1	0.3	0.9	4.5	6.8	16.5
Estimated average crash freq. during Study Period, crashes/yr:	29.1	0.3	0.9	4.5	6.8	16.5

Crashes by Facility Component	**Nbr. Sites**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Freeway segments, crashes:	10	28.1	0.3	0.8	4.3	6.6	16.0
Ramp segments, crashes:	4	1.0	0.0	0.0	0.2	0.2	0.5
Crossroad ramp terminals, crashes:	0	0.0	0.0	0.0	0.0	0.0	0.0

Crashes for Entire Facility by Year	**Year**	**Total**	**K**	**A**	**B**	**C**	**PDO**
Estimated number of crashes during the Study Period, crashes:	2050	29.1	0.3	0.9	4.5	6.8	16.5
	2051						
	2052						
	2053						
	2054						
	2055						
	2056						
	2057						
	2058						
	2059						
	2060						
	2061						
	2062						
	2063						
	2064						
	2065						
	2066						
	2067						
	2068						
	2069						
	2070						
	2071						
	2072						
	2073						

Distribution of Crashes for Entire Facility

Crash Type	**Crash Type Category**	**Estimated Number of Crashes During the Study Period**					
		Total	**K**	**A**	**B**	**C**	**PDO**
Multiple vehicle	Head-on crashes:	0.1	0.0	0.0	0.0	0.0	0.0
	Right-angle crashes:	0.3	0.0	0.0	0.1	0.1	0.1
	Rear-end crashes:	7.6	0.1	0.3	1.7	2.5	3.0
	Sideswipe crashes:	2.3	0.0	0.1	0.4	0.6	1.1
	Other multiple-vehicle crashes:	0.3	0.0	0.0	0.1	0.1	0.1
	Total multiple-vehicle crashes:	10.5	0.2	0.4	2.2	3.4	4.3
Single vehicle	Crashes with animal:	0.3	0.0	0.0	0.0	0.0	0.3
	Crashes with fixed object:	13.4	0.1	0.3	1.7	2.5	8.8
	Crashes with other object:	2.0	0.0	0.0	0.1	0.2	1.6
	Crashes with parked vehicle:	0.3	0.0	0.0	0.0	0.1	0.2
	Other single-vehicle crashes	2.6	0.0	0.1	0.5	0.7	1.3
	Total single-vehicle crashes:	18.6	0.2	0.4	2.3	3.5	12.2
	Total crashes:	29.1	0.3	0.9	4.5	6.8	16.5

Evaluation Site Summary

General Information

Project description:	DEIS South Alternative				
Analyst:	JMT (NTS/HAK)	Date:	2/4/2025	Area type:	Urban
First year of analysis:	2050	Total length of freeway segments for Study Period (mi):		8.196	
Last year of analysis:	2050				

Site Description

Freeway Segments

Number	Lanes	Study Period Length (mi)	Study Period Description
1	4	0.260	10000
2	4	0.436	10600
3	4	0.682	12900
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6	4	1.049	26800
7	4	0.958	32340
8	4	1.042	37400
9	4	0.871	42900
10	4	0.947	47500
11	0	0.000	52500
12	0	0.000	0
13	0	0.000	0
14	0	0.000	0
15	0	0.000	0
16	0	0.000	0
17	0	0.000	0
18	0	0.000	0
19	0	0.000	0
20	0	0.000	0

Ramp Segments

Number	Study Period Description	Number	Study Period Description
1	WB Off	21	0
2	EB On	22	0
3	WB On	23	0
4	EB Off	24	0
5	0	25	0
6	0	26	0
7	0	27	0
8	0	28	0
9	0	29	0
10	0	30	0
11	0	31	0
12	0	32	0
13	0	33	0
14	0	34	0
15	0	35	0
16	0	36	0
17	0	37	0
18	0	38	0
19	0	39	0
20	0	40	0

Crossroad Ramp Terminals

Number	Config.	Control	Study Period Description
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0